Mutual Fund Flows and the Supply of Capital in Municipal Financing*

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Abstract

This paper identifies the impact of fluctuations in the supply of capital from mutual funds on municipal bond financing and makes three contributions to the literature. First, we develop an identification strategy based on the Morningstar rating methodology at the moment that funds reach 5 years in operation. This approach isolates supply-side effects that are orthogonal to both fund and issuer fundamentals and can be applied in a broad range of settings. We show that issuance probability increases and yields decrease in response to exogenous flows. Second, we show that exogeneous fund flows lead to more municipal bond issuances when funds, issuers, and underwriters are connected through existing relationships. This result highlights the role of relationship lending in the context of municipal bond financing. Third, our results suggest that municipal bond issuers exploit favorable financing conditions to issue bonds with shorter delays and lower transaction costs, such as non-general-obligation bonds that require no voter approval and non-green bonds. These frictions can limit the impact of capital-supply shocks on municipal financing.

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 accounted for 26.5% of all municipal bond holdings in the U.S. as of the third quarter of 2020, making those funds the largest non-household municipal bondholders. In this paper, we propose and implement a novel identification strategy to provide 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 not immediately apparent how much and through which mechanisms fund flows impact municipal financing. On one hand, municipalities largely raise funds through bond issuance as opposed to lending from banks.[1] Mutual funds are the second largest holders of municipal bonds after households, and, as such, a larger supply of capital to funds should encourage 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. More generally, measuring the effects of flows on issuance is complicated by the fact that mutual fund flows are affected by past performance and, consequently, by the fundamentals of bond issuers themselves (Wardlaw, 2020; Berger, 2021).

There is also limited evidence of whether fund-underwriter-issuer relationships matter in this setting. Despite functioning as a public market, and thus in principle largely involving arm's-length lending, the municipal bond market is also highly fragmented. Small regional borrowers seeking financing rely on their underwriters, who also have ongoing relationships with mutual funds.[2] On the mutual fund side, funds are likely to value relationships with underwriters who enable them to obtain the desired

[1] Ivanov and Zimmermann (2021) estimate the size of the municipal bank loan market at around $200 billion as of the third quarter of 2020, which only accounts for just over 5% of the total amount outstanding in municipal bonds, at over $3.9 trillion.
[2] Municipal bonds for 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 bonds through competitive sales, in which issuers take bids from multiple underwriters.

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

In this paper, we document a statistically and economically strong association between fund flows and the likelihood of issuance. We use a sample of 20,502 municipal issuers held by one or more of the 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 issuers already included in a fund's portfolio as well as with a 1.4% increase in the issuance amount.

We employ a new identification approach to separate the supply-side effects of bond investor flows from demand-side effects in which municipalities may have better performance (and thus drive fund flows) and also be more likely to issue new bonds to finance local growth opportunities. The starting point for this approach is the stylized fact that Morningstar ratings are an important driver of fund flows (Del Guercio and Tkac, 2008 and Reuter and Zitzewitz, 2021). Our instrument exploits mechanical and predictable changes in Morningstar overall star ratings that are unrelated to recent performance or fund fundamentals. Morningstar publishes overall star ratings ranging 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 corresponding time horizon (Morningstar, 2021). Crucially, overall star-rating calculations depend on the age of a fund. When a fund is between 3 and 5 years old, the 5-year star rating is unavailable and the overall star rating is the

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

same as the 3-year star rating. Once a fund reaches 5 years in operation, however, Morningstar uses 5-year risk-adjusted returns to obtain 5-year star ratings. The 3- and 5-year star ratings are then averaged with 40% and 60% weights, 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 prior to the time of calculation, a fund's overall star rating may jump up or down at the time it turns 5 years old, regardless of recent performance. For example, the 5-year rating of a fund that turned 5 years old in June 2015 may differ from its 3-year rating based on its performance between June 2010 and June 2012. Importantly, by the time of this rating change, any fundamental information contained in fund performance between 2010 and 2012 is already several years old, and so should have been incorporated in market prices and fund flows.

We are not the first to use Morningstar ratings and their methodology as a driver of mutual fund flows (see, among others, Del Guercio and Tkac, 2008; Reuter and Zitzewitz, 2021; Ben-David, Li, Rossi and Song, 2022a, 2022b). Compared to how existing work has used Morningstar ratings, our use of performance in the distant past and the moment that a fund reaches 5 years in operation allows us to separate ratings changes themselves from unobserved information that drives both returns and ratings. This approach also has the potential to be used more broadly, both outside the municipal bond market and in other time periods, which is generally not possible when we use changes in ratings methodologies that occur at a specific point in time.

We first examine whether a fund's risk-adjusted performance between 3 and 5 years in the past affects the likelihood of an upgrade of its overall Morningstar rating 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 rankings against their Morningstar category peers (hereafter, MRAR [-59, -36]), in a manner that is identical to how Morningstar calculates overall star ratings. We find that MRAR [-59, -36] is a significant driver of fund upgrading at the 5-year mark. In terms of economic magnitude, moving

up from the 25th to the 75th percentile in MRAR [-59, 36] increases the likelihood that a fund is upgraded from a 4- to a 5-star rating at the 5-year mark by 22 percentage points.

Importantly, and despite the predictable nature of these upgrades, we find that these overall rating upgrades at the 5-year mark elicit strong investor flow response without noticeable pre-trends. Upgraded 5-year-old funds receive extra inflows of 12.4% over the subsequent three months compared with their non-upgraded 5-year-old counterparts over the first three months following an upgrade, with high statistical significance. This is consistent with Morningstar ratings being highly salient for investors in mutual funds, and with investors not fully considering the origins of ratings changes.

We then proceed to examine whether variation in 5-year-old fund performance measured three years before affect issuance decisions made by the issuers they hold. Using MRAR [-59, -36] as a continuous treatment variable in a difference-in-differences (DiD) setting, we find that an improvement in funds' risk-adjusted performance ranking from the 25th to the 75th percentile increases the likelihood that municipalities issue new bonds held by these funds during the ensuing quarter by 1.0%, which amounts to a 7% increase in the unconditional likelihood of municipal bond issuance. Issuance amounts also increase by 3.4%–7.4% for these same municipalities conditional on issuance, although the estimates are statistically weaker. These results suggest that an exogenously driven investor inflow into mutual funds drives more bond issuance in the primary market.

Existing relationships between a fund, underwriter, and issuer play an important role in mediating bond issuances to capital-supply shocks. In terms of both issuance likelihood and amount regressions, we find that the link between exogenous investor flows and the likelihood of new issuance exists *only* when a mutual fund and an issuer share a previous relationship. We say that a mutual fund and an issuer have an existing relationship if the fund has previously purchased new bond issuances underwritten by the lead underwriter (i.e., the fund has a previous relationship with the underwriter) *and* the issuer has issued a bond with the same underwriter in the past (i.e., the issuer has a previous relationship with the underwriter). Chen, Cohen, and Liu (2021) note that the relationship between an issuer and an

underwriter is sticky, with 87% of the issuer's bonds issued through the same underwriter. Schultz (2012) finds as well that the market for municipal bond underwriting is fragmented, with underwriters depending heavily on established sets of clients for issuances. Using triple DiD regressions, we find that both the probability and amount of issuance respond to flows to mutual funds only for municipalities with previously established relationships with the funds.

We next consider whether flows are associated with a higher probability of participation in new issuances. As multiple funds participate in any single borrower's bond issuance, we can exploit our fund-issuer-level data and an identification strategy that is similar in spirit to Khwaja and Mian (2008) and use issuer-quarter fixed effects to control for unobservable time-varying demand-side factors. This approach allows us to cleanly measure how fund-level variation in flows that is unrelated to issuer-level factors affect decisions to purchase newly issued bonds, further alleviating the endogeneity concern that can arise when funds' recent holdings are correlated with local growth opportunities. As in our previous results, we also find that a fund is more likely to participate in new issuances in response to favorable capital inflows, particularly when the fund and the bond underwriter already share a previous relationship. This evidence further suggests that relationships matter significantly for the allocation of capital in the municipal bond market (consistent with Berger (2021), who also finds that funds do not trade proportionally in response to liquidity shocks).

Flow-driven capital supply shocks also help reduce the cost of financing for municipalities. In addition to issuing more frequently, issuers also enjoy reduced financing costs when mutual fund bondholders receive investor inflows, particularly from investors with whom they have relationships. In terms of baseline economic magnitude, a rise in MRAR [-59, -36] from the 25^{th} to the 75^{th} percentile is associated with a lower bond issuance yield of 23.6 bps.

The alternatives for selecting underwriters in the municipal bond market provide an additional setting in which to examine the relationship channel for capital flows. In a negotiated sale of municipal bonds, an issuer selects a particular underwriter (who is typically a relationship underwriter) and

negotiates the terms of a deal with the underwriter who brings an existing customer base including mutual funds. In contrast, in a competitive sale, all broker-underwriters can bid for bond issuance. Thus, the intricacies of existing relationships between issuers, underwriters, and mutual funds are more likely to manifest in negotiated sales. We thus examine whether the link between mutual fund flows and municipal bond issuance is stronger when issuers enter negotiated sales with underwriters as opposed to engaging in competitive sales. Our empirical results show that the economic magnitude of the identification term is larger when bonds are issued through negotiated sales, further pointing to the importance of the relationship channel for capital flows.

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. We use several proxies of the ease and speed of issuance to test issuers' responses to capital supply shocks. We first check whether fund-flow shocks lead to 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 involve a greater degree of uncertainty surrounding passage (Cellini, Ferreira, and Rothstein, 2010), we expect issuers to utilize non-GO issuances more extensively to exploit temporary positive financing conditions. In particular, these implicit issuance costs are likely to be sizeable in states with steeper political hurdles for GO issuances, such as those that require supermajority approval for GO issuance. Although the differences are not always statistically significant, the direction of the tests is consistent with this hypothesis. We find that the magnitude of a response to fund-flow shocks is generally stronger among issuances involving non-GO bonds only, particularly in states with supermajority requirements.

Finally, we examine whether municipalities are more likely to issue refunding bonds to refinance existing bonds or issue new bonds regardless of refunding in response to flow-driven capital shocks. On the one hand, municipal issuers may take advantage of temporarily favorable capital-supply conditions to refinance early and better manage their maturity profiles, akin to their corporate counterparts (Xu, 2018; Mian and Santos, 2018). On the other hand, they may use the proceeds to fund new projects that they

may have otherwise found themselves unable to finance. Our results show that investor inflows into mutual funds are associated primarily with new issuances for new projects rather than for refunding. We further examine whether the influx of capital finances certain specific uses such as green bond issuances. We find little evidence that municipalities exploit flow-driven capital shocks to issue green bonds, which often require lengthy and time-consuming third-party verification.

We contribute to the literature in several ways. First, we extend the growing literature on the real effects of municipal financing as well as studies that investigate 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 how prices respond 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 costs, 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 more generally. Whereas the important role that relationship lending plays has been well documented in the banking literature,[6] the 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. While Yasuda (2005) shows that bond issuers' relationships with their relationship banks affect

[6] Studies of 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).

their underwriter choices, the paper does not indicate how relationships with underwriters shape borrowing in the bond market. 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, unlike these studies, we document 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 reducing agency costs can also reduce financing costs for municipalities.

Third, we contribute to the growing body of studies that focus on 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 supply-side effects in corporate bond markets, ours is the first to provide evidence indicating the causal effects of the capital supply in municipal financing.

Lastly, our empirical strategy also contributes to the large body of literature that examines the effects of mutual fund flows on corporate decisions, beginning with Edmans, Goldstein, and Jiang (2012) and Khan, Kogan, and Serafeim (2012),[7] reporting evidence of a feedback channel for market prices. While Wardlaw (2020) calls into question the validity of using a flow-driven measure of mispricing, we present a Morningstar ratings-based identification setting that enables us to tease out a plausibly exogenous component of mutual fund flows, in particular the investor response to a change in overall

[7] 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).

star ratings stemming from a mechanical change in the rating methodology when a fund reaches the 5-years-in-operation point. This identification bypasses several 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

We combine data on municipal issuers and their bond issuance from the Bloomberg terminal and the FTSE Russell Mergent Municipal Bond database with fund holdings and characteristics from the CRSP Survivor-Bias-Free U.S. Mutual Fund database and the Morningstar database. The ensuing subsections 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 identifies the issuer of a given municipal bond.

