Conflicts of Interest in Municipal Bond Advising and Underwriting*

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Abstract

When can financial advisor conflicts of interest generate worse outcomes for clients? A regulation following from Dodd-Frank prohibits municipal advisors from simultaneously acting as bond underwriters. Using a difference-in-differences approach and 20,051 bond auctions, I test whether this reduction in advisor privileges affects financial advice and borrower outcomes. Bonds with potential dual advisor-underwriters see financing costs fall by 11.4 basis points after the advisor is no longer allowed to underwrite. The decline follows from increases in standardization, third party certification, and auction participation—consistent with limiting the adverse selection that arises due to advisors withholding information from the market.

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1 Introduction

Conflicts of interest are common in financial services, but their presence is not necessarily detrimental for the customers in a market that can discipline those conflicts. A fundamental source of financial conflicts of interest is that customers purchasing financial products are less informed about the market for those products than the firms that sell them (Campbell, 2016). Financial advisors are intermediaries that play a key role in providing information to customers about the market and potentially to the market about the customer. However, that role in information provision may be subject to a conflict of interest if the advisor can profit by withholding information. While recent literature has found reputational concerns and adjustments by customers can both help the market discipline potential conflicts,[1] there is still widespread belief among regulators that conflicts can harm customers, including borrowers in the $4 trillion municipal bond market in the US (U.S. Securities and Exchange Commission, 2012). Using auction data, I show how conflicts of interest among municipal financial advisors led to higher borrowing costs for states and local governments by exacerbating informational asymmetries leading to decreased market participation.

Municipal advisors are one of the most important intermediaries in the municipal bond market and provide services including structuring bonds, developing plans for how to spend and invest funds, preparing public documents, and soliciting credit rating agencies on behalf of states and local governments. At the same time, advisors have a *conflict of interest* when they are part of a firm that is also vying to provide underwriting services, which is "a situation in which a party to a transaction can potentially gain by taking actions that adversely affect its counterparty" (Mehran and Stulz, 2007, p. 268). Such "dual advisors"—which made up 25% of the advising market before 2011—have a profit function that is increasing in primary market municipal borrowing costs while holding all else constant.[2] I show that a regulation prohibiting dual advisors from concurrently underwriting municipal debt lowers borrowing costs on average, implying that market forces alone do not fully discipline advisor conflicts of interest.

The primary market for US municipal bonds provides a prime laboratory to learn about why, how, and how much conflicts of interest can impact customer outcomes for two particular reasons. First, many municipal bonds are required to be placed with an underwriter using an auction, the results of which are public. Directly observing submitted bids allows me to measure competitive

[1] Mehran and Stulz (2007) provide a recent overview of the empirical literature on conflicts of interest in financial markets, focusing on sell-side analysts. They argue that real impacts of conflicts of interest are usually benign in the empirical literature although there are some contexts like independence of mutual fund boards where conflicts matter.

[2] Underwriter profits in this context are an equilibrium outcome of two markets: primary market auctions and sales to secondary market investors. All else equal, underwriter profit is increasing in the yield from the auction because it pays a lower price to the municipal issuer and is able to receive the same price from secondary market investors. If the conflicted advisor can take actions that raise the yield in both markets, it can increase underwriting profits as long as the yield increases more in the primary market than in the secondary market.

forces that may discipline conflicts in a more granular way than through broad notions of market concentration or conduct. Second, the municipal bond market is made up of over 50,000 heterogeneous borrowers and segmented by state geography (Butler, 2008), taxation (Babina et al., 2021), and regulation (Cestau et al., 2021). This market, which includes borrowers ranging from the state of California to school districts in rural Pennsylvania, has scope for informational asymmetries and market power that may be important for how the market disciplines potential conflicts. I find that the impact of removing a conflict of interest is largest for opaque issues where underwriting auction participation is scarce and where financial advisors are able to guide borrowers away from getting third party certifications like credit ratings. Meanwhile, large portions of the market show limited impacts of the conflict or its removal.

The regulation limiting advisors' ability to underwrite was enacted by the Municipal Securities Rulemaking Board (MSRB) updating Rule G-23 as a consequence of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010.[3] Schapiro (2010) and SEC (2011) explain the reasoning behind prohibiting dual advisors from actively performing both roles: since underwriters can profit from higher interest costs in the primary market, the advice provided by an advisor seeking to act as underwriter may be biased toward higher interest cost debt structures. Critics of the regulation worried that interest costs would increase as municipal advisors are prohibited from underwriting because the underwriter market suffers from a fundamental lack of participation such that the marginal participant can be very important (Bond Dealers of America, 2019). How a conflict of interest for financial advisors manifests, and whether it has any deleterious effects for clients, is ultimately an empirical question.

A financial transaction with advice can been thought of as taking part in two stages. In the first stage a financial advisor and a municipality work together to design a financial product that suits the municipality's needs taking into account a second stage in which the municipality finds a financial service firm from whom to buy the product. The extent to which a conflict of interest will affect the first stage outcome is unclear. A dual advisor can extract transfers from their municipal clients by taking any action that increases their own profits in the second stage. However, the advice may not necessarily be biased by the conflict of interest because financial advisors face potential reputational and other concerns that discipline their behavior (Mehran and Stulz, 2007).

The second stage of issuing a municipal bond is often required to take place in a first-price, sealed-bid auction. Underwriters submit yields that they are willing to receive to underwrite the

[3]Subchapter H of Title IX of Dodd-Frank, formalized by an update to MSRB Rule G-23 on November 27, 2011 disallows advisors from vying for underwriting business for any bond issue for which they offered advice. For an overview of all of the regulatory changes affecting municipal advice since Dodd-Frank, see Bergstresser and Luby (2018). I abstract away from the registration and fiduciary rules in 2014 and 2015, respectively, as well as the enhanced certification requirements associated with the Series 50 exam in 2017 since these regulations affect all advisors and thus will not interfere with the difference-in-differences research design.

bond package that an issuer already structured with the help of an advisor and the low bid wins. The general theory of auctions developed by Milgrom and Weber (1982) provides some structure for what could happen when the advisor is removed from the second stage. In the Milgrom and Weber (1982) model with affiliated values, where the value of winning the auction to each participant may depend on the values of other market participants, there are two potential forces at work when one competitor is added to the market. The first is the *competitive effect*: one more competitor means you need to bid a little bit more aggressively in order to win the auction and so you bid a lower yield. The second is the *adverse selection effect*. The value of winning has a common value component, so each additional bid you beat raises the likelihood that your bid was an overestimate of this common value and you bid less aggressively (i.e., bid a higher yield).[4] When a dual advisor is barred from participating in the second stage, the remaining potential underwriters may bid less aggressively because they have a higher chance of winning conditional on the bid, but they also could bid more aggressively because the chance of winning when their estimate of the common value is overly positive has decreased. Which effect dominates is an empirical question and can be influenced by the advisor's actions in the first stage.

