Mutual Fund Flows and Capital Supply in Municipal Financing*

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Abstract

We show causal effects of capital supply from mutual funds on municipal financing. We employ a novel identification strategy based on Morningstar star rating introductions to isolate the supply-side effects that are orthogonal to both fund and bond issuer fundamentals. The results using both this instrument and existing approaches in the literature show that higher flows into municipal bond funds lead to more municipal bond issuance and larger issues on more favorable terms. Relationships among funds, issuers, and underwriters matter for how capital is allocated, as capital follows previous primary market interactions. Municipal issuers take advantage of favorable shocks to capital supply by opting for issues with less potential for delay and with lower transaction costs, such as non-general-obligation and non-green bonds.

JEL classification: G23, G32, H74

Keywords: Municipal bonds, Capital Supply, Bond Funds, Fund flows

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1. Introduction

Bond mutual funds are an important source of capital in the municipal bond market. Figure 1 shows that mutual funds account for 26.5% of the entire municipal bond holdings in the U.S. as of the third quarter of 2020, making them the largest non-household group of municipal bondholders. Yet, despite the importance of municipal bond markets in infrastructure building and maintenance, financing public services and local government expenditures, the literature has largely ignored the role that bond funds play as a capital supplier in the municipal bond market. In this paper, we provide the first causal evidence that capital flows from bond funds have a significant impact on municipal bond issuance decisions, and that this impact is mediated through existing fund-underwriter-issuer relationships.

FIGURE 1 HERE

It is *a priori* not clear how much and through which mechanisms fund flows should impact municipal financing. On the one hand, municipal financing is largely achieved through bond issuance as opposed to lending from banks.[1] As the second largest holders of municipal bonds after households, more supply of capital to funds should lead to more debt issuance. On the other hand, demand-side frictions (e.g., institutional or local political constraints) could lead to a sluggish response and a small-measured elasticity of issuance to flows.

It is also unclear whether fund-underwriter-issuer relationships should matter in this setting. Despite being a public market, and thus in principle having the properties of arm's length lending, the municipal bond market is also highly fragmented. Small regional borrowers looking for financing rely on their underwriters who also have on-going relationships with mutual funds.[2] On the mutual fund side, funds are likely to value relationships with underwriters that allow them to obtain the desired allocations

[1] Ivanov and Zimmermann (2021) estimate the size of the municipal bank loan market to be around $200 billion as of the third quarter of 2020, which only accounts for just over 5% of the total amount outstanding of the municipal bonds at over $3.9 trillion.

[2] Municipal bonds of relatively small issuers (e.g., local municipalities) are typically sold through negotiated sales, in which issuers sell bonds through their relationship underwriters. Large muni issuers (e.g., states) often issue through competitive sales, in which issuers take bids from multiple underwriters.

in initial offerings of bonds,[3] and also need to trade with these institutions later when they function as dealers in the secondary markets.[4] These factors suggest that capital flows from funds to municipal issuers are likely to operate through fund-underwriter-issuer relationships, a unique economic channel in the municipal bond markets that is distinct from the feedback channel that works through observable market prices.[5]

In this paper, we document a statistically and economically strong association between fund flows and both the likelihood and size of individual issuance. We use a sample of 20,502 municipal issuers held by one or more of 3,312 share classes of 1,010 U.S. municipal bond funds between 2000 and 2020. A simple regression of fund flows on issuance suggests that a one-standard-deviation increase in fund flows is associated with a 0.55% increase in the likelihood of new issuance by the issuers already in a fund's portfolio, and with a 1.4% increase in the issuance amount. However, a key identification challenge is that this association could be driven by both a supply-side effect, i.e., greater availability of capital leading to issuance, as well as the demand-side effect by which some municipalities may be more attractive (and thus drive fund flows) and more likely to issue new bonds because of local growth opportunities.

We employ a new identification approach to tease out the supply-side effect of bond investor flows using mechanical and predictable changes in Morningstar overall star ratings. Morningstar publishes overall star ratings from 1 to 5 stars, calculated as the weighted averages of 3-, 5-, and 10-year star ratings, which in turn are constructed using the within-category rankings of each share class based on its risk-adjusted return over the said time horizon (Morningstar, 2021). Crucially, the way in which overall star ratings are calculated changes depending on the age of the fund. When a fund is between 3 and 5 years

[3] Prior studies in corporate bonds document favoritism in bond offerings (e.g., Nikolova, Wang, and Wu, 2020), with underwriters offering greater portion to their relationship investors at discount (e.g., Cai, Helwege, and Warga, 2007).
[4] The lack of market liquidity of municipal bonds also adds to the importance of relationships in this market (Harris and Piwowar, 2006; Green, Li, and Schürhoff, 2007; Schwert, 2017). Lenders, or asset managers in the municipal bond market, will need to contact dealers for secondary market transactions, who also tend to be the underwriters in the primary market.
[5] Edmans, Goldstein, and Jiang (2012) and Khan, Kogan, and Serafeim (2012), for example, show that noise in prices induced by fund fire sales and purchases affects corporate financing. In municipal bonds, this feedback effect of market prices is almost non-existent as municipal bonds trade typically only a few times per year (see, e.g., Schwert, 2017).

old, the 5-year star rating is unavailable, and the overall star rating is the same as the 3-year star rating. However, upon a fund reaching the age of 5 years, Morningstar begins to calculate the 5-year risk-adjusted return and the resulting 5-year star rating. The 3- and 5-year star ratings are then averaged with a 40% and 60% weight, respectively, and rounded to the nearest integer to form a new overall star rating. Thus, depending on a fund's risk-adjusted performance between 3 and 5 years from the time of calculation, a fund's overall star rating may jump up or down despite very little change in its recent performance (and generally with no change in the 3-year rating). Importantly, this information is already several years old, and yet overall star ratings are a salient feature of funds that investors respond to. By examining 5-year-old funds' risk-adjusted performance between 3 and 5 years ago, and by identifying investor flows that are plausibly orthogonal to the underlying fundamentals and capital demand, we can bypass identification concerns relating to unobserved portfolio fundamentals simultaneously driving issuer-level outcomes, returns, and fund flows.

We first examine whether a fund's risk-adjusted performance between 3 and 5 years ago affects the likelihood of its overall Morningstar rating upgrade at the 5-year mark. To this end, we calculate 5-year-old funds' Morningstar risk-adjusted returns (MRARs) between [-59, -36] months and calculate their percentile ranking within their Morningstar category peers, in a manner identical to how Morningstar calculates the overall star rating. We find that this MRAR [-59, -36] percentile is a significant driver of whether a fund is upgraded at the 5-year mark. In terms of economic magnitude, a 5-year-old fund moving from the 50th to 75th percentile of MRAR [-59, 36] has a 11-percentage-point higher likelihood of being upgraded. We further confirm these upgrades of 5-year-old funds to be largely tangential to recent performance. However, using this MRAR [-59, -36] percentile as an instrument, we find that these overall rating upgrades at the 5-year mark nevertheless elicit strong investor flow response. The upgraded 5-year-old funds receive extra inflows of 59.4% compared to non-upgraded 5-year-old counterparts over the first 12 months following the upgrade, with strong statistical significance. We thus document strong investor response to an overall star rating change that is largely tangential to recent fund performance.

We then proceed to examine whether the plausibly exogenous investor inflows into these funds affect the issuance decisions of the issuers they hold. Using the MRAR [-59, -36] percentile, i.e., a fund's risk-adjusted performance between 3 and 5 years ago, as a continuous treatment variable in a difference-in-difference setting, we fund that an improvement in the mutual fund bondholders' risk-adjusted performance ranking from the 50^{th} to 75^{th} percentile increases the likelihood of new issuance during the ensuing quarter by 0.5%, with a 10.2% larger issuance amount. These results suggest that an exogenously driven investor inflow into mutual funds appears to drive greater issuance in the primary market.

Though supposedly arms-length, the previous relationships between the fund, the issuer, and the underwriter play an important role in the municipal bond market. Chen, Cohen, and Liu (2021) note that the relationship between the issuer and the underwriter is sticky, with 87% of an issuer's bonds issued through the same underwriter. Schultz (2012) further finds that the market for municipal bond underwriting is fragmented, with the underwriters highly dependent on their established set of clients for potential issuances. We thus define a mutual fund an issuer to be in a previous relationship when the fund has participated in previous bond offerings underwritten by the lead underwriter *and* the issuer has a previous relationship with the same lead underwriter. We then interact our difference-in-difference terms with an indicator variable denoting whether the mutual fund shares a previous relationship with the issuer and re-estimate the baseline issuance regressions. In both issuance likelihood and amount regressions, we find that the strong link between exogenous investor inflows and the likelihood of new issuance exists *only* when the mutual fund and the issuer share a previous relationship.

In addition to the issuance regressions, we explore further into the role of previous relationship by examining whether the mutual fund participates in the new issuance of a given issuer. To this end, we employ a strategy similar in spirit to Khwaja and Mian (2008), whereby we exploit within-issuer-quarter variation in fund-level shocks. Given that multiple funds participate in the bond issuance of a single borrower, this allows us to control for unobservable time-varying factors driving the demand-side effect and gives us the opportunity to cleanly measure how fund-level shocks affect the decision to participate

in a new issue. Once again, we find that a fund is more likely to participate in the new issuances in response to favorable capital inflows only when it already shares a previous relationship with the issuer in question. The evidence suggests that relationships matter strongly for the allocation of capital following supply-side shocks in the municipal bond market.

In addition to the likelihood and amount of new issuance, we examine whether the issuers are able to enjoy a reduction in the financing cost when mutual fund bondholders receive investor inflows. We find that issuers are able to issue at a lower offering yield when investors commit more capital into mutual funds, particularly with whom they have previous relationship. In terms of baseline economic magnitude, an increase in the MRAR [-59, -36] percentile from the 50^{th} to the 75^{th} percentile is associated with a decrease in the offering yield of 11.8 bps, with the coefficient estimate of mutual funds and issuers with a previous relationship three times larger in magnitude than those without. Specifically, our results indicate that issuers are not only able to issue more bonds in greater amounts but do so at a lower cost in response to investor flows into mutual funds with previous relationships.

Having established how fund flows drive municipal bond issuance and how relationships shape this effect, we explore which types of bonds are more likely to be issued in response to favorable capital supply conditions. We first examine whether the link between mutual fund flows and the likelihood and amount of municipal bond issuance is stronger when issuers enter into a negotiated sale with underwriters as opposed to competitive bids. In a non-competitive negotiated sale, the issuer selects a particular underwriter and enters into negotiation before the underwriter approaches its existing pool of potential customer base including mutual funds. In contrast, in competitive auction bids, bonds are advertised for sale and any broker dealer can bid for the bond. Thus, the intricacies of the existing relationship between the issuer, underwriter, and mutual fund are more likely to manifest themselves in negotiated sales. Our empirical analysis confirms that the economic significance of the identification term is generally larger when bonds are issued through negotiated sales.

We then proceed to check whether issuers are more likely to issue general obligation (GO) or non-GO (i.e., revenue bond) issuance. Given that GO bonds require voter approval, which takes more time to organize, and with a greater degree of uncertainty surrounding its passage (Cellini, Ferreira, and Rothstein, 2010), we expect issuers to utilize more non-GO issuances that carry markedly lower transaction costs. In particular, the difference in transaction cost is likely to be particularly sizeable in states with steeper political hurdle for GO issuances, such as those that require a supermajority approval for GO issuance at the bond elections. Consistent with this hypothesis, we find that the magnitude of the response, as well as the statistical significance of the effects, are markedly stronger among issuances involving non-GO bonds only, particularly in states with more political obstacles to GO bond issuance.

We also examine whether the issuers are more likely to engage in net new issuance or refinancing of existing issues in response to an inflow of capital into their mutual fund bondholders. On the one municipal issuers may take advantage of temporarily favorable capital supply conditions to refinance early and better manage their maturity profile, akin to their corporate counterparts (Xu, 2018; Mian and Santos, 2018). On the other hand, they may use the proceeds for new projects that they may have otherwise found it unable to finance. We find that investor inflows into mutual funds are primarily associated with new issuances. In addition to the source of repayment and capital purpose, we further examine whether the influx of capital finances certain specific uses such as green bond issuances. We find little evidence that the issuers use the proceeds to finance green bond issuances, which often require lengthy and time-consuming third-party verifications.

We contribute to the literature in several directions. First, we extend the growing literature on the real effects of municipal financing, and how shocks to the informational environment, including changes in ratings, affect pricing, issuance and local outcomes (e.g., Adelino, Cunha, and Ferreira, 2017; Cornaggia, Cornaggia, and Israelsen, 2018). Gao, Lee, and Murphy (2020) consider the effects on yields of newspaper closures and the consequent reduction in local information production and government oversight. Painter (2020) measures the response of prices to the effects of climate change. Several recent papers

have investigated the effects of taxes on the municipal bond market (see, e.g., Garrett, Ordin, Roberts, and Suárez Serrato, 2017, and Babina, Jotikasthira, Lundblad, and Ramadorai, 2021). Whereas most existing studies focus on issuer-specific or overall market conditions and their effects on the likelihood of issuance and/or borrowing cost, we contribute to the literature by highlighting the existence of a strong supply-side effect in this highly fragmented market. This supply-side effect is particularly economically meaningful given the large presence of mutual funds as bondholders in the municipal bond market.