We supplement this data with the Mergent Municipal Bond data. The Mergent dataset includes detailed information on municipal bond issuance dating back to the 1970s, including issuance amounts, coupons, maturity, option features, and underwriters. The dataset also provides information on capital purpose (new money versus refunding), the source of repayment (general obligation versus revenue bonds), and the use of proceeds (e.g., healthcare, education, and public services). Combining these two datasets provides us with rich information at both the issuer and individual issuance levels.

2.2. Fund characteristics

We collect all surviving and discontinued fixed income funds in the CRSP database with the first two letters of the CRSP objective code "IU," which denotes municipal bond funds. We use this dataset to construct fund returns, flows, total net assets (TNA), expense ratios, and fund age (described in detail in the Appendix). The CRSP fund data are merged with data from Morningstar Direct, which provide

funds' 3-, 5-, and 10-year star ratings as well as their overall star ratings at each month's-end. We also collect Morningstar fund categories and risk-adjusted returns (MRARs), the latter variable used by Morningstar to compute the ranking of each fund 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. Our sample includes all funds that are flagged as municipal bond funds by both the CRSP and the Morningstar databases. Wherever necessary, share class-level data are aggregated at the fund level weighted by the previous month's-end TNAs of each share class.[8] Finally, to align the frequency of fund characteristics with holdings information, we convert monthly data into quarterly frequency.

2.3. Fund-holdings information

We combine the Morningstar and CRSP databases to obtain quarterly fund-holdings data. Both databases contain holdings information at either the monthly or quarterly level for our sample funds. We run our analysis at the quarterly level because of more comprehensive overall coverage and thus convert the holdings information for any fund reporting at a monthly frequency into quarterly frequency using the latest monthly information within a given quarter. The Morningstar data provide wider coverage of fund holdings than the CRSP data, but our version of Morningstar holdings data ends in April 2015. We supplement these holdings data with holdings information from CRSP that runs through September 2020.[9]

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

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

The aforementioned holdings data combined with fund characteristics from CRSP and Morningstar as well as issuer and issuance characteristics from Bloomberg and Mergent allow us to form our samples at varying observationl levels. For example, 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 observation. Using this sample, we can also construct an issuer-quarter-level sample, with fund-level information such as quarterly flows and returns aggregated at the issuer level weighted by the previous quarter's-end holding share of each fund. Finally, we also construct an issuer-share class-quarter sample in an analogous manner. Even though portfolio holdings are determined at the fund level, flows differ across share classes of the same fund as their ages can be different. Our identification strategy utilizes variations in flows emanating from shocks to individual share classes, which necessitates regressions at the issuer-share class-quarter level. All continuous variables are winsorized at the 1% and 99% levels. Our final sample consists of 20,502 issuers and 3,312 share classes of 1,010 funds, running from the first quarter of 2000 through the third quarter of 2020, which amounts to 15,916,478 observations at the issuer-share class-quarter level, or 788,477 observations at the issuer-quarter level.

2.4. Summary statistics

Table 1 Panel A presents summary statistics for issuer characteristics computed at the issuer-quarter level. We find that, on average, municipalities issue new bonds in around 14.2% of the quarters during our sample period (or about once every 21 months). The average new issuance amount is around $58.3 million, with an inter-quartile range of over $54 million, indicating substantial variation in issuance amounts. New issues on average amount to 20.8% of issuers' total bonds outstanding. A substantial portion of bonds are held by mutual funds, with on average 48.5% of dollar amounts for a municipal issuer held by municipal funds. There is also considerable variation in the percentage of bond holdings by municipal funds, with a standard deviation of 49.0%, and, for one-quarter of our issuer-quarter observations, more than two-thirds, or 67.6% to be exact, of an issuer's bonds are held by municipal

funds. These statistics suggest that investor flows into and out of municipal bond funds are likely to elicit a nontrivial response on the part of the issuers they hold.

TABLE 1 HERE

Table 1 Panel B provides summary statistics for fund characteristics at the fund-quarter level. The average quarter fund flow is positive, indicating that the municipal fund sector grew in our sample period. The mean annual MRAR is 4.3% with a standard deviation of almost 14%, indicating wide variation in risk-adjusted fund returns. We also find that our sample funds hold on average 191 bonds from 95 unique issuers in their portfolios and 30.1% of the outstanding bonds of any given issuer.

In Table A.1 in the Internet Appendix, we present summary statistics for 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 on average more new filing issuances (where proceeds from issuances are new money) compared with refunding issuances (where some outstanding bonds are replaced with new bonds), with the former accounting for 55.0% of issuances. We observe, however, substantial variation at the state level, whereas the share of new filings is close to 70% in New Mexico and Mississippi, accounting for only 44.3% of issuances in Pennsylvania. Revenue bond issuances (hereafter REV bonds, which comprise 27.8% of total issuances) are slightly more common than GO issuances (22.2%), but once again there is considerable heterogeneity between states.

3. Fund flows and municipal bond issuance

Our main identification strategy is based on the performance of 5-year-old funds 3 to 5 years before they reach the 5-year mark, which Morningstar suddenly includes in its calculations of overall ratings and more specifically fund rankings during that period. We exploit this variation in fund performance that is predetermined at least three years in the past to establish a causal relationship between fund flows

and municipal bond financing. Our analysis also demonstrates the importance of established relationships between issuers, underwriters, and funds in mediating capital flows to bond issuers. Below we first explain in detail how Morningstar assigns overall star ratings.

3.1. Morningstar star-rating methodology

Morningstar publishes discrete overall star ratings in which it awards from 1 to 5 stars for each fund share class every month. The star ratings are calculated as follows. First, at each month's-end, 3-, 5-, and 10-year risk-adjusted returns (i.e., MRARs) 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 on share class *i* in month *t*, and T is either 36, 60, or 120 months. Then, using MRARs over each time horizon T, Morningstar ranks all share classes within a given 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. This procedure yields the 3-year star ratings for all share classes in operation for 3 or more years, 5-year star ratings for share classes in operation for 5 or more years, and similarly for the 10-year star rating.

Morningstar then produces a rounded weighted average of these star ratings over varying horizons to arrive at its final overall star ratings. Share classes in operation fewer than 3 years are not rated. For share classes that have been in operation for between 3 years and 4 years, 11 months, the overall star rating is simply the 3-year star rating. For share classes that have operated for between 5 years and 9 years, 11 months, Morningstar assigns a 60% weight to the 5-year rating and a 40% weight to the 3-year rating, and then takes the nearest integer. So, if a share class has a 5-year rating of 3 stars and a 3-year rating of 5 stars, the overall star rating is the nearest integer to $3.8\ (= 0.6 \times 3 + 0.4 \times 5)$, i.e., 4 stars. Finally, for share classes in operation more than 10 years, a 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 an "overall star rating."

3.2. Identification strategy: 24-month MRAR measured 3 years in the past

Fund flows are not randomly assigned and can be driven by unobservable demand-side factors, so it is important to identify shocks to fund flows that are orthogonal to these potentially confounding factors. The main identification strategy we use to address this endogeneity issue is to exploit Morningstar's methodology for calculating overall fund ratings when funds reach the 5-year mark.

When a share class has operated for 5 years, a 5-year star rating becomes available and both the 3- and 5-year star ratings are used to calculate the overall star rating, as opposed to simply using the 3-year star rating. It is important to point out that the difference between the 3- and 5-year star ratings stems from a share class's risk-adjusted performance between 3 and 5 years in the past. Any informational content embedded in this performance is at least 3 years old and stale, and thus it will be unrelated to unobservable demand-side factors that can affect municipalities' bond-issuance decisions. Nevertheless, a share class can be upgraded mechanically to a higher rating following the inclusion of the newly available 5-year rating in the calculation of the overall rating. As Morningstar ratings are salient, flows are likely to respond to such mechanical rating changes even though no new information is considered when Morningstar calculates these rating changes.

Our key variable that captures this effect is the percentile ranking of a share class's MRAR between [-59, -36] months (i.e., MRAR[-59,-36]) within its Morningstar category. Variation in MRAR[-59,-36] will be reflected in the overall rating only after 36 months. Thus, even though such an update in the overall rating is predictable, it is unlikely to be correlated with any demand-side factors that drive municipalities' current financing decisions.

The relevance condition for this identification strategy is that investors should react strongly to such an introduction of stale information at the 5-year mark even when the information has been available

for at least 3 years. With the change in the rating calculation at the 5-year mark, the stale information in risk-adjusted performance suddenly affects the likelihood of an upgrade in the overall star rating. To the extent that the overall star rating is salient and investors pay special attention to it, perhaps because of (in)attention or even because of institutional or organizational frictions that make it optimal to follow this particular fund feature, funds that are otherwise similar but vary in MRAR[-59,-36] would nevertheless receive differing flow volumes, depending on which side of the star-rating boundary they fall on.[10]

3.3. Relevance of the identification strategy

We first examine the extent to which MRAR [-59, 36] percentiles significantly increase the likelihood of overall rating upgrades in share classes that pass the 5-year mark and the extent to which investor flows respond to such rating upgrades driven by stale information. To this end, we perform a set of regressions for a sample of 5-year-old share classes that are either upgraded or remain at their previous ratings at the 5-year mark (our sample includes 427 such share classes in 269 individual funds). Specifically, we use the MRAR [-59, -36] percentile as an instrument for the upgrade indicator variable, 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 a positive effect on investor flows measured over horizons of [1, 3] and [1, 6] months following the 5-year mark. As control variables, we include fund performance over [-2, 0] months from the 5-year mark to control for rating upgrades and fund flows driven by recent fund performance. This control also enables us to compare the predictive power of the MRAR [-59, -36] percentile with that of the recent performance following the rating upgrade at the 5-year mark. We also include year-quarter fixed effects. Table 2 presents our results.

[10] Our paper is thus related to papers in prior literature that emphasize the importance of overall Morningstar ratings for fund investors, including Del Guercio and Tkac (2008), Ben-David, Li, Rossi, and Song (2022a), Evans and Sun (2021) and Reuter and Zitzewitz (2021). On a related front, Hartzmark and Sussman (2019) find a sizeable difference in investor flows in response to Morningstar sustainability star ratings.

TABLE 2 AND FIGURE 2 HERE

In Panel A we show two-stage least squares results. Column (1) of Panel A presents the first-stage regression results for the effects of past performance on the upgrade indicator. We find that MRAR [-59, -36] percentiles significantly increase the likelihood that a fund receives an overall rating upgrade at the 5-year mark: a fund that rises from the 25th to the 75th percentile of the MRAR [-59, -36] is 22 %(=0.50×0.441) more likely to be upgraded at the 5-year mark. Even though information in this risk-adjusted measure is at least 3 years old, it is strongly and positively associated with the likelihood of a rating upgrade. In contrast, recent fund performance does not bear strong association with the MRAR [-59, -36] percentile. As can be seen in columns (4) and (5), for example, neither the past quarter fund return nor the MRAR percentile of the past quarter—two measures of recent fund performance—has a strong relationship with the MRAR [-59, -36] percentile.

In columns (2) and (3) we report the results derived from a second-stage regression of fund flows on the upgraded indicator. For 3-months flows following an upgrade (column 2), we find the coefficient on the instrumented upgrade indicator to be 0.124, with statistical significance at the 5% level, implying that an upgraded 5-year-old share class with good MRAR [-59, -36] performance receives extra inflows of 12.4%. We find that both the statistical and economic significance of this finding increase as the flow horizon extends forward, showing that the effect of the overall rating upgrade is long-lasting. As seen in column (3), for example, the upgrade indicator predicts additional 6-month inflows amounting to 27.4%. We thus expect that investor flows following 5-year-old funds' rating upgrades can have substantial capital-supply effects.