Using a difference-in-differences research design to identify the net effect, I compare the borrowing cost for bonds sold at auction that employ an advisor who also offers underwriting services, potential "dual advisors," to bonds that are issued with advice from an independent advisor—an advisor not associated with an investment bank—before and after Rule G-23 was updated to ban concurrent advising and underwriting on November 27, 2011. I define the set of dual advising firms based on behavior before Dodd-Frank. Because municipalities select into using "dual advisors," my primary identification strategy accounts for selection by using within-issuer variation across both advisors and time, focusing on the set of competitively sold, general obligation, tax exempt bonds. The preferred specification indicates that borrowing costs decrease by 11.4 basis points (bps), or 5.3%, for dual advisor issues relative to independent advisor issues after regulation. The average treatment effect masks substantial heterogeneity: school districts for whom the dual advisor bid in most of their auctions before 2011 saw borrowing costs decline by 45bps while borrowers who get at least six bids on average have no change in borrowing costs after regulation. The effect is concentrated in the most opaque corners of the market where attention from other

[4]The nomenclature used to describe the mechanics of the affiliated values auction here was introduced by Hong and Shum (2002) who also focused on a similar procurement auction where the low bid wins. For bidder i with signal x_i in an auction with n bidders, the general optimal bidding function can be written as

$$s_n(x_i) = \frac{s_n'(x_i)[1 - F_{-i,n}(x_i|x_i)]}{f_{-i,n}(x_i|x_i)} + v_n(x_i, x_i).$$

Milgrom and Weber (1982) showed that, under some general conditions for a low-bid auction, the first term is decreasing in n, which is the competitive effect, while the second term is increasing in n, which is the adverse selection effect.

potential underwriters is relatively low.

Identification in the difference-in-differences research design assumes that outcomes for dual advised and independently advised issues would have moved in parallel absent the regulatory intervention. As *prima facie* evidence in favor of the parallel trends assumption, I show that dual advised and independently advised issues have similarly trending outcomes during the great recession in 2008-09 and following years. Next, I show that the observed effects are not a function of changing composition of bonds and that the yield decrease is concentrated entirely in new money issues and issues by opaque school districts where asymmetric information is most likely prevalent and scope for adverse selection is largest. Extended analysis in Internet Appendix C details an alternative identification strategy using inverse probability weights, robustness to measurement and specification decisions including advisor-by-issuer fixed effects, and a placebo test highlighting no effect of regulation on unaffected advisors in firms with investment banks.[5]

To shed light on the relative importance of potential mechanisms for explaining declining borrowing costs, I begin by measuring changes in auction participation and outcomes. This yields two pieces of evidence that the adverse selection effect is dominant. First, when the dual advisor is no longer allowed to bid, the total number of submitted bids increases by 0.4 bids relative to a median of 5 bids, indicating that the removed bids are more than fully replaced (i.e., the treated auctions have net entry after barring a historical participant). Second, the winning bid decreases (the winning bidder pays more) and this increase in bids is observed across the whole distribution of bidders such that the average and median bid also increase in the same magnitude as the winning bid, indicating that all remaining potential underwriters bid more aggressively, and it is not simply that the winning bid was luckier for the issuer. As additional evidence of the adverse selection effect, I document the presence of the *winner's curse* in 2008-2011 when non-advisors win underwriting auctions while bidding against dual advisors. I find lower *ex post* gross spreads for non-advisor underwriters who win auctions against a dual advisor, consistent with non-advisor underwriter wins being subject to adverse selection.

Next, I test whether the average structure of bonds is changing in the first stage in a manner consistent with changing advice. I find that bonds with potential dual advisors become more similar to bonds with independent advisors after 2011. Among dual advised issues, the maturities for similar size issues become shorter, although this result is statistically weak, and the bonds

[5] A similar update to MSRB Rule G-17, the *fair dealing rule* for underwriters of negotiated deals, was implemented in August 2012 and required that underwriters disclose their compensation structure and that they are not financial advisors. This regulation could impact the negotiated business of both dual and independent advisors and provides one reason for my focus on competitive sales. It is conceivable that the negotiated underwriting business of dual advisors is harmed by Rule G-17, which could conceivably lead to them trying to extract relatively more value from their competitive advisory business studied in this paper and could bias my estimates toward finding increases in costs for dual advised auctions, which is the opposite of what I find. Rule G-17 is discussed more in Appendix B.1.

are more likely to obtain a credit rating or use a credit enhancement.[6] The newly rated bonds are similarly rated to the market as a whole, which suggests they were not eschewing ratings because of underlying creditworthiness differences. These patterns are consistent with conflicted dual advisors encouraging credit worthy issuers to avoid third party certifications to increase private information that other underwriters would not have in order to increase adverse selection and their own profits. The increase in third-party certifications and standardization manifests as more liquid trading on secondary markets.[7] The decrease in borrowing costs is large when compared to the costs associated with obtaining third party credit certifications, but Section 6 discusses how this comparison omits other potential costs.

