WINNING AT THE STARTING LINE: UNDERWRITER CONNECTIONS AND MUNICIPAL BOND FUND PERFORMANCE*

Bingkuan Cao† Russ Wermers‡ Zihan Ye§

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Abstract

In this paper, we study the strategies of municipal bond mutual funds in primary muni markets, focusing on the role of fund-underwriter connections. Given the illiquidity of the muni bond market, mutual funds often depend on the primary market to acquire bonds. Our analysis reveals that muni funds hold more newly issued bonds offered by underwriters with which they have pre-existing relationships, and that these holdings tend to be more underpriced at offering—yielding a higher first-month return. Quantitative analysis suggests that a *single* underwriter connection creates $19k in added value for a fund per quarter, with a single lead underwriter connection contributing even more significantly to quarterly value-added ($44k). Performance comparisons show that funds in the top quintile of underwriter connections outperform those in the bottom quintile by 0.15% per quarter. Our findings highlight the substantial benefits that municipal bond funds derive from their connections with muni underwriters in return for the placement of new issues.

Keywords: Municipal bond issuance, underwriter, primary market allocation, mutual funds, performance evaluation

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†University of Nebraska-Lincoln; E-mail: bcao4@unl.edu

‡University of Maryland at College Park; E-mail: wermers@umd.edu

§University of Tennessee; E-mail: zihan.ye@utk.edu

1 INTRODUCTION

Municipal bond mutual funds ("muni funds") represent a significant investment vehicle due to the tax-exempt status of their holdings, and to the daily liquidity that they offer to investors. By the end of 2020, nearly 600 muni funds held over 25% of the $4 trillion municipal bond market in the United States. Despite their scale and importance in the market, the strategies underlying their portfolio management and profit generation remain largely unknown in the literature.

Muni funds are very different from other types of mutual funds. Specifically, considering the illiquidity of the muni bond market, strategies that involve high levels of secondary-market trading are much more costly for muni bond funds, as compared to equity and other fixed-income funds. In this paper, we investigate the primary market engagement of muni funds as a potential major source of their value-added for investors. In doing so, we examine the influence of a muni fund's connections with underwriters on the portfolio composition and overall performance of that fund.

We believe that the municipal bond market presents a unique setting in which to study mutual fund participation in the primary market for securities. To wit, a municipal bond's trading frequency is notably low, with an average of only ten trades in its first year, post-issuance. This lack of security turnover, coupled with the concentrated ownership of most muni bonds by muni funds, escalates transaction costs well beyond that of stocks and corporate bonds, with effective spreads averaging about 1% even for institutional-size trades (Harris and Piwowar, 2006). Consequently, muni funds are heavily dependent on the primary market to acquire new positions in their portfolios.

Further, the primary market for muni bonds is very active, with about 9,000 new issues each year, and an average of 9 separate muni bonds in each issue. These new issues, by their very nature, are much smaller in value than typical new issues of corporate bonds, thus creating a very fragmented primary market for investors. Despite a moderate average underpricing of 23 basis

points, this fragmentation results in a high level of price dispersion, as documented in Green and Hollifield (2007), offers strategic opportunities for funds.

Our study explores the ties between mutual funds and bond underwriters, who wield considerable influence over bond offerings and pricing, and the impact of these relationships on fund allocations and the resulting value-added by muni funds. Leveraging a comprehensive map of fund-underwriter connections, our fund holdings-level analysis shows that funds consistently secure larger allocations of new issues of municipal bonds from underwriters with whom they have established prior connections, and that these positions are economically advantageous, featuring bonds that are underpriced at issuance and deliver superior returns within the first month, post-issuance. At the muni fund level, a 2SLS analysis suggests that the fund's connections with underwriters have an significant impact on their overall performance. A single underwriter connection creates \$19k value for a fund per quarter, with lead underwriter connections contributing \$44k per quarter. In addition, when using the fund-underwriter connection as a predictor, we find that the 20% most connected funds outperform the 20% least connected funds by 0.15% per quarter.

We begin our analysis by constructing a comprehensive network of fund-underwriter connections using SEC filings following Ottonello, Rizzo, and Zambrana (2022). Under SEC rules, mutual funds are required to report the ten largest principals with whom they do the largest amount of principal transactions—which include both primary market allocations and secondary market trading—in N-SAR filings before 2018, and N-CEN filings beginning in 2018. Then, we manually match these principal names with underwriter names in the municipal bond market provided in the Mergent Municipal bond database, and construct a comprehensive map of fund-underwriter connections.

Our fund holdings-level analysis reveals a compelling pattern in the primary market: municipal bond funds with pre-established links to one or more bond underwriters allocate an additional 8.69

basis points (bps) on average to a newly issued bond, a substantial increase given the typical portfolio weight of 44 bps per new bond. This effect amplifies with multiple underwriter connections, showing a 3.5 bps incremental investment per additional underwriter tie. Notably, the influence is even more pronounced for connections with lead underwriters, where each bond linked to a lead underwriter sees a 7.22 bps increase in fund investment. This pattern is not attributed to funds' preference for bonds from familiar issuers (Zhu, 2021), as confirmed by our robustness tests that exclude bonds from issuers already represented in the funds' portfolios during the preceding 12 months.

However, it is not immediately obvious how the increased primary market allocation through fund-underwriter connections affect fund performance. On one hand, underwriters may favor connected funds by allocating underpriced bonds in return for steady primary market engagements (Benveniste and Spindt, 1989; Binay, Gatchev, and Pirinsky, 2007) or enhanced secondary market interactions (Reuter, 2006; Nimalendran, Ritter, and Zhang, 2007; Nikolova, Wang, and Wu, 2020), potentially yielding profitable allocations for the funds. On the other hand, underwriters could disadvantage connected funds by pressuring them into supporting unattractive issues, making these funds a "dumping ground" for less attractive (lower demand) offerings (Ritter and Zhang, 2007). In addition, the constant demand from bond mutual funds for new portfolio additions might compel them to accept less favorable issues from underwriters, in anticipation of a stable and continuous supply of primary market allocations. Additionally, a fund receiving primary market allocations can potentially save on the substantial transaction costs of purchasing the bond in the illiquid secondary market (Flanagan, Kedia, and Zhou, 2023).

Consequently, the exact contribution of fund-underwriter connections to fund performance calls for an empirical exploration, which we conduct in this study. Accordingly, we construct an overall return measure which equals the first-month return of newly issued bonds against their

offering price using only secondary market transactions that occur at dealer ask prices. This measure captures both underpricing and secondary market transaction costs of newly issued bonds.

Our analysis takes advantage of the richness in portfolio holdings data to study the role of fund-underwriter connections in funds' selection of newly issued bonds. Given a muni fund's portfolio disclosure, we compare the return of bonds associated with connected vs. unconnected underwriters. We observe that bonds linked to underwriters with established relationships with the fund (connected bonds) are significantly more underpriced, leading to higher returns over the first month after issuance than those without such connections (unconnected bonds). Specifically, connected bonds outperform unconnected bonds by 13.9 bps in the first month, a significant margin given the overall average first-month abnormal return of 23 bps for municipal bonds. To address the possible concern of insufficient transactions in the secondary market, we use the market value reported in fund portfolio disclosures to calculate returns for a complete sample of bond holdings as a robustness check. Our findings consistently show that connected bond holdings yield higher returns than unconnected ones after issuance.

To further tighten the link between fund-underwriter connections and initial bond returns, and to eliminate the potential confounding effects of secondary market acquisitions, we adopt two strategies. First, we match mutual fund holdings of newly issued bonds with primary market transactions and successfully link 42% of fund positions with identical "dealer to customer" sales transactions based on the par value traded—indicating that the muni fund purchased the position in the primary market from that dealer. Among these matched transactions, we find that more than 90% of the fund holdings in newly issued bonds are transacted on either the offering date or the next business day, indicating that municipal bond funds rely heavily on the primary market to acquire newly issued bonds. In this subset, we observe the transaction date and price at which funds acquire their position in newly issued bonds, and find that our findings remain robust. Ad-

ditionally, to further disentangle the primary market channel and the secondary market channel, we rerun our analysis on restricted samples of bond holdings that are issued within narrow time frames—0-1 days, 0-7 days, and 0-14 days—before the portfolio disclosure date, ensuring the reported allocations of newly issued bonds accurately reflect primary market distributions. This approach confirms our results even within these more narrowly defined samples.

At the muni fund level, we are interested in examining to what extent a fund's primary market engagement affects its performance. Aggregating underwriter connections to the fund level, we find that the number of connections a fund has with primary market dealers is a significant predictor of fund performance. Specifically, when we sort funds into five quintile portfolios based on the number of connections they have, we observe that the most connected quintile of funds outperform the least connected quintile by a margin of 0.15% per quarter, which is statistically significant. The difference in performance is not driven by fund size, though smaller funds benefit more from these connections. Employing an instrumental variable (IV) approach, we use fund-underwriter connection as an instrumental variable for a fund's primary market allocation to establish a causal inference between funds' investment in newly issued bonds and their performance. The idea underlying our instrument is that the instrument allows us to isolate the part of the initial allocation that is attributable to the fund-underwriter connection. This identification strategy allows to pin down the effect of fund-underwriter connection on fund performance through its impact on funds' primary market allocation. From an economic perspective, the instrument satisfies the exclusion restriction because it is unrelated to fund performance other than through its impact on funds' primary market allocation. Our 2SLS regression analysis indicates that each underwriter connection contributes an average value of $19,000 to a fund in one quarter. We also find that ties with lead underwriters prove even more effective, with each such connection adding approximately $44,000 in value per quarter.

Overall, our findings suggest that municipal bond funds benefit substantially from their connections with underwriters. Funds get more allocation of newly issued bonds from their connected underwriters. In addition, these allocations of connected bonds are more underpriced and have higher return in the secondary market, which contribute to better fund performance. At the fund level, we find that more connected funds perform significantly better than less connected funds.