Figure 2 graphically illustrates the effect of the MRAR [-59, -36] on fund flows at the 5-year mark (Panel A). We plot differences in quarterly flows between funds in the top and bottom MRAR [-59, -36] terciles. While there is no noticeable pattern in flow differences between the top and bottom tercile funds prior to the 5-year mark, there is an immediate positive increase in flows to funds in the top tercile relative to flows to funds in the bottom tercile, an effect that tends to persist for the ensuing quarters. Panel B

plots flow responses to rating upgrades at the 5-year mark. We find that, while flow responses to rating upgrades in Panel B are stronger, they also tend to be noisier than those to MRAR [-59, -36] percentiles as plotted in Panel A.

Though we engage in two-stage least squares regressions using MRAR [-59, -36] as an instrument in Panel A, our reduced form analysis in Panel B provides the magnitude on the MRAR [-59, -36] coefficient directly. We obtain a similar result when we use tercile indicators for MRAR [-59, -36] instead, with the top tercile receiving significantly more inflows in comparison with the bottom tercile (columns (3) and (4)).

There might be a concern that the results above combine the effect of upgrades of the 3-year rating that happen simultaneously with the 5-year anniversary of the fund. Table A.2 of the Internet Appendix repeat the same analysis but restricts the sample to funds that experience no changes in the 3-year rating. The results are quantitatively and qualitatively unchanged.

3.4. Fund flows and municipal bond issuance

As discussed in the previous section, the MRAR [-59, -36] generates variation in fund flows that is plausibly exogenous to demand-side factors related to bond issuance. We now proceed in a DiD-style setting to exploit this variation in MRAR [-59, -36] and examine differences in the likelihood of new issuance between municipalities held by share classes upgraded at the 5-year mark and those that remain at their previous ratings at the 5-year mark.

The DiD regressions are carried out as follows. For each share class that passes the 5-year mark, we classify four quarters before and after the 5-year mark as the event window. The post-5-year indicator variable is set to one for the 5-year-mark quarter and all quarters thereafter and zero otherwise. We then interact this indicator with our continuous treatment variable, the MRAR [-59, -36] percentile, which is measured at the 5-year-mark quarter and set to remain constant for each share class throughout the event window. As control variables, we include the overall MRAR of each share class, which is the weighted

average of past 3- and 5-year MRARs,[11] and share class, issuer, and state-by-year-quarter fixed effects. The dependent variable is the new issue indicator defined for each issuer-quarter, which takes the value of one if there is municipal bond issuance during the quarter. We include only municipal issuers for which more than 2.5% of their outstanding bonds are held by those share classes at the 5-year mark. This cutoff ensures that we focus on municipalities to whom the flows of these funds may be relevant. The results are robust to using alternative cutoffs, as we discuss below and show in Table A.3 of the Internet Appendix. The regressions are performed using the issuer-share class-quarter level data, as we examine the responses of municipalities when funds are subject to flow shocks.[12] Table 3 presents the DiD regression results.

TABLE 3 HERE

The results reported in columns (1) and (2) of Panel A in Table 3 indicate that municipalities are more likely to issue bonds when their mutual fund holders' past returns (over three years old) are in a higher percentile. As can be seen in column (1), for example, the coefficient estimate on the interaction term between "Post" and MRAR [-59, -36] is 0.02, with a *t*-statistic of 2.78, indicating that a rise in MRAR [-59, -36] from the 25th to the 75th percentile increases the likelihood of new bond issuance during the subsequent four quarters by 0.5×0.02=1%. We also find that this issuance effect occurs mainly within issuers as we find consistent results both with issuer fixed effects (column 1) and without those effects (column 2). For columns (3) and (4) we employ the rating upgrade indicator at the 5-year mark directly (i.e., simply whether a fund is upgraded when a fund turns 5 years old) instead of the MRAR [-59, -36] as a treatment variable. Column (3) shows that an overall star rating upgrade at 5 years of age leads to a 1.3% increase in the likelihood of new issuance during the subsequent four quarters. Lastly, in columns (5) and (6), we report the ordinary least squares (OLS) regression results for next-quarter issuance indicators on

[11] See the appendix for variable definitions.

[12] Although we conduct regressions at the issuer-share class-quarter level for Table 3, we confirm that our issuance identification regression results are fully robust when we restrict the sample to share classes with no contemporaneous changes in 3-year ratings (Table A.4) and when we conduct similar regressions at the issuer-quarter level instead, as revealed in Table A.5 in the Internet Appendix.

fund flows using sample funds regardless of age, and we find a positive link between fund flows and bond issuance.

Our DiD regression results suggest that the strong empirical link between the likelihood of new issuance and fund flows can be seen as causal, whereby increasing the supply of capital with municipal mutual funds encourages municipalities to issue more new bonds. Thus, the additional supply of capital into mutual funds appears to be absorbed by a rise in issuance in the primary market, rather than by higher prices in secondary-market trading alone, perhaps because of high illiquidity, infrequent trading, and the transaction costs associated with municipal bond trading (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, 2022). In a market where secondary-market purchases are particularly costly, as is the case with municipal bonds, a strong relationship between the supply of capital and bond issuance is to be expected.

The previous results show that additional capital from mutual funds makes bond issuance more likely. In Panel B of Table 3, we now use a DiD setting similar to that we used for Panel A to examine whether increasing the supply of capital also increases new issuance amounts *conditional* on bond issuance. The results show that bond amounts tend to increase as well, although the results are statistically weaker. As can be seen in column (1), we find a positive coefficient on the interaction term but without statistical significance when issuer fixed effects are included. For Column (2), we remove issuer fixed effects and find that the coefficient estimate increases and is statistically significant (with a *t*-statistic of 2.66). In columns (3) and (4) we provide the DiD regression results based on the rating upgrade indicator at the five-year mark and show that the coefficient estimates on the interaction term are positive and statistically significant at conventional levels.

In Table A.3 in the Internet Appendix, we show that the qualitative results of our main regressions in Table 3 Panel A, with the new issuance indicator as the dependent variable, are robust to alternative cut-offs for minimum fund holdings. Moreover, although we conduct regressions at the issuer-share

class-quarter level, with each issuer-share class pair as the cross-sectional unit, we confirm that all results in Table 3 are qualitatively unchanged when we collapse share class-level information into issuer-quarter level, as revealed in Table A.5 in the Internet Appendix. We choose to present the results from regressions conducted at the issuer-share class-quarter level in the main body as our key identifying shock, i.e., MRAR [-59, -36] materially affecting the likelihood of a share class's Morningstar rating upgrade at the 5-year mark, occurs at the individual share class level. Finally, in Table A.6 in the Internet Appendix, we confirm that our results remain unchanged when we use MRAR [-59, -36] tercile indicators rather than its continuous value, with the issuers held by 5-year-old share classes in the top MRAR [-59, -36] tercile subsequently more likely to engage in new bond issuances.

3.5. Underwriter relationship and bond issuance

A defining characteristic of the municipal bond market is its fragmented structure. For example, 333,905 municipal bond issuances since 2000 that are included in the Mergent database were underwritten by more than 2,000 lead underwriters,[13] many of which are regional banks, with a much lower combined market share for the top 10 underwriters than in the IPO or convertible bond markets (Butler, 2008). Regarding the secondary market, Li and Schürhoff (2019) note a clear core–periphery structure, with 10 to 30 highly interconnected dealers at the center but the other 2,000 operating on the periphery with very little connectivity. Given this market fragmentation, underwriters are known to rely heavily on their established customers. As Schultz (2012) notes, it is typically underwriters, not investors, who make the first contacts, approaching likely investors for new issues. Moreover, municipal issuers are slow to change underwriters, with on average 87% of new bonds issued with the same underwriter (Chen, Cohen, and Liu, 2021).

Given these characteristics, it is natural to hypothesize that the observed patterns in fund flows and the likelihood of new issuances by the issuers those funds hold are stronger when a fund has prior

[13] This number is more than double the number of lead underwriters for corporate bonds, which stands at around 1,000 over the same time period.

relationships with the issuer and the underwriter. Put differently, when it seems plausible that a mutual fund is a "natural client" for the issuer's bonds, we would expect fund flows and new issuances to bear a stronger association. We define the three-way previous relationship between a fund, an issuer, and an underwriter as follows. First, we require the issuer to have issued a bond with the bond's lead underwriter as the underwriter for that bond during the preceding twelve quarters *and* the fund to hold a nonzero amount of new issuances underwritten by this lead underwriter over the same time horizon. We define each two-way relationship (underwriter-fund, issuer-fund, issuer-underwriter) analogously.

Using this definition of a previous relationship, we consider the probability that a new issuance occurs as an outcome. Specifically, we estimate a triple interaction between 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 (do not have) a previous relationship and zero otherwise. Table 4 presents our results.

TABLE 4 HERE

The results reported in column (1) of Table 4 indicate that the identifying term, i.e., the triple interaction between the MRAR [-59, -36] percentile, the post 5-year indicator, and the indicator for whether a fund, issuer, and underwriter share a previous relationship is positive and statistically significant. This indicates that supply shocks are especially likely to lead to issuance when they flow through existing relationships. In terms of economic magnitude, the coefficient estimate is somewhat larger than that of the baseline estimate reported in Table 3 (such that moving from the 25^{th} to the 75^{th} percentile represents an increased probability of issuance of $0.5\times(0.036+0.002)=1.9\%$). The next three columns indicate that issuer-fund and issuer-underwriter relationships are particularly important for explaining the differential effects of relationships, more so than those between underwriters and the funds. Thus, the strong causal link between investor flows into mutual fund bondholders and the likelihood of new issuances seems largely confined to existing relationships in the market.

3.6. Fund participation in new issues

So far we have explored the effects of capital supply shocks to funds on issuer behavior, and in this subsection we consider whether a fund that experiences additional flows is more likely to participate in a new issue. One important benefit of considering fund participation is that it allows us to purge out demand-side effects by controlling for issuer-by-time fixed effects in the regressions, an identification strategy akin to Khwaja and Mian (2005). We focus on incidents in which lending from mutual funds actually occurs, that is, when new bonds are issued. By including issuer-by-time fixed effects, we compare lending decisions (i.e., the participation decisions in new bond purchases) made by mutual funds that hold the same municipal issuer's existing municipal bonds. Our capital supply hypothesis then suggests that funds that experience positive capital-flow shocks are more likely to participate in new bond purchases than are funds that do not experience such shocks, within the same issuer.

Specifically, we run the regression below to examine whether funds with more flows are more likely to participate in new issuances made by issuers they hold. Note that we cannot extend the empirical strategy using MRAR [-59, -36] because there are very few instances in the data with multiple funds having a non-missing value of this measure for the same issuer in the same quarter. Instead, we use the full sample without restricting to the exact moment funds turn 5 years old and consider how flows are related to participation in new issues:

$$Participation_{ijt} = \beta_1 Flow_{i,t} \times Relationship_{ijt} + \beta_2 Relationship_{ijt} + \beta_3 Flow_{i,t} + IssuerQtr_{j,t} + \varepsilon_{i,t} \quad (2)$$

where the new-issuance participation indicator, $Participation_{ijt}$, takes the value of one if fund *i* holds nonzero amounts of issuer *j*''s newly issued bond at the end of quarter *t*. This participation indicator varies within issuers and quarters, so we can include issuer-by-quarter fixed effects, $IssuerQtr_{j,t}$, and

examine the likelihood that funds with higher quarterly lagged flows participate, allowing us to remove time-varying demand-side unobservables and strengthening our identification. As is the case with Khwaja and Mian (2005) in the bank setting where firms borrow from multiple banks, this approach limits our analysis to municipal borrowers with multiple fund relationships.[14] We thus also examine whether the likelihood of participation in new issuances differs when a fund and an issuer share a previous relationship by interacting the *Flow* variable terms with the indicator variables denoting the presence of the previous relationship (or lack thereof).

TABLE 5 HERE

Table 5 presents the estimation results. The results reported in column (1) show a positive and highly significant coefficient on $Flow_{it}$ (with a *t*-statistic of 6.9), indicating that funds are *on average* more likely to participate in new bond issues when they experience positive flows. The results reported in columns (2)-(5) indicate the importance of previous relationships between funds and issuers in driving funds' participation decisions in new bond purchases. The interaction between the $Flow_{it}$ term and the previous relationship indicator is significant for the relationship between funds and underwriters, while the other connections are not statistically or economically significant in this regression. This suggests, as we would expect, that funds use the relationship with their underwriter to decide which bonds to purchase in response to variation in flows.