The larger importance of the adverse selection effect relative to the competitive effect of removing an intermediary conflict of interest stands in contrast to much of the existing literature. Many papers find that the competitive effect—having more firms participate in the market—is more important to client outcomes than a potential conflict of interest. For example, Puri (1996), Gande, Puri and Saunders (1999), and Drucker and Puri (2005) study the Glass-Steagall Act and it's repeal and find that the impact of additional competition swamps the potential downside of allowing potentially conflicted agents from participating in the market. In many scenarios, even a single additional competitor is enough to dominate other market design characteristics (Bulow and Klemperer, 1996). The paramount role of competition shows up repeatedly throughout the literature on financial intermediaries and the municipal bond market is no exception (Cestau, 2019; Garrett et al., 2023). The academic focus on the importance of competition is consistent with the policy debate around Rule G-23, which centers on the marginal impact of losing the dual advisor's bid in the second stage (Bond Dealers of America, 2019). The present study argues that competition, as measured by the participation in auctions, is a function of the dual advisor's conflict of interest because of the adverse selection effect. Firms are less willing to compete when information is endogenously withheld. While the competitive landscape of the industry is important, dual advisors were able to profit in the least competitive parts of the market by advising bonds that were issued in a more opaque manner.[8]

In the market for consumer financial advice, a similar conflict of interest arises from the dual function of some financial advisors who both give advice about what securities to buy and who

[6]Credit enhancements in the market include bond insurance, letters of credit, and guarantees.

[7]I also test for changes in the quality of underwriting proxied by 30-day underpricing in Appendix C.9 and find no statistically significant evidence of a deterioration in eventual underwriting quality although the difference-in-differences point estimates are mostly positive.

[8]The headline estimates finding material impacts of a conflict of interest here are largely consistent with studies of other financial services where the intermediary controls information, such as credit rating agencies. Credit ratings agencies have been shown to use their informational advantage over clients to extract information rents (Jiang, Stanford and Xie, 2012; Griffin and Tang, 2011). Similarly, integrated mortgage lenders are able to benefit from informational advantages relative to non-integrated lenders to cream skim the least risky mortgages (Stroebel, 2016).

also directly sell their own funds. The empirical literature has overwhelmingly shown that this conflict of interest drives financial advisors to give advice that lowers net yields for investors while enriching the firm through increased demand for its own investment products or through the ability to adjust their own portfolios (Foerster et al., 2017; Hackethal, Haliassos and Jappelli, 2012; Fecht, Hackethal and Karabulut, 2018; Hoechle et al., 2018; Mullainathan, Noeth and Schoar, 2012; Chalmers and Reuter, 2012; Boyson, 2019; Bhattacharya, Illanes and Padi, 2019). In a related study on consumer financial advice, Egan, Matvos and Seru (2019) show that advisory firms specialize in misconduct and profit from focusing on unsophisticated rich and less educated individuals. A similar mechanism shows up in this paper where certain types of advisors can deter competition by withholding information regarding small, opaque, and likely unsophisticated municipal issuers as well.[9]

This study also contributes to the literature that studies municipal borrowing costs and thus the cost of providing many public goods at a subnational level. Municipal borrowing costs vary widely across the US with true interest costs ranging from 0.1% to over 8% in this sample from SDC Platinum (2016) for 2008 to 2015. Municipal borrowing costs are driven by factors including tax rates and exemptions (Poterba, 1989; Fortune, 1991; Ang, Bhansali and Xing, 2010; Cestau, Green and Schürhoff, 2013; Liu and Denison, 2014; Garrett et al., 2023), market segmentation and illiquidity (Schultz, 2012; Schwert, 2017; Cestau et al., 2019; Babina et al., 2021), market structure faced by the issue (Cestau et al., 2021; Cestau, 2019; Ivanov and Zimmerman, 2019), environmental risk (Goldsmith-Pinkham et al., 2020), racial bias (Dougal et al., 2019), and many other local characteristics and decisions (Poterba and Rueben, 2001; Cornaggia, Hund and Nguyen, 2019; Gao, Lee and Murphy, 2020). The choice of financial intermediaries affects borrowing costs and these agents are often chosen through political connections (Simonsen and Hill, 1998; Butler, Fauver and Mortal, 2009) or by geographic proximity (Butler, 2008). Advisors have wide breadth to affect borrowing costs by changing the structure of municipal bonds, by their differing abilities to find underwriters, and by their reputations for working with municipalities to create successful issues (Clarke, 1997; Liu, 2015; Moldogaziev and Luby, 2016; Bergstresser and Luby, 2018; Daniels et al., 2018). This study adds a novel finding to the public finance literature that conflicting financial incentives of advisors also negatively affect outcomes for municipal bonds by endogenously increasing asymmetric information and thus adverse selection, especially in low-participation corners of the market.

This paper proceeds as follows. Section 2 describes the municipal bond issuance process, the involvement of the financial advisor, and the context surrounding the change in MSRB Rule G-23

[9]Increased information provision lowering borrowing costs is also consistent with other research on how information impacts the municipal bond market such as Baber and Gore (2008) and is related to the larger literature on information and the cost of capital (Duarte et al., 2008).

while Section 3 discusses the data that are employed in the analysis. The empirical design and results are described in Section 4 along with several robustness checks, alternative identification strategies, and treatment effect heterogeneity. Channels behind the observed effect are described and measured in Section 5. With several additional assumptions, the net costs of the regulation are described in Section 6. Section 7 concludes.

2 Financial Advisors and MSRB Rule G-23

Municipalities issue over $400 billion dollars of bonds each year to finance investment in public goods such as water treatment plants, roads, and schools. Interest payments on these bonds make up one of the largest public expenditures for state and local governments. Some of the investments financed by municipal debt raise property values and tend to be associated with other positive economic outcomes (Dagostino, 2019; Adelino, Cunha and Ferreira, 2017; Cellini, Ferreira and Rothstein, 2010). However, several frictions in the market increase borrowing costs for public entities. First, the market to hire underwriters is not perfectly competitive (Garrett et al., 2023; Cestau et al., 2019). Second, municipalities often lack the financial sophistication to navigate the issuance process on their own because they issue debt infrequently in a market segmented into narrow markets by local tax exemptions and regulation (U.S. Securities and Exchange Commission, 2012; Schultz, 2012; Bergstresser and Luby, 2018; Babina et al., 2021).