Our paper relates to several strands of literature. First, we contribute to a vast literature exploring whether and how mutual fund managers provide valuable services for their clients. Starting with Jensen (1968) and continuing with Carhart (1997) and others, both academics and practitioners have developed numerous strategies and measures to evaluate funds.[1] Common strategies including security selection (e.g. Daniel, Grinblatt, Titman, and Wermers, 1997; Ferson and Mo, 2016), market timing (e.g. Chen, Ferson, and Peters, 2010; Kacperczyk, Nieuwerburgh, and Veldkamp, 2014), all require significant tradings in the secondary market, which makes them ineffective for municipal bond funds. This paper contributes to the literature of mutual funds by providing a comprehensive study on municipal bond funds' primary market activities and how a fund's primary market outcome affects its overall performance.

We also contribute to a nascent literature studying the role of underwriters in the municipal bond market, the $4 trillion dollar market characterized by illiquidity and opacity and provides essential financing for public infrastructure. Prior studies document that the supply and competition of underwriters (Garrett, Ordin, Roberts, and Suárez Serrato, 2023), their local knowledge (Butler, 2008), and inventory risk (Dougal, Gao, Mayew, and Parsons, 2019) is key determinants of bond pricing efficiency and issuance cost. While existing literature focus on the dynamics between issuers and underwriters, our paper pioneers an exploration into the distribution of new issues to institutional investors. We shed light on the significant role that connections between underwriters

[1] See Wermers (2011), Ferson (2010), and Ferson (2013) for more comprehensive surveys on fund performance evaluation.

and mutual funds – the second-largest clientele in the municipal bond market – play during the issuance process, thereby providing a fresh perspective on underwriter-investor interactions.

Our results also add to a broad literature studying the the importance of underwriter-investor relationships in the IPO process. In equity market, Reuter (2006) document a robust, positive correlation between commissions paid to lead underwriters and reported mutual fund holdings of the IPOs they underwrite (see also Nimalendran et al. (2007)). In addition, Binay et al. (2007) find that underwriters favor institutions they have previously worked with in the past IPOs and regular investors benefit through greater participation in underpriced issues. In corporate bond market, Nagler and Ottonello (2017) show that underwriters systematically place the most underpriced bonds to closely affiliated investors in the aftermath of the 2007-08 financial crisis. Nikolova et al. (2020) find that insurers with a stronger trading relationship with an offering's underwriters receive more profitable allocations. We add to this literature by expanding the discussion into the municipal bond market and show that fund-underwriter connections significantly influence bond allocations.

2 Data and Background

2.1 Municipal bond primary market and mutual funds

The municipal bond market has over $4.1 trillion bond outstanding by 2020, with almost $400 billion issued every year. The market has in total over 50,000 issuers from diverse local government entities, ranging from large state issuers such as the State of Texas and the State of California, to small rural cities and townships in Montana. In our sample period between 2000 and 2019, 50,089 municipal issuers made a total of 309,022 bond issues, including 272,408 tax-exempt issues, where each new issue on average included 9 separate bonds across different maturities. In terms of market

participants, retail investors are the largest clientele, holding over $1.6 trillion directly. Mutual fund is the largest institutional investors, holding another $1 trillion bonds. Banks and insurance companies each hold about half of the remaining $1 trillion, with banks predominantly investing in tax-advantaged, bank-qualified municipal debt.

In the primary market, underwriters play a key role in the main issuance methods, including negotiated sales and competitive sales, which are the municipal bond counterparts to book building and auctions. Different from auctions for corporate securities, the winning underwriter is allocated the whole issue and distributes the bonds to investors. A notable aspect of the municipal bond market is the absence of a clear separation between primary and secondary transactions, as primary allocations can continue for several days after issuance (Green and Hollifield, 2007). Underwriters are allowed to hold a significant fraction of newly issued bonds in inventory and sell those bonds at prices different from offering price in the secondary market. Because of the great market power possessed by underwriters, a good relationship with underwriters could be crucial to the success of mutual funds in the primary market. In the meantime, given the relatively low underwriter spreads and the associated inventory risks, retail brokers rarely engage retail customers directly in primary offerings (Green, Hollifield, and Schürhoff, 2007), which in turn makes connections with mutual funds—which hold 25% of the market and stand as the market's largest institutional clientele—important to underwriters.

Like most fixed-income mutual funds, municipal bond funds have constant demand for new bonds to replace the maturing bonds (or bonds that fall short of the target duration) in the portfolio. Because of the illiquid secondary market, municipal bond funds rely heavily on primary market to get allocation of newly issued bonds. The average turnover for municipal bond funds is only 29% in a year, which is significantly lower than the 70% average turnover for corporate bond mutual funds. Within a year, a typical municipal bond fund purchases 72 new bonds, which accounts for

94% of the total fund turnover. Among these new purchases, about half of them are newly issued bonds that are allocated directly by underwriters. This reliance underscores the primary market's pivotal role in determine a fund's performance. Since municipal bonds are underpriced on average at issuance, acquiring newly issued bond in the primary market could be nonnegotiable source of income for funds. In addition, since newly issued municipal bonds have high levels of price dispersion (Green and Hollifield, 2007) and underwriters play an important role in influencing markups (Griffin, Hirschey, and Kruger, 2023), connections with underwriters could potentially also help funds to get access to more underpriced bonds or purchases bonds at more favorable prices.

2.2 Data and sample construction

2.2.1 Mutual fund data

Our first dataset is a fund-level monthly panel of U.S. municipal bond mutual funds from January 2000 to December 2019. To construct this fund sample, we start from a comprehensive survivor bias-free sample of municipal bond funds from Morningstar mutual fund database.[2] We follow the steps described in Berk and Van Binsbergen (2015) to map Morningstar fund shareclasses to CRSP mutual fund shareclasses to get information on fund returns, TNA, expense ratio, and turnovers. Next, we value weight different classes of the same fund to aggregate them into a single fund. We further limit our sample to funds that are at least one year old and remove funds observations before the fund reaches $10 million in AUM to alleviate incubation bias (Evans, 2010). Our final sample

[2]Our sample includes all 16 Morningstar categories of municipal bond funds: "US Fund Muni National Interm", "US Fund Muni National Long", "US Fund Muni National Short", "US Fund Muni New York Long", "US Fund Muni California Long", "US Fund High Yield Muni", "US Fund Muni New York Intermediate", "US Fund Muni California Intermediate", "US Fund Muni Single State Short", "US Fund Muni Single State Interm", "US Fund Muni Minnesota", "US Fund Muni Pennsylvania", "US Fund Muni Single State Long", "US Fund Muni Ohio", "US Fund Muni Massachusetts", "US Fund Muni New Jersey".

contains 1,054 unique municipal bond mutual funds with 154,913 fund-month observations over the sample period of January 2000 to December 2019.

In addition to the fund sample, we construct an associated dataset of detailed portfolio holdings for all municipal bond funds in our sample from 2000 to 2019 using Morningstar fund holdings data. Morningstar holdings database contains both mandatory and voluntary portfolio disclosures. Our holdings sample contains a total of 92,929 portfolio disclosures with 19,702,186 fund holdings observations. Since not all funds report their holdings to Morningstar on a monthly basis, we further construct a fund-by-quarter panel of funds with complete holdings coverage as our main fund and holdings sample. For funds that have multiple portfolio disclosures in a quarter, we use the last disclosure within the quarter. We further restrict our sample to dedicated municipal bond mutual funds by removing fund observations that invest less than 85% in municipal bonds. The final panel contains 983 unique funds with 47,686 fund-quarter observations from January 2000 to December 2019. Table 1 presents summary statistics on our main fund sample. On average, municipal bond funds hold 98.8% in municipal bonds at any given time, with 221 different securities in their portfolios. Among these holdings, 8.74 of them newly issued municipal bonds on average which accounts for a total of 3.84% weight in the portfolio.[3]

2.2.2 FUND-UNDERWRITER CONNECTIONS

To construct a fund-underwriter network, we first collect information on funds' primary principals from N-SAR filings (Item 22.) for the years 2000 to 2018 and N-CEN filings (Item C.17.) for the years after 2018. Before 2018, investment companies were mandated to report their top ten principals in terms of the dollar volume of securities transactions, including both primary market

[3] A bond is considered newly issued within three month since offering date. See Appendix A.1 for all variable definitions.

allocations and secondary market trades, in their N-SAR filings.[4] This information was reported at reporting entity level (CIK) at semiannual frequency. Following the replacement of the N-SAR form with the N-CEN form in 2018, these disclosures of the ten largest principals shifted to an annual reporting frequency at the fund level (Series ID), requiring adaptation in our data collection methodology.[5]

Next, we gather underwriter information from Mergent Municipal Bond Securities Data. Mergent offer the names of all underwriters, including the lead underwriter, of municipal bond issues. We then manually match the names of the funds' reported principals with those of bond underwriters to form a comprehensive network of fund-underwriter connections. For each newly issued municipal bond, this network enables us to identify which funds had previously established connections with the underwriters, allowing a deeper analysis of the primary market's influence on fund portfolios and performance.

Formally, a fund is considered connected to an underwriter if the fund list the underwriter among its top ten principals, indicating significant securities transactions between them. This connection is considered current during the reporting period of which the N-SAR/N-CEN filings are valid, and considered established in the subsequent two-year period following the reporting date.[6] To avoid look-ahead bias, we rely on established connections as our key measure for fund-underwriter connections in all empirical analysis.

Table 1 reports summary statistics of underwriter connections at the fund level. Among the 8.84 newly issued bonds that a typical fund holds in a quarter, 5.28 of them are acquired from connected

[4]The definition of principals in SEC filings are excerpted in Appendix A.2.

[5]The exact adopting time of N-CEN form is not the same for all funds since funds have different fiscal calendars. But all funds were required to switch to N-CEN by the end of 2018.