Second, we also contribute to the literature on relationship lending and the role of nonbank financial intermediaries in more general. Whereas the important role of relationship lending has been well documented in the banking literature,[7] the important role of underwriters in bringing together suppliers and demanders of investor capital in an arms-length public market for municipal bonds has yet to be examined. A related study by Zhu (2021) examines the cross-sectional association between investor flows and corporate bond issuances, but we focus on a market where the nature of market segmentation and the issuers' reliance on their existing underwriters is orders of magnitudes more severe. Furthermore, we show the causal relationship between fund flows and municipal bond issuance using a set of identification strategies that are new to the literature. Garrett (2021) focuses on underwriter conflicts of interest and shows that a reduction in potential agency costs leads to lower financing costs for municipalities.

Third, we contribute to the growing body of studies that focus the supply side effect of capital. Lemmon and Roberts (2010) and Erel, Julio, Kim, and Weisbach (2012), for example, examine how firms choose debt financing in response to changes in capital supply conditions. Chernenko and Sunderam (2012) show that frictions in capital supply driven by credit ratings affect corporate bond financing. Ma (2019) and Ben-Rephael, Choi, and Goldstein (2021) document market timing in the corporate bond market driven by cross-sectional and aggregate fund flows. While most of these studies examine the

[7] Studies on relationship banking include but are not limited to Rajan (1992), Petersen and Rajan (1994), Berger and Udell (1995), Puri, Rocholl, and Steffen (2011), Jiménez, Ongena, Peydró, and Saurina (2012), Iyer, Peydró, da-Rocha-Lopes, and Schoar (2014), Bolton, Freixas, Gambacorta, and Mistrulli (2016), and Beck, Degryse, Haas, and van Horen (2018).

supply side effect in corporate bond markets, ours is the first to provide evidence showing the causal effect of capital supply in municipal financing.

Lastly, our empirical strategy also contributes to the large literature examining the effect of mutual fund flows on corporate decisions, beginning with Edmans, Goldstein, and Jiang (2012) and Khan, Kogan, and Serafeim (2012),[8] showing evidence for the feedback channel of market prices. While Wardlaw (2020) calls into question the validity of using flow-driven measure of mispricing, we present two Morningstar-based identification settings that enable us to tease out a plausibly exogenous component of mutual fund flows, particularly the investor response to a change in the overall star rating stemming from a mechanical change in the rating methodology when a fund reaches the age of 5 years. This identification bypasses the concerns raised in the literature and allows us to discern the causal effects of supply-side shocks to capital availability.

2. Data and variable construction

In our empirical analysis, we combine data on municipal issuers and their bond issuance from the Bloomberg and the FTSE Russell Mergent Municipal Bond databases with fund holdings and characteristics from the CRSP Survivor-Bias-Free U.S. Mutual Fund database and the Morningstar databases. In the ensuing subsections, we outline how our main variables of interest are constructed from these datasets.

2.1. Issuer characteristics

We begin with the sample of municipal bond issues covered in the Bloomberg and the FTSE Russell Mergent Municipal Bond databases. Bloomberg issuance data contains a swath of information on the issuer, including sector, state, assets and liabilities, and other municipal operating variables. It further

[8] Other papers using this fund flow price pressure measure include, but are not limited to, Derrien, Kecskes, and Thesmar (2013), Phillips and Zhdanov (2013), Norli, Ostergaard, and Schindele (2015), Lee and So (2017), Bonaime, Gulen, and Ion (2018), Eckbo, Makaew, and Thorburn (2018), Agarwal and Zhao (2019), Dessaint, Foucault, Fresard, and Matray (2019), Choi, Hoseinzade, Shin, and Tehranian (2020), and Dessaint, Olivier, Otto, and Thesmar (2021).

contains the Federal Information Processing System (FIPS) code to identify the issuer's county. We use this to match the county-level macroeconomic data of the issuing entity, such as population and personal income per capita, taken from the Bureau of Economic Analysis (BEA), and unemployment rate from the Bureau of Labor Statistics (BLS).

We then supplement this information with the municipal bond issuance information in the FTSE Russell Mergent Municipal Bond data. The dataset contains detailed information on municipal bond issuance dating all the way back to 1970s, including the issuance amount, coupon, maturity, option features, underwriter, and historical and current credit ratings. The dataset further provides information on capital purpose (new money vs. refunding), source of repayment (general obligation, revenue bond, public improvement bonds, etc.), and the use of proceeds (e.g., healthcare, education, and public services) associated with each issuance, as well as the information on the bond's credit enhancements. When the two datasets are combined, we obtain rich information at both the issuer as well as individual issuances.

2.2. Fund characteristics

We begin with all surviving and discontinued fixed income funds in the CRSP Survivor-Bias-Free Mutual Fund database with the first two letters of the CRSP objective code "IU," which denotes municipal bond funds. We use the dataset to collect and construct fund returns, flows, total net assets (TNA), expense ratios, and fund age (described in detail in the Appendix). We separately collect information on all funds that are flagged as municipal bond funds in the Morningstar database. In addition to the Morningstar category of each share class, we further collect its 3-, 5-, and 10-year as well as the overall star ratings at each month-end. We further collect the information on Morningstar risk-adjusted return (MRAR), the variable used by Morningstar to compute the ranking of each share class within its category (and consequently the star rating for each horizon).

We follow the methodology outlined in Berk and van Binsbergen (2015) and Pástor, Stambaugh, and Taylor (2015) to match each share class in the CRSP database (*crsp_fundno*) with the Morningstar

share class identifier (*secid*) using CUSIP identifiers. We then restrict out attention to all funds that are flagged as municipal bond funds by both the CRSP and the Morningstar databases. Wherever necessary, we aggregate the share class-level data at the fund level using the previous month-end TNA of each share class as the weights.[9] Finally, to align the frequency of fund characteristics and holdings information, we convert monthly data into quarterly frequency.

2.3. Fund holdings information

We use both the Morningstar and the CRSP databases to identify a fund's holding information. Both databases contain the holdings information at either monthly or quarterly level for our sample funds. We run our analysis at the quarterly level due to better overall coverage and to avoid interpolation within quarters (we convert the holdings information of any fund reporting at a monthly frequency into quarterly frequency). Our sample of Morningstar holdings end in April 2015, but we supplement the information with the holdings information from CRSP up to September 2020.[10]

Once we augment the holdings dataset with fund characteristics from CRSP and Morningstar, as well as the issuer and issuance characteristics from Bloomberg and FTSE Russell Mergent Municipal, we can identify all issuer-fund holding combinations in a given quarter. This then allows us to form regression samples at different observation levels: First, we construct an issuer-fund-quarter dataset for all issuers held at least once by a municipal bond fund, with each issuer-fund pair as the unit of cross-sectional observation. Second, using this sample, we also construct an analogous sample at the issuer-quarter level, with fund-level information of mutual fund bondholders (such as quarterly flows and returns) aggregated at the issuer level using the previous quarter-end holding share of each fund as a fraction of the issuer's total amount outstanding as the weight. Finally, we also construct an issuer-share

[9] For fund-level TNA, we sum the TNAs of all share classes, while we take the maximum age of all share classes to compute the age of a fund.

[10] Whenever we have Morningstar holdings available for a fund at a given quarter, we elect to utilize this information first, and we use the CRSP holdings information whenever Morningstar holdings data is unavailable. The two datasets provide very similar information whenever we observe funds and quarters in the two datasets.

class-quarter sample in an analogous manner. Even though the portfolio holding is determined at the fund and not at the share class level, our identification strategy utilizes variation in flows emanating from shocks at individual share class level, which necessitates regressions at the issuer-share class-quarter level. All continuous variables are winsorized at the 1% and the 99% levels. Our final sample consists of 20,502 issuers and 3,312 share classes of 1,010 funds between the first quarter of 2000 and the third quarter of 2020, which amounts to 4,552,023 observations at the issuer-fund-quarter level, or 788,477 observations at the issuer-quarter level.

2.4. Summary statistics

Table 1 Panel A presents the summary statistics of issuer characteristics computed at the issuer-quarter level. We find that, on average, issuers issue a new bond on around 14.2% of the quarters during our sample period (or about once every 21 months). The average amount of new issuance is around $58.3 million, with the inter-quartile range of over $54 million, indicating a substantial variation in issuance amounts. New issues on average amount to 20.8% of the issuer's total bonds outstanding. We find that issuers hold substantial leverage, with liabilities amounting to 51.4% of their total assets. There is, however, a large variation in the degree of leverage, with a standard deviation of 65.0%.

TABLE 1 HERE

Panel B summarizes the characteristics of our sample of municipal bond funds at the fund-quarter level, with positive average quarterly fund flows and returns observed during our sample period. On average, our sample funds hold 191 bonds from 95 different issuers in their portfolio. For an average issuer, 48.5% of its outstanding bonds is held by funds (conditional on funds holding any of its bonds). Funds hold, on average, 30.1% of the outstanding bonds of a given issuer. We also note a considerable variation in the total percentage holdings by municipal bond funds, which has a standard deviation of 49.0%; in fact, for a quarter of our issuer-quarter observations, more than two-thirds, or 67.6% to be exact, of the issuer's outstanding bonds are held by our sample funds. This suggests that investor flows

into and out of municipal bond funds are, in turn, likely to elicit a nontrivial response on the part of the issuers that they hold.

Finally, in Panel C, we present summary statistics on municipal bond issues by state. In total, we record over 1.92 million bond issuances, with California, Texas, and New York accounting for 12.9%, 9.7%, and 7.2% of total issuances, respectively. California and New York also account for 17.8% and 17.0% of all 7,708 green bond issuances. We observe more new filing issuances (where the proceeds from the issuance is new money, as reported in Mergent Municipal) compared to refunding (where some outstanding bonds are replaced with new bonds) issuances on average, with the former accounting for 55.0% of issuances. However, there is substantial variation at the state level; whereas the share of new filings is close to 70% in New Mexico and Mississippi, they account for only 44.3% of issuances in Pennsylvania. Revenue bond issuances (27.8% of total issuances) are slightly more common compared to general obligation issuances (22.2%), but once again, there is a great deal of heterogeneity between the states. For example, in Texas, the proportions of general obligation and revenue bond issuances are 36.3% and 16.8%, respectively, but at the other end of the spectrum in Florida, we find the corresponding figures to be 2.1% and 43.8%, respectively. We thus find general obligation issuances to be prevalent in some states while revenue bonds to be dominant means of issuances in others.

3. Fund flow and municipal bond issuance

In this section, we first engage in our identification strategy using Morningstar ratings to establish the causal relationship between fund flow and municipal bond issuance. We further examine the role of the previous relationship between the issuer, the fund, and the underwriter to trace out how capital flows to bond issuers. In addition to the likelihood and quantity of new issuance, we explore whether plausibly exogenous flows into mutual fund bondholders also improve the prices at which issuers borrow.

3.1. Morningstar star ratings

In an empirical setting examining the relationship between fund flow and the likelihood of new issuances by issuers they hold, omitted variables are a concern. Flows are not randomly determined and can be driven by past returns and other unobservable fund and issuer fundamentals that may be associated with municipalities' decisions to issuer more bonds. Thus, it is important to identify shocks to mutual fund flows that are likely to be unrelated to the fundamentals.[12]

To this end, we turn to Morningstar overall star ratings for identification purposes. Morningstar publishes discrete overall star ratings from 1 to 5 stars for each fund share class every month. The star ratings are calculated as follows. First, at each month-end, 3-, 5-, and 10-year risk-adjusted returns (i.e., MRAR) are calculated. Specifically, MRAR is defined as

$$MRAR_{i,t}(T) = \left[\frac{1}{T}\sum_{j=0}^{T-1}\left(1 + ER_{i,t-j}\right)^{-2}\right]^{-\frac{12}{2}} - 1, \quad (1)$$

where $ER_{i,t}$ is the excess return of share class *i* in month *t*, and T is either 36, 60, or 120 months. Then, using the MRAR over each time horizon T, Morningstar ranks all share classes within a Morningstar category. The top 10% are assigned 5 stars, the next 22.5% 4 stars, the next 35% 3 stars, the next 22.5% 2 stars, and the bottom 10% 1 star, respectively. This procedure yields the 3-year star rating for all share classes aged 3 years or older, 5-year star rating for those aged 5 years or older, and similarly for the 10-year star rating.