A municipality that wishes to invest in a new public project can be imperfectly informed about the market for their debt. The municipality may hire a municipal financial advisor (henceforth, "advisor") to develop a financial plan to raise funds through a bond offering or other debt instrument and how they will pay for it. After a municipality decides to issue bonds, the advisor helps structure the debt, create public disclosure documents, solicits a credit rating or credit enhancement, and makes a plan to find an underwriter who will certify the debt and sell the bonds to investors on a secondary market. I focus on competitive sales where an underwriter is picked by submitting the lowest yield to maturity in a first-price, sealed bid auction. The underwriter is responsible for certifying the quality of the bond issue to the market and for selling the bonds to investors or other broker-dealers.

The process of issuing municipal debt in the US is regulated by the Municipal Securities Rulemaking Board (MSRB), which develops rules regarding how advisors, underwriters, and issuers are allowed to interact. Since its founding by Congressional mandate in 1975, the MSRB has been charged with protecting investors and the public interest from financial malfeasance by municipalities and financial institutions. The MSRB created Rule G-23 in 1978, which was primarily geared toward disclosure of roles. The original rule required that advisors would have to disclose their intent or ability to underwrite to municipalities that they were advising. Potential dual advisor

underwriters would need to get permission from the issuer to potentially fulfill a dual role. Historically, it was common for advisors to act as both advisor and underwriter for a given bond issue. Dual advisors underwrote about 15% of the competitive issues they advised before 2011.

The underwriter and municipality have different and potentially opposing goals when issuing debt: a municipality that wants to minimize financing costs will want a low interest cost but the underwriter wants to maximize profits, which increase with interest costs (holding investor demand and other factors constant). Even if taking a specific action lowers the eventual price investors will pay for a bond, as long as the price that the underwriter pays to the municipality decreases more, then this would be a profit increasing action for the underwriter in their role as an advisor. Schapiro (2010) summarizes the SEC's opinion on the conflict of interest:

> "Financial Advisers should be prohibited from resigning as financial advisor to an issuer, and then underwriting that issuer's bonds, as they are currently allowed to do under MSRB Rule G23. Right now, a financial professional advising a municipality can guide the municipality towards securities tailored to his firm's advantage, then resign and act as underwriter. This is a classic example of conflict of interest." - Mary Schapiro, May 7, 2010

In response to the financial crisis of 2007-08, Congress passed the Dodd-Frank Wall Street Reform and Consumer Protection Act in July of 2010, which added a new charge to the MSRB's function in Subchapter H of Title IX. In addition to protecting investors and the public interest, the MSRB also became responsible for protecting states and other municipal entities who sell debt through financial intermediaries. To do so, the MSRB was given the power to regulate municipal financial advisors separately from underwriters and broker-dealers.

The first new regulation from the MSRB after Dodd-Frank was a restatement of Rule G-23, which shifted from focusing on disclosure to a prohibition of behavior. On August 17, 2010, the MSRB posted a request for comments regarding how Rule G-23 could be changed to better reflect the new functions under Dodd-Frank. By February 2011, the MSRB filed the final language with the SEC and, on May 31, 2011, the SEC officially approved the final changes to Rule G-23 that prohibited all municipal financial advisors from underwriting any debt about which they offered advice. The regulation came into effect six months later on November 27, 2011 (SEC, 2011). Bergstresser and Luby (2018) review the other changes facing advisors after Dodd-Frank including a registration rule in 2014, a fiduciary rule after 2015, and additional licensing requirements in 2017 that affect all municipal financial advisors.[10]

[10]While there is potential for dual advisors to change their behavior during the period between Dodd-Frank and the official start of the rule, the lack of any pre-trends in yields between 2008 and 2011 in the empirical analysis suggests that there was not an important response to the threat of regulation before it happened.

3 Municipal Bond Market Data and Outcomes

Analysis data come from the SDC Platinum Global Public Finance database (SDC Platinum, 2016). SDC lists all municipal bond issues with a full description of the characteristics of the issue. The data include the sale date, the principal size, an account of individual bonds in each issue and associated coupons, maturity dates, CUSIP codes, and many other bond characteristics. See Internet Appendix A for definitions of all variables used from SDC. These data provide the basic information to estimate a pricing model of municipal bond issues in the primary market and they include the names of the financial advisor and underwriter.

The SDC data include listings of bonds that are sold via direct negotiation with an underwriter and those sold competitively at auction. I focus on competitive sales for three primary reasons. First, advisors are almost always present in competitive sales while their potential actions as underwriters are differently regulated in the negotiated market. Second, most bond sales that take place competitively are statutorily required to do so while negotiated sales almost always represent an endogenous choice on the part of the issuer (Cestau et al., 2021). Third, the use of advisors is undergoing a dramatic increase in the negotiated market where they offer a different set of services than what issuers require for competitive sales and where regulation binds differently. Competitive sales also have the added benefit of being able to directly observe competition related mechanisms since bids become public information after the auction.[11]

The second dataset provides networks of municipal advisors, investment banks, and financial holding companies that provide municipal underwriting services developed by Bergstresser and Luby (2018). This list identifies municipal advisors in the SDC data that are associated with an underwriting entity. I call such advisors who also offer broker-dealer services through another arm of the same business "dual advisors" if they are ever observed advising and underwriting the same competitive deal between 2008 and 2010. The behavior of these dual advisors is controlled by the reformed version of MSRB Rule G-23. Advisors that are not associated with an investment bank cannot act as a broker-dealer—whether or not such behavior is forbidden by Rule G-23—so their behavior is not directly affected by the 2011 reform. I refer to those financial advisors as "independent" or "dedicated" advisors.[12] Four investment banks have advising lines of business but never submit bids on issues on which they offered advice in the sample. The advising branches of these firms are used in a placebo test that shows no treatment effect for advisors who never engaged in dual advisor behavior.[13] The market for municipal financial advice is made up of many types of firms, from companies advising over 500 competitive issues per year down to advisors

[11] See Appendix B.1 for more discussion of the focus on competitive sales and the history of advisors in negotiated sales.

[12] The geographic distribution of dual advisors and borrowing behavior is discussed in Appendix B.

[13] See Internet Appendix C.5 for more information and results of the placebo test.

that advise less than one issue per year on average. The 15 largest dual advisors from 2008 to 2011 are shown in Table A.1. The largest of these advisors is FirstSouthwest. Before the 2011 reform, FirstSouthwest advised over 300 issues per year, while smaller advisors like D. A. Davidson & Company and GMS Group LLC both advised fewer than 10 issues each year.