[6]For instance, Vanguard Intermediate-Term Tax-Exempt Fund disclosed that J.P. Morgan Securities was the principal with whom the fund had the most principal purchase in the reporting period between 11/01/2019 and 10/31/2020 in the N-CEN filing. Thus, this connection is considered current during this reporting period, and considered established during the period between 11/01/2020 and 10/31/2022.

underwriters. The average number of established connections a fund has is 10.88 which is larger than the average number of connected bonds in the portfolio since the average (median) number of underwriters per municipal bond is 3.33 (2). In summary, the statistics indicate that municipal bond mutual funds consistently acquire newly issued bonds to their portfolio every quarter from both connected and unconnected underwriters.

2.2.3 MUNICIPAL BOND ISSUANCE AND TRADING DATA

To complement our fund sample, we obtain information on municipal bonds from two data sources – bond characteristics from the Mergent Municipal Fixed Income database (Mergent) and secondary market transaction data from the Municipal Securities Rulemaking Board (MSRB). The Mergent database provides bond information including bond offering amounts, offering date, offering price and yield, sale type, and underwriter identities for all municipal bonds. In addition, the MRSB trade data provides detailed information on the trade price and quantity of every single transaction for all municipal bonds since 2005, including customer and inter-dealer transactions.

Combining the two data sources allows us to measure the underpricing and the overall benefit of municipal bond after issuance. The literature in equity IPOs typically measures the benefit of primary market allocation as the abnormal return in the first day of trading in the secondary market. The approach is adopted by Cai, Helwege, and Warga (2007) and Nikolova et al. (2020), among others, which study the underpricing of corporate bond issues. However, given the infrequent trading of municipal bonds, we adapt the approach by taking the average daily price of a municipal bond in the first 30 days after issuance to replace the initial transaction price in the secondary market (see also **?**). The initial return of a municipal bond i offered at time t is calculated as:

$$Ret^{B}_{i,t+\bar{n}} = \frac{\bar{P}_{i,t+\bar{n}} - OP_{i,t}}{OP_{i,t}} \tag{1}$$

where $OP_{i,t}$ is the offering price, $\bar{P}_{i,t+\bar{n}}$ is the average daily transaction price in the first 30 days after issuance (i.e., $1 \leq n \leq 30$) on days when transactions occur, and $\bar{n}$ is the average days of n when the municipal bond i is traded since bond issuance. Following the method used in Bessembinder, Kahle, Maxwell, and Xu (2009) on corporate bonds, we calculate the daily price of municipal bonds as trade size-weighted average prices using all transactions occurred within a day including dealer sell, dealer buy, and inter dealer transactions. Since market conditions could change over time, we benchmark each bond raw return against a credit rating- and maturity-matched index return over the same period. That is, the underpricing of offering i, UP_i, is calculated as

$$UP_i = Ret^B_{i,t+\bar{n}} - Ret^I_{i,t+\bar{n}} \tag{2}$$

where $Ret^I_{i,t+n}$ is the cumulative return over the $\bar{n}$-day period starting on offering date$t$ of the ICE BofA index with the same credit rating and maturity category as those of bond i. We obtain ICE BofA index returns from Morningstar Direct.

One limitation of the underpricing measure specified in Equation (2) is that it does not fully capture the cost saving benefit of primary market allocation over secondary market purchase. As documented in Flanagan et al. (2023), investors could save substantial transaction costs from primary market allocation by avoiding acquiring corporate bonds in the secondary market. Given the higher illiquidity of municipal bonds than corporate bonds, the savings from avoiding secondary market purchases could be even more substantial. Comparing a fund which successfully get allocation of a bond in the primary market with another fund which fails in the primary market and purchases the bond in the secondary market at dealer ask price, the overall return of getting primary market allocation in bond i issued at time t including the saving from transaction costs is

calculated as:

$$\text{Overall Return}_{i,t} = \frac{\bar{P}^{ask}_{i,t+\bar{n}} - OP_{i,t}}{OP_{i,t}} - Ret^{I}_{i,t+\bar{n}} \tag{3}$$

The calculation of overall return uses only "dealer sell to customer" transactions, and thus incorporates the purchasing costs in secondary market (i.e., bid-ask spreads charged by dealers).

Finally, we construct a overall dollar-based profit measure at security level to estimate the dollar gain of holding a newly issued bond for a fund. The profit measure for fund j of holding new bond i offered at time t is calculated as:

$$\text{Overall Profit}^{j}_{i,t} = \text{Overall Return}_{i} \times v^{j}_{i,t} \tag{4}$$

where $v^{j}_{i,t} = \text{TNA}_{j,t} \times w^{j}_{i,t}$ is the dollar position of fund j invested in bond i at time t. $\text{TNA}_{j,t}$ is the total net asset of fund j at time t, and $w^{j}_{i,t}$ is fund j's portfolio weight in bond i at time t.

3 Empirical Strategy

We aim to explore the primary market strategies of municipal bond mutual funds, focusing on how fun-underwriter connections influence funds' portfolio management and performance. Given that newly issued municipal bonds are typically underpriced (Green and Hollifield, 2007), securing allocations in the primary market can be a significant revenue stream for municipal bond funds. In addition, with a continuous need to replace maturing bonds or balance portfolio with a target duration, access to the primary market could also mitigate the higher transaction costs associated with secondary market purchases. We thus hypothesize that municipal bond funds can leverage their connections with underwriters to secure preferential allocations in municipal bond offerings.

A major empirical challenge in our study is that the data on investors' primary market allo-

cations are proprietary and rarely disclosed by underwriters. Prior work such as Zhu (2021) uses portfolio quarter-end holdings to proxy for allocations received by individual corporate bond funds for bonds issued anytime during the quarter.[7] However, this measure is noisy because quarter-end holdings in newly issued bonds could be the result of primary market allocation or secondary market trading that takes place between the offering and the end of the quarter. To circumvent this limitation, Cici, Gibson, Qin, and Zhang (2023) construct a return-based method to detect corporate bond mutual funds' primary-market activities.

In this paper, we take a more direct approach by matching mutual fund holdings of newly issued bonds with MSRB transaction data. A unique feature of municipal bond transaction data is that it captures all municipal bond trades, including primary and secondary market activities, around the issuance date. Given the thin market of municipal bonds, we successfully align 42% of fund positions with identical "dealer to customer" sales, based on the exact par value traded. Among the matched transactions, we find that more than 90% of the trades occur on either the offering date or the next day with an average markup below 1 basis point. We thus conclude that, for municipal bond funds, quarter-end/month-end holdings of newly issued bonds at quarter-end or month-end effectively reflect primary market allocations for municipal bond funds.

We perform analysis at both fund-holdings level and fund level to answer the two key questions: 1) does fund-underwriter connections lead to increased allocation of newly issued bonds with superior return? 2) does fund-underwriter connections lead to enhanced fund performance?

3.1 Fund-holdings level analysis

To study the role of fund-underwriter connections in fund portfolio management, we utilize fund portfolio disclosures to compare fund positions in connected bonds and unconnected bonds. Con-

[7]For Equity IPOs, Reuter (2006) and Binay et al. (2007) infer allocations from institutional holdings at the end of the quarter following issuance.

nected bonds are bonds whose underwriters have an established connection with the fund. Since municipal bond funds hold both connected bonds and unconnected bonds in their portfolio, we explore the within-portfolio variation to examine whether funds tend to hold more connected bonds than unconnected bonds. This setting allows us to control for most observed and unobserved fund- and time- level factors that might affect fund holdings such as manager skill, fund size, fund flows, fund recent performance, and overall market conditions. We run the following regression:

$$w_{i,t}^{j} = \alpha_{j,t} + \beta \mathbf{1}_{i,t}^{j} + \delta z_{i,t} + u_{i,t}^{j} \tag{5}$$

where $\alpha_{j,t}$ is fund-by-quarter fixed effects, and $\mathbf{1}_{i,t}^{j}$ is an indicator variable equal to one when the underwriter of bond i has an established connection to fund j at time t, and zero otherwise. $z_{i,t}$ is a set of bond level control variables including bond offering type (i.e., negotiated deal or competitive deal), callable option, source of repayment (i.e., general obligation or revenue), bond time to maturity, and credit rating.[8]

In addition to the "quantity" of primary market allocation, we are also interested in the "quality" of the allocation. By replacing the dependent variable in Equation (5) with overall return of acquiring a newly issued municipal bond, we run the regression:

$$\text{Overall Return}_{i,t} = \alpha_{j,t} + \beta \mathbf{1}_{i,t}^{j} + \delta z_{i,t} + u_{i,t}^{j} \tag{6}$$

The coefficient β provides insights into whether the connected new bonds within a fund portfolio yield higher return than the unconnected new bonds. On one hand, underwriters might favor connected funds with more underpriced municipal bond issues, rewarding them for their ongoing

[8]We transform credit ratings into numeric values where the highest rated bonds (*AAA*) are assigned a value of 21, the second highest (*AA+*) 20, and so forth to the lowest rated bonds (*D*) which are assigned a value of 0. Unrated bonds are assigned a value of -1.

involvement in the primary market or secondary market activities. Such underpriced allocations can yield higher post-issuance returns, directly enhancing fund performance. On the other hand, underwriters might allocate less favorable allocations to connected funds, possibly as a means to offload less desirable issues or in exchange for a steady stream of new bonds to fulfill the funds' consistent demand. Therefore, it remains an empirical question on whether and how funds' connections with underwriter affect the profitability of funds' initial allocations.

In summary, a fund holdings level analysis enables us to make use of within-portfolio variations to cleanly identify the effect of fund-underwriter connection on both the quantity and the quality of funds' primary market allocations.