3.7. Fund flows and bond yields

Our analysis has hitherto examined the *quantity* effect of the supply of capital on bond issuance. Fund flows also, however, likely affect the cost of financing for issuers, enabling them to issue municipal bonds at lower yields. This effect will be also more prominent when a fund that experiences a favorable capital inflow has a tight-knit previous relationship with the issuer and the underwriter, as suggested by our previous results. We examine this hypothesis using the following DiD regression set-up:

[14] 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).

$$Offer\ yield_{i,t+1} = \beta_0 + \beta_1 MRAR[-59,-36]\ percentile_{i,t} \times Post\ 5year_{i,t}$$
$$\beta_2 MRAR[-59,-36]\ percentile_{i,t} + \beta_3 Post\ 5year_{i,t} + Controls +$$
$$Fixed\ effects + \varepsilon_{i,t}. \quad (3)$$

The dependent variable, $Offer\ yield_{i,t+1}$, is defined as the average issuance yield on all bond offerings issued by a municipality held by our sample of 5-year-old funds in quarter $t+1$. We conduct regression analyses at the bond-quarter level while controlling for maturity and debt seniority. Table 6 presents our results.

TABLE 6 HERE

Table 6 presents the results based on the DiD regression specified in Eq. (3). We find the interaction term between MRAR [-59, -36] percentile and the post-5-year indicator to be negative and highly statistically significant, with a *t*-statistic over 4. We also find that the economic magnitude is sizable: an improvement in the risk-adjusted performance of 5-year-old funds from the 25th to the 75th percentile is associated with a decrease in the offering yield of 0.5×-0.473=-0.237%, or 23.7 bps. Our analysis of bond-offering yields thus indicates that flows into mutual funds also reduce the financing costs that municipal issuers incur.

4. Further Identifying the Economic Channels: Methods of Sales and Source of Repayments

In this section, we first provide additional evidence indicating the importance of established relationships in mediating flow-driven capital supply by examining competitive and negotiated sales of municipal bonds. Next, we examine the source of repayments for General Obligation (GO) and Revenue

(REV) bonds, as well as political transaction costs associated with GO bond issuance that drive municipalities' financing decisions in response to flow-driven capital supply shocks.

4.1. Method of bond sales

There are two broad ways in which municipal bonds are issued and sold through underwriters. In a competitive sale, a municipality takes bids regarding the terms of a bond issuance and sale from multiple underwriters, and typically the underwriter offering the best terms wins the deal. In a negotiated sale, a municipality issues bonds through its relationship underwriters and negotiates with them over the terms of issuance. Given our earlier results regarding the importance of the relationship between issuers, underwriters, and mutual funds in mediating fund flows and bond issuance, we would expect the capital-supply effects to be more pronounced when bonds are sold through negotiated sales than through competitive sales because the former transactions typically occur with relationship underwriters.

We thus examine the capital supply effects of competitive and negotiated sales in two separate regressions and report the results in Table 7. In the first regression, our dependent variable is an indicator variable that takes the value of one if and only if the issuer issues at least one bond through a competitive sale (i.e., negotiated sales are given a "0" in this regression, and the sample remains the same in both columns). The dependent variable in the second regression is an indicator for new issuance if the issuer issues only through a non-competitive negotiated sale (and competitive sales are assigned a value of "0"). Given the way the dependent variables are defined, the sum of the coefficients in the two regressions is approximately equal to the coefficient in column (1) of Table 3. We employ these dependent variables in our DiD regressions with the MRAR [-59, -36] percentile as the continuous treatment variable, as with Table 3.

TABLE 7 HERE

Table 7 presents the regression results for competitive sales and negotiated sales, respectively. As expected, we find that the effect of fund flows on new bond issuance is stronger for negotiated sales,

although we cannot distinguish the two coefficients statistically. The coefficient estimate on the DiD term reported in column (2) for negotiated sales is 0.011, almost 50% higher than the coefficient estimate reported in column (1) for competitive sales. Combined with our earlier results, this analysis of the method of sales further suggests the importance of issuer–underwriter relationships for explaining the strong link between mutual fund flows and municipal bond issuance.

4.2. Source of repayment

Municipal bonds fall broadly into two categories, namely General Obligation and Revenue bonds. General Obligation (GO) bonds are backed by municipalities' taxing power to meet payment obligations and therefore issuing these bonds often requires voter approval. Voter approval is by no means a foregone conclusion, 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 margins of 5% or less. In comparison, Revenue (REV) bonds are paid off with cash flows from revenue-generating enterprises and projects without explicit legal pledges from municipalities or voter approval. The additional steps, such as voter approval, required for the issuance of GO bonds makes it easier for issuers to issue non-GO bonds when they want to quickly take advantage of favorable capital supply conditions.

To obtain the results reported in Table 8, we examine the extent to which municipalities issue GO bonds rather than non-GO bonds given exogenous capital-supply shocks from mutual funds by separately considering new issuances with and without GO bond issuance. To this end, we create a dependent variable indicating whether issuers issue at least one GO bond during a given quarter and another dependent variable indicating whether all new issuances during the quarter are non-GO bonds. In both cases, the sample includes all observations, such that non-GO bonds are given a "0" when we consider GO issuance, and the reverse when we look at non-GO issuance. Table 8 presents the estimation results based on the DiD regressions using these dependent variables.

TABLE 8 HERE

In Panel A of Table 8, we find that the effect of MRAR [-59, -36] at the 5-year mark is particularly strong for REV issuances. As seen in column (2), for example, the coefficient estimate on the DiD interaction term is 0.012, with a *t*-statistic of 2.15 for the case in which only REV bonds are issued. In contrast, results reported in column (1) indicate that the coefficient estimate on the interaction term is merely 0.003 and statistically nonsignificant. These results are thus consistent with the notion that issuers take advantage of a temporarily favorable capital supply with issuances that involve lower uncertainties surrounding voter approval.

In Panels B and C, we further examine the effects of political transactional costs associated with voter approval required for GO bond issuance. Specifically, we perform subsample analyses based on supermajority requirements for the issuance of GO bonds, which raise the political hurdle for bond issuance even higher.[15] We then estimate the GO and non-GO issuance regressions as seen in Panel A, but separately for the subsample of states with (Panel B) and states without supermajority requirements (Panel C).

The results reported in Panel B of Table 8 indicate that, in states with supermajority requirements, the effects of flow-driven capital supply are concentrated in REV bond issuance. As can be seen in column (2), for example, the coefficient estimate for the interaction term is 0.029, more than twice the estimate reported in Panel A, with a *t*-statistic of 1.953. In contrast, the coefficient on the interaction term reported in column (1) is only 0.011 and statistically nonsignificant, indicating that fund flows do not drive GO bond issuance in states with supermajority requirements for such issuance (although we cannot reject that the difference could be statistically zero). Given that these are states where the issuance of GO bonds is particularly costly from a transaction-cost standpoint, it is not surprising to observe a more statistically significant relationship between fund flows and REV bond issuance in such states. In

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

comparison, the results reported in Panel C indicate that the supply of capital from mutual funds does not increase REV bond issuance significantly.

These results suggest that political obstacles to GO bond issuance are an important consideration from issuers' perspective when responding to temporarily favorable capital-supply conditions. In a similar vein, for Table A.7 in the Internet Appendix, we re-estimate the offering-yield regressions associated with Table 6, albeit separately for GO and non-GO issuances. We find consistently that capital flows into mutual fund bondholders with previous relationships substantially reduce only the offering yields of non-GO issuances, particularly when mutual fund bondholders and issuers share previous relationships.

5. Where Does the Money Go? Purpose of Issuance and Sustainable Financing

5.1. Purpose of issuance

We now consider the extent to which municipalities, in response to favorable capital-supply conditions, issue bonds to refund existing issues. 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 lengthen existing maturities (e.g., Xu, 2018; Mian and Santos, 2018). Given that municipal bonds tend to carry higher yields than Treasuries even after adjusting for taxes because of high default risk and illiquidity (e.g., Schwert, 2017), an inflow of capital may encourage issuers to roll over their existing debt and lengthen the maturity of their bonds. On the other hand, municipalities may wish to use such a temporarily favorable capital-supply condition to start a new project that they may otherwise have been unable to finance. In this case, municipalities may want to issue new bonds ("new filings") instead of refunding existing bonds. We compare refunding bond issues and new filing issues using separate indicator variables for issuances without refunding bonds and for issuances with at least one refunding bond. Table 9 presents the estimation results based on the DiD regressions.

TABLE 9 HERE

The results reported in columns (1) and (2) of Table 9 indicate that municipalities are much more likely to issue new filing bonds than refunding bonds. For example, the results reported in column (1) indicate that the coefficient estimate on the DiD term, i.e., interaction between 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 coefficient estimate on the DiD term loses statistical significance when we consider issuances that involve at least one refunding, as shown in column (2). Moreover, the column (2) results also indicate that the economic magnitude of the coefficient estimate on the interaction term for issuances that do not include any refunding bond issues is more than three times that for issuances that include refunding. At conventional levels, we can distinguish the two coefficient estimates using a one-sided test but not a two-sided test. The results reported in Table 9 offer suggestive evidence that investor inflows into upgraded funds primarily enable issuers to finance new projects.

5.2. Use of issuance proceeds and sustainable financing

For Tables A.9 and A.10 in the Internet Appendix, we examine the types of projects for which municipalities use issuance proceeds from bond financing in response to flow-driven capital-supply shocks. For Table A.9, for example, we examine whether this exogenous supply of capital affects certain sectors more than others. Overall, we find that this additional supply of capital appears to be channeled toward financing, housing, and development as well as general uses. For Table A.10, we explore whether investor flows exert differential impacts on the comparative likelihood of green and non-green bond issuance, given the importance of municipal green bond issuances compared with those of corporate green bonds (e.g., Baker, Bergstresser, Serafeim, and Wurgler, 2018; Larcker and Watts, 2020). We find that the flow-driven capital supply is directed primarily towards non-green issuances, likely because green bond issuance often involves third-party verification (e.g., Flammer, 2021), which increases the administrative burden and transaction cost of issuance, making it more difficult for issuers to take advantage of temporarily favorable capital-supply conditions.

6. Conclusion

This paper introduces a novel identification strategy to the literature to identify the effects of mutual fund flows on municipal bond issuance, and shows that underwriter-fund-issuer relationships are critical to understand the effects of capital supply in this setting. 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. Following the addition of the new 5-year rating to the overall rating methodology, funds with favorable risk-adjusted performance between 3 and 5 years in the past are likely to be upgraded on the basis of this past performance. We find that, even though this upgrade is driven by stale information and is largely inconsequential for recent performance, investors respond strongly to the upgrade. These inflows lead, in turn, to more frequent and larger bond issuances on the part of issuers that are already held by these funds. We argue that this strategy is immune to concerns raised in the literature regarding the identification of the effects of mutual fund flows on real outcomes.

Capital flows to issuers based on existing relationships at the underwriter-fund-issuer level, suggesting an important role for relationships in what looks at first sight like an arms-length market. Frictions in the issuance of new bonds that depend on the offering method and bond type also affect the use of funds, and we find that issuers are somewhat more likely to use supply-driven funds to finance new projects. Overall, we find strong evidence of a supply-side effect in municipal financing that operates through lender–borrower relationships, with issuers taking advantage of favorable capital-supply conditions resulting from fund investor inflows.

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Appendix. Variable descriptions

In this table, we provide detailed definitions of the variables in our empirical analysis, with the data sources noted in parentheses.

A.1. Issuer characteristics

New issuance indicator (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.