Next, I match the SDC and advisor firm structure data with first-price, sealed bid auction results from The Bond Buyer (2016). The Bond Buyer, one of the primary trade publications for municipal bond underwriting and trading, is a regular source of information regarding the primary market for municipal bonds. Starting in 2008, they began publishing the results of recent competitive auctions for underwriting privileges with bids for all participants in addition to advance notices of upcoming auctions. I match the primary market auction results from The Bond Buyer to SDC based on the issuer name and state, issue size, issue date, and underwriter to establish a list of 41,182 competitive municipal bond auctions from February 21, 2008 through December 31, 2015. I further restrict the sample to those issues with principal greater than $1 million, those funded by general obligation,[14] issues that employ an advisor,[15] and those qualifying for the federal tax exemption to find a final set of 20,051 auctions made up of 286,042 individual bonds with principal value of $349 billion. 5,735 of the auctions employ dual advisors. Municipal Bonds are generally issued in series with 2-20 bonds in a single auction. The unit of observation for the main analysis is the auction level.

The median auction in the sample receives bids from five potential underwriters and the modal auction receives 4 bids, but this masks substantial heterogeneity. 13% of the sample receives only 1 or 2 bids, while 11% of the sample receives 9 or more bids. The distributions of the number of bids submitted in these auctions are shown in Figure 1, separated by advisor type and whether the auction happened before or after November 27, 2011. The changes between the pre- and post-Rule G-23 bid distributions for each advisor type are shown in panel (C), which provides a preliminary difference-in-differences estimator for the change in very low participation issues. Pre-regulation, 30% of dual advised issues received three or less bids. Post-regulation, only 22% of dual advised bonds received 3 or less bids—an 8 percentage point decline. Over the same period, all other advisor issues only decreased the share of auctions with three or less bidders from 26% to 24%. The change in auction participation over time is revisited with controls in a formal difference-in-differences analysis in Section 4.2. The auction data also shed light on how frequently dual advisors bid on the issues they advise, even if they don't win, which I display in Table A.1. FirstSouthwest bid in 49% of issues they advised, very close to the average, while

[14] Bonds backed by "general obligation"—referred to as general obligation bonds—are usually backed by the full faith and credit of the issuing municipality, meaning that unrelated tax streams may be used to pay off the debt and any revenues from the project are not specifically ear-marked for debt repayment.

[15] Almost all competitive sales employ a financial advisor. Restricting on having an advisor eliminates some very short-term issues as well as some refunding issues. This also eliminates debt that is likely very simple in terms of structure, which is not a good comparison group to bonds with advisors.

another major dual advisor UniBank Fiscal Advisory Services only bid in 15.5% of the issues that they advised. This variation in bidding likelihood provides additional variation for later empirical tests.

Secondary market transaction data are gathered from the Municipal Securities Rulemaking Board (2019). The MSRB Historical Transactions data report every trade involving a registered broker-dealer—purchases and sales, separately—in the over-the-counter municipal bond market. I match the MSRB prices to their primary market issues by matching CUSIPs at the bond level to the SDC data. These data allow me to measure differences in secondary market outcomes that arise due to regulation of the primary market. The data report trade date and time, trade price, trade yield, trade size, and whether the counter party was a final investor or a broker-dealer.

3.1 Selecting a Dual Advisor for a Particular Competitive Sale

In order to test whether selection is likely to bias the estimates of a difference-in-differences research design, I examine what sort of issuers choose to hire dual advisors and what sort of issues dual advisors may specialize in. I begin by estimating a linear probability regression describing the choice of dual advisor for each bond issue,

$$\mathbb{1}\{dual_{ijt} = 1\} = \eta_t + X_{ijt}\beta + \varepsilon_{ijt}, \tag{1}$$

where subscript i indicates the issue, j indicates the issuer, and t indicates the time. X_{ijt} includes variables controlling for size, years to maturity, refunding status, credit ratings, use of funds, type of issuer, frequency of issuer borrowing, and average auction participation (number of bidders) for other issues for the same issuer.

I estimate this regression with three different sets of fixed effects to highlight the size and direction of selection with different sources of variation. Figure 2 shows the estimated coefficients for all three specifications using issues from 2008 to November 2011, before any reforms from Dodd-Frank take effect. Point estimates and standard errors are included in Table A.3. The results from the regression without any geographic controls suggests that municipalities select advisors based on characteristics of issues. The variation in issue characteristics is mostly explained by spatial variation across states in the average type of issue. With state fixed effects, the effects of most controls disappear except for refunding issues, which are still more likely to choose dual advisors. Further, the issues from issuers with more auction participation on average are less likely to choose dual advisors after controlling for state differences, reversing the overall pattern.

Figure 2 also shows estimates of Equation 1 using issuer fixed effects. In this specification, variation in selection comes from issuers who issue multiple times choosing different advisors for sequential issues. After controlling for issuer fixed effects, all of the observable differences

between dual advisor and independent advisor issues go away. Using issuer fixed effects, the identifying variation for the analysis in the following sections comes from two sources: issuers who never change their advisor for all observed issues and issuers who switch advisors in both pre- and post-reform periods. This switching behavior is not related to Dodd-Frank nor the new regulation in 2011 and it is documented more fully in Appendix B.3.

4 Borrowing Costs After Rule G-23

Borrowing costs are the outcome of interest for municipal borrowers where we may expect the effects of a conflict of interest to manifest. A conflicted dual advisor who also intends to underwrite a given issue could potentially profit by increasing the yield in the primary market as long as the yield at which they place bonds with investors increases by less. If borrowing costs in the primary market auctions increase after regulation, it suggests that the competition provided by the dual advisor in the second stage was the most important factor for client outcomes. If borrowing costs decrease, it suggests the the adverse selection effect is most important, and motivates further questions about why adverse selection is important in these transactions.