3.2 Fund level analysis

Next, we want to examine to what extent a fund's primary market outcome affects its overall performance. Given the key role of fund-underwriter connections in funds' primary market activities, we are interested in studying whether more connected funds would also have better overall performance than less connected funds. We use two different measures to evaluate fund performance. First, we calculate benchmark-adjusted returns (Ret^{adj}) which equals the difference between fund return and prospectus benchmark return over the same period. Second, we estimate fund 4-factor alpha for each fund from the regression using 5-day overlapping returns:

$$R^e_{j,d} = \alpha_j + \beta_1 R^e_{b,d} + \beta_2 R_{credit1,d} + \beta_3 R_{credit2,d} + \beta_4 R_{term,d} + u_{j,d} \tag{7}$$

where α_j is the estimated 4-factor alpha of fund j. $R^e_{j,d}$ is fund j's excess return over 5-day periods ending on day d. $R^e_{b,d}$, $R_{credit1,d}$, $R_{credit1,d}$, and $R_{term,d}$ are the return of the four factors specified in Appendix A.1.

We first examine whether more investment in newly issued bonds lead to superior fund performance. To do so, we run the following regression:

$$Ret^{adj}_{j,t+1} = \alpha_j + \beta w^j_{new,t} + \delta x_{j,t} + u_{j,t+1} \tag{8}$$

where $w^j_{new,t} = \sum_i w^j_{i,t}$ is the total portfolio weight in new bonds for fund j at time t, and $x_{j,t}$ is a set of fund level control variables including fund alpha, flows, log fund size, log fund age in months, expense ratio, turnover, and tracking errors. A positive estimate of β indicates that holding new municipal bonds contribute positively to fund future performance.

To further strengthen the link between fund-underwriter connection on fund performance, we conduct a two-stage least-squares (2SLS) regression analysis using the number of fund-underwriter connection in a fund portfolio as an instrument variable for the fund investment in newly issued bonds. The idea underlying our instrument is that it allows us to isolate the part of the initial allocation that is attributable to the fund-underwriter connection. From an economic perspective, the instrument satisfies the exclusion restriction because it is unrelated to fund performance other than through its impact on funds' primary market allocation. The instrument variable analysis establishes a causal inference between fund investment in newly issued bonds and fund performance.

We run the first stage regression as:

$$w^j_{new,t} = \alpha_j + \beta N_{connections,jt} + \delta x_{j,t} + u_{j,t+1} \tag{9}$$

where $N_{connections,jt}$ is the total number of underwriter connections that fund j has at time t.

The second stage regression is:

$$Ret^{adj}_{j,t+1} = \alpha_j + \beta \hat{w}^j_{new,t} + \delta x_{j,t} + u_{j,t+1} \tag{10}$$

where $\hat{w}^j_{new,t}$ is the first-stage estimation of the dependent variable. A positive β estimate in 2SLS regression indicates a causal link that a fund that investment more in newly issued municipal bonds perform better on average.

4 Empirical Results

In this section, we present empirical evidence that municipal bond funds benefit from their connections with underwriters through increased primary allocation of bonds underwritten by connected underwriters. Moreover, these allocations tend to be more underpriced and have higher first-month returns after issuance.

4.1 Effects on primary allocations and bond returns

Table 2 illustrates the effect of fund-underwriter connection on funds' investment in newly issued municipal bonds at portfolio holdings level. Column (1) shows that funds with established connections to one or more of the bond's underwriters invest an additional 8.69 basis points (bps) on average in connected bonds than unconnected bonds. The increased portfolio weight is economically large given the average (median) portfolio weight in newly issued bonds is 44 (21) bps. Having a connection with the underwriter of a bond leads to a 20% increase in the portfolio weight of the bond compared to the average weight in newly issued bonds.

With each municipal bond typically involving 3.3 underwriters, including a lead underwriter, Column (2) highlights the incremental gains from having multiple connections. For a given bond, each additional connection the bond's underwriters is associated with 3.04bps increase in investment in that bond. The influence of being connected to the lead underwriter is even more pronounced, as shown in Column (3), leading to a further 7.22bps investment. Expanding the analysis to dollar amounts, Columns (4) to (6) echo these findings. Each additional connection to a bond's

underwriters results in a $0.4 million increase in investment (Column (5)), with a connection to the lead underwriter yielding an additional $1.02 million (Column (6)). Together, the results underscore substantial financial benefits derived from fund-underwriter connections.

Zhu (2021) find that mutual funds frequently purchase additional new issues from firms whose bonds they already hold. Chen, Cohen, and Liu (2022) document stickiness in the underwriter-issuer relationship where 87% of a municipality's bonds are issued with the same underwriter. Based on these findings, an alternative explanation to funds' inclination to hold more connected bonds as shown in Table 2 could stem from funds holding a larger share of bonds from issuers who consistently employ the same underwriters for new issues. To mitigate this potential confounding effect, we rerun the holdings-level regression by excluding bonds that were newly issued by municipalities whose other bonds had been in the fund's portfolio within the previous 12 months. This approach helps us isolate the influence of fund-underwriter connections from that of fund-issuer relationships, offering a clearer view of the role of the former. The results are presented in Table 3. We note that the number of observations in Table 3 is reduced by 75% when we filter out bonds from recurrent issuers, echoing findings of Zhu (2021) in corporate bond market. Yet, the effect of fund-underwriter connection remain robust and significant. On average, municipal bond funds hold 7.8 bps more connected bonds than unconnected bonds in terms of portfolio weights (column (1)), and $1.06 million more investment in terms of dollar position (column (4)). The results in Table 3 indicate that the increased investment in newly issued bonds is driven by underwriter connections rather than issuer connections.

Next, we examine the overall return of the newly issued municipal bonds held by municipal bond funds. Specifically, we are interested in comparing the performance of invested bonds whose underwriters are connected to the fund (connected bonds) with those not connected to the fund (unconnected bonds). We run the analysis at fund holdings level and report the results in Table 5. In

Column (1) where the dependant variable of interest is the portfolio weight in newly issued bonds, the coefficient estimate is statistically insignificant. This result suggests that, unconditionally, municipal bond funds do not exhibit superior ability in choosing new bonds. Those newly issued bonds that funds choose to hold more do not generate higher returns on average in the first month after issuance. However, upon closer examination of connected versus unconnected bonds, we find that connected bonds perform significantly better. As shown in Column (2), the overall return of connected bonds is 13.90 bps higher than unconnected bonds, which is economically significant compared to an average 23 bps first-month abnormal return across all municipal bonds. Further analysis in Column (3) highlights the incremental value of underwriter connections, with each additional connection correlating with a 5.38 basis points increase in bond overall return. These results indicate that the superior returns stem from the allocation of connected bonds through fund-underwriter connections, rather than from the allocation of new bonds in general, highlighting the value of access to more underpriced bonds that appreciate in value post-issuance. Besides increased initial allocation, funds' connections with underwriters also have a selection effect that help funds get access to more profitable allocations in the primary market.

4.1.1 Robustness

Given that we observe only quarter-/month-end portfolio holdings of funds, one limitation of our analysis so far is that we do not directly observe the transaction date and price at which funds acquire newly issued bonds. A potential concern with previous findings is that the observed fund holdings in newly issued bonds might come from secondary market purchases potentially at prices different from offering price. More importantly, this secondary market channel could confound our results when a bond's underwriter in the primary market becomes a dealer of the bond in the secondary market post-issuance (Goldstein, Hotchkiss, and Nikolova (2021)). A plausible

alternative explanation to our finding is that connections between funds and underwriters could also prompt funds to purchase additional bonds from the secondary market, thereby creating a positive link between fund-underwriter connections and increased investments in newly issued bonds.

To address this concern, we conduct two robustness tests. In the first test, we restrict our holdings sample to include only bonds that are issued within a few days before the portfolio disclosure date. In this more closely specified set of newly issued bonds, an observed holding in fund portfolio is more likely to be primary market allocations than secondary market purchases. Specifically, we focus on bonds issued within narrow time frames—0-1 days, 0-7 days, and 0-14 days—prior to the portfolio disclosure date, to make sure that the reported weightings of newly issued bonds truly represent primary market allocations. Table 6 presents the regression results on samples of bond holdings issued proximate to the portfolio disclosure date. In Column (1) of Table 6, our revised analysis includes only fund holdings in bonds issued either on the portfolio disclosure date or the preceding day, and the effect of fund-underwriter connections stays robust – funds hold 6.5bps more connected bonds than unconnected bonds on average. Across all columns, our findings consistently corroborate previous findings that funds exhibit a preference for holding more bonds from connected underwriters, reinforcing the significance of primary market channels in fund-underwriter connections.

In the second robustness test, we match mutual fund holdings of newly issued bonds with MSRB transaction data, which encompasses all municipal bond trades, including primary and secondary market activities, around the issuance date. In the thinly traded municipal bond market, we successfully match 42% of fund positions with identical "dealer to customer" sales based on the exact par value traded. Among these matched transactions, we observe the transaction date and price at which funds acquire their positions in newly issued bonds. We find that over 90% occurred

on the issuance date or the following day, with an average markup below 1 basis point, which further support our argument that municipal bond funds rely on primary market rather than secondary market to acquire newly issued bonds. We then revisit the analysis in Table 5 with this subset of matched primary market allocations, using actual trade prices. This method ensures primary market allocations are captured accurately and allows for the calculation of actual fund returns using transaction prices. The results, presented in Table 7, show consistent and qualitatively similar outcomes regarding bond returns and dollar profits in the four weeks post-issuance, confirming that primary market allocations of connected bonds yield higher returns.