Morningstar then produces a rounded weighted average of the star ratings over different horizons to arrive at its final overall star rating. Share classes younger than 3 years are not rated. For share classes between 3 years and 4 years and 11 months old, the overall star rating is simply the 3-year star rating. For share classes between 5 years and 9 years and 11 months old, Morningstar assigns a 60% weight to the 5-year rating and a 40% weight to the 3-year rating, then takes the nearest integer. So, if a share class has a 5-year rating or 3 stars and a 3-year rating of 5 stars, the overall star rating is the nearest integer to

[12] One exception to the literature is Zhu (2021), who uses Bill Gross' largely unexpected departure from PIMCO in September 2014 as a quasi-exogenous shock to corporate bond fund flows. However, notwithstanding the fact that this represents a single shock in time, this shock is less suitable for our research question because PIMCO's market share in the municipal bond fund market was only 0.4% in June 2014, well below their 16.5% share in the corporate and general bond fund market.

$0.6 \times 3 + 0.4 \times 5 = 3.8$, i.e., 4 stars. Finally, for share classes older than 10 years, 50% weight is placed on the 10-year rating, with the remaining 30% and 20% weights on the 5- and 3-year ratings, respectively. We refer to this rounded integer star rating as "overall star rating."

3.2. Identification strategy

As our main identification strategy, we exploit the timing of the methodology for the calculation the overall rating. Crucially, when a share class reaches the age of 5 years, 5-year star rating becomes available and both the 3- and 5-year star ratings start to be utilized to construct the overall star rating, as opposed to just the 3-year star rating. It is important to point out that any difference between the 3- and 5-year star ratings stems from the share class's risk-adjusted performance between 3 and 5 years ago and is thus *unrelated* to a fund's recent performance. Yet, despite little change in recent underlying performance, a share class could mechanically be upgraded to a higher rating due to the inclusion of the newly available 5-year rating for a particular fund, not least because a majority of the weight is placed on the new 5-year star rating.

To capture this effect, we first calculate the percentile ranking of a share class's MRAR between [-59, -36] months within its Morningstar category at each month-end.[13] In doing so, we calculate the measure of a share class's risk-adjusted performance between [-59, 36] months in a manner directly comparable to Morningstar's methodology for star rating calculation. We then identify all share classes reaching their 5-year mark during our sample period, whose new overall star rating either experiences an upgrade or remains the same at the 5-year mark. Our key variable of interest for these share classes is the MRAR [-59, 36] percentile computed above, which can have a sizable impact on the likelihood of whether a share class becomes upgraded at the 5-year mark due to a change in the rating methodology.

The rationale behind this identification strategy is that investors should not react to an upgrade of the overall rating that is based on stale (more than 3 years old) information. However, due to the

[13] We calculate the MRAR ranking for all share classes within a Morningstar category with a continuous history of monthly returns between [-59, -36] months.

change in the rating methodology at the 5-year mark, the stale risk-adjusted performance can significantly affect the likelihood of an upgrade in the overall star rating for these 5-year-old share classes. If investors pay particular attention to the overall rating, perhaps because of inattention, or even due to institutional or organizational frictions that make it optimal to follow this particular measure, share classes with no difference in recent performance would nevertheless receive a disproportionate share of flows depending on which side of the star rating boundary they fall into.[14]

3.3. Morningstar rating and fund flows

We first check whether the MRAR [-59, 36] percentile has a significant impact on the likelihood of overall rating upgrade among share classes that turn 5 years old, and whether investor flows respond to such stale-information-driven rating upgrades. To this end, we perform a set of two-stage least squares for a sample of 5-year-old share classes that are either upgraded or remain at their previous ratings at the 5-year mark. Specifically, we use the MRAR [-59, -36] percentile as an instrument for upgrade indicator, which takes the value of one if the share class is upgraded at the 5-year mark and zero if it remains at its previous rating at the 5-year mark. We then examine whether the instrumented upgrade indicator has an impact on investor flows for horizons of [1, 3], [1, 6], and [1, 12] months following the 5-year mark. In addition to the MRAR [-59, -36] percentile, we use recent fund return, specifically fund return between [-2, 0] months of the 5-year mark, to control for recent fund performance. This enables us to examine whether stale risk-adjusted performance between 3 and 5 years ago affects the likelihood of rating upgrade at the 5-year mark even after controlling for recent performance. We further include year-quarter fixed effect. Table 2 presents our results.

TABLE 2 AND FIGURE 2 HERE

[14] Our paper is thus related to papers in the previous literature that emphasize the importance of the overall Morningstar rating for fund investors, including Del Guercio and Tkac (2008), Ben-David, Li, Rossi, and Song (2021), Evans and Sun (2021) and Reuter and Zitzewitz (2021). On a related front, Hartzmark and Sussman (2019) find a sizeable difference in investor flows on the basis of Morningstar sustainability star ratings.

Column (1) indicates that MRAR [-59, -36] percentile significantly affects the likelihood of a share class being upgraded at the 5-year mark, with a *t*-statistic of 6.6. In terms of economic magnitude, a share class moving from 50th to 75th percentile of the risk-adjusted performance between 3 and 5 years ago has a 0.25×0.441=0.11, or 11 percentage point higher likelihood of being upgraded at the 5-year mark. Even though this stale risk-adjusted measure is at least three years old, it has a strong impact on the likelihood of 5-year-old share class's upgrade due to the aforementioned change in rating methodology. In fact, as further revealed in columns (5) and (6), neither the MRAR [-2, 0] percentile nor the 3-month return between [-2, 0], i.e., two measures of recent fund performance, has a strong relation with the likelihood of overall rating upgrade at the 5-year mark. This is not surprising given that a majority (60%) of rating weight is assigned to a longer-horizon, more backward-looking 5-year rating at the 5-year mark.

Columns (2) through (4) then report our second-stage analysis of investor flows into upgraded classes. For the first three months following the upgrade, we find the coefficient on the instrumented upgrade indicator to be 0.124 with statistical significance at the 5% level, implying that the upgraded 5-year-old share classes receive extra inflows of 12.4% compared to non-upgraded 5-year-old counterparts. We find both the statistical and economic significance to increase as the horizon increases, with the extra 12-month inflow amounting to 59.4% with a *t*-statistic exceeding 3 as revealed in column (4). We thus find the economic magnitude of the investor response following the 5-year-old share class's rating upgrade to be sizable.

In addition to the instrumental variable analysis, Figure 2 Panel A graphically illustrates the dynamics of the difference in investor flows between those that are upgraded at the 5-year mark vs. those that remain at their previous rating. Whereas there is no noticeable pattern in the flow difference between the two groups prior to the 5-year mark, there is an immediate and sizeable increase in investor flows of upgraded classes relative to those that do not from once they reach 5 years and beyond, which remains strong over the next three quarters before eventually subsiding in the fourth quarter. Our analysis in

Table 2 thus documents strong investor flow response to mechanical changes in overall Morningstar ratings that are not driven by recent performance but stemming from a change in rating methodology.

3.4. Morningstar ratings and issuance

Table 2 reveals a strong positive relation between overall Morningstar rating upgrades that occur mechanically at the 5-year mark resulting from methodology change and investor flow response. Using this identification set-up, we now examine whether the investor inflows following changes in Morningstar overall star ratings of 5-year-old share classes affect the issuance decisions of them municipal issuers in our sample. However, because we focus on relatively young share classes to exploit mechanical variations in rating methodology, these share classes tend to be smaller in size. Therefore, it is unlikely that the investor inflows into these share classes would affect all issuers in a meaningful manner, so we focus on share classes that hold a substantial proportion of the outstanding bonds. In Table A.1 in the Appendix we consider various minimum holding weight cut-offs, starting from the absence of a cut-off to a minimum of 5% holding weight of all outstanding bonds during the quarter preceding the share class's 5-year mark. As expected, though the issuance regression results are qualitatively robust regardless of minimum cut-offs. Given the observed patterns, we focus on all issuers that are held with a holding weight of 2.5% or greater during the quarter preceding our sample share class's 5-year mark.

For this subsample of issuer-share class-quarters, we first graphically plot the difference in the likelihood of new issuance between issuers held by share classes upgraded at the 5-year mark and those that remain at their previous rating at the 5-year mark and present the results in Figure 2 Panel B. We find the patterns to be remarkably similar to investor flows plotted in Panel A with a one-quarter lag; issuers held by funds moving to the higher rating category are indeed more likely to issue during the first two quarters following the share class's 5-year mark. This one-quarter delay likely reflects the time and effort required to issue a new municipal bond.

We test this in a regression setting in Table 3. We consider four quarters before and after the 5-year mark as the event window and perform difference-in-difference regressions as follows. We first construct the post 5-year indicator, which takes the value of one for the 5-year-mark quarter and all quarters thereafter and zero otherwise. We then interact this with either (i) MRAR [-59, -36] percentile, namely the share class's risk-adjusted performance between 3 and 5 years ago, imposed constant for each share class throughout the event window, or (ii) upgrade indicator, which takes the value of one for share classes that become upgraded at the 5-year mark and zero otherwise. We further control for overall MRAR of the share class, and we include share class, issuer, and state-by-year-quarter fixed effects. MRAR [-59, -36] percentile here may thus be thought of as a continuous treatment variable for the difference-in-difference analysis. We then consider either the next-quarter new issuance indicator, which takes the value of one if and only if there is municipal bond issuance during the quarter, or log new issuance amount, as the dependent variable. In addition to these difference-in-difference regression analysis, we also present the results of standard OLS regression results of next-quarter new issuance indicator or log new issuance amount on mutual fund bondholders' holding-weighted average flow. Table 3 presents our results.

TABLE 3 HERE

Columns (1) and (2) of Table 3 presents the difference-in-difference regression results using the MRAR [-59, -36] percentile as continuous treatment variable. We find that an increase in the mutual fund bondholders' risk-adjusted performance between 3 and 5 years ago from the 50^{th} to 75^{th} percentile increases the likelihood of new municipal bond issuance during the ensuing quarter by $0.25 \times 0.02 = 0.5\%$, and the issuance amount increases by $0.25 \times 0.408 = 10.2\%$. In both regressions, the interaction term of MRAR [-59, -36] percentile and the post 5-year indicator is statistically significant at the 1% level. In columns (3) and (4), we confirm that the results are qualitatively robust when we use the upgrade indicator as the treatment variable instead. We find that an overall star rating upgrade at a share class's 5-year mark leads to a 1.3% increase in the likelihood of new issuance during the subsequent four quarters when they

hold 2.5% or more of an issuer's outstanding bonds, compared to share classes that remain at their previous overall star rating. As for the issuance amount, we document a 26.6% increase in the issuance amount. Given that our sample issuers, on average, issue $92.90 million in new issuance per quarter, this amounts to an extra issuance of $24.71 million. In both regressions, we obtain statistical significance at the 1% level.[19]

Our identifying regression results are in line with OLS regressions of the new issuance indicator or the log new issuance amount on fund flow in columns (5) and (6), suggesting that the strong empirical link between the likelihood and amount of new issuance and investor flows into mutual fund bondholders ought to be seen as a causal link, whereby an exogenously driven investor inflow into mutual fund bondholders is consistent with an ensuing increased willingness on the part of issuers to issue more new bonds. Put differently, an excess supply of capital into mutual funds in turn appears to be absorbed through greater issuance in the primary market, consistent with significant illiquidity, infrequent trading, and transaction cost in the *secondary* market for municipal bonds (e.g., Harris and Piwowar, 2006; Green, Li, and Schürhoff, 2007; Schwert, 2017), with the average holding-level zero-trading-day ratio of municipal bond funds standing at a staggering 85% (Choi, Kronlund, and Oh, 2021). In a market where secondary market purchases are particularly difficult and costly, as is the case of municipal bonds, we observe a strong relation between capital supply and the likelihood of new bond issuance.[20]

3.5. Fund, issuer, and underwriter relationship

A defining characteristic of the municipal bond market is its fragmented structure. For example, 333,905 municipal bond issuances since 2000 with lead underwriter details available in the FTSE Russell Mergent Municipal database were underwritten by 2,023 lead underwriters. This is more than double the

[19] Given that MRAR [-59, -36] percentile and the upgrade indicator yield qualitatively similar results, we focus on MRAR [-59, -36] percentile as the continuous treatment variable of interest for the remainder of the paper.
[20] Though we conduct regressions at the issuer-share class-quarter level in Table 3, we confirm our issuance identification regression results to be fully robust when we conduct similar regressions at the issuer-quarter level instead, as revealed in Table A.2 in the Appendix.

number of lead underwriters for corporate bonds, which stands at around 1,000 over the same time period. Many municipal underwriters are local banks, with the market characterized by a much lower combined market share of the top 10 investment banks than the market for IPOs or convertible bond issuances (Butler, 2008). As for the secondary market, Li and Schürhoff (2019) note a clear core-periphery structure in the municipal bond market, with 10 to 30 highly interconnected dealers at the center but the other 2,000 at the periphery with very little connection. Further contributing to this market segmentation is the fact that in-state and out-of-state residents are often treated differently in terms of state tax privileges, making risk sharing across different states difficult (Babina, Jotikasthira, Lundblad, and Ramadorai, 2021). Due to this market fragmentation, underwriters are known to rely heavily on their established customers; as Schultz (2012) notes, it is usually the underwriters, not the investors, that makes the first contact, approaching likely investors for new issues. Moreover, as Chen, Cohen, and Liu (2021) note, municipal issuers are slow to change their underwriters, with a municipal issuer issuing, on average, 87% of its bonds with the same underwriter.