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 that have been in operation between 36 and 59 months, we use the 3-year MRAR to calculate the overall MRAR. For funds that have been in operation between 60 and 119 months, we average the 3- and 5-year MRAR with 40% and 60% weights, respectively. For funds that have been in operation more 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 star ratings over specific time horizons. At the end of each month, all share classes belonging to specific Morningstar categories are ranked based on 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. The overall rating score is then calculated as follows:

1. Share classes that have aged less than three years are not rated.
2. The overall rating score for share classes that have been in operation between 36 and 59 months is the 3-year star rating.

3. The overall rating score for share classes that have been in operation between 60 and 119 months places a 40% weight on the 3-year star rating and a 60% weight on the 5-year star rating.
4. The overall rating score for share classes that have been in operations longer for 10 years or longer places a 20% weight on the 3-year star rating, a 30% weight on the 5-year star rating, and a 50% weight on the 10-year star rating.

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

Fund return (CRSP MF): Time-weighted total return on 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 on 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 a fund's previous quarter's-end total net assets.

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

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

A.3. Issue characteristics

Issuance yield (Mergent Municipal): Yield to maturity at the time of issuance, in percentages.

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

Revenue bond issue (Mergent Municipal): An issue repayment of which is backed by 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 results in new money flowing 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.

Competitive issue (Mergent Municipal): An issue where the offering type of the bond is determined through a bidding process, as reported in Mergent Municipal.

Negotiated issue (Mergent Municipal): An issue where the offering process of the bond involves the negotiation of terms, as reported in Mergent Municipal.

Green bond (Bloomberg/Mergent Municipal): A bond that is flagged as a green bond by both Bloomberg and Mergent Municipal.

Table 1. Summary statistics

In this table we report summary statistics for our sample of municipal issuers and mutual funds. The sample period runs from 2000Q1 through 2020Q3. We report issuer characteristics in Panel A and fund characteristics in Panel B. For a detailed definitions of each variable, see the appendix. Continuous variables are winsorized at the 1% and 99% levels; these summary statistics are computed using winsorized values.

Panel A. Issuer characteristics

	Obs.	Mean	St. Dev.	P1	P25	P50	P75	P99
New issuance indicator	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
Issuance yield	56,554	3.834	1.713	0.520	2.521	4.000	5.050	7.500
Average percentage held per fund (%)	798,758	30.07	39.30	0.105	3.660	13.33	42.19	100.0
Percentage $ amount 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
MRAR (%, annualized)	51,041	4.264	13.904	-38.868	-2.787	4.188	12.215	46.433
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

Table 2. Morningstar rating changes and fund flows

The table presents cross-sectional regression results for fund flows and Morningstar rating upgrade when share classes have existed for 5 years using the percentile ranking of past returns as the instrument. We identify all share classes that have existed for 5 years during our sample period whose overall Morningstar ratings have either been upgraded or remained the same at the 5-year mark, with *upgrade indicator* denoting the upgraded share classes. To instrument for the likelihood of an upgrade, we calculate the percentile rank (between 0 and 1) 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 for which there are continuous return histories between [-59, -36] at the same point in time. We refer to this measure as *MRAR [-59, -36] percentile*. Panel A presents two-stage least squares results using *MRAR [-59, -36] percentile* as the instrument. In column (1), we present the first-stage regression results with the upgrade indicator as the dependent variable and with the fund return between [-2, 0] months as an additional control, while in columns (2) and (3) we present the second-stage results for cumulative fund flows between [1, 3] and [1, 6] months following upgrades. In the last two columns, we run OLS regressions of MRAR [-59, -36] percentile on either the (i) MRAR [-2, 0] percentile or (ii) fund return between [-2, 0] months relative to the 5-year mark. Panel B shows reduced form regressions of fund flows as the outcomes and both *MRAR [-59, -36] percentile* as the independent variable and terciles of *MRAR [-59, -36] percentile* as the explanatory variables. Returns and flows are raw values unless otherwise explicitly stated. In all instances, we include year-quarter fixed effects. *t*-statistics based on robust standard errors are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Two-stage least squares

	Dependent variables				
	(1) Upgrade indicator	(2) Fund flow [1, 3]	(3) Fund flow [1, 6]	(4) MRAR [-59, -36] percentile	(5) MRAR [-59, -36] percentile
MRAR [-59, -36] percentile	0.441***				
	(6.620)				
Upgrade indicator		0.124**	0.274***		
		(2.165)	(2.676)		
MRAR [-2, 0] percentile				0.065	
				(0.243)	
Fund return [-2, 0]	1.244	0.722	0.933		0.860
	(0.766)	(1.109)	(0.923)		(0.718)
No. of observations	427	427	427	427	427
Kleibergen-Paap F-statistic	43.82				
Quarter FE	YES	YES	YES	YES	YES

Panel B: Reduced form regressions using MRAR [-59, -36] percentile and tercile splits

	Dependent variable			
	(1)	(2)	(3)	(4)
	Fund flow	Fund flow	Fund flow	Fund flow
	[1, 3]	[1, 6]	[1, 3]	[1, 6]
MRAR [-59, -36]	0.055**	0.121***		
percentile	(2.376)	(3.014)		
Top tercile indicator			0.036**	0.088***
			(2.198)	(3.171)
Middle tercile indicator			0.018	0.047
			(1.064)	(1.589)
Fund return [-2, 0]	0.876	1.274	0.867	1.240
	(1.456)	(1.442)	(1.431)	(1.391)
No. of observations	427	427	427	427
R-squared	0.141	0.160	0.140	0.161
Quarter FE	YES	YES	YES	YES

Table 3. Morningstar rating changes and issuance decisions

For 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-differences 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. For columns (1) and (2), we interact this variable with *MRAR [-59, -36] percentile* at the time of an upgrade, imposed continuously throughout the event window, as defined in Table 2. For columns (3) and (4), we interact the post-5-year indicator directly with the upgrade indicator instead (i.e., a dummy variable for whether a share class is upgraded or not). With the inclusion of share-class fixed effects, the standalone *MRAR [-59, -36] percentile* or *Upgrade indicator* are subsumed by fixed effects. In Panel A we focus on the next-quarter new issuance indicator as the dependent variable, while for Panel B 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) of both panels, we use OLS regressions of the next-quarter new-issuance indicator or log new-issuance amount on fund flow. We also control for overall MRAR as well as issuer, share-class, and state-by-quarter fixed effects in all instances. *t*-statistics based on standard errors that are 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 probability

	Dependent variable: New issuance indicator					
	(1)	(2)	(3)	(4)	(5)	(6)
Post 5-year indicator	-0.015**	-0.016**	0.002	-0.019**		
	(-2.235)	(-2.295)	(0.335)	(-2.216)		
MRAR [-59, -36] percentile	0.020***	0.026***				
× Post 5-year indicator	(2.777)	(3.292)				
Upgrade indicator			0.013***	0.014*		
× Post 5-year indicator			(2.834)	(1.858)		
Fund flow					0.008***	0.008***
					(7.280)	(4.770)
MRAR	-0.002	-0.004***	0.000	0.002	0.001**	0.002***
	(-1.051)	(-3.236)	(0.292)	(0.676)	(2.308)	(3.269)
No. of observations	245,644	245,995	250,148	250,710	13,367,291	13,367,424
Adjusted R-squared	0.432	0.102	0.435	0.121	0.385	0.095
Share class FE	YES	YES	YES	YES	YES	YES
Issuer FE	YES	NO	YES	NO	YES	NO
State-by-quarter FE	YES	YES	YES	YES	YES	YES

Panel B: Issuance amount

	Dependent variable: Log new issuance amount					
	(1)	(2)	(3)	(4)	(5)	(6)
Post 5-year indicator	-0.013	-0.052	-0.085	-0.158*		
	(-0.255)	(-1.080)	(-1.128)	(-1.788)		
MRAR [-59, -36] percentile	0.067	0.145**				
× Post 5-year indicator	(1.118)	(2.655)				
Upgrade indicator			0.161***	0.144**		
× Post 5-year indicator			(3.350)	(2.131)		
Fund flow					0.015***	0.002
					(2.811)	(0.237)
MRAR	0.022	0.035	0.022	0.028	0.007***	0.006*
	(0.670)	(1.083)	(1.219)	(1.256)	(3.041)	(1.831)
No. of observations	59,990	60,948	60,581	61,731	4,161,686	4,162,443
Adjusted R-squared	0.507	0.196	0.518	0.232	0.447	0.191
Share class FE	YES	YES	YES	YES	YES	YES
Issuer FE	YES	NO	YES	NO	YES	NO
State-by-quarter FE	YES	YES	YES	YES	YES	YES

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

For this table we check whether new-issuance probability differs depending on whether there is previous relationship between a fund, an issuer, and an underwriter. We treat an issuer, an underwriter, and a fund as related 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 volume of the new issuances underwritten by this lead underwriter over the same time horizon. Two-way relationship between underwriter-fund, issuer-fund, and issuer-underwriter pairs are defined analogously. We control for issuer, state-by-quarter, and share-class fixed effects. *t*-statistics based on standard errors robust that are 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			
Relationship defined as:	(1) Issuer-underwriter-fund	(2) Underwriter-fund	(3) Issuer-fund	(4) Issuer-underwriter
MRAR [-59, -36] percentile * Post 5-year * Previous relationship	0.036**	0.011	0.044***	0.032**
	(2.552)	(0.826)	(3.019)	(2.409)
MRAR [-59, -36] percentile * Post 5-year	0.002	0.012	0.001	0.003
	(0.139)	(0.869)	(0.055)	(0.248)
MRAR [-59, -36] percentile * Previous relationship	-0.014	-0.002	-0.026***	-0.015
	(-1.375)	(-0.211)	(-2.898)	(-1.539)
Previous relationship * Post 5-year	-0.026**	-0.006	-0.032***	-0.022**
	(-2.482)	(-0.609)	(-3.060)	(-2.197)
Post 5-year	-0.001	-0.010	-0.000	-0.003
	(-0.132)	(-0.953)	(-0.043)	(-0.268)
Previous relationship	-0.029***	-0.009	0.016**	-0.030***
	(-3.352)	(-1.044)	(2.081)	(-3.429)
MRAR	-0.002	-0.002	-0.002	-0.002
	(-0.998)	(-1.064)	(-1.057)	(-0.988)
No. of observations	245,644	245,644	245,644	245,644
Adjusted R-squared	0.433	0.432	0.432	0.433
Share class FE	YES	YES	YES	YES
Issuer FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Table 5. Fund flow and issuance participation: The role of relationships

For this table, we examine whether funds experiencing inflows are more likely to purchase new issuances. Specifically, in column (1), we run OLS regressions with the *new issuance participation indicator*, which takes the value of one if a fund purchases a non-zero portion of an issuer's new issuance, on lagged fund flow. In columns (2) through (5), we interact lagged fund flow with the previous relationship indicators, both for the three-way relationship between the issuer, underwriter, and the fund, as well as for each of the two-way relationship. We control for issuer-by-quarter fixed effects to compare the likelihood of participation between funds holding the same issuer at a given point in time. *t*-statistics based on standard errors that are 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 participation indicator				
	(1)	(2)	(3)	(4)	(5)
Relationship defined as:		Issuer-underwriter-fund	Underwriter-fund	Issuer-fund	Issuer-underwriter
Fund flow	0.014***	0.011***	0.008***	0.015***	0.016***
	(6.877)	(6.051)	(5.304)	(6.788)	(5.305)
Previous relationship		0.085***	0.034***	0.015***	-0.019***
		(15.264)	(12.751)	(6.539)	(-4.335)
Fund flow×		-0.002	0.009***	-0.001	-0.004
Previous relationship		(-0.480)	(3.776)	(-0.527)	(-1.456)
No. of observations	14,933,962	14,933,962	14,933,962	14,933,962	14,933,962
Adjusted R-squared	0.403	0.416	0.405	0.403	0.403
Issuer-by-quarter FE	YES	YES	YES	YES	YES