To address the lack of transactions of municipal bonds in the secondary market, we utilize fund holdings data in this section to calculate bond returns and compare the performance between connected and unconnected bonds in fund holdings. The Morningstar holdings dataset provides both the par value and market value for each portfolio position, which allows us to calculate bond market prices at each disclosure date. It's worth noting that the market values reported in fund portfolios do not necessarily reflect actual transaction prices. As discussed in Cici, Gibson, and Merrick (2011), funds have significant discretion to value their "hard-to-value" securities. Although many funds use external pricing services, there is still dispersion in valuation across funds and bond prices are sometimes stale (Choi, Kronlund, and Oh, 2022). Nevertheless, such valuation inconsistencies are unlikely to bias our analysis, provided there is no systematic differences between the valuation of connected bonds and unconnected bonds. Using fund valuations of bonds rather than actual transaction prices allows us to compute bond returns from offering date to disclosure date for all bonds in fund portfolio in a consistent way. As a result, this approach facilitates a comprehensive comparison of returns between connected and unconnected bonds over longer horizon, circumventing potential limitations due to infrequent trading.

Table 8 reports the regression results of comparing the returns of connected and unconnected

bonds in fund portfolios based on reported market value. Across the columns, we categorize our holdings sample into six two-week windows, ranging from 1-2 weeks to 11-12 weeks, based on the time period between the bond offering date and the portfolio disclosure date, to ensure consistent comparison of bond returns across similar horizons. From the table, we observe that connected municipal bonds consistently outperform unconnected ones, even after controlling for bond characteristics. The average return of connected bonds over unconnected bonds is 11.84 basis points, with all but one subset (bonds issued 9 to 10 weeks prior to portfolio disclosure date) showing statistically significant outperformance. Overall, results in Table 8 show robustness of our findings that mutual funds derive substantial profit from primary allocations in municipal bonds through fund-underwriter connections.

4.2 Fund-Underwriter Connection and fund performance

In this section, we further investigate the effect of fund-underwriter connections on fund performance. First, we single sort funds at the end of each quarter into five quintile portfolios based on the number of connections in the fund. Consistent with our expectation, we find that the number of connections a fund has is positively associated with fund investment in newly issued bonds and the number of newly issed bonds in the portfolio, as shown in Panel (a) and (b) of Figure 1, respectively. On average, funds in the top connection quintile invest 3.8% more in newly issued bonds than those in the bottom quintile. Moreover, the top-quintile funds hold an average of 20 additional newly issued bonds compared to the bottom-quintile funds.

Panel (c) and (d) of Figure 1 present evidence that more connected funds significantly outperform their less connected counterparts. The most connected funds in the top quintile, on average, achieve an 8 basis points higher alpha and a 12 basis points higher benchmark-adjusted return in one quarter than the least connected funds in the bottom quintile.

In subsequent regression analysis, shown in Column (1) of Table 9, we find that fund holdings in newly issued municipal bonds do not predict subsequent fund performance, suggesting that, on average, funds do not demonstrate superior skill in selecting new bonds. Conversely, instrumental variable analysis reveals that funds' investments in newly issued bonds, facilitated by their connections with underwriters, contribute to superior fund performance in the following quarter. The first-stage results, shown in Column (3) of Table 10, indicate that each additional connection with underwriters results in a $2.20 million increase in investment in newly issued municipal bonds by funds. The second-stage results of the 2SLS analysis, presented in Column (3) of Table 11, reveal that a unit increase in the predicted investment in newly issued bonds is associated with an $8,600 increase in value in the next quarter. Combining the results in both stages of the 2SLS analysis, we find that each underwriter connection generates, on average, $19,000 in value for a fund in one quarter. Further analysis reveals even greater value from connections with lead underwriters, with each additional connection with a lead generating $44,000 in value for a fund in one quarter.

Since fund size is related to both underwriter connection and fund returns, we next investigate how size interacted with underwriter connection is associated with fund performance. We double sort funds into quintiles first by fund size and then by the number of connections at the end of each quarter. Table 12 presents the average quarterly benchmark-adjusted returns for each of the 5-by-5 portfolio of funds. Results indicate that funds with more underwriter connections consistently outperform those with fewer, a trend that is statistically significant across all size groups except for the largest funds. The effect of fund-underwriter connections is more pronounced among smaller funds, with the most connected funds in the smallest size group outperforming the least connected by an average of 0.32% per quarter. Grouping all funds together, we find that the most connected funds still outperform the least connected funds by an average of 0.15% per quarter, equivalent to 0.6% higher return in a year.

5 CONCLUSION

In this paper, we document the pivotal role of primary market allocations in municipal bond funds' portfolio management, highlighting the substantial influence of fund-underwriter connections on fund performance. Our analysis reveals that municipal bond funds with established connections with bond underwriters consistently secure larger allocations of new issues in the primary market. Besides increased allocation, underwriter connections also affect funds' selection of newly issued bonds. We find that fund holdings in connected new bonds are more underpriced at issuance and thus deliver superior returns within the first month post-issuance. At the fund level, funds with more underwriter connections outperform their less connected counterparts, due to their enhanced access to and profitability from these primary market allocations. Our findings demonstrate the significant benefits municipal bond funds derive from underwriter relationships, underscoring the critical importance of primary market allocations as a significant source of income.

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TABLE 1: **Summary Statistics**

This table reports the summary statistics for a sample of 983 U.S. municipal bond mutual funds from January 2000 to December 2019. The sample contains 47,686 fund-quarter observations. A new muni in the fund portfolio is defined as a municipal bond issued within three months before the portfolio disclosure date. A new muni is connected to a fund if at least one underwriters of the municipal bond have an established connection with the fund.

	Mean	Std	25%tile	Median	75%tile
TNA (million $)	767.19	2,153.18	83.80	209.30	608.70
Age (years)	18.40	8.31	12.25	18.33	24.50
Expense ratio (% per annum)	0.77	0.24	0.62	0.77	0.93
Weekly tracking error (%)	0.18	0.17	0.09	0.13	0.20
Turnover (per annum)	0.28	0.29	0.12	0.19	0.33
Fund flows (% per qtr)	0.07	6.31	-2.84	-0.73	1.91
Net return (% per qtr)	0.98	2.28	0.03	0.94	2.08
Benchmark-adjusted return (% per qtr)	-0.14	1.28	-0.40	-0.11	0.18
4-factor alpha (% per annum)	-0.48	1.72	-1.14	-0.48	0.18
Number of holdings (per disclosure)	221.69	331.20	75	129	236
Num of new munis (per disclosure)	8.74	18.54	1	4	9
Portfolio weight in munis (%)	98.84	2.92	98.07	99.56	100.00
Portfolio weight in new munis(%)	3.84	3.79	1.21	2.95	5.28
Num of connected new munis	5.28	13.13	0	2	5
Num of connections (per disclosure)	10.88	20.42	0	3	12

TABLE 2: **Explaining Portfolio Holdings in Newly Issued Municipal Bonds**

The table reports fund-quarter-holdings panel regression results of Equation (5) using our sample of U.S. municipal bond mutual funds from Jan. 2000 to Dec. 2019. The sample includes only holdings of newly issued municipal bonds. In Column (1) - (3), the dependent variable is the portfolio weight (%) in each newly issued municipal bond. In Column (4) - (6), the dependent variable is the dollar amount (in millions) invested in each newly issued municipal bond. All variables are winsorized at 0.5% of both tails. Standard errors clustered by time and fund are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Portfolio Weight (%)			Position Value ($ millions)		
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbf{1}_{\text{connected}}$	0.0869***			1.1441***		
	(0.0060)			(0.0909)		
$N_{\text{connections}}$		0.0304***			0.3990***	
		(0.0017)			(0.0281)	
$\mathbf{1}_{\text{lead connected}}$			0.0722***			1.0160***
			(0.0047)			(0.0797)
$ln(maturity)$	0.0254***	0.0260***	0.0264***	0.3466***	0.3553***	0.3561***
	(0.0052)	(0.0052)	(0.0052)	(0.0909)	(0.0906)	(0.0904)
$\mathbf{1}_{\text{GO}}$	0.0163***	0.0210***	0.0141***	0.1754**	0.2368***	0.1544*
	(0.0053)	(0.0052)	(0.0053)	(0.0835)	(0.0853)	(0.0843)
$\mathbf{1}_{\text{negotiated}}$	−0.0676***	−0.0591***	−0.0698***	−1.0325***	−0.9201***	−1.0566***
	(0.0051)	(0.0053)	(0.0051)	(0.1025)	(0.1022)	(0.1031)
$\mathbf{1}_{\text{callable}}$	0.0253***	0.0191***	0.0251***	0.3663***	0.2842***	0.3668***
	(0.0061)	(0.0060)	(0.0061)	(0.1096)	(0.1070)	(0.1092)
$\mathbf{1}_{\text{insured}}$	−0.0703***	−0.0607***	−0.0739***	−0.8768***	−0.7517***	−0.9171***
	(0.0064)	(0.0062)	(0.0065)	(0.0821)	(0.0771)	(0.0827)
Fund×Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond rating FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	418,641	418,641	418,641	418,641	418,641	418,641
R^2	0.6527	0.6565	0.6520	0.3529	0.3611	0.3522

TABLE 3: **Explaining Portfolio Holdings in Newly Issued Municipal Bonds (excluding Past Issuer)**