In this instance, it would be natural to surmise that the observed patterns in fund flow and the likelihood of new issuances by issuers they hold would be stronger when the fund has prior relationship with the issuer and the underwriter. Put differently, when there are reasons to believe that the mutual fund would be a "natural client" of the issuer's bonds, we would expect fund flows and new issuances to bear a stronger association. We define the fund and the issuer to be in a "previous relationship" with the issuer and the underwriter as follows. Specifically, we require that the issuer has issued a bond with the lead underwriter of the bond as the underwriter over the past twelve quarters *and* the fund holds a nonzero amount of the new issuances underwritten by this lead underwriter over the same time horizon. Using this definition of the previous relationship, we first consider the new issuance indicator and log new issuance amount regressions in the previous subsection. Specifically, we engage in a triple interaction by interacting the MRAR [-59, -36] percentile and the post 5-year indicator variables with two mutually

exclusive indicator variables that take the value of one if the fund and the issuer have (does not have) a previous relationship and zero otherwise. Table 4 Panel A presents our results.

TABLE 4 HERE

Column (1) of Table 4 Panel A indicates that the identifying term, i.e., the interaction of the MRAR [-59, -36] percentile and the post 5-year indicator, is large and statistically significant when the fund, issuer, and the underwriter share a previous relationship. In terms of the economic magnitude, the coefficient estimate is almost three times that of the baseline estimate in Table 3. In contrast, when the fund and the issuer do not share a previous relationship as defined above, not only do we find the identifying term to lose statistical significance, but it also reverses its sign. Thus, the strong causal link between investor flows into mutual fund bondholders and the likelihood and amount of new issuance seems largely confined to funds and issuers that share a previous relationship. Log new issuance amount regressions in Panel A column (2) reveal a similar picture, with the coefficient on the triple interaction of MRAR [-59, -36] percentile, post 5-year indicator, and the previous relationship indicator almost three times that of the baseline estimate.

We then proceed to ask whether funds experiencing favorable inflows as a result of Morningstar rating upgrades at the 5-year mark are in turn more likely to participate in the new issuances of issuers they hold. Specifically, we run regressions of the following form:

$$New\ issuance\ participation\ dummy_{i,t} =$$

$$\beta_0 + \beta_1 MRAR[-59,-36]\ percentile_{i,t} \times Post\ 5year_{i,t} + Fixed\ effects + \varepsilon_{i,t}. \quad (2)$$

Here, the new issuance participation dummy takes the value of one if a fund holds nonzero amount of the issuer's newly issued bond at the end of the quarter. Unlike the new issuance dummy, this new issuance participation dummy varies within issuer and quarter, so we can include issuer-by-quarter fixed effects and examine the likelihood of participation among 5-year-old funds with different risk-adjusted performance between 3 and 5 years ago for a given issuer and quarter, akin to Khwaja and Mian (2005; 2008). This has an additional benefit of removing any time-varying unobserved demand-side

heterogeneity, which strengthens our identification. Like in the bank setting, this limits the analysis to borrowers with multiple relationships.[21] We then consider whether the likelihood of participation in new issuances differ when the fund and the issuer share a previous relationship by interacting the difference-in-difference terms with the two mutual indicator variables denoting the presence of previous relationship or lack thereof.

While the baseline difference-in-difference result in column (1) of Table 4 Panel B is not statistically significant, we find that the triple interaction term of MRAR [-59, -36] percentile, post 5-year indicator, and the previous relationship indicator is highly significant with a *t*-statistic exceeding 5, as revealed in column (2). In contrast, for funds and issuers that do not share a previous relationship, we find the likelihood of participation in new issuances actually falls after the funds with favorable MRAR [-59, -36] percentile turns 5 years old. Our results in Table 4 thus signal the importance of the role of previous interactions between the suppliers and the demanders of capital in this supposedly arms-length but highly fragmented market.

3.6. Morningstar ratings and offering yield

Our analysis hitherto examines the *quantity* effect of capital supply inflows, with regards to the likelihood and amount of new issuance. However, it is also possible that fund flows have a favorable *price* effect on the financing cost of the issuers, enabling them to issue municipal bonds at a lower offering yield. In particular, our earlier analysis on the fund, issuer, and underwriter relationship indicates that this price effect is likely to be more prominent when the fund that experiences favorable capital inflow has a tight-knit previous relationship with the issuer and the underwriter. We examine this possibility using the following difference-in-difference regression set-up around the Morningstar rating methodology change at the 5-year mark:

$$Offering\ yield_{i,t+1} = \beta_0 + \beta_1 MRAR[-59, -36]\ percentile_{i,t} \times Post\ 5year_{i,t}$$

[21] For a discussion of the issue of single-relationship firms see, among many others, Paravisini, Rappoport, and Schnabl (2015), Cahn, Duquerroy, and Mullins (2017), or Degryse, De Jonghe, Jakovljević, Mulier, and Schepens (2018).

$$+Controls + Fixed\ effects + \varepsilon_{i,t}. \quad (3)$$

Offering yield is defined as the issuance-amount-weighted average offering yield of all bonds issued by a municipal issuer in a given quarter. Along with this baseline specification, we interact the identifying terms with the two mutually exclusive indicator variables denoting whether there exists previous relationship between the issuer and the mutual fund, in the identical manner to Table 4. In all instances, we conduct regressions at the bond-quarter level while controlling for maturity and debt seniority. Table 5 presents our results.

TABLE 5 HERE

Column (1) of Table 5 presents the baseline difference-in-difference regression results. We find the interaction term of MRAR [-59, -36] percentile and the post 5-year indicator to be significantly negative with a *t*-statistic close to -5. In terms of economic magnitude, an increase in the risk-adjusted performance of 5-year-old funds from the 50th to the 75th percentile is associated with a decrease in the offering yield of 0.25×-0.473=-0.118%, or 11.8 bps. When we consider the differential effect of a previous relationship between the fund and the issuer in column (2), we find that the coefficient on the identifying term for funds and issuers with a previous relationship is -0.554, three times that of those without a relationship, with stronger statistical significance. Furthermore, F-statistic from the test of the equality of the coefficients for those with and without a previous relationship are significant at the 5% level. Our analysis of offering yield thus indicates that, in addition to the likelihood and amount of new issuance, plausibly exogenous flows into fund bondholders also serves to reduce the financing costs of municipal issuers, particularly when the mutual fund bondholder shares a previous relationship with the issuer.

4. Additional Evidence on Flow and Issuance

The previous section establishes that investor flows into municipal bond funds are associated with a greater likelihood of issuance by issuers that these funds hold, and that funds are more likely to

participate in these issuers' new issuances, particularly when they have an established relationship with the issuer and/or the lead underwriter. In this section, we explore whether the issuers are more likely to issue certain types of bonds over others in response to favorable capital supply conditions.

4.1. Method of offering

There are two broad ways in which an underwriter may acquire municipal bonds from the issuer before they are reoffered to the general public. First, in a competitive sale, any broker dealer may bid to acquire the bond, with the bidder that offers the most favorable financing terms being awarded the fruits of the auction. In a non-competitive negotiated sale, the issuer selects an underwriter and negotiates with the latter over the terms of the issuance before the latter approaches its customer client base. Given our earlier results with regards to the importance of the relationship between the issuer, the underwriter, and the mutual fund on the link between fund flows and the likelihood and amount of issuance, we would expect the results to be stronger in statistical and economic significance when bonds are sold through negotiated sales rather than competitive bids. In Table 6, we examine whether this is the case by separating issuances with competitive vs. non-competitive sales. Specifically, we use the new issuance difference-in-difference regressions using the MRAR [-59, -36] percentile as the continuous treatment variable as in columns (1) and (2) of Table 3, but with two separate dependent variables that take the value of one (for the case of the new issuance indicator) or the issuance amount (for the issuance amount regressions) if and only if the issuer issues at least one bond through a competitive sale vs. if the issuer issues only through non-competitive negotiated sales. Table 6 presents the results.

TABLE 6 HERE

Columns (1) and (2) present the regression results with the new issuance indicator as the dependent variable. As expected, the coefficient for issuances that do not involve competitive sales (0.011) are larger than that of issuances with at least one competitive bid (0.007). Log new issuance amount regressions in columns (3) and (4) reveal a similar picture, with the coefficient on the Morningstar

identification terms always more statistically and economically significant when bonds are sold only through negotiated sales. Combined with our earlier results on the likelihood of participation in new issuances as well as offering yield, our analysis of the issuance offering method further highlights the importance of the issuer-underwriter relationship in explaining the strong link between mutual fund flows and municipal bond issuance.

4.2. Source of repayment

Municipal bonds broadly fall into two categories, namely general obligation (GO) and revenue bonds. GO bonds are issued with a pledge by the municipality to use its taxing powers, if necessary, to meet its obligation, and therefore the issuance of these bonds often requires voter approval at the ballot. Voter approval is not a bygone conclusion by any means, and many of these ballots are fiercely contested, with Cellini, Ferreira, and Rothstein (2010) reporting that the election outcomes of 35% of their sample of school GO bonds are decided by a margin of 5% or less. In contrast, revenue bonds are repaid with cash flows from a revenue-generating entity without an explicit legal pledge from the municipality itself. Most revenue bonds consequently do not require voter approval as they do not carry a taxing pledge. The additional steps required to undertake the issuance of GO bonds imply that issuers may prefer to issue non-GO bonds, with a markedly lower transactional cost, to take a brisk advantage of favorable supply conditions. We examine whether this is the case in Table 7 by separately considering new issuances with vs. without a GO bond issuance. To this end, we create two separate dependent variables that take the value of one if and only if the issuer issues at least one GO bond during the quarter vs. all new issuances during the quarter are non-GO bonds. Moreover, we further engage in an empirical analysis of the political transactional cost associated with GO bond issuance. Specifically, we single out states with a supermajority requirement for the issuance of GO bonds, which raises the political hurdle for bond

issuance even further.[22] We then estimate the GO vs. non-GO issuance regressions, but separately for states with vs. without such a supermajority requirement. Table 7 presents the results.

TABLE 7 HERE

Columns (1) and (2) of Panel A presents the regression results using the new issuance indicator as the dependent variable. We find the identification term to be statistically significant at the 5% level when the issuer engages in issuances involving non-GO bonds only, with the point estimate more than four times larger. Column (3) and (4) reveal a similar picture when we consider the log new issuance amount as the dependent variable. Our results are thus consistent with issuers taking advantage of temporarily favorable capital supply with issuances that involve lower transactional cost and uncertainties surrounding its passage.

For a more direct test of the transactional cost associated with GO issuance, we divide our issuers into two groups depending on whether they reside in a state with a supermajority approval requirement for GO issuances. Panels B and C presents the subsample regression results for states with and without such supermajority requirement, respectively. In both states with and without supermajority approval requirements, we find the link between fund flows and the likelihood of GO bond issuance to be weak. In addition, we find both the economic and statistical significance of non-GO issuance to be stronger in states with a supermajority approval requirement, regardless of whether we consider the new issuance indicator or log new issuance amount as the dependent variable. Given that these are states where the issuance of GO bonds is particularly costly from a transactional cost standpoint, it is not surprising to observe a more statistically significant relation between fund flow and non-GO bond issuance in such states. This further suggests that potential political obstacles to GO bond issuance are an important consideration from the issuers' perspective when responding to temporarily favorable capital supply conditions. In a similar vein, in Table A.3 in the Appendix, we re-estimate the offering yield regressions

[22] For example, Missouri requires either a four-seventh or two-thirds majority depending on the election date for the approval of GO bonds.

in Table 5, albeit separately for GO vs. non-GO as issuances. We consistently find that capital flows into mutual fund bondholders with previous relationship substantially reduce the offering yield of non-GO issuances only, particularly when the mutual fund bondholder and the issuer share a previous relationship.