In order to measure what happens to issuer borrowing costs after the reform of MSRB Rule G-23, I begin by estimating a standard difference-in-differences regression (Bertrand, Duflo and Mullainathan, 2004):

$$b_{1ijt} = \alpha \text{dual}_i + \beta \text{dual}_i \times \text{post}_t + X_{ijt}\Gamma + \lambda_j + \lambda_t + \varepsilon_{ijt}, \tag{2}$$

where b_1 is the winning bid for an auction, which is measured as the true interest cost (TIC) of the bond series. The results are robust to defining the outcome as the yield-to-worst instead of TIC.[16] Subscript i indicates the bond series, subscript j denotes the issuer, while subscript t indicates the time. X_{ijt} includes control variables that influence the value of the bond package. The measures of TIC, which are a specific calculation of yield-to-maturity defined by the MSRB, primarily come from The Bond Buyer (2016) when available and are otherwise imputed from SDC Platinum (2016).

The baseline controls include issuer fixed effects, year fixed effects, and controls for state economic conditions and fiscal policies.[17] Additional specifications add controls for market conditions, fixed effects for refund status, fixed effects for callable bonds, a control for natural log of

[16] TIC is a standard measure of interest cost in the municipal finance literature, but it is not a complete measure of financing costs because it ignores early repayment risk (Luby and Orr, 2019). Internet Appendix C.3 details other calculations of interest costs that take prepayment risk into account and shows that results are robust to the measurement of interest costs.

[17] The state economic condition and policy controls include income tax rates from which municipal bonds are exempt, log of state GDP, log of intergovernmental transfers, and unemployment rates averaged to the year-level.

size that is allowed to vary by year, flexible time trends for different types of municipal entities, and fixed effects for three bond maturity bins. post_t is an indicator that is equal to one if an issue takes place after November 27, 2011 and zero otherwise. dual_i is an indicator variable for issues that are advised by a dual advisor defined by the advisor's behavior before 2011. β is the change in interest costs for issues with dual advisors after the reform of Rule G-23, which is the treatment effect of interest. All regressions are estimated with standard errors clustered at the issuer level.

The unconditional average borrowing costs for dual advisor issues and independent advisor issues normalized to match in 2011 are shown in Figure 3. This figure highlights that the parallel trends assumption appears to hold in the data with no controls in the X_{ijt} matrix. Further, this figure shows how aggregate trends in municipal borrowing costs are decreasing through the sample, but the aggregate trends are affecting dual advisor issues and independent issues in the same manner in the preperiod—including during the period when the Rule G-23 regulation was first being discussed.

Estimates of α and β from Equation 2 are shown in Table 1. The question this regression answers is whether the policy-relevant outcome—borrowing costs—changes differently for dual advised issues than issues with independent advisors before and after the change to MSRB Rule G-23. The first column shows the estimates with issuer fixed effects, year fixed effects, and controls for state economic conditions. In this specification, interest costs fall by 12.5 basis points for dual advised issues after the reform of Rule G-23, significant at the 0.001 percent level.[18] A causal interpretation of this regression is that regulating the conflict of interest from dual advisors by prohibiting underwriting lowers borrowing costs for treated issues by 12.5 bp, or about 5.8% relative to the mean of 216 bp, relative to issues with independent advisors.

The identifying assumption behind this causal interpretation is that variance-weighted interest costs would change in parallel for bonds with dual advisors and independent advisors within the same issuer. I estimate four more specifications with increasing controls to capture other market changes and bond characteristics that could conceivably drive this result.

The second column of Table 1 adds three flexible controls for market fluctuations on the day that the underwriter auction is held. First, SIFMA (2019) reports a swap rate index for AAA-rated municipal variable rate debt obligations (VRDOs) that captures fluctuations specific to the municipal market. Second, I add controls for 1-year and 10-year swap rates for the 3-month LIBOR reported by Board of Governors of the Federal Reserve System (2018). These controls adjust for different preferences for market timing that interact with secular market trends and risk, but the addition of market risk controls has no effect on the estimated coefficients. Flexible time trends for different types of issuers are added in column (3). The functional form is a fixed effect for each

[18] Issues that use a dual advisor have interest costs that are 6.085 basis points higher on average in the pre-period. This is not statistically significant.

issuer type—school districts, counties and special districts, states and state agencies, townships, cities, and other issuers—interacted with year fixed effects. This captures how the secular trends affect different types of borrowers since advisors may specialize in funding certain types of projects that change around the same time as the Rule G-23 reform. The inclusion of flexible time trends does not have a material effect on the estimates.

Column (4) of Table 1 adds several controls for issue specific characteristics that are generally driven by the nature of the project financed by the bond instead of by advice from the advisor. The controls include a fixed effect for the refunding status of the bond,[19] a control for the natural log of the principal value of the bond, and indicators for the callability of the bond. Controlling for the bond characteristics that the advisor does not directly influence does not change the estimated coefficients in a material way. Finally, I add fixed effects for the final maturity of each issue cut into three bins in column (5). The measurement in relatively coarse bins in this case is because advisors may be able to influence the time to maturity as I will show in Section 5.1, which makes precise fixed effects for time to maturity endogenous controls although their inclusion does not have a material impact on the estimates. I also do not include controls for credit rating or credit enhancements in the baseline specification because these are margins over which dual advisors change behavior as shown in Section 5.1. The presence of idiosyncratic shocks to credit worthiness is only a threat to identification insofar as the shocks are correlated with the choice of using a dual advisor, which would show up in the pretrends during 2008 and 2009 when markets were much more volatile than in later years in the sample. To further rule out confounding effects of correlated shocks to underlying issuer credit worthiness and propensity to employ a dual advisor, I include several specifications that restrict the set of issuers to those whose issuing behavior and other observable characteristics are unchanging during the sample in Internet Appendix C.4.[20]

The estimates from the fully saturated specification in column (5) indicate that borrowing costs for dual advisor issues fall by 11.4 bp (p-value < 0.001), which is 5.3% of the average yield in the sample, relative to the interest costs for comparable issues with independent advisors. This result is stable across specifications, suggesting that observable changes in bond characteristics and other market trends are not driving results. In Internet Appendix C.4, I show that all participating underwriters, including the losing underwriters, bid more aggressively for dual advisor bonds after the regulation such that the average and median bids also decrease in the same magnitude.