The table reports fund-quarter-holdings panel regression results of Equation (5) using our sample of U.S. municipal bond mutual funds from Jan. 2000 to Dec. 2019. The sample includes only holdings of newly issued municipal bonds whose issuer's other bonds are not in the fund portfolio over the past 12 months. In Column (1) - (3), the dependent variable is the portfolio weight (%) in each newly issued municipal bond. In Column (4) - (6), the dependent variable is the dollar amount (in millions) invested in each newly issued municipal bond. All variables are winsorized at 0.5% of both tails. Standard errors clustered by time and fund are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Portfolio Weight (%)			Position Value ($ millions)		
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbf{1}_{\text{connected}}$	0.0780***			1.0594***		
	(0.0058)			(0.1009)		
$N_{\text{connections}}$		0.0289***			0.3536***	
		(0.0021)			(0.0331)	
$\mathbf{1}_{\text{lead connected}}$			0.0688***			0.9905***
			(0.0053)			(0.0938)
$ln(maturity)$	0.0233***	0.0237***	0.0240***	0.2407**	0.2515***	0.2463***
	(0.0053)	(0.0054)	(0.0053)	(0.0929)	(0.0939)	(0.0928)
$\mathbf{1}_{\text{GO}}$	0.0000	0.0054	−0.0020	−0.0703	−0.0191	−0.0907
	(0.0061)	(0.0061)	(0.0061)	(0.0794)	(0.0843)	(0.0807)
$\mathbf{1}_{\text{negotiated}}$	−0.0609***	−0.0583***	−0.0621***	−0.8843***	−0.8613***	−0.8975***
	(0.0058)	(0.0058)	(0.0057)	(0.0964)	(0.0975)	(0.0962)
$\mathbf{1}_{\text{callable}}$	0.0316***	0.0272***	0.0315***	0.3692***	0.3100***	0.3704***
	(0.0066)	(0.0066)	(0.0065)	(0.0927)	(0.0919)	(0.0922)
$\mathbf{1}_{\text{insured}}$	−0.0669***	−0.0604***	−0.0694***	−0.8269***	−0.7628***	−0.8533***
	(0.0078)	(0.0075)	(0.0080)	(0.0937)	(0.0879)	(0.0946)
Fund×Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond rating FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	105,391	105,391	105,391	105,391	105,391	105,391
R^2	0.8017	0.8032	0.8014	0.4827	0.4858	0.4826

TABLE 4: **Explaining Portfolio Holdings in Newly Issued Municipal Bonds (Bond FE)**

The table reports fund-quarter-holdings panel regression with bond fixed effects using our sample of U.S. municipal bond mutual funds from Jan. 2000 to Dec. 2019. The sample includes only holdings of newly issued municipal bonds which are held by at least two mutual funds. In Column (1) - (3), the dependent variable is the portfolio weight (%) in each newly issued municipal bond. In Column (4) - (6), the dependent variable is the dollar amount (in millions) invested in each newly issued municipal bond. All variables are winsorized at 0.5% of both tails. Standard errors clustered by time are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Portfolio Weight (%)			Position Value ($ millions)		
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbf{1}_{\text{connected}}$	0.0449***			0.0976		
	(0.0075)			(0.0880)		
$N_{\text{connections}}$		0.0210***			0.1412***	
		(0.0034)			(0.0336)	
$\mathbf{1}_{\text{lead connected}}$			0.0462***			0.1556**
			(0.0054)			(0.0639)
α	0.0077***	0.0077***	0.0077***	0.0200	0.0203	0.0201
	(0.0009)	(0.0009)	(0.0009)	(0.0128)	(0.0129)	(0.0129)
Flow	0.0040***	0.0040***	0.0040***	0.0000	−0.0002	−0.0001
	(0.0005)	(0.0005)	(0.0005)	(0.0041)	(0.0042)	(0.0041)
$ln(size)$	−0.1621***	−0.1624***	−0.1622***	1.3466***	1.3433***	1.3462***
	(0.0037)	(0.0037)	(0.0037)	(0.0322)	(0.0323)	(0.0323)
$ln(age)$	0.0137***	0.0136***	0.0136***	−0.1247***	−0.1293***	−0.1261***
	(0.0046)	(0.0046)	(0.0046)	(0.0310)	(0.0312)	(0.0311)
Expense	0.0200	0.0170	0.0195	−0.1161	−0.1543	−0.1225
	(0.0137)	(0.0137)	(0.0138)	(0.0997)	(0.0973)	(0.1003)
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	215,450	215,450	215,450	215,450	215,450	215,450
R^2	0.6314	0.6316	0.6316	0.5921	0.5923	0.5921

TABLE 5: **The Benefit of Primary Market Allocation in Fund Holdings**

The table reports fund-quarter-holdings panel regression results of Equation (6) using our sample of U.S. municipal bond mutual funds from Jan. 2005 to Dec. 2019. The sample starts in 2005 to match the sample period of transaction data in MSRB. The sample includes only holdings of newly issued municipal bonds. In Column (1) - (3), the dependent variable is the overall returns of newly issued municipal bonds in the first 30 days after issuance defined in Equation (3). In Column (4) - (5), the dependent variable is the overall profit gained for each holdings of newly issued municipal bond defined in Equation (4). All variables are winsorized at 0.5% of both tails. Standard errors clustered by time and fund are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Overall Return (%)			Overall Profit ($ Thousands)	
	(1)	(2)	(3)	(4)	(5)
Portfolio weight (%)	0.0103				
	(0.0163)				
$\mathbf{1}_{\text{connected}}$		0.1390***		9.6939***	
		(0.0163)		(1.4000)	
$N_{\text{connections}}$			0.0538***		4.3050***
			(0.0048)		(0.4511)
$ln(maturity)$	0.2859***	0.2786***	0.2814***	11.4543***	11.5989***
	(0.0259)	(0.0260)	(0.0259)	(1.5105)	(1.5341)
$\mathbf{1}_{\text{GO}}$	−0.0232	−0.0073	0.0056	1.2534	2.4489**
	(0.0171)	(0.0172)	(0.0174)	(0.9878)	(0.9766)
$\mathbf{1}_{\text{negotiated}}$	0.0204	0.0317**	0.0534***	−1.7897**	0.0711
	(0.0146)	(0.0148)	(0.0143)	(0.8976)	(0.8474)
$\mathbf{1}_{\text{callable}}$	−0.0389*	−0.0318	−0.0433**	−1.9496*	−2.8030**
	(0.0214)	(0.0212)	(0.0210)	(1.0995)	(1.1286)
$\mathbf{1}_{\text{insured}}$	0.2464***	0.2654***	0.2865***	0.8160	2.7097***
	(0.0251)	(0.0251)	(0.0256)	(0.8255)	(0.8347)
Fund×Time FE	Yes	Yes	Yes	Yes	Yes
Bond rating FE	Yes	Yes	Yes	Yes	Yes
Observations	300,387	300,387	300,387	300,387	300,387
R^2	0.3203	0.3230	0.3273	0.1891	0.1975

TABLE 6: **Explaining Portfolio Holdings in Newly Issued Municipal Bonds (Last Days)**

The table reports fund-quarter-holdings panel regression results of Equation (5) using our sample of U.S. municipal bond mutual funds from Jan. 2005 to Dec. 2019. The sample starts in 2005 to match the sample period of transaction data in MSRB. The sample includes only holdings of municipal bonds which are issued in the last few days before portfolio disclosure. In each column, the regression sample is further divided into holdings of bonds that are issued in different periods prior to portfolio disclosure date. In Column (1) - (3), the dependent variable is the overall returns of newly issued municipal bonds in the first 30 days after issuance defined in Equation (3). In Column (4) - (5), the dependent variable is the overall profit gained for each holdings of newly issued municipal bond defined in Equation (4). All variables are winsorized at 0.5% of both tails. Standard errors clustered by time and fund are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Portfolio Weight (%)			Position Value ($ millions)		
	0-1 days	**0-7 days**	**0-14 days**	**0-1 days**	**0-7 days**	**0-14 days**
$\mathbf{1}_{\text{connected}}$	0.065***	0.100***	0.093***	1.007***	1.081***	1.105***
	(0.015)	(0.010)	(0.007)	(0.195)	(0.121)	(0.099)
$ln(maturity)$	0.059***	0.032***	0.030***	0.687***	0.400***	0.324***
	(0.014)	(0.010)	(0.008)	(0.213)	(0.147)	(0.108)
$\mathbf{1}_{\text{GO}}$	0.014	0.013	0.004	−0.058	0.250	0.165
	(0.029)	(0.013)	(0.009)	(0.324)	(0.180)	(0.121)
$\mathbf{1}_{\text{negotiated}}$	−0.069***	−0.074***	−0.079***	−0.790***	−0.887***	−1.025***
	(0.022)	(0.010)	(0.007)	(0.207)	(0.143)	(0.113)
$\mathbf{1}_{\text{callable}}$	−0.010	0.025**	0.029***	−0.045	0.124	0.310***
	(0.022)	(0.010)	(0.008)	(0.298)	(0.141)	(0.108)
$\mathbf{1}_{\text{insured}}$	−0.129***	−0.077***	−0.074***	−0.605	−0.739***	−0.739***
	(0.039)	(0.015)	(0.011)	(0.366)	(0.127)	(0.096)
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond rating FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,752	29,184	66,963	4,752	29,184	66,963
R^2	0.658	0.536	0.531	0.370	0.286	0.275

TABLE 7: **The Benefit of Primary Market Allocation in Fund Holdings (Matched Transaction)**

The table reports fund-quarter-holdings panel regression results of Equation (6) using our sample of U.S. municipal bond mutual funds from Jan. 2005 to Dec. 2019. The sample starts in 2005 to match the sample period of transaction data in MSRB. The sample includes only holdings of newly issued municipal bonds. In Column (1) - (3), the dependent variable is the overall returns of newly issued municipal bonds in the first 30 days after issuance defined in Equation (3). In Column (4) - (5), the dependent variable is the overall profit gained for each holdings of newly issued municipal bond defined in Equation (4). All variables are winsorized at 0.5% of both tails. Standard errors clustered by time and fund are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Overall Return (%)			Overall Profit ($ Thousands)	
	(1)	(2)	(3)	(4)	(5)
Portfolio weight (%)	−0.0114				
	(0.0163)				
$\mathbf{1}_{\text{connected}}$		0.0599***		4.6404***	
		(0.0127)		(0.6590)	
$N_{\text{connections}}$			0.0256***		2.7323***
			(0.0051)		(0.3604)
$ln(maturity)$	0.1810***	0.1773***	0.1775***	6.3684***	6.2916***
	(0.0198)	(0.0197)	(0.0198)	(0.7663)	(0.7702)
$\mathbf{1}_{\text{GO}}$	0.0268*	0.0340**	0.0401**	1.5058*	2.3727***
	(0.0154)	(0.0155)	(0.0160)	(0.8516)	(0.8644)
$\mathbf{1}_{\text{negotiated}}$	0.0041	0.0086	0.0130	−2.1419**	−1.5622*
	(0.0127)	(0.0129)	(0.0125)	(0.8778)	(0.8318)
$\mathbf{1}_{\text{callable}}$	0.0765***	0.0786***	0.0745***	1.9009**	1.5387
	(0.0170)	(0.0170)	(0.0170)	(0.9563)	(0.9336)
$\mathbf{1}_{\text{insured}}$	0.1433***	0.1541***	0.1624***	0.6188	1.7955**
	(0.0243)	(0.0245)	(0.0248)	(0.8841)	(0.8483)
Fund×Time FE	Yes	Yes	Yes	Yes	Yes
Bond rating FE	Yes	Yes	Yes	Yes	Yes
Observations	118,781	118,781	118,781	118,781	118,781
R^2	0.4018	0.4023	0.4032	0.2818	0.2859