4.3. Capital purpose

We now ask whether the municipalities, in response to favorable capital supply conditions, prefer to engage in new issuances or refund their existing issuances at or nearing the maturity. On the one hand, it is well known that firms actively engage in debt maturity management (e.g., Choi, Hackbarth, and Zechner, 2018; 2021), often taking advantage of favorable credit supply conditions to refinance early and "kick maturity down the road" (e.g., Xu, 2018; Mian and Santos, 2018). Given that municipal bonds carry substantially higher yields compared to the Treasuries even after adjusting for taxes due to a high price of default risk (e.g., Schwert, 2017), an inflow of capital may encourage the issuers to roll over their existing debt and lengthen the maturity. On the other hand, issuers may wish to use this temporarily favorable capital supply condition to start a new project that they may otherwise have not been able to finance. We examine this issue in Table 8 in a manner similar to Table 7, by separately considering issuer-quarters with issuances involving only new filings vs. those that involve at least one refunding, using the information on the capital purpose in Mergent Municipal. Table 8 presents the results.

TABLE 8 HERE

Columns (1) and (2) present the results with the new issuance indicator as the dependent variable. Column (1) reveals that the identifying term, i.e., the interaction of the MRAR [-59, -36] percentile and the post 5-year indicator, is large and significant when we focus on issuances that involve new filings only. In contrast, the identifying term loses statistical significance when we consider issuances that involve at least one refunding, as revealed in column (2). Moreover, the economic magnitude of the identifying term for issuances that only involve new filings is more than three times that of issuances that include refunding. A similar pattern emerges when we consider the log new issuance amount as the dependent variable

instead in columns (3) and (4), with the statistical and economic significance of the interaction term being markedly stronger for issuances that involve only new filings. The results in Table 8 suggest that investor inflows into upgraded funds primarily enable issuers to finance new projects.

4.4. Further evidence on issuance

In Tables A.5 and A.6 in the Appendix, we examine other aspects of the issuers' issuance decision in response to investor flows into their mutual fund bondholders following a mechanical change in the Morningstar rating methodology. First, in Table A.5, we examine whether this exogenous supply of capital affects certain sectors more so than others. Overall, we find this additional supply of capital appears to be primarily driven toward financing, housing and development as well as general uses. In Table A.6, we proceed to explore whether investor flows has a differential impact on the likelihood of green vs. non-green bond issuance, given the importance of the municipal green bond issuances compared to those of corporate green bonds (e.g., Baker, Bergstresser, Serafeim, and Wurgler, 2018; Larcker and Watts, 2020). We find that the additional supply of capital is directed primarily towards non-green issuances, likely because green bond issuance often involves third party verifications (e.g., Flammer, 2021) that increase the administrative burden and transaction cost of issuance, making it more difficult for the issuers to take advantage of temporarily favorable capital supply conditions.

5. Conclusion

This paper uses a novel identification strategy to identify the effect of mutual fund flows on bond issuance. In order to generate variation in flows that is orthogonal to fund fundamentals, we use the change in Morningstar's methodology for calculating overall star ratings at the five-year mark. Due to the addition of the new 5-year rating into the overall rating methodology, funds with favorable risk-adjusted performance between 3 and 5 years ago are likely to be upgraded on the basis of this past performance. Even though this upgrade is driven by stale information and is largely tangential to recent performance,

we find that investors respond strongly to the upgrade. These inflows, in turn, lead to more bond issuance and larger issues on the part of issuers already held by these funds.

Capital flows to issuers according to existing relationships at the underwriter-fund-issuer level, suggesting an important role for relationships in what looks at first sight as an arms-length market. Issuers are more likely to use supply-driven funds to finance new projects and to issue bonds with lower costs of issuance such as non-general-obligation and non-green bonds. Overall, we find strong evidence of a supply-side effect in municipal financing that operates through lender-borrower relationship, with issuers taking advantage of favorable capital supply conditions emanating from fund investor inflows.

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Appendix. Variable descriptions

In this table, we provide detailed definition of the variables in our empirical analysis, with the data source in parentheses.

A.1. Issuer characteristics

New issuance dummy (Mergent Municipal): An indicator variable that takes the value of one when a municipal issuer issues a bond in a given quarter.

Log new issuance amount (Mergent Municipal): Log of the total amount of bond issuance by a municipal issuer in a given quarter. For all issuer-quarters without issuance, this value is set to zero.

Total assets (Bloomberg): The sum of short- and long-term assets on the issuer's balance sheet.

Total liabilities (Bloomberg): The sum of short- and long-term liabilities on the issuer's balance sheet.

Sales revenue (Bloomberg): The revenue generated after the deduction of sales returns, allowances, discounts, and sales-based taxes, including the subsidies from federal or local government.

Tax revenue (Bloomberg): The sum of income tax revenues, property tax revenues, sales and use tax revenues, tourist taxes, franchise taxes, and other tax revenues.

Pension underfunding (Bloomberg): The difference between the fair value of the plan assets less the projected benefit obligation. The pension plan is over(under)funded if the plan assets exceed (do not exceed) the projected benefit obligation.

Personal income (Bureau of Economic Analysis): Personal income from wages and salaries, social security and other government benefits, dividends and interest, business ownership, and other sources per capita in the issuer's county, in thousands of dollars, as provided by the Bureau of Economic Analysis.

Unemployment rate (Bureau of Labor Statistics): Number of unemployed persons divided by the labor force in the issuer's county, as reported in the Bureau of Labor Statistics.

A.2. Fund characteristics

Morningstar Risk-Adjusted Return (MRAR, Morningstar): Morningstar provides information on each share class's MRAR over 3- , 5- , and 10-year horizons. Overall MRAR is calculated in the following manner. For funds between the age of 36 and 59 months, we use the 3-year MRAR to calculate the overall MRAR. For funds between the age of 60 and 119 months, we average the 3- and 5-year MRAR with 40% and 60% weights, respectively. For funds older than 10 years, we average the 3-, 5-, and 10-year MRAR with 20%, 30%, and 50% weights, respectively.

Morningstar overall star rating (Morningstar): Morningstar uses 3-, 5-, and 10-year MRAR to calculate the star rating over specific time horizons. At the end of each month, all share classes belonging to the same Morningstar categories are ranked on the basis of MRAR over the horizon of interest, and the top 10% receive 5 stars, the next 22.5% 4 stars, the next 35% 3 stars, the next 22.5% 2 stars, and the bottom 10% 1 star. Then, the overall rating score is calculated as follows.

1. Share classes below the age of three years are not rated.
2. The overall rating score of share classes between the age of 36 and 59 months is the 3-year star rating.
3. The overall rating score of share classes between the age of 60 and 119 months places 40% weight on the 3-year star rating and 60% weight on the 5-year star rating, respectively.
4. The overall rating score of share classes older than or equal to 10 years places 20% weight on the 3-year star rating, 30% weight on the 5-year star rating, and 50% weight on the 10-year star rating, respectively.

The overall star rating is the rounded integer value of the overall rating score.

Fund return (CRSP MF): Time-weighted total return of a fund during a quarter, compounded using monthly returns.

Fund flow (CRSP MF): We estimate monthly flows using monthly returns as follows:

$$Flow_{j,t} = \frac{TNA_{j,t} - TNA_{j,t-1}(1 + r_{j,t})}{TNA_{j,t-1}}$$

where $TNA_{j,t}$ is fund *j*'s total net assets and $r_{j,t}$is the monthly return of fund *j* at month *t*. We compound monthly fund flows during a quarter to arrive at quarterly fund flow.

Fund size (CRSP MF): Natural log of the fund's previous quarter-end total net assets.

Fund age (CRSP MF): Years since the first appearance of the oldest share class on the CRSP Mutual Fund file.

Expense ratio (CRSP MF): Expense ratio as reported in the CRSP Mutual Funds database.

A.3. Issue characteristics

General obligation (GO) issue (Mergent Municipal): An issue whose source of repayment is not from a specific project but backed by the credit and taxing power of the issuer, as reported in Mergent Municipal.

Revenue bond issue (Mergent Municipal): An issue whose source of repayment is backed by the revenues from a specific project and does not have general recourse, as reported in Mergent Municipal.

New filing issue (Mergent Municipal): An issue where the proceeds from the issuance is new money to the issuer, as reported in Mergent Municipal.

Refunding issue (Mergent Municipal): An issue whose issuance replaces an outstanding bond, as reported in Mergent Municipal.

Green bond (Bloomberg/Mergent Municipal): A bond that is flagged to be green bonds by both Bloomberg and Mergent Municipal.

Table 1. Summary statistics

This table reports summary statistics on the sample of issuance and fund-level data. The sample period runs from 2000Q1 through 2020Q3. We report issuer characteristics in Panel A, while fund characteristics are presented in Panel B. For a detailed description of the definition of each variable, see the appendix. Continuous variables are winsorized at the 1% and 99% levels; these summary statistics are computed using these winsorized values.

Panel A. Issuer characteristics

	Obs.	Mean	St. Dev.	P1	P25	P50	P75	P99
New issuance dummy	831,257	0.142	0.349	0.000	0.000	0.000	0.000	1.000
New issuance amount ($ millions)	116,805	58.37	85.28	0.710	8.570	21.75	62.85	325.1
New issuance / Total outstanding	116,773	0.208	0.181	0.002	0.054	0.143	0.344	0.527
Total asset ($ billions)	336,480	0.319	1.073	0.000	0.008	0.027	0.105	7.771
Total liabilities ($ billions)	305,236	0.218	0.741	0.000	0.003	0.011	0.058	5.266
Leverage	305,215	0.514	0.650	0.004	0.174	0.378	0.652	5.010
Population (millions)	781,663	0.952	1.730	0.009	0.125	0.373	0.933	9.876
Personal income per capita ($ thousands)	781,663	39.92	13.77	18.24	30.21	37.70	46.53	92.25
Unemployment rate (%)	779,128	5.901	2.484	2.300	4.100	5.300	7.100	14.40
Average percentage held per fund (%)	798,758	30.07	39.30	0.105	3.660	13.33	42.19	100.0
Total percentage held by funds (%)	798,758	48.45	49.01	0.633	16.67	34.49	67.62	100.0

Panel B. Fund characteristics

	Obs.	Mean	St. Dev.	P1	P25	P50	P75	P99
Morningstar overall rating	45,353	3.471	0.982	1.000	3.000	3.000	4.000	5.000
Fund flow (%, per quarter)	51,041	0.132	7.229	-16.39	-2.958	-0.844	1.779	33.85
Fund size ($ millions)	51,041	657.2	1,291.4	5.800	75.50	192.6	578.3	7,852.3
Fund return (%, per quarter)	51,041	1.055	1.954	-5.121	0.065	1.014	2.166	6.441
Fund age	51,041	17.98	8.689	1.166	11.49	17.60	24.24	38.75
Expense ratio (%)	50,941	0.782	0.246	0.120	0.630	0.778	0.936	1.503
Number of bonds held	59,628	190.9	244.8	9.000	60.00	106.0	208.0	1,460.0
Number of issuers held	59,628	95.08	102.6	7.000	35.00	57.00	109.0	560.0

Panel C. Issuance characteristics by state

State	No. of new issuances	No. of new filings	No. of refundings	No. of GO issuances	No. of revenue bond issuances	No. of green bond issuances	Total new issuance amount ($ millions)	New issuance / Total outstanding (%)
AK	4,703	2,654	2,018	699	1,318	0	23.12	3.45
AL	25,592	11,732	13,741	4,742	8,088	35	86.03	3.50
AR	17,688	9,027	8,589	3,158	5,767	127	30.69	4.14
AZ	33,531	20,883	12,433	6,644	9,989	162	155.8	3.88
CA	248,005	139,252	106,861	56,268	81,225	1,372	1,490.7	3.55
CO	38,064	19,565	17,860	5,456	13,283	106	179.2	3.72
CT	35,011	21,238	13,397	11,284	5,916	140	158.7	4.68
DE	3,983	2,170	1,789	849	1,023	1	21.45	2.84
FL	65,786	32,822	32,209	1,384	28,846	113	383.7	3.30
GA	28,799	16,328	12,036	2,456	11,781	3	189.7	3.44
HI	7,479	4,385	3,025	2,495	1,664	80	56.88	3.25
IA	17,742	11,411	6,270	4,674	4,945	122	44.87	4.55
ID	7,858	4,836	2,984	1,341	2,403	0	24.95	3.97
IL	60,518	31,919	27,706	17,870	11,436	153	380.0	3.55
IN	35,400	18,348	16,606	956	16,797	331	139.1	3.87
KS	37,033	19,375	17,544	9,094	8,786	38	66.37	3.85
KY	33,002	18,468	13,884	2,337	14,449	85	91.48	3.47
LA	19,411	11,026	8,046	3,018	7,200	28	93.94	3.38
MA	49,818	25,332	24,083	15,032	11,671	508	316.0	5.29
MD	32,510	19,130	13,180	7,709	8,754	134	170.3	3.42
ME	12,185	7,717	4,422	2,286	4,029	88	29.19	3.76
MI	56,912	29,539	26,748	15,219	10,242	76	240.5	3.22
MN	72,139	47,483	24,316	17,411	12,296	167	143.7	3.80
MO	37,803	21,619	15,923	5,340	13,322	44	120.7	3.92
MS	15,600	10,833	4,710	1,820	5,154	11	44.28	3.26
MT	7,140	4,643	2,470	1,775	1,894	0	13.50	5.04
NC	34,857	20,621	14,054	5,328	11,986	30	151.3	3.68
ND	9,834	4,646	5,011	741	4,128	21	14.19	4.39
NE	23,037	12,195	10,794	4,021	5,623	11	62.91	4.47
NH	7,968	4,961	2,733	1,707	2,278	1	26.82	4.19
NJ	62,723	32,973	29,394	14,704	16,044	495	352.3	5.10
NM	13,355	9,307	3,911	1,908	4,804	46	50.85	4.11
NV	15,033	8,805	5,924	1,824	3,075	7	80.76	3.66
NY	137,646	82,325	53,197	27,391	36,867	1,310	1,219.1	5.85
OH	79,928	39,618	39,672	23,021	16,197	317	281.2	3.83
OK	16,397	10,896	5,131	1,706	7,642	0	56.53	4.64
OR	28,865	17,801	11,002	8,213	6,133	97	101.6	3.63
PA	88,296	39,131	48,370	23,521	18,612	252	375.7	3.52
RI	12,500	8,102	4,332	1,871	4,394	219	33.38	3.86
SC	23,528	12,781	10,581	4,725	6,778	26	105.6	3.73
SD	5,124	2,661	2,389	548	2,278	0	15.32	3.23
TN	27,858	13,322	14,130	6,614	7,466	91	118.1	3.38
TX	185,846	96,058	88,487	67,421	31,291	270	896.5	3.97
UT	15,548	8,976	6,417	2,366	5,906	64	64.17	3.66
VA	39,440	21,615	16,691	6,131	14,082	47	172.7	3.51
VT	5,432	3,333	2,038	890	2,165	96	15.12	3.20
WA	40,567	21,628	18,653	8,517	11,425	276	221.3	3.58
WI	31,658	17,001	14,398	10,129	7,020	108	130.7	5.09
WV	6,315	3,033	3,233	432	2,817	0	23.82	3.20
WY	2,211	1,228	935	14	939	0	8.81	2.92
Total	1,917,678	1,054,752	844,327	425,060	532,228	7,708	9,273.6	3.97