The event study with annual coefficients associated with the specification in column (5) of Table 1 is shown in Figure 4, normalized such that the difference in borrowing costs in 2011 is equal to zero. Each annual coefficient is the interaction of dual_i with a year indicator.[21] In the

[19] The primary categories for this variable are refunding, advanced refunding, and new money.

[20] Additional specifications including endogenous controls that were included in early versions of this paper are shown and discussed in Appendix C.1 with coefficients varying between -8.2 bp and -10.7 bp.

[21] Dates after November 26, 2011 are combined with 2012, since the updated MSRB Rule G-23 came into effect on

pre-period, dual advisor issues were more expensive than issues with independent advisors, and there is a drop of 10 basis points immediately in 2012. The following years in the post-reform period show borrowing costs continue decreasing for dual advisor issues with estimates ranging from -10 basis points in 2013 to -22 basis points in 2015. Figure 4 also serves as an informal check to the assumption of parallel trends. Visual examination of the graph indicates that there are no observable pre-trends in the treatment effect of hiring a dual advisor instead of an independent advisor since the preperiod estimates are all within 2 basis points of each other. Further, 2008 to 2010 were very volatile years for municipal bonds, and the lack of differential trends in those years highlights that general volatility does not affect dual advised and independently advised issues differently.

4.1 Composition and Borrowing Cost Robustness

A potential concern with the analysis so far is that the set of bonds being taken to market could be responding to the regulation and the observed interest cost effect could reflect a change in market composition not captured by the rich set of controls. Several recent papers have shown that the number and amount of bonds that municipal entities issue increase as yields decrease (Dagostino, 2019; Yi, 2020; Haughwout, Hyman and Shachar, 2021). Notably, Adelino, Cunha and Ferreira (2017) show that municipalities borrow more in response to credit upgrades. In the case of MSRB Rule G-23, if borrowing costs actually increase for affected municipalities so much that marginal borrowers no longer issue, they may drop out of the market entirely. If marginal borrowers have a higher interest cost to start with, their exit from the market could be conflated with a decrease in borrowing costs. This potential mechanism can be directly tested by measuring the extensive and intensive quantity responses to the regulation. First, I test whether issuers who issued bonds with a dual advisor pre-2011 are more or less likely to issue after the regulation than other municipalities by using a linear probability model. In all specifications, issuers with dual advisors are more likely to issue after regulation, not less likely, which would bias the interest cost results toward zero although the effect is always statistically insignificant. Second, I change the dependent variable in Equation 2 to be either the number or aggregate par value of issues before and after regulation for a given issuer and aggregate bonds to the issuer level. I fail to reject the null hypothesis that the quantity of issues is unaffected by the use of dual advisors around the change to MSRB Rule G-23. The results of these regressions are shown in Tables 2 and 3.

A related general equilibrium concern is that the underwriting arms of dual advisors may change their behavior after Rule G-23. These underwriters used to regularly underwrite issues that their firm advised, and now they have a requirement to only underwrite issues that their firm does

November 27, 2011.

not advise. This equilibrium response will create extra underwriting supply for non-dual advised issues and creates a potential SUTVA violation: control units may have some partial spillover from the treatment issues as the removed bid doesn't necessarily disappear but moves from treatment to control. This bias would push me toward finding (1) increases in auction participation and (2) decreases in yields in independently advised (control) issues relative to dual advised (treatment) issues. Both of these potential biases are the opposite of the empirical results, suggesting that my estimates could be somewhat attenuated toward zero relative to the true data generating process.

The estimates from the saturated specification in column (5) of Table 1 are robust across other specifications. In Internet Appendix C.2, I show that these results are robust to a different identification strategy using Hirano, Imbens and Ridder (2003) weights. In the robustness check, I estimate probabilities of using a dual advisor in the pre-period in a first stage. I calculate a counterfactual probability of choosing a dual advisor for each bond based on observables. The inverse of the probability of choosing the observed advisor type is used as a weight in a weighted least squares regression, which finds that bonds with dual advisors see interest costs fall by 7.1 basis points after Rule G-23 was updated. Internet Appendix C.4 discusses additional specifications with advisor and advisor-by-issuer fixed effects, setting the choice of dual advisor equal to the pre-period average share, defining dual advisors by the share of auctions on which each dual advisor bids, and with a restricted sample to consistent issuers. Finally, Internet Appendix C.5 presents a placebo test using investment banks that sell both financial advice and underwriting services but never on the same bond issue before 2011. The placebo advisors have no change in borrowing cost after the regulation.

4.2 Auction Participation

The major concern of attempting to limit a conflict of interest by removing the conflicted advisor from the second stage auction is that removing the dual advisor from the set of potential underwriters will decrease participation in the underwriter market, which would increase interest costs for bonds with a dual advisor. The analysis on borrowing costs above shows that, even if participation is decreasing, the policy-relevant outcome is improving on average. However, if auction participation is decreasing, it may indicate that the policy of prohibiting advisors from underwriting has a negative impact on client outcomes as well through the competitive channel. Below, I use the difference-in-difference regression from Equation 2 to measure the change in auction participation, which I measure as the number of bids submitted in the underwriter auction, to test what happens to competitive forces in the underwriter market. This formalizes the differences in participation by advisor type shown in Panel (C) of Figure 1.

I start by using the same controls as above in a regression explaining the number of bids submit-

ted because factors that affect borrowing costs are also going to affect profitability for underwriters and marketability of debt to final investors. In addition to these controls, I also include controls for the number of potential underwriters who are likely to consider submitting bids in a given auction. I follow the methods of Roberts and Sweeting (2016) and Athey, Levin and Seira (2011) to identify a set of unobservable potential bidders for each auction.[22] I define potential underwriters as all underwriters who submit bids for bond issues that are in the same state-issuer type bin (e.g. school districts in North Carolina) as well as in the same principal size quintile in the 365 days leading up to each auction, plus the actual underwriters who submit bids. The advisor is removed from the set of potential bidders in the post period if they have recently bid in similar auctions since they are legally not allowed to underwrite bonds that that they advise. Controlling for potential bidders in this way forces me to drop 2008 from the underwriter competition regressions since I do not observe 365 days of bidding behavior before those auctions in order to construct the potential bidder measure.