TABLE 8: **Returns of Newly Issued Bonds in Fund Holdings**

The table reports fund-quarter-holdings panel regression results of Equation (6) using our sample of U.S. municipal bond mutual funds from Jan. 2000 to Dec. 2019. The sample includes only holdings of municipal bonds that are issued within three months as of the portfolio disclosure date. The dependent variable is the returns of bond from offering date to portfolio disclosure date, calculated using bond offering price and reported market value of bonds in fund portfolio. In each column, the regression sample is further divided into holdings of bonds that are issued in different weeks prior to portfolio disclosure date to ensure that the compared returns between connected and unconnected bonds are at similar horizons. All variables are winsorized at 0.5% of both tails. Standard errors clustered by time and fund are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Bond Return (bps)					
	1-2 weeks	3-4 weeks	5-6 weeks	7-8 weeks	9-10 weeks	11-12 weeks
$\mathbf{1}_{\text{connected}}$	14.210***	8.966***	9.501**	14.372***	4.633	16.156**
	(3.939)	(3.378)	(4.765)	(5.004)	(6.091)	(6.326)
$ln(maturity)$	11.974***	20.029***	18.996***	27.506***	28.858***	36.684***
	(3.715)	(5.187)	(5.928)	(6.392)	(6.871)	(7.546)
$\mathbf{1}_{\text{GO}}$	−4.178	−5.707	−0.868	−1.728	0.003	4.564
	(5.071)	(4.248)	(5.053)	(6.121)	(6.182)	(6.515)
$\mathbf{1}_{\text{negotiated}}$	−0.569	11.338***	3.743	12.038**	8.555	5.726
	(4.952)	(3.961)	(6.674)	(4.745)	(6.391)	(5.647)
$\mathbf{1}_{\text{callable}}$	−33.477***	−38.749***	−28.105***	−39.327***	−29.166***	−41.026***
	(8.436)	(9.995)	(9.653)	(10.861)	(9.105)	(12.678)
$\mathbf{1}_{\text{insured}}$	11.855***	17.369***	15.243**	32.027***	34.722***	36.667***
	(4.295)	(6.133)	(7.438)	(9.147)	(10.536)	(8.385)
Fund×Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond rating FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	65,562	76,236	59,240	68,606	55,199	68,056
R^2	0.149	0.310	0.384	0.436	0.481	0.521

TABLE 9: **Predicting Fund Performance (Reduced-Form)**

The table reports fund-quarter panel regression results using our sample of US municipal bond mutual funds from Jan. 2000 to Dec. 2019. The dependent variable in Column (1) - (3) is the next-quarter benchmark-adjusted return (in percentage). The dependent variable in Column (4) - (6) is the next-quarter value added (in $ millions). All variables are winsorized at 0.5% of both tails. Standard errors clustered by time-category groups are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Benchmark-adjusted Return (%)			Value Added ($ millions)		
	(1)	(2)	(3)	(4)	(5)	(6)
w_{muni}	0.0017					
	(0.0015)					
v_{muni}				0.0112***		
				(0.0037)		
$N_{\text{connections}}$		0.0006***			0.0189**	
		(0.0002)			(0.0076)	
$\mathbf{1}_{\text{lead connected}}$			0.0009***			0.0456**
			(0.0003)			(0.0197)
4-factor alpha	−0.0014	−0.0014	−0.0014	0.0621	0.0692	0.0689
	(0.0110)	(0.0110)	(0.0110)	(0.0712)	(0.0715)	(0.0714)
Fund flows	0.0011	0.0011	0.0012	−0.0058	−0.0017	−0.0028
	(0.0010)	(0.0010)	(0.0010)	(0.0092)	(0.0089)	(0.0095)
Tracking error	0.2620*	0.2617*	0.2609*	2.2973***	2.4821***	2.4319***
	(0.1341)	(0.1340)	(0.1339)	(0.7961)	(0.8214)	(0.8186)
Expense ratio	−0.1024***	−0.0912***	−0.0938***	0.8944***	0.4830*	0.5508*
	(0.0216)	(0.0222)	(0.0221)	(0.2348)	(0.2484)	(0.2818)
$ln(age)$	0.0055	−0.0003	0.0011	−0.1979**	−0.0193	−0.0365
	(0.0106)	(0.0113)	(0.0111)	(0.0961)	(0.1206)	(0.1341)
Category × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	44,271	44,271	44,271	44,271	44,271	44,271
R^2	0.3961	0.3962	0.3962	0.2871	0.2843	0.2854

TABLE 10: **Explaining Portfolio Holdings in Newly Issued Municipal Bonds (First-Stage)**

The table reports the results of first-stage regressions of Equation (9) using our fund-quarter sample of US municipal bond mutual funds from Jan. 2000 to Dec. 2019. The dependent variable in Column (1) and (2) is the total weight (%) invested in newly issued municipal bonds by a fund. The dependent variable in Column (3) and (4) is total market value ($ millions) invested in newly issued municipal bonds by a fund. All variables are winsorized at 0.5% of both tails. Standard errors clustered by time-category groups are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Total Weight (%)		Total Market Value ($ millions)	
	(1)	(2)	(3)	(4)
$N_{\text{connections}}$	0.0445***		2.1984***	
	(0.0013)		(0.0240)	
$\mathbf{1}_{\text{lead connected}}$		0.0506***		3.4193***
		(0.0043)		(0.2087)
4-factor alpha	0.0498***	0.0543***	0.5476***	0.6830***
	(0.0159)	(0.0159)	(0.1672)	(0.1876)
Fund flows	0.1671***	0.1796***	0.0556	0.4227***
	(0.0053)	(0.0055)	(0.0446)	(0.0693)
Tracking error	−0.0294	−0.0768	16.5497***	12.9094***
	(0.1893)	(0.1942)	(2.1650)	(2.0871)
Expense ratio	1.0334***	0.6605***	−27.0645***	−36.4985***
	(0.0930)	(0.0934)	(1.2025)	(1.9756)
$ln(age)$	−0.9769***	−0.7932***	11.4249***	16.7317***
	(0.0440)	(0.0469)	(0.5082)	(0.8513)
Category × Time FE	Yes	Yes	Yes	Yes
Observations	44,837	44,837	44,837	44,837
R^2	0.3239	0.2980	0.6656	0.6097

TABLE 11: **Predicting Fund Performance**

The table reports the results of 2SLS regressions of Equation (10) using our fund-quarter sample of US municipal bond mutual funds from Jan. 2000 to Dec. 2019. The dependent variable in Column (1) and (2) is the next-quarter benchmark-adjusted return (in percentage). The dependent variable in Column (3) and (4) is the next-quarter value added (in $ millions). Time-by-category fixed effects are included in all regressions. All variables are winsorized at 0.5% of both tails. Standard errors clustered by time-category groups are reported in the brackets under each coefficient. Stars denote standard statistical significance (***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, respectively).

Dependant Var:	Benchmark-adjusted Return (%)		Value Added ($ millions)	
	(1)	(2)	(3)	(4)
$\hat{w}_{muni}$ (IV:$N_{\text{connections}}$)	0.0125***			
	(0.0043)			
$\hat{w}_{muni}$ (IV:$\mathbf{1}_{\text{lead connected}}$)		0.0161***		
		(0.0050)		
$\hat{v}_{muni}$ (IV:$N_{\text{connections}}$)			0.0086**	
			(0.0035)	
$\hat{v}_{muni}$ (IV:$\mathbf{1}_{\text{lead connected}}$)				0.0129**
				(0.0052)
4-factor alpha	−0.0020	−0.0022	0.0646	0.0605
	(0.0110)	(0.0111)	(0.0714)	(0.0711)
Fund flows	−0.0010	−0.0017	−0.0023	−0.0081
	(0.0011)	(0.0012)	(0.0090)	(0.0104)
Tracking error	0.2622*	0.2622*	2.3429***	2.2679***
	(0.1345)	(0.1346)	(0.8043)	(0.8112)
Expense ratio	−0.1041***	−0.1047***	0.7133***	1.0113***
	(0.0217)	(0.0216)	(0.2501)	(0.3526)
$ln(age)$	0.0120	0.0142	−0.1183	−0.2493
	(0.0103)	(0.0100)	(0.1151)	(0.1547)
Observations	44,271	44,271	44,271	44,271
R^2	0.3945	0.3932	0.2869	0.2870

TABLE 12: **Double Sort: 5-by-5 Fund Size and Underwriter Connection**

The table reports the quarterly benchnmark-adjusted return for the 5-by-5 fund size and underwriter connection portfolios for all municipal bond funds from 2001 to 2019. At the end of each quarter, funds sorted by fund size and the number of connections (sequentially and in that order). Then, we calculate the equally-weighted benchmark-adjusted return in the next quarter for each of the 25 portfolios. The table reports the average quarterly benchnmark-adjusted return (%) over the entire sample period. T-statistics (in parentheses) are based on White's standard errors.