Table 2. Morningstar rating changes and fund flow

In Panel A of this table, we present the two-stage least squares cross-sectional regression results of fund flow and Morningstar rating upgrade when share classes reach the age of 5 years, using the percentile ranking of past returns as the instrument. We identify all share classes that reach the age of 5 years during our sample period whose overall Morningstar rating either is upgraded or remains the same at the 5-year mark, with the *upgrade indicator* denoting the upgraded share classes. To instrument for the likelihood of an upgrade, we calculate the percentile rank of each share class's Morningstar risk-adjusted return (MRAR) between [-59, -36] month at the 5-year mark within the Morningstar category against all share classes within the category that have continuous return history between [-59, -36] at the same point in time. We refer to this measure as *MRAR [-59, -36] percentile*. In column (1), we present the first-stage regression with the upgrade indicator as the dependent variable, with the fund return between [-2, 0] as an additional control, while in columns (2) through (4), we present the second-stage results for cumulative fund flows between [1, 3], [1, 6], or [1, 12] months following the upgrade. In column (5), we run OLS regressions with fund return between [-2, 0] months relative to the 5-year mark as the dependent variable. In column (6), we perform the same regression for MRAR [-2, 0]. In all instances, we include year-quarter fixed effect. In Panel B, we run OLS panel regressions of fund flow or return on 5-star indicator at the share class-quarter level. *5-star indicator* takes the value of one for 5-star classes, and we limit our attention to share classes rated either 4 or 5 stars with an overall rating score of above or equal to 4.0. We focus on within-share-class variation in Morningstar star rating through the inclusion of share class fixed effect. We further include overall Morningstar risk-adjusted return (MRAR), the continuous running variable used for the construction of Morningstar star rating, as a control. Columns (1) through (3) present the results for fund flows, while fund return [-2, 0] and MRAR [-2, 0] results are presented in columns (4) and (5). We control for share class and year-quarter fixed effects. *t*-statistics based on robust standard errors are reported in parentheses in Panel A, while *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses in Panel B. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Upgrades at the 5-year mark

	Dependent variable					
	(1)	(2)	(3)	(4)	(5)	(6)
	Upgrade indicator	Fund flow [1, 3]	Fund flow [1, 6]	Fund flow [1, 12]	Upgrade indicator	Upgrade indicator
MRAR [-59, -36] percentile	0.441***					
	(6.620)					
Upgrade indicator		0.124**	0.274***	0.594***		
		(2.165)	(2.676)	(3.349)		
MRAR [-2, 0] percentile					0.297	
					(0.760)	
Fund return [-2, 0]	1.244	0.722	0.933	2.961		1.623
	(0.766)	(1.109)	(0.923)	(1.544)		(0.977)
No. of observations	427	427	427	427	427	427
R-squared		-0.328	-0.167	-0.146	0.581	0.538
Kleibergen-Paap F-statistic	43.82					
Quarter FE	YES	YES	YES	YES	YES	YES

Table 3. Morningstar rating changes and issuance decisions

In columns (1) through (4) of this table, we examine the issuance decisions of issuers held by our sample funds using the Morningstar rating methodology change at the 5-year mark as our identification method. To this end, we employ a difference-in-difference approach at the issuer-share class-quarter level as follows. First, we focus our attention on [-4, 4] quarters around all share classes that reach the 5-year mark. *Post 5-year indicator* takes the value of one for the 5-year mark quarter and all subsequent quarters over the event window. In columns (1) and (2), we interact this with *MRAR [-59, -36] percentile* at the time of upgrade, imposed constant throughout the event window, as defined in Table 2. In columns (3) and (4), we interact the post 5-year indicator with the upgrade indicator instead. Due to the inclusion of share class fixed effect, the standalone *MRAR [-59, -36] percentile* or *upgrade indicator* is subsumed by fixed effect. In columns (1) and (3), we focus on the next-quarter new issuance dummy as the dependent variable, while in columns (2) and (4), we focus on log new issuance amount as the dependent variable instead. In all instances, we focus on all issuers whose outstanding bonds are held by the share classes reaching the 5-year mark with a holding weight equal to or greater than 2.5% during the quarter preceding the 5-year mark. Finally, in columns (5) and (6), we use OLS regressions of the next-quarter new issuance indicator or log new issuance amount on fund flow. All regressions are conducted at the issuer-share class-quarter level. We further control for overall MRAR as well as issuer, share class, and state-by-quarter FE in all instances. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable					
	(1)	(2)	(3)	(4)		
	New issuance indicator	Log new issuance amount	New issuance indicator	Log new issuance amount	New issuance indicator	Log new issuance amount
Post 5-year indicator	-0.015**	-0.294**	0.002	-0.002		
	(-2.235)	(-2.334)	(0.335)	(-0.021)		
MRAR [-59, -36] percentile	0.020***	0.408***				
× Post 5-year indicator	(2.777)	(3.035)				
Upgrade indicator			0.013***	0.266***		
× Post 5-year indicator			(2.834)	(3.241)		
Fund flow					0.008***	0.140***
					(7.280)	(7.174)
MRAR	-0.002	-0.025	0.000	0.013	0.001**	0.027**
	(-1.051)	(-0.629)	(0.292)	(0.497)	(2.308)	(2.255)
No. of observations	245,644	245,644	250,148	250,148	13,367,291	13,367,291
Adjusted R-squared	0.432	0.455	0.435	0.463	0.386	0.412
Share class FE	YES	YES	YES	YES	YES	YES
Issuer FE	YES	YES	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES	YES	YES

Table 4. Fund flow and muni bond issuance: The role of fund-issuer-underwriter relationship

In Panel A of this table, we check whether the new issuance indicator and log new issuance amount regressions conducted in Table 3 differ depending on whether there is previous relationship between the fund, the issuer, and the underwriter. We consider an issuer and a fund to hold previous relationship when the issuer has previously issued a bond with the lead underwriter of the bond as the underwriter over the past twelve quarters *and* the fund holds a nonzero amount of the new issuances underwritten by this lead underwriter over the same time horizon. Then, in Panel B, we examine whether funds experiencing inflows are more likely to participate in the new issuances of the issuers they hold. Specifically, we run difference-in-difference regressions with the *new issuance participation indicator*, which takes the value of one if a fund purchases non-zero amount of an issuer's new issuance, as the dependent variable, and *MRAR [-59, -36] percentile* interacted with the *post 5-year indicator*. In column (1), we employ our 5-year Morningstar methodology change identification, while we separately consider those with and without previous relationship in column (2). In Panel A, we control for issuer, state-by-quarter, and share class fixed effect, while we control for issuer-by-quarter fixed effect in Panel B to compare the likelihood of participation between different fund holding the same issuer at a given point in time. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Issuance regressions

	Dependent variable	
	(1)	(2)
	New issuance indicator	Log new issuance amount
MRAR [-59, -36] percentile × Post 5-year × Previous relationship[(a)]	0.054***	1.051***
	(6.041)	(6.620)
MRAR [-59, -36] percentile × Post 5-year × No previous relationship[(b)]	-0.016	-0.285
	(-1.409)	(-1.345)
Tests of coefficient equality H_0: (a) = (b)	25.06	28.51
(p-value)	0.000	0.000
No. of observations	245,644	245,644
Adjusted R-squared	0.433	0.456
Issuer FE	YES	YES
State-by-quarter FE	YES	YES
Share class FE	YES	YES

Panel B. New issuance participation

	Dependent variable: New issuance participation indicator	
	(1)	(2)
MRAR [-59, -36] percentile × Post 5-year	0.008	
	(0.838)	
MRAR [-59, -36] percentile × Post 5-year × Previous relationship[(a)]		0.070***
		(5.399)
MRAR [-59, -36] percentile × Post 5-year × No previous relationship[(b)]		-0.018*
		(-1.904)
Tests of coefficient equality H_0: (a) = (b)		123.40
(p-value)		0.000
No. of observations	219,740	219,740
Adjusted R-squared	0.343	0.350
Issuer-by-quarter FE	YES	YES

Table 5. Fund flow and muni bond issuance: Offering yield

In this table, we examine the relationship between fund flow and the price at which muni bonds are issued, i.e., offering yield. Using our 5-year Morningstar rating methodology change as identification, we check whether additional flows into an issuer's fund bondholders affect the offering yield of all bonds that the issuer issues during the ensuing quarter. In column (1), we focus on the interaction between *MRAR [-59, -36] percentile* and the *post 5-year indicator*, while in column (2), we further interact them with previous relationship and no previous relationship indicator variables. Regressions are conducted at the bond-quarter level. In addition to the holding-weighted-average MRAR of fund bondholders, we further control for the issuing bond's maturity and debt seniority. We further include issuer and state-by-quarter fixed effects. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Offering yield (%)	
	(1)	(2)
MRAR [-59, -36] percentile × Post 5-year	-0.473***	
	(-4.825)	
MRAR [-59, -36] percentile × Post 5-year × Previous relationship[(a)]		-0.554***
		(-3.488)
MRAR [-59, -36] percentile × Post 5-year × No previous relationship[(b)]		-0.186**
		(-2.520)
Controls	YES	YES
Tests of coefficient equality H_0: (a) = (b)		5.43
(p-value)		0.0239
No. of observations	5,802	5,802
Adjusted R-squared	0.891	0.891
Issuer FE	YES	YES
State-by-quarter FE	YES	YES

Table 6. Fund flow and muni bond issuance: Issuance offering method

In this table, we present the difference-in-difference regression results of our 5-year Morningstar rating methodology identification as in Table 3, interacting *MRAR [-59, 36] percentile* with the *post 5-year indicator*, albeit separately considering issuances that are offered as competitive bids vs. those that are placed non-competitively. For the case of the new issuance indicator, we assign the value of one if the issuer issues at least one bond that satisfies the criteria and zero otherwise, while we sum the amount of issuances that satisfy the criteria for the case of log new issuance amount. All specifications include overall MRAR as control as well as issuer, share class, and state-by-quarter fixed effects. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable			
	New issuance indicator		Log new issuance amount	
	(1)	(2)	(3)	(4)
	Competitive offerings	Excl. competitive offerings	Competitive offerings	Excl. competitive offerings
MRAR [-59, -36] percentile × Post 5-year indicator	0.007*	0.011*	0.131*	0.226*
	(1.757)	(1.768)	(1.814)	(1.938)
No. of observations	245,644	245,644	245,644	245,644
Adjusted R-squared	0.369	0.408	0.388	0.422
Issuer FE	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Table 7. Fund flow and muni bond issuance: GO vs. revenue bond issuance