Table 6. Fund flow and bond issuance: Offering yield

For this table, we examine the relationship between fund flow and the prices at which muni bonds are issued, i.e., the offering yield. Using 5-year Morningstar rating methodology change for identification, we check whether additional flows into an issuer fund's bondholders affect the offering yield of bonds issued during the ensuing quarter. Regressions are conducted at the bond-quarter level. In addition to the holdings-weighted-average MRAR of fund bondholders, we further control for the issuing bond's maturity and debt seniority. We also include issuer and state-by-quarter fixed effects. *t*-statistics based on standard errors that are robust to heteroskedasticity and clustered by quarter are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Offering yield (%)
MRAR [-59, -36] percentile × Post 5-year	-0.473***
	(-4.409)
Post 5-year	0.374***
	(4.418)
MRAR [-59, -36] percentile	0.289***
	(2.830)
MRAR	0.148***
	(7.746)
Maturity	0.004***
	(10.119)
Seniority	0.951***
	(4.764)
No. of observations	5,802
Adjusted R-squared	0.891
Issuer FE	YES
State-by-quarter FE	YES

Table 7. Fund flows and bond issuance: Issuance offering method

In this table, we present difference-in-differences regression results for our 5-year Morningstar rating methodology identification, as in Table 3, interacting *MRAR [-59, 36] percentile* with the *post-5-year indicator*, albeit separately when considering issuances that are offered as competitive bids and those that are placed by negotiation. We assign the value of one to the new issuance indicator if the issuer issues at least one bond that satisfies the criteria and zero otherwise. One-sided tests are conducted based on the coefficient on negotiated sales being greater than that of competitive sales. All specifications include overall MRAR as a control as well as issuer, share-class, and state-by-quarter fixed effects. *t*-statistics based on standard errors that are robust to heteroskedasticity and that are 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)
	Competitive sales		Negotiated sales
MRAR [-59, -36] percentile ×	0.007*		0.011*
Post 5-year indicator	(1.757)		(1.768)
Coefficient of difference		0.004	
(*t*-statistic)		(0.58)	
No. of observations	245,644		245,644
Adjusted R-squared	0.369		0.408
Issuer FE	YES		YES
Share class FE	YES		YES
State-by-quarter FE	YES		YES

Table 8. Fund flow and bond issuance: GO versus revenue bond issuance

In this table we present difference-in-differences regression results for 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 and those that do not. For Panel A we consider the full sample while in Panels B and C we consider states that have supermajority requirements for the approval of GO bonds separately from those that do not. One-sided tests are conducted based on the coefficient on revenue bond being greater than that of GO bond. All specifications include overall MRAR as a control as well as issuer, share class, and state-by-quarter fixed effects. *t*-statistics based on standard errors that are 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		
	(1)		(2)
	At least one GO issuance		All REV issuance
MRAR [-59, -36] percentile ×	0.003		0.012**
Post 5-year indicator	(1.183)		(2.146)
Coefficient of difference		0.008	
(*t*-statistic)		(1.45)	
No. of observations	245,644		245,644
Adjusted R-squared	0.430		0.431
Issuer FE	YES		YES
Share class FE	YES		YES
State-by-quarter FE	YES		YES

Panel B. States with a supermajority requirement

	Dependent variable: New issuance indicator		
	(1)		(2)
	At least one GO issuance		All REV issuance
MRAR [-59, -36] percentile ×	0.011		0.029*
Post 5-year indicator	(1.045)		(1.953)
Coefficient of difference		0.018	
(*t*-statistic)		(0.95)	
No. of observations	33,605		33,605
Adjusted R-squared	0.428		0.348
Issuer FE	YES		YES
Share class FE	YES		YES
State-by-quarter FE	YES		YES

Panel C. States without a supermajority requirement

	Dependent variable: New issuance indicator		
	(1)		(2)
	At least one GO issuance		All REV issuance
MRAR [-59, -36] percentile ×	0.002		0.009
Post 5-year indicator	(0.671)		(1.601)
Coefficient of difference		0.007	
(*t*-statistic)		(1.08)	
No. of observations	212,037		212,037
Adjusted R-squared	0.429		0.444
Issuer FE	YES		YES
Share class FE	YES		YES
State-by-quarter FE	YES		YES

Table 9. Fund flows and issuance: New filings versus refunding issuance

In this table we present the difference-in-differences regression results for our 5-year Morningstar rating methodology identification as in Table 3, interacting *MRAR [-59, 36] percentile* with the *post-5-year indicator*, albeit separately for issuer-quarters that consist of only new filings and those that include at least one refunding. One-sided tests are conducted based on the coefficient on new filings being great than that of refunding. All specifications include overall MRAR as a control as well as issuer, share-class, and state-by-quarter fixed effects. *t*-statistics based on standard errors that are 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)
	New filings only		At least one refunding
MRAR [-59, -36] percentile ×	0.016***		0.005
Post 5-year indicator	(3.389)		(0.709)
Coefficient of difference		0.010	
(*t*-statistic)		(1.33)	
No. of observations	245,644		245,644
Adjusted R-squared	0.392		0.195
Issuer FE	YES		YES
Share class FE	YES		YES
State-by-quarter FE	YES		YES

Figure 1. Holders of municipal bonds

For 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 holdings of municipal bonds by investors.

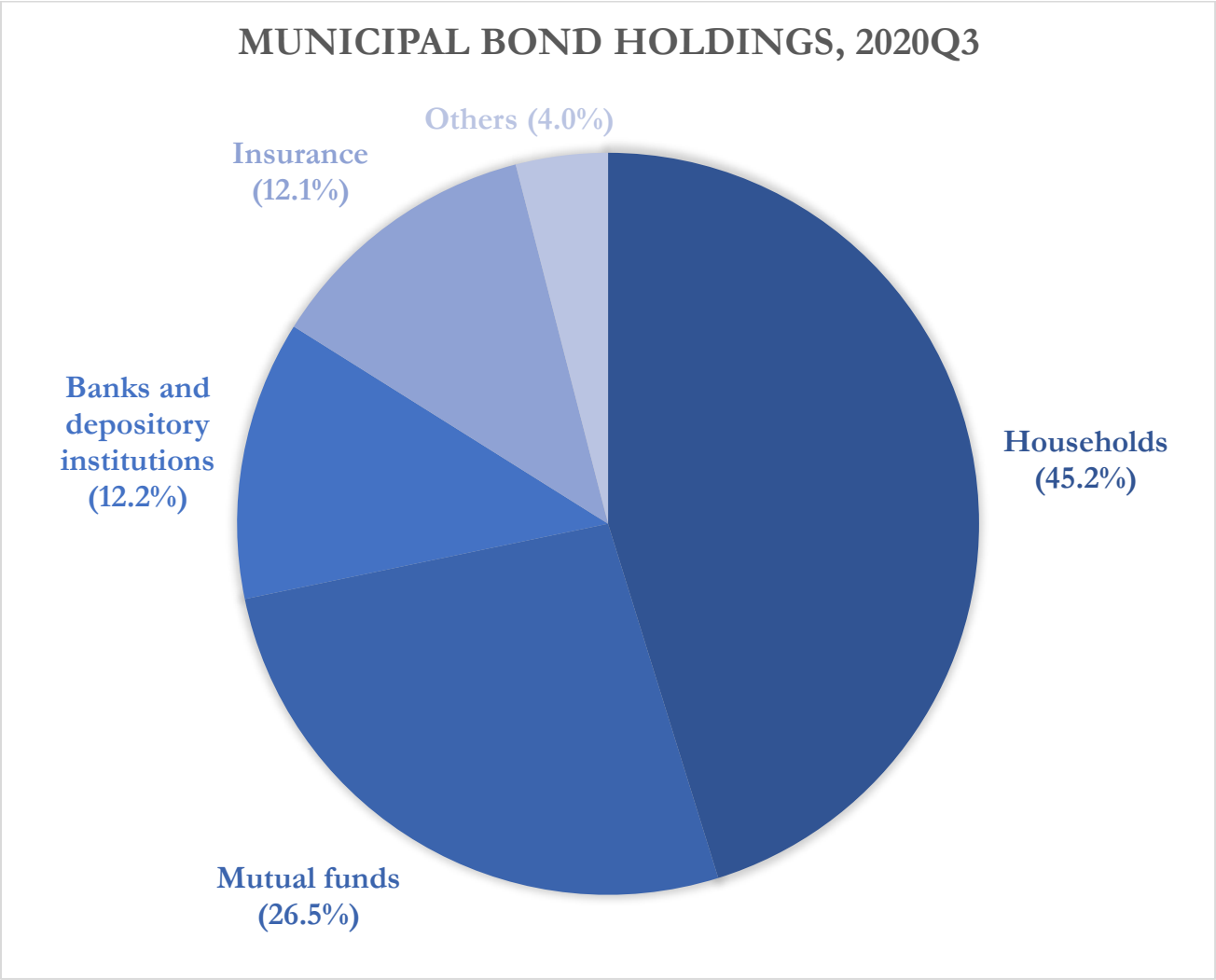
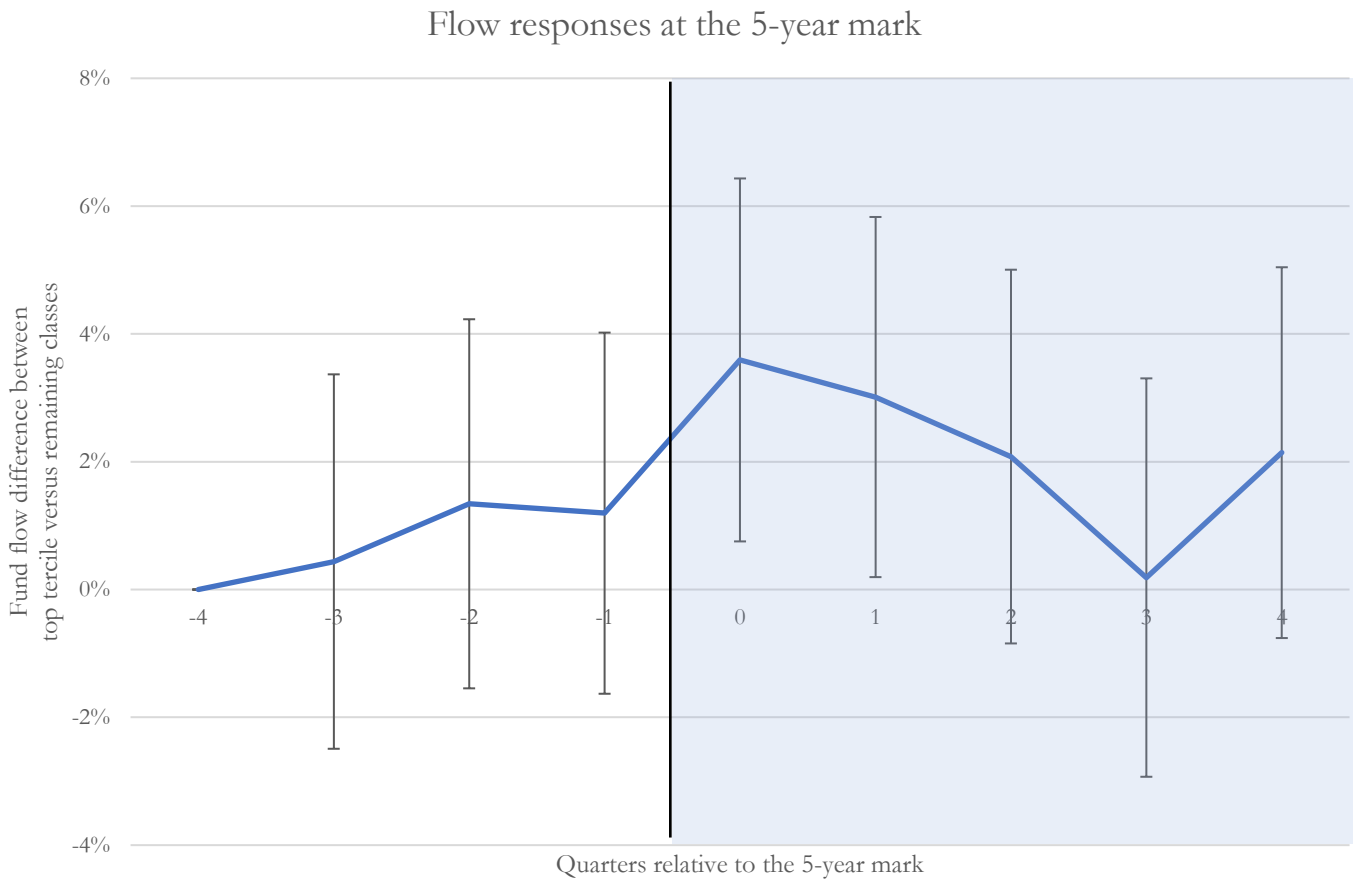