The estimates from regressions of the number of bidders on dual advisor and dual advisor interacted with the post-reform dummy variable, conditional on number of potential bidders-by-year, are shown in Table 4. These regressions show that dual advisor issues had less competition before MSRB Rule G-23. Point estimates of the pre-period effect of hiring a dual advisor fall between -0.612 and -0.647 and are significant at the 0.001% level in all specifications. After MSRB Rule G-23, total auction participation increases by 0.423-0.462 underwriters, all significant at the 0.001% level. In the preferred specification in column (5), the joint effect of hiring a dual advisor in the post-reform period is not statistically distinguishable from zero (-0.189 bidders with a p-value of 0.243). This indicates that dual advisor issues had less competition than comparable issues with independent advisors before regulation, but this difference goes away after the dual advisor is removed from bidding. These results are also consistent with the unconditional difference-in-differences presented in Panel (C) of Figure 1 that show the number of auction participants increasing for dual advisor issues after Rule G-23 and indepently advised issues having roughly the same number of bidders over time.

The median bond issue has five underwriters submit bids, so an increase of 0.42 underwriters represents a 8.4% increase in the number of underwriters competing for business. Focusing on non-advisor underwriters, I repeat the analysis above using the number of non-advisor bids as the dependent variable and show the regression estimates in Table A.14. Bonds with dual advisors have 1.03 to 1.06 fewer bids from non-advisor underwriters from 2009-2011, significant at the 0.001% level in all specifications. Taking the advisor out of the set of potential bidders increases participation by non-advisors by 0.88 to 0.92 underwriters, which is also significant at the 0.001%

[22]These papers identify potential bidders in timber auctions as firms who bid in nearby auctions within a short amount of time as well as the observed participants in a given auction.

level in all specifications and represents a 17.6% increase in the number of non-advisors vying for underwriting business.

Figure 5 showcases an event study version of the preferred specification in column (5) of Table A.14 that is normalized such that the difference in 2011 equals zero. Visual examination of the pre-trend shows that, much like the interest cost regressions, there is no differential trend in auction participation for dual advisor issues before the MSRB Rule G-23 reform, but underwriter competition jumps by 0.5 non-advisor underwriter bids immediately in 2012 and continues increasing in future years to 0.9 additional non-advisor underwriters competing for underwriting business relative to the pre-period mean. Participation in auctions for municipal bond underwriting increases such that dual advisor issues and independent advisor issues have a very similar amount of competition after the reform, and this appears consistent across the distribution of participation shown in Figure 1.

4.3 Heterogeneity of Rule G-23 Impacts

Municipal bonds differ widely in observable characteristics, the relative participation in the auctions, and in the potential for adverse selection. Broadly speaking, non-advisor underwriters are informed about the state of the market, but may be less informed on the specifics of a certain bond—especially if the advisor or issuer does not readily provide that information. One margin of variation in publicly available information outside of the advisor's control is refunding status. One quarter of the competitive primary market is made up of issues that are refunding existing debt. Refunding issues, as opposed to new money issues, are used to refinance existing bonds, often at a lower interest rate or in a way that reduces short term cash outflows for municipalities. If there is a sense in which advisors are able to withhold some relevant information from other potential underwriters to accentuate adverse selection in the underwriting auctions, it should matter more for issues where other underwriters cannot already look to the secondary market to learn about the exact demand for a certain bond. Figure 6 replicates the baseline results separately for new money and refunding issues. For refunding issues, dual advisors are not associated with any borrowing cost change around the regulation. However, borrowing costs for new money issues decrease with a larger magnitude than in the baseline results. This heterogeneity is suggestive of dual advisors having some control over available information for new money issues in the primary market even though non-advisor underwriters are informed when there is ongoing trading such as for refunding issues.

There are other ways of separating municipal bond issues based on expected participation or potentially exploitable asymmetric information. Garrett et al. (2023) show that competition from an additional potential underwriter has the largest effect on borrowing costs in bond sales where

there are relatively few other underwriter bidders. Rule G-23 removed a single bidder without replacement, so it should be expected that the competitive effect have the most detrimental impact in auctions with fewer bidders. I separate bond issues by expected level of auction participation to test for differential impacts in auctions where the marginal bidder may matter more. To define the expected level of participation, I reintroduce the concept of "leave-out competition," or the average number of underwriter bids for other issues by the same issuer, and separate the sample into thirds based on this measure. The low participation issues come from issuers who have one to four underwriters competing for business, while the high participation issues come from issuers who have six or more underwriters bidding in their other auctions on average. This definition of participation for other issues minimizes the endogeneity of the advisor type choice from issue-specific idiosyncratic factors.

I estimate the difference-in-differences regression from Equation 2 while adding interactions for each third of the sample according to expected participation. Panel (A) of Figure 7 shows that the low participation issues are the ones for whom borrowing costs are decreasing, with an average 29 bp decrease in yields. High participation issues with dual advisors see an insignificant decrease in borrowing costs relative to similar bond auctions with independent advisors. The medium participation issues have a decline in interest cost that is statistically significant at the 1% level, but is smaller in magnitude than the impact for low participation issues. The declining impact of Rule G-23 as more participants are expected is not consistent with the missing bid from the dual advisor being the first order impact of Rule G-23.

The same pattern holds when comparing across average state auction participation instead of the issue-specific expected participation from the leave-out measurement. Panel (B) of Figure 7 presents results of the test where participation is defined at the state level to take advantage of the Butler (2008) insight that municipal underwriting markets are largely local to the state. I sort states based on the average number of bids submitted across all auctions and then choose the first 16 states as the low category, the next 17 states as the medium category, and the final 17 states as the high category.[23] The states with relatively less attention in any given auction on average are the places where issuers with the largest impacts reside. The magnitude of estimates monotonically moves toward zero as there are more participants for each auction on average. Appendix C.6 presents six additional splits across state auction characteristics and shows that the estimates are uniformly larger in states with more segmented markets and higher variance auction outcomes.

In panel (C), I present a split based on issuer type instead of expected or observed participation in auctions. Different types of issuers access financial markets for a variety of reasons, and have differing levels of sophistication with which they approach the market. Entities ranging from states