In this table, we present the difference-in-difference regression results of our 5-year Morningstar rating methodology identification as in Table 3, interacting *MRAR [-59, 36] percentile* with the *post 5-year indicator*, albeit separately considering issuer-quarters that involve at least one general obligation (GO) issuance vs. those that do not. In Panel A, we consider the full sample, while in Panels B and C, we separately consider states that have supermajority requirements for the approval of GO bonds vs. those that do not. All specifications include overall MRAR as control as well as issuer, share class, and state-by-quarter fixed effects. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Full sample

	Dependent variable			
	New issuance indicator		Log new issuance amount	
	(1)	(2)	(3)	(4)
	At least one GO issuance	No GO issuance	At least one GO issuance	No GO issuance
MRAR [-59, -36] percentile × Post 5-year indicator	0.003	0.012**	0.058	0.244**
	(1.183)	(2.146)	(1.091)	(2.402)
No. of observations	245,644	245,644	245,644	245,644
Adjusted R-squared	0.430	0.431	0.464	0.446
Issuer FE	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Panel B. States with a supermajority requirement

	Dependent variable			
	New issuance indicator		Log new issuance amount	
	(1)	(2)	(3)	(4)
	At least one GO issuance	No GO issuance	At least one GO issuance	No GO issuance
MRAR [-59, -36] percentile × Post 5-year indicator	0.011	0.029*	0.194	0.552*
	(1.045)	(1.953)	(1.000)	(1.988)
No. of observations	33,605	33,605	33,605	33,605
Adjusted R-squared	0.428	0.348	0.453	0.353
Issuer FE	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Panel C. States without a supermajority requirement

	Dependent variable			
	New issuance indicator		Log new issuance amount	
	(1)	(2)	(3)	(4)
	At least one GO issuance	No GO issuance	At least one GO issuance	No GO issuance
MRAR [-59, -36] percentile × Post 5-year indicator	0.002	0.009	0.029	0.201*
	(0.671)	(1.601)	(0.605)	(1.868)
No. of observations	212,037	212,037	212,037	212,037
Adjusted R-squared	0.429	0.444	0.466	0.460
Issuer FE	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Table 8. Fund flow and muni bond issuance: New filing vs. refunding issuance

In this table, we present the difference-in-difference regression results of our 5-year Morningstar rating methodology identification as in Table 3, interacting *MRAR [-59, 36] percentile* with the *post 5-year indicator*, albeit separately considering issuer-quarters that consist of only new filings vs. those that include at least one refunding. All specifications include overall MRAR as control as well as issuer, share class, and state-by-quarter fixed effects. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable			
	New issuance indicator		Log new issuance amount	
	(1)	(2)	(3)	(4)
	New filings only	At least one refunding	New filings only	At least one refunding
MRAR [-59, -36] percentile × Post 5-year indicator	0.016***	0.005	0.316***	0.093
	(3.389)	(0.709)	(3.923)	(0.762)
No. of observations	245,644	245,644	245,644	245,644
Adjusted R-squared	0.392	0.195	0.408	0.195
Issuer FE	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Figure 1. Holders of municipal bonds

In this figure, we use the December 2020 release of the Federal Reserve's Financial Accounts of the United States (Z.1) item L.212 to graphically illustrate the percentage holding of municipal bonds by various financial institutions.

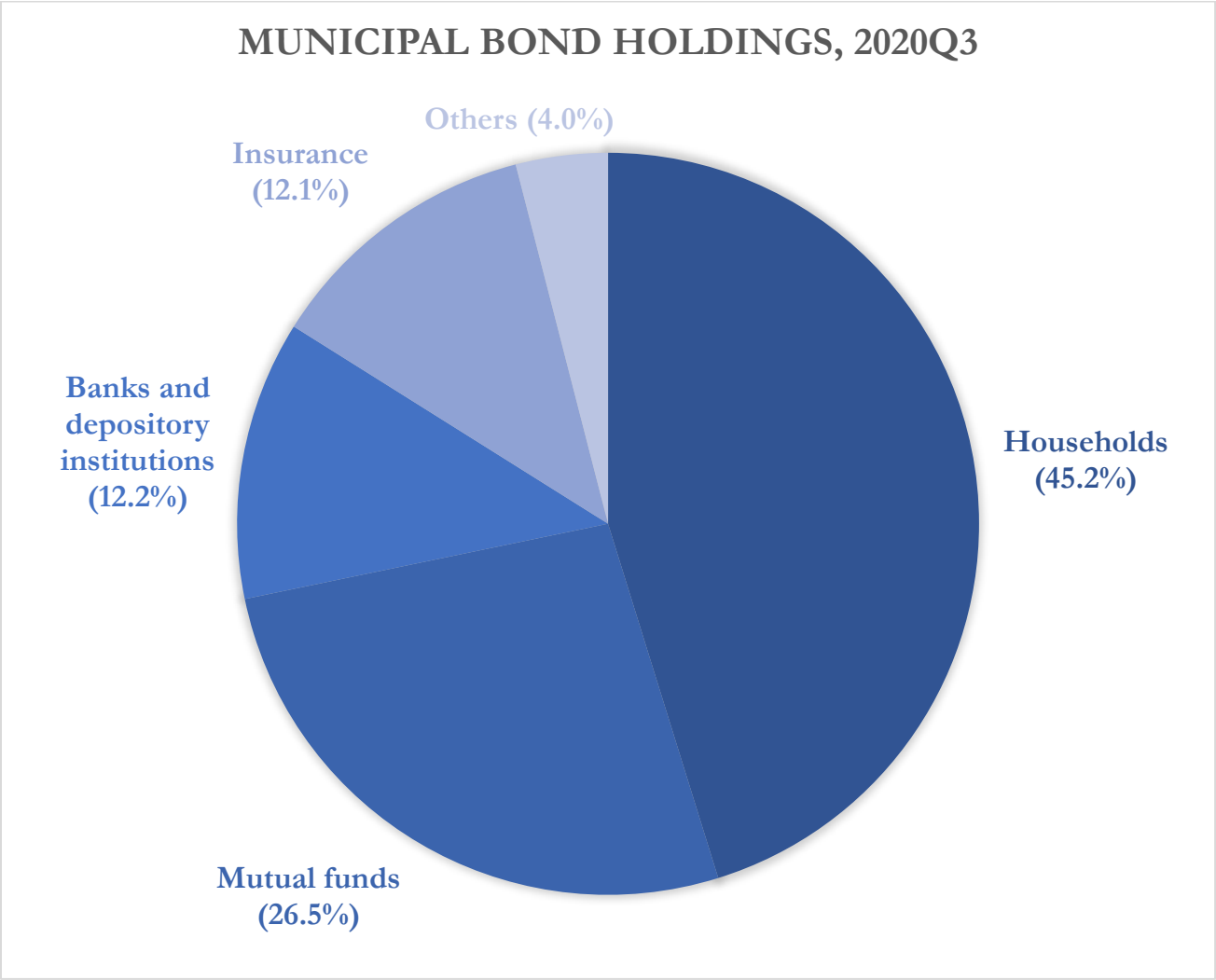
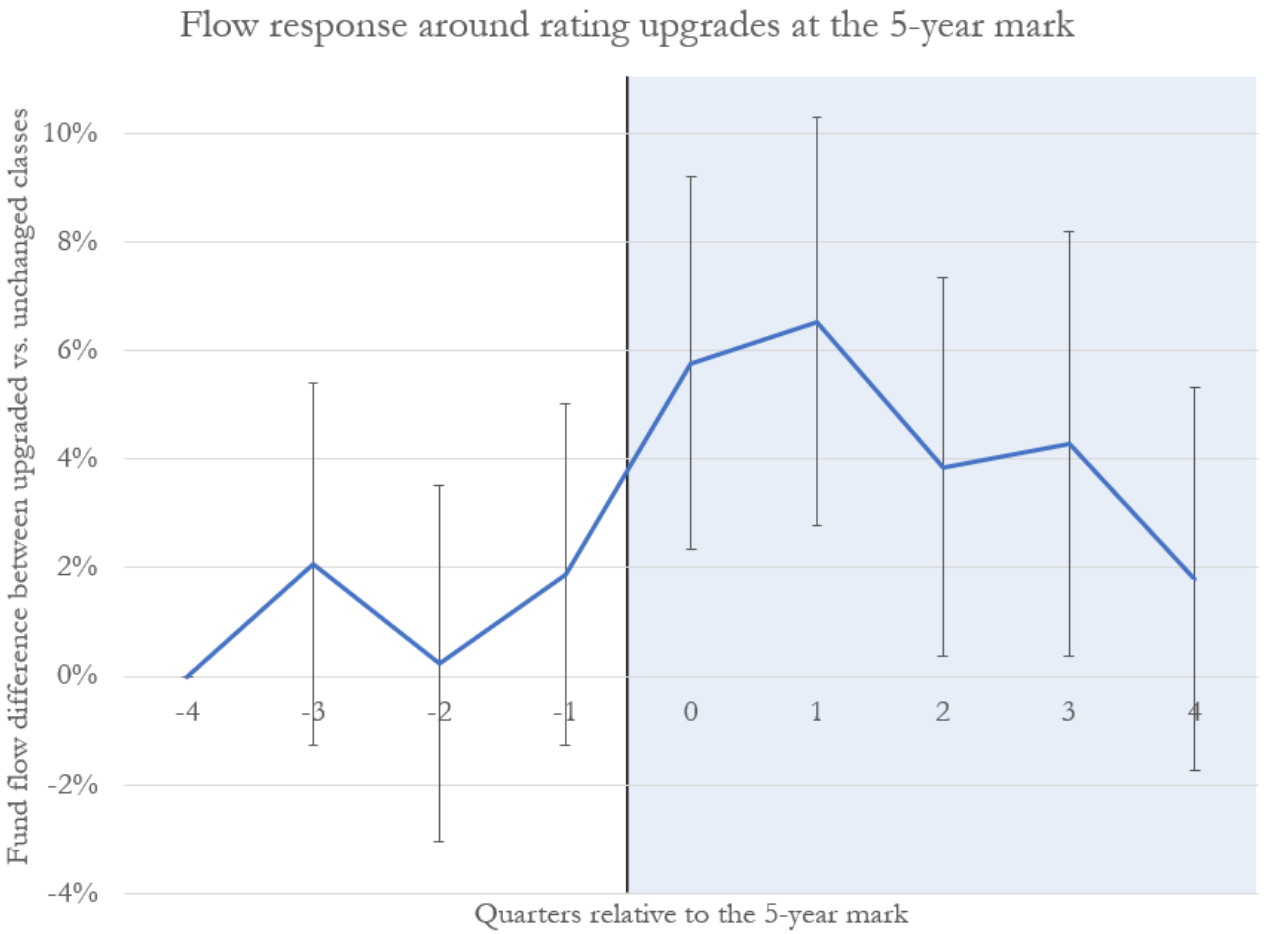


Figure 2. Morningstar star rating change at 5-year rating introduction

In this table, we compute the difference in quarterly flows or the likelihood of new issuance between share classes that experience an upward changing at their 5-year, when the Morningstar's star rating calculation method changes, and those that remain at their previous star rating. The quarter at which a share class reaches the age of 5 years is defined as quarter 0. Error bars denote the 90% confidence interval.