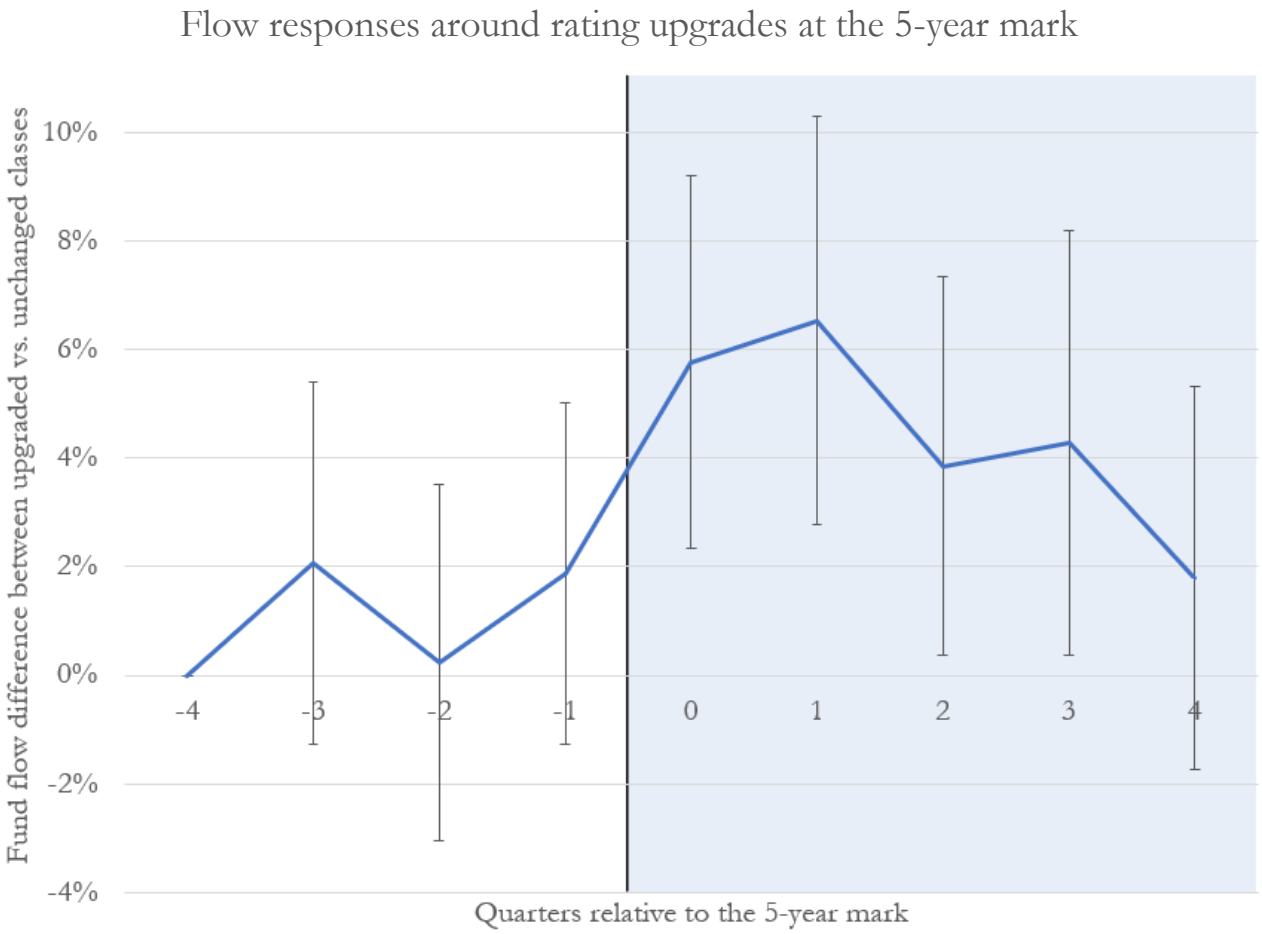
Figure 2. Flow response and Morningstar star rating change at 5-year rating introduction

For this figure we compute differences in quarterly flows between share classes at the 5-year mark. For Panel A, we compare share classes whose MRAR [-59, -36] percentiles falls into the top terciles with the remaining share classes. For Panel B, we compare share classes that experience upward changes in their ratings at their 5-year marks, when Morningstar's star-rating calculation method changes, with those that remain at their previous star ratings. The quarter at which a share class reaches 5 years of existence is defined as quarter 0. Error bars denote 90% confidence intervals.

Panel A. Fund flows with an MRAR [-59, 36] tercile indicator



Panel B. Fund flows with rating upgrades



Internet Appendix to:

"Mutual Fund Flows and the Supply of Capital in Municipal Financing"

This Version: February 6, 2023

Table A.1. Municipal bond issuance characteristics by state

This table presents the number of municipal bond issuances by state and bond characteristics. For a detailed definitions of each variable, see the appendix.

State	No. of new issuances	No. of new filings	No. of refundings	No. of GO bond issuances	No. of revenue bond issuances	No. of competitive offerings	No. of negotiated offerings	Super-majority require-ments	Total new issuance amount ($millions)	New issuance / Total outstanding (%)
AK	4,703	2,654	2,018	699	1,318	578	2,438	0	23.12	3.45
AL	25,592	11,732	13,741	4,742	8,088	10,715	7,608	0	86.03	3.50
AR	17,688	9,027	8,589	3,158	5,767	5,977	6,749	0	30.69	4.14
AZ	33,531	20,883	12,433	6,644	9,989	7,150	13,822	0	155.8	3.88
CA	248,005	139,252	106,861	56,268	81,225	42,727	138,319	0	1,490.7	3.55
CO	38,064	19,565	17,860	5,456	13,283	4,700	19,965	0	179.2	3.72
CT	35,011	21,238	13,397	11,284	5,916	13,995	10,348	0	158.7	4.68
DE	3,983	2,170	1,789	849	1,023	900	1,796	0	21.45	2.84
FL	65,786	32,822	32,209	1,384	28,846	16,583	24,957	0	383.7	3.30
GA	28,799	16,328	12,036	2,456	11,781	4,363	14,929	0	189.7	3.44
HI	7,479	4,385	3,025	2,495	1,664	1,220	3,919	0	56.88	3.25
IA	17,742	11,411	6,270	4,674	4,945	10,699	2,933	0	44.87	4.55
ID	7,858	4,836	2,984	1,341	2,403	1,187	4,066	0	24.95	3.97
IL	60,518	31,919	27,706	17,870	11,436	13,370	28,109	0	380.0	3.55
IN	35,400	18,348	16,606	956	16,797	8,091	17,284	0	139.1	3.87
KS	37,033	19,375	17,544	9,094	8,786	15,696	10,277	0	66.37	3.85
KY	33,002	18,468	13,884	2,337	14,449	19,344	4,768	0	91.48	3.47
LA	19,411	11,026	8,046	3,018	7,200	5,326	8,310	0	93.94	3.38
MA	49,818	25,332	24,083	15,032	11,671	25,593	10,871	0	316.0	5.29
MD	32,510	19,130	13,180	7,709	8,754	14,419	8,716	0	170.3	3.42
ME	12,185	7,717	4,422	2,286	4,029	3,981	5,210	0	29.19	3.76
MI	56,912	29,539	26,748	15,219	10,242	9,679	26,839	0	240.5	3.22
MN	72,139	47,483	24,316	17,411	12,296	37,225	11,552	0	143.7	3.80
MO	37,803	21,619	15,923	5,340	13,322	11,470	14,467	0	120.7	3.92
MS	15,600	10,833	4,710	1,820	5,154	2,808	7,116	1	44.28	3.26
MT	7,140	4,643	2,470	1,775	1,894	906	4,208	0	13.50	5.04
NC	34,857	20,621	14,054	5,328	11,986	8,788	15,553	0	151.3	3.68
ND	9,834	4,646	5,011	741	4,128	5,353	1,602	0	14.19	4.39
NE	23,037	12,195	10,794	4,021	5,623	5,999	9,656	0	62.91	4.47
NH	7,968	4,961	2,733	1,707	2,278	3,302	2,397	0	26.82	4.19
NJ	62,723	32,973	29,394	14,704	16,044	20,376	20,908	0	352.3	5.10
NM	13,355	9,307	3,911	1,908	4,804	3,324	5,726	0	50.85	4.11
NV	15,033	8,805	5,924	1,824	3,075	6,090	3,117	0	80.76	3.66
NY	137,646	82,325	53,197	27,391	36,867	58,302	33,017	0	1,219.1	5.85
OH	79,928	39,618	39,672	23,021	16,197	12,245	42,306	1	281.2	3.83
OK	16,397	10,896	5,131	1,706	7,642	2,809	9,472	1	56.53	4.64
OR	28,865	17,801	11,002	8,213	6,133	5,562	14,878	0	101.6	3.63
PA	88,296	39,131	48,370	23,521	18,612	18,393	40,161	0	375.7	3.52
RI	12,500	8,102	4,332	1,871	4,394	3,953	5,257	0	33.38	3.86
SC	23,528	12,781	10,581	4,725	6,778	11,349	5,277	0	105.6	3.73
SD	5,124	2,661	2,389	548	2,278	904	2,767	1	15.32	3.23
TN	27,858	13,322	14,130	6,614	7,466	11,736	8,196	0	118.1	3.38
TX	185,846	96,058	88,487	67,421	31,291	77,113	61,631	1	896.5	3.97
UT	15,548	8,976	6,417	2,366	5,906	6,238	4,781	0	64.17	3.66
VA	39,440	21,615	16,691	6,131	14,082	14,847	12,736	0	172.7	3.51
VT	5,432	3,333	2,038	890	2,165	786	3,328	0	15.12	3.20
WA	40,567	21,628	18,653	8,517	11,425	11,710	14,675	1	221.3	3.58
WI	31,658	17,001	14,398	10,129	7,020	11,378	10,769	0	130.7	5.09
WV	6,315	3,033	3,233	432	2,817	1,152	3,256	1	23.82	3.20
WY	2,211	1,228	935	14	939	484	1,010	0	8.81	2.92
Total	1,917,678	1,054,752	844,327	425,060	532,228	591,215	745,235	7	9,273.6	3.97

Table A.2. Morningstar rating changes and fund flows: Holding 3-year rating fixed

The table presents cross-sectional regression results for fund flows and Morningstar rating upgrade when share classes have existed for 5 years using the percentile ranking of past returns as the instrument, as in Table 2 Panel A. However, in this table, we restrict our attention to all share classes whose overall Morningstar ratings have either been upgraded or remained the same at the 5-year mark, but with the 3-year rating (i.e., the rating under the "old" methodology) remaining unchanged at the 5-year mark. Once again, to instrument for the likelihood of an upgrade, we calculate the percentile rank (between 0 and 1) 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 for which there are continuous return histories between [-59, -36] at the same point in time. We refer to this measure as *MRAR [-59, -36] percentile*. We presemt two-stage least squares results using *MRAR [-59, -36] percentile* as the instrument. In column (1), we present the first-stage regression results with the upgrade indicator as the dependent variable and with the fund return between [-2, 0] months as an additional control, while in columns (2) and (3) we present the second-stage results for cumulative fund flows between [1, 3] and [1, 6] months following upgrades. In the last two columns, we run OLS regressions of MRAR [-59, -36] percentile on either the (i) MRAR [-2, 0] percentile or (ii) fund return between [-2, 0] months relative to the 5-year mark. In all instances, we include year-quarter fixed effects. *t*-statistics based on robust standard errors are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables				
	(1) Upgrade indicator	(2) Fund flow [1, 3]	(3) Fund flow [1, 6]	(4) MRAR [-59, -36] percentile	(5) MRAR [-59, -36] percentile
MRAR [-59, -36] percentile	0.440***				
	(6.363)				
Upgrade indicator		0.136**	0.285***		
		(2.285)	(2.610)		
MRAR [-2, 0] percentile					
Fund return [-2, 0]	1.314	0.690	0.883		
	(0.808)	(1.001)	(0.823)		
No. of observations	389	389	389	389	389
Kleibergen-Paap F-statistic	40.49				
Quarter FE	YES	YES	YES	YES	YES