Size quintile	$N_{\textbf{connections}}$ quintile						
	Low	2	3	4	High	All	High-Low
Low	-0.252	-0.240	-0.112	-0.053	0.069	-0.105	0.320
	(-5.4)	(-5.76)	(-2.59)	(-1.02)	(1.13)	(-2.9)	(4.06)
2	-0.124	-0.136	-0.053	-0.076	0.054	-0.064	0.178
	(-3.26)	(-3.23)	(-1.16)	(-1.47)	(0.82)	(-1.57)	(2.86)
3	-0.066	-0.052	-0.026	0.017	0.068	-0.012	0.134
	(-1.41)	(-1.28)	(-0.46)	(0.31)	(1.09)	(-0.24)	(3.5)
4	-0.020	0.002	0.008	0.100	0.087	0.035	0.107
	(-0.32)	(0.03)	(0.14)	(1.62)	(1.55)	(0.63)	(2.87)
High	0.058	0.037	0.125	0.097	0.083	0.081	0.034
	(0.86)	(0.5)	(1.83)	(1.45)	(1.91)	(1.37)	(0.77)
All	-0.081	-0.058	-0.011	0.017	0.073	0.029	0.153
	(-1.89)	(-1.24)	(-0.23)	(0.33)	(1.33)	(0.69)	(4.18)
High-Low	0.310	0.276	0.237	0.150	0.014	0.186	
	(4.1)	(3.41)	(4.11)	(3.04)	(0.37)	(4.43)	

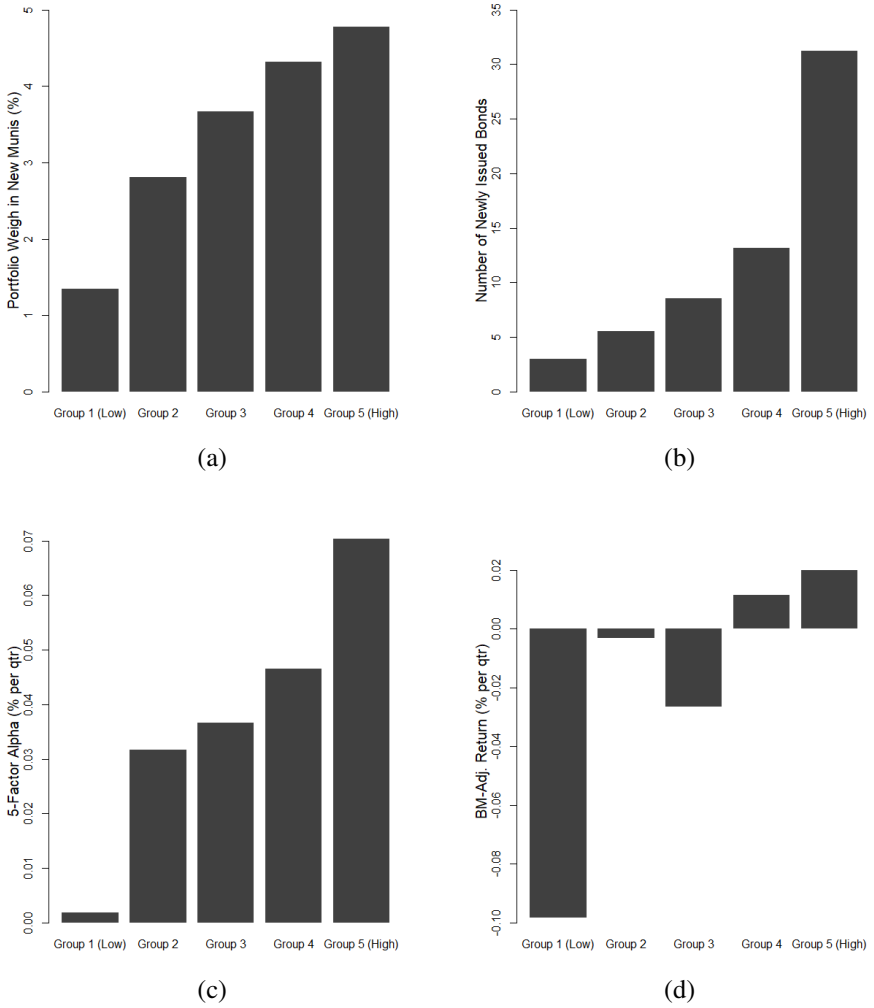

FIGURE 1: **Single Sort: Fund Connections** At the end of each quarter, funds are sorted into five quintile portfolios based on their total number of connections in the portfolio. The figure plots the average (a) total weight invested in newly issued bonds; (b) number of newly issued bonds in the portfolio; (c) the next-quarter 4-factor alpha; (d) next-quarter benchmark adjusted return for each of the five quintile portfolios.

INTERNET APPENDIX

TABLE A.1: **Variable Definitions**

Variable	Description
Newly issued bond	A bond is considered newly issued within three month since offer date.
Current fund-underwriter connection	A fund is considered to have a current connection with a underwriter during the reporting period in which the fund discloses the underwriter as one of the ten principals with whom the fund has the largest principal transactions in the N-SAR/N-CEN filings.
Established fund-underwriter connection	A fund is considered to have an established connection with a underwriter in the following 24-month period when the fund discloses the underwriter as one of the ten principals in any N-SAR/N-CEN filings.
$\mathbf{1}_{\text{lead connected}}$	An indicator variable which equals to one if the fund has an established connection with the lead underwriter of a newly issued bond.
$\mathbf{1}_{\text{connected}}$	An indicator variable which equals to one if the fund has an established connection with any of the underwriters of a newly issued bond.
$N_{\text{connections}}$	The total number of established connections a fund has across all newly issued municipal bonds the fund hold given a portfolio disclosure.
$\mathbf{1}_{\text{negotiated}}$	An indicator variable which equals to one if the bond was offered in a negotiated deal in the primary market, and zero otherwise.
$\mathbf{1}_{\text{GO}}$	An indicator variable which equals to one if the municipal bond is a general obligation bond, and zero otherwise.
$\mathbf{1}_{\text{callable}}$	An indicator variable which equals to one if the municipal bond has callable features, and zero otherwise.
$\mathbf{1}_{\text{insured}}$	An indicator variable which equals to one if the municipal bond is a insured, and zero otherwise.
$ln(maturity)$	The natural log of the number of months to maturity for a bond.
4-factor alpha	The annualized alpha of a fund against five bond market factors estimated in a regression using past 12 months of 5-day overlapping returns.
Market factor ($R^e_{b,d}$)	the return of the long-short portfolio of Bloomberg Municipal Bond Index and Bloomberg Treasury Index.
Credit 1 ($R_{credit1,t}$)	the return of the long-short portfolio of ICE Bloomberg US Corporate Index and Bloomberg Treasury Index
Credit 2 ($R_{credit2,t}$)	the return of the long-short portfolio of ICE BofAML US High Yield Master II Index and Bloomberg Treasury Index.
Term ($R_{term,t}$)	is the return of the long-short portfolio of Bloomberg Long Treasury Index and Bloomberg 1-3Y Treasury Index.

Variable Definitions (cont.)

Variable	Description
Fund flows	The 3-month flow of a fund calculated as $\frac{TNA_t}{TNA_{t-1}} - (1 + ret_t)$.
Tracking error	The standard deviation of a fund's benchmark-adjusted returns calculated using past 12 months of 5-day overlapping returns.
Expense ratio	The annual expense ratio charged by a fund (reported by CRSP).
Turnover ratio	Minimum of aggregated sales or aggregated purchases of securities, divided by the average 12-month Total Net Assets of the fund.
$ln(age)$	The natural log of the number of months a fund has operated since inception.

TABLE A.2: **Principal Definitions in SEC filings**

N-SAR, item 22. Registrant's portfolio transactions with entities acting as principals.
List the 10 entities acting as principals with whom Registrant did the largest amount of portfolio transactions (include all short-term obligations, and U.S. Gov't & tax-free securities) in both the secondary market & in underwritten offerings set forth in order of size based upon total value of principal transactions during the current reporting period.

N-CEN, Instructions to Item C.16 and Item C.17.
To help Registrants distinguish between agency and principal transactions, and to promote consistent reporting of the information required by these items, the following criteria should be used:

1. If a security is purchased or sold in a transaction for which the confirmation specifies the amount of the commission to be paid by the Registrant, the transaction should be considered an agency transaction and included in determining the answers to Item C.16.
2. If a security is purchased or sold in a transaction for which the confirmation specifies only the net amount to be paid or received by the Registrant and such net amount is equal to the market value of the security at the time of the transaction, the transaction should be considered a principal transaction and included in determining the amounts in Item C.17.
3. If a security is purchased by the Registrant in an underwritten offering, the acquisition should be considered a principal transaction and included in answering Item C.17 even though the Registrant has knowledge of the amount the underwriters are receiving from the issuer.
4. If a security is sold by the Registrant in a tender offer, the sale should be considered a principal transaction and included in answering Item C.17 even though the Registrant has knowledge of the amount the offeror is paying to soliciting brokers or dealers.
5. If a security is purchased directly from the issuer (such as a bank CD), the purchase should be considered a principal transaction and included in answering Item C.17.
6. The value of called or maturing securities should not be counted in either agency or principal transactions and should not be included in determining the amounts shown in Item C.16 and Item C.17. This means that the acquisition of a security may be included, but it is possible that its disposition may not be included. Disposition of a repurchase agreement at its expiration date should not be included.
7. The purchase or sales of securities in transactions not described in paragraphs (1) through (6) above should be evaluated by the Fund based upon the guidelines established in those paragraphs and classified accordingly. The agents considered in Item C.16 may be persons or companies not registered under the Exchange Act as securities brokers. The persons or companies from whom the investment company purchased or to whom it sold portfolio instruments on a principal basis may be persons or entities not registered under the Exchange Act as securities dealers.