Panel A. Fund Flow



Panel B. New issuance

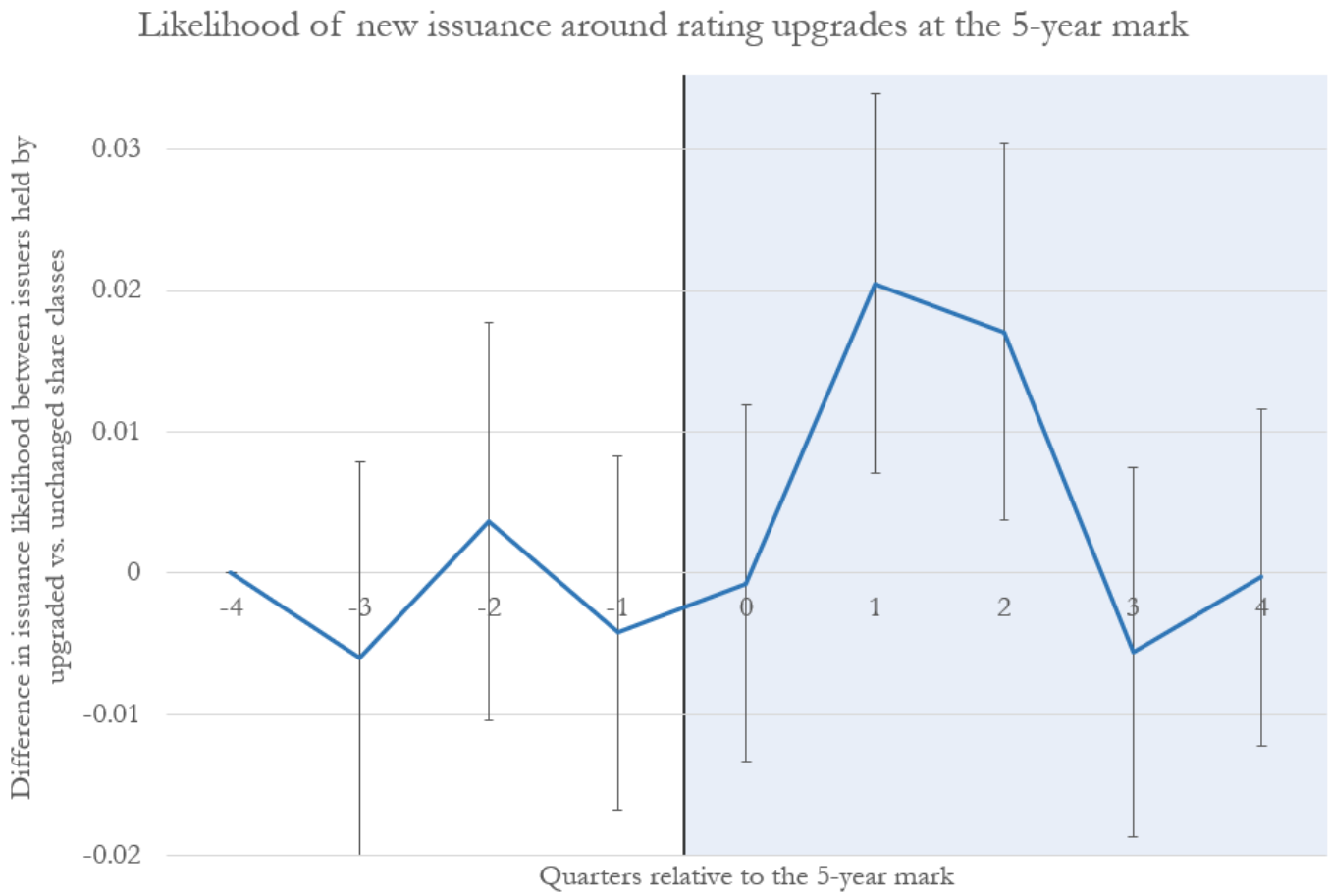


Table A.1. Morningstar rating changes and issuance decisions

In this table, we examine the issuance decisions of issuers held by our sample funds using the Morningstar rating methodology change at the 5-year mark as our identification method as in columns (1) and (2) of Table 3, but for alternative minimum holding weight cut-offs. We consider (i) no minimum holding weight, (ii) 1%, and (iii) 5%. All other controls and fixed effects specification are identical to Table 3. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable					
	New issuance indicator			Log new issuance amount		
	(1)	(2)	(3)	(4)	(5)	(6)
Minimum holding weight	All issuers	1%	5%	All issuers	1%	5%
Post 5-year dummy	-0.007	-0.018***	-0.019***	-0.145	-0.354***	-0.371***
	(-1.504)	(-3.435)	(-3.580)	(-1.590)	(-3.625)	(-3.756)
MRAR [-59, -36] percentile ×	0.011*	0.016**	0.015*	0.235*	0.344**	0.317**
Post 5-year dummy	(1.741)	(2.280)	(1.957)	(1.945)	(2.557)	(2.253)
MRAR	-0.000	-0.001	-0.001	0.003	-0.012	-0.014
	(-0.289)	(-0.650)	(-0.584)	(0.111)	(-0.351)	(-0.324)
No. of observations	412,189	317,286	301,008	412,189	317,286	301,008
Adjusted R-squared	0.411	0.395	0.396	0.431	0.416	0.416
Share class FE	YES	YES	YES	YES	YES	YES
Issuer FE	YES	YES	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES	YES	YES

Table A.2. Morningstar rating changes and issuance decisions: Issuer-quarter level analysis

In this table, we examine the issuance decisions of issuers held by our sample funds using the 5-year Morningstar rating methodology change identification strategy as in Table 3, but with the regressions conducted at the issuer-quarter level instead of issuer-share class-quarter level. When an issuer is held concurrently by share classes that both are upgraded as well as those that remain the same, we take the maximum value, i.e., we treat them as upgraded-held. We further control for holding-weighted overall MRAR of all fund bondholders as well as issuer and state-by-quarter FE in all instances. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable					
	(1)	(2)	(3)	(4)	(5)	(6)
	New issuance indicator	Log new issuance amount	New issuance indicator	Log new issuance amount	New issuance indicator	Log new issuance amount
MRAR [-59, -36] percentile	-0.020	-0.359				
	(-1.475)	(-1.550)				
Upgrade indicator			-0.001	-0.016		
			(-0.409)	(-0.325)		
Post 5-year indicator	-0.004	-0.053	0.003	0.050		
	(-0.406)	(-0.338)	(1.218)	(1.199)		
MRAR [-59, -36] percentile × Post 5-year indicator	0.026**	0.459**				
	(2.057)	(2.023)				
Upgrade indicator × Post 5-year indicator			0.012***	0.233***		
			(3.594)	(3.890)		
Fund flow					0.061***	1.181***
					(3.069)	(3.319)
MRAR	-0.000	0.005	0.004***	0.068***	0.001	0.015
	(-0.194)	(0.121)	(2.783)	(2.903)	(1.314)	(1.316)
No. of observations	108,793	108,793	264,906	264,906	620,594	620,594
Adjusted R-squared	0.270	0.288	0.235	0.251	0.195	0.211
Issuer FE	YES	YES	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES	YES	YES

Table A.3. Fund flow and muni bond issuance: Offering yield of different issuance types

In this table, we examine the relationship between fund flow and offering yield in a similar manner to Table 5, but separately for (i) GO vs. non-GO issuances and for (ii) new filing vs. refunding issuances. Panel A presents the results for baseline regressions, while Panel B presents the results of our difference-in-difference specification interacted with previous relationship and no previous relationship indicators. All other regression specifications are identical to Table 5. Regressions are conducted at the bond-quarter level. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Baseline offering yield regressions

	Dependent variable: Offering yield (%)			
	(2)	(3)	(4)	(5)
	GO issuance	Non-GO issuance	New filing issuance	Refunding issuance
MRAR [-59, -36] percentile × Post 5-year	0.095	-0.512***	-0.394***	-0.430***
	(0.550)	(-4.526)	(-2.823)	(-3.636)
Controls	YES	YES	YES	YES
No. of observations	1,438	4,459	2,557	3,026
Adjusted R-squared	0.940	0.875	0.908	0.886
Issuer FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Panel B. Previous relationship vs. no previous relationship

	Dependent variable: Offering yield (%)			
	(2)	(3)	(4)	(5)
	GO issuance	Non-GO issuance	New filing issuance	Refunding issuance
MRAR [-59, -36] percentile × Post 5-year	-0.012	-0.615***	-0.413**	-0.515**
× Previous relationship	(-0.101)	(-3.599)	(-2.302)	(-2.070)
MRAR [-59, -36] percentile × Post 5-year	-0.049	-0.200**	0.037	-0.383***
× No previous relationship	(-0.365)	(-2.533)	(0.264)	(-3.855)
Controls	YES	YES	YES	YES
Tests of coefficient equality H_0: (a) = (b)	0.06	6.06	4.13	0.26
(p-value)	0.8053	0.0174	0.0477	0.6096
No. of observations	1,438	4,459	2,557	3,026
Adjusted R-squared	0.940	0.875	0.908	0.887
Issuer FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Table A.4. Fund flow and muni bond issuance: OLS regression results

In this table, we examine our main results in a simple OLS setting. In Panel A, we estimate the relationship between the new issuance participation indicator and fund flow (also interacted with previous relationship and no previous relationship indicators in column 2) akin to columns (3) and (4) of Table 4. In Panel B, we examine the relationship between offering yield and fund flow at the bond-quarter level, similar to Table 5. In Panel C, we examine the relationship between the issuers' issuance decision and fund flow, albeit separately for competitive bids vs. non-competitive placements, as in Table 6. Panels D and E then present the results for (i) GO vs. non-GO issuances and (ii) new filing vs. refunding issuances as in Table 7 Panel A and Table 8. All other regression specifications are identical to the respective main tables. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. New issuance participation decisions

	Dependent variable: New issuance participation indicator	
	(1)	(2)
Fund flow	0.014***	
	(10.458)	
Fund flow × Previous relationship		0.050***
		(10.799)
Fund flow × No previous relationship		0.002
		(1.420)
Tests of coefficient equality H_0: (a) = (b)		91.70
(p-value)		0.0000
No. of observations	15,633,478	15,633,478
Adjusted R-squared	0.398	0.398
Issuer-by-quarter FE	YES	YES

Panel B. Offering yield

	Dependent variable: Offering yield (%)	
	(1)	(2)
Fund flow	-0.464***	
	(-4.150)	
Fund flow × Previous relationship		-0.452***
		(-3.429)
Fund flow × No previous relationship		-0.303**
		(-2.387)
Controls	YES	YES
Tests of coefficient equality H_0: (a) = (b)		0.83
(p-value)		0.3643
No. of observations	170,128	170,128
Adjusted R-squared	0.818	0.818
Issuer FE	YES	YES
State-by-quarter FE	YES	YES

Panel C. Competitive vs. non-competitive offerings

	Dependent variable			
	New issuance indicator		Log new issuance amount	
	(1)	(2)	(3)	(4)
	Competitive offerings	Excl. competitive offerings	Competitive offerings	Excl. competitive offerings
Fund flow	0.001	0.008***	0.012	0.151***
	(1.206)	(8.437)	(1.009)	(8.240)
No. of observations	13,367,291	13,367,291	13,367,291	13,367,291
Adjusted R-squared	0.295	0.341	0.313	0.357
Issuer FE	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Panel D. GO vs. non-GO issuances

	Dependent variable			
	New issuance indicator		Log new issuance amount	
	(1)	(2)	(3)	(4)
	At least one GO issuance	No GO issuance	At least one GO issuance	No GO issuance
Fund flow	0.002***	0.008***	0.030***	0.139***
	(3.960)	(7.641)	(3.939)	(7.326)
No. of observations	13,367,291	13,367,291	13,367,291	13,367,291
Adjusted R-squared	0.346	0.378	0.378	0.398
Issuer FE	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Panel E. New filing vs. refunding issuances

	Dependent variable			
	New issuance indicator		Log new issuance amount	
	(1)	(2)	(3)	(4)
	New filings only	At least one refunding	New filings only	At least one refunding
Fund flow	0.004***	0.005***	0.040***	0.100***
	(6.856)	(6.236)	(3.023)	(6.000)
No. of observations	13,367,291	13,367,291	13,367,291	13,367,291
Adjusted R-squared	0.219	0.287	0.223	0.305
Issuer FE	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Table A.5. Fund flow and muni bond issuance: Use of proceeds

In this table, we estimate the difference-in-difference regression with the new issuance indicator as the dependent variable and MRAR [-59, -36] percentile interacted with the post 5-year indicator as in column the new issuance dummy regression in column (1) of Table 3, but separately for issuances with the following use of proceeds as reported in Mergent Municipal: public service, environment, and recreation; financial, housing, and development; transport; utilities; higher education; other education; healthcare. In addition to these seven specific categories, we also include general purpose and other uses. All specifications include overall MRAR as control as well as issuer, share class, and state-by-quarter fixed effects. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: New issuance indicator							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Use of proceeds	General Purpose and Others	Transportation	Public Services, Environment, and Recreation	Finance, Development, and Housing	Utility	Higher Education	Other Education	Healthcare
MRAR [-59, -36] percentile ×	0.008*	0.003	0.003	0.004*	0.005	0.002	-0.004**	0.005
Post 5-year	(1.807)	(1.005)	(0.790)	(1.957)	(1.603)	(0.737)	(-2.172)	(1.600)
No. of observations	245,644	245,644	245,644	245,644	245,644	245,644	245,644	245,644
Adjusted R-squared	0.265	0.356	0.250	0.413	0.305	0.436	0.289	0.452
Issuer FE	YES	YES	YES	YES	YES	YES	YES	YES
Share class FE	YES	YES	YES	YES	YES	YES	YES	YES
State-by-quarter FE	YES	YES	ES	YES	YES	YES	YES	YES

Table A.6. Fund flow and muni bond issuance: Green vs. non-green bonds

In this table, we estimate the difference-in-difference regression with the new issuance indicator as the dependent variable and MRAR [-59, -36] percentile interacted with the post 5-year indicator as in column the new issuance dummy regression in column (1) of Table 3, albeit separately for issuances involving at least one green bond issuance vs. those that only involve non-green issuances. All specifications include overall MRAR as control as well as issuer, share class, and state-by-quarter fixed effects. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by issuer and quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: New issuance indicator	
	(1)	(2)
	At least one green issuance	No green issuance
MRAR [-59, -36] percentile × Post 5-year	0.000	0.020***
	(0.542)	(2.751)
No. of observations	245,644	245,644
Adjusted R-squared	0.249	0.409
Issuer FE	YES	YES
Share class FE	YES	YES
State-by-quarter FE	YES	YES