Table A.3. Morningstar rating changes and issuance decisions: Other minimum holding weights

For this table, we examine issuance decisions made by issuers held by our sample funds using the Morningstar rating methodology change at the 5-year mark for identification, as with columns (1) and (2) of Table 3, but for alternative minimum holding weight cut-offs. We consider (i) no minimum holding weight, (ii) a 1% holding weight, and (iii) a 5% holding weight. All other controls and fixed-effects specifications are identical to those for Table 3. *t*-statistics based on standard errors that are 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)
Minimum holding weight	All issuers	1%	5%
Post 5-year dummy	-0.007	-0.014**	-0.014**
	(-1.281)	(-2.210)	(-2.119)
MRAR [-59, -36] percentile ×	0.012**	0.019**	0.019**
Post 5-year dummy	(2.129)	(2.665)	(2.541)
MRAR	-0.001	-0.002	-0.002
	(-0.876)	(-1.311)	(-1.133)
No. of observations	344,337	256,711	239,934
Adjusted R-squared	0.445	0.432	0.433
Share class FE	YES	YES	YES
Issuer FE	YES	YES	YES
State-by-quarter FE	YES	YES	YES

Table A.4. Morningstar rating changes and issuance decisions: Holding 3-year rating fixed

For 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 Table 3 Panel A columns (1) through (4), but for a smaller sample of share classes that do not experience a change in the 3-year rating (the overall rating under the "old" methodology) at the 5-year mark. We employ a difference-in-differences 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. For columns (1) and (2), we interact this variable with *MRAR [-59, -36] percentile* at the time of an upgrade, imposed continuously throughout the event window, as defined in Table 2. For columns (3) and (4), we interact the post-5-year indicator directly with the upgrade indicator instead (i.e., a dummy variable for whether a share class is upgraded or not). With the inclusion of share-class fixed effects, the standalone *MRAR [-59, -36] percentile* or *Upgrade indicator* are subsumed by fixed effects. We focus on the next-quarter new issuance indicator as the dependent variable. In all instances, we focus on all issuers whose outstanding bonds are held by the share classes reaching the 5-year mark with the 3-year rating unchanged, with a holding weight equal to or greater than 2.5% during the quarter preceding the 5-year mark. We also control for overall MRAR as well as issuer, share-class, and state-by-quarter fixed effects in all instances. *t*-statistics based on standard errors that are 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)
Post 5-year indicator	-0.016**	-0.018**	0.002	-0.020**
	(-2.267)	(-2.361)	(0.355)	(-2.219)
MRAR [-59, -36] percentile	0.022***	0.028***		
× Post 5-year indicator	(2.716)	(3.234)		
Upgrade indicator			0.013**	0.014
× Post 5-year indicator			(2.366)	(1.621)
MRAR	-0.002	-0.004***	0.001	0.001
	(-0.972)	(-3.373)	(0.368)	(0.415)
No. of observations	220,704	221,063	228,250	228,824
Adjusted R-squared	0.431	0.103	0.435	0.122
Share class FE	YES	YES	YES	YES
Issuer FE	YES	NO	YES	NO
State-by-quarter FE	YES	YES	YES	YES

Table A.5. Morningstar rating changes and issuance decisions: Issuer-quarter level analysis

For this table, we examine issuance decisions made by issuers held by our sample funds using the 5-year Morningstar rating methodology change for identification, as with Table 3, but with the regressions conducted at the issuer-quarter level instead of the issuer-share-class-quarter level. When an issuer is held concurrently by share classes that are both upgraded as well as by 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 MRARs of all fund bondholders as well as issuer and state-by-quarter fixed effects in all instances. *t*-statistics based on standard errors that are 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 probability

	Dependent variable: New issuance indicator					
	(1)	(2)	(3)	(4)	(5)	(6)
MRAR [-59, -36] percentile	-0.031**	-0.050***				
	(-2.230)	(-3.285)				
Upgrade indicator			0.000	0.004		
			(0.086)	(0.742)		
Post 5-year indicator	-0.004	0.024*	0.008	0.021***		
	(-0.396)	(1.906)	(1.533)	(3.100)		
MRAR [-59, -36] percentile	0.026*	0.010				
× Post 5-year indicator	(1.868)	(0.674)				
Upgrade indicator			0.011**	0.019***		
× Post 5-year indicator			(2.036)	(3.168)		
Fund flow					0.061***	0.187***
					(3.069)	(3.861)
MRAR	0.000	-0.017***	0.000	-0.019***	0.001	0.001
	(0.166)	(-7.496)	(0.121)	(-8.365)	(1.314)	(0.597)
No. of observations	67,226	67,226	67,226	67,226	620,594	621,194
Adjusted R-squared	0.136	0.035	0.136	0.035	0.195	0.027
Issuer FE	YES	NO	YES	NO	YES	NO
State-by-quarter FE	YES	YES	YES	YES	YES	YES

Panel B: Issuance amount

	Dependent variable: Log new issuance amount					
	(1)	(2)	(3)	(4)	(5)	(6)
MRAR [-59, -36] percentile	0.252	-0.808***				
	(0.921)	(-4.327)				
Upgrade indicator			0.122	0.184**		
			(1.179)	(2.043)		
Post 5-year indicator	0.120	0.240	0.019	0.298***		
	(0.597)	(1.494)	(0.186)	(3.423)		
MRAR [-59, -36] percentile	-0.098	0.371				
× Post 5-year indicator	(-0.366)	(1.664)				
Upgrade indicator			0.077	0.228**		
× Post 5-year indicator			(0.625)	(2.069)		
Fund flow					1.173***	2.878***
					(5.580)	(3.994)
MRAR	0.057	-0.070**	0.058	-0.115***	0.011	0.082***
	(1.154)	(-2.022)	(1.174)	(-3.681)	(0.891)	(4.987)
No. of observations	4,921	7,180	4,921	7,001	76,649	79,967
Adjusted R-squared	0.324	0.084	0.325	0.091	0.352	0.051
Issuer FE	YES	NO	YES	NO	YES	NO
State-by-quarter FE	YES	YES	YES	YES	YES	YES

Table A.6. Morningstar rating changes and issuance decisions: MRAR [-59, 36] tercile indicators

This table presents issuance decisions made by issuers held by our sample funds using the Morningstar rating methodology change at the 5-year mark for identification, using tercile indicators in lieu of *MRAR [-59, -36] percentile* as the treatment variable. All other regression specifications are identical to those for Table 3. Columns (1) and (2) present the results for new-issuance probability, while columns (3) and (4) present the results for log new-issuance amount. All regressions are conducted at the issuer-share-class-quarter level. We also control for overall MRAR as well as issuer, share-class, and state-by-quarter fixed effects in all instances. *t*-statistics based on standard errors that are 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)
Post 5-year indicator	-0.006	-0.003	0.066	0.097***
	(-1.031)	(-0.528)	(1.646)	(2.800)
Top tercile indicator ×	0.013**	0.015***	0.016	0.043
Post 5-year indicator	(2.504)	(2.917)	(0.363)	(0.832)
Middle tercile indicator ×	0.002	-0.002	-0.070	-0.052
Post 5-year indicator	(0.432)	(-0.506)	(-1.580)	(-1.189)
MRAR	-0.002	-0.004***	0.041	0.071
	(-0.939)	(-2.905)	(1.030)	(1.614)
No. of observations	245,644	245,995	31,731	32,005
Adjusted R-squared	0.432	0.102	0.575	0.328
Issuer FE	YES	NO	YES	NO
Share class FE	YES	YES	YES	YES
State-by-quarter FE	YES	YES	YES	YES

Table A.7. Fund flow and bond issuance: Offering yield of different issuance types

For this table, we examine the relationship between fund flows and offering yield in a manner similar to that in Table 5, but separately for (i) GO and REV issuances and (ii) new filings and refunding issuances. Panel A presents the results of baseline regressions while Panel B presents the results of our difference-in-differences specification interacted with previous relationship and no previous relationship indicators. All other regression specifications are identical to those associated with Table 5. Regressions are conducted at the bond-quarter level. *t*-statistics based on standard errors that are 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 (%)			
	(1) GO issuance	(2) REV issuance	(3) New filings	(4) 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 versus no previous relationship

	Dependent variable: Offering yield (%)			
	(1) GO issuance	(2) REV issuance	(3) New filings	(4) 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.8. Fund flow and bond issuance: OLS regression results

For this table, we examine our main results in a simple OLS setting. For Panel A, we estimate the relationship between the new-issuance participation indicator and fund flows (also interacted with previous-relationship and no-previous-relationship indicators for column 2), as with columns (1) and (2) of Table 5. For Panel B, we examine the relationship between offering yield and fund flows at the bond-quarter level, as with Table 6. In Panel C, we examine the relationship between issuers' issuance decisions and fund flows, albeit separately for competitive bids and non-competitive placements, as with Table 7. Panels D and E then present the results for (i) GO and REV issuances and (ii) new filings and refunding issuances, as with Table 8 Panel A and Table 9. All other regression specifications are identical to those for the respective main tables. *t*-statistics based on standard errors that are 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

	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 versus non-competitive offerings

	Dependent variable: New issuance indicator	
	(1)	(2)
	Competitive sales	Negotiated sales
Fund flow	0.001	0.008***
	(1.206)	(8.437)
No. of observations	13,367,291	13,367,291
Adjusted R-squared	0.295	0.341
Issuer FE	YES	YES
Share class FE	YES	YES
State-by-quarter FE	YES	YES

Panel D. GO versus non-GO issuances

	Dependent variable: New issuance indicator	
	(1)	(2)
	At least one GO issuance	All REV issuance
Fund flow	0.002***	0.008***
	(3.960)	(7.641)
No. of observations	13,367,291	13,367,291
Adjusted R-squared	0.346	0.378
Issuer FE	YES	YES
Share class FE	YES	YES
State-by-quarter FE	YES	YES

Panel E. New filings versus refunding issuances

	Dependent variable: New issuance indicator	
	(1)	(2)
	New filings only	At least one refunding
Fund flow	0.004***	0.005***
	(6.856)	(6.236)
No. of observations	13,367,291	13,367,291
Adjusted R-squared	0.219	0.287
Issuer FE	YES	YES
Share class FE	YES	YES
State-by-quarter FE	YES	YES

Table A.9. Fund flow and bond issuance: Use of proceeds

For this table, we estimate a difference-in-differences regression with the new issuance indicator as the dependent variable and the MRAR [-59, -36] percentile interacted with the post-5-year indicator as in the new-issuance dummy regression results reported in column (1) of Table 3, but separately for issuances with the use of proceeds, as reported in Mergent Municipal and categorized as follows: public service, environment, and recreation; financial, housing, and development; transport; utilities; higher education; other education; and healthcare. In addition to these seven specific categories, we also include general purpose and other uses. All specifications include overall MRAR as a control as well as issuer, share class, and state-by-quarter fixed effects. *t*-statistics based on standard errors that are 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							
Use of proceeds	(1) General Purpose and Others	(2) Transportation	(3) Public Services, Environment, and Recreation	(4) Finance, Development, and Housing	(5) Utility	(6) Higher Education	(7) Other Education	(8) 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	YES	YES	YES	YES	YES	YES

Table A.10. Fund flow and bond issuance: Green versus non-green bonds

For this table, we estimate the difference-in-differences regression with the new issuance indicator as the dependent variable and the MRAR [-59, -36] percentile interacted with the post-5-year indicator as with the new issuance dummy regression results reported in column (1) of Table 3, albeit separately for issuer-quarters involving at least one green bond issuance and those that involve only non-green issuances. All specifications include overall MRAR as a control as well as issuer, share class, and state-by-quarter fixed effects. *t*-statistics based on standard errors that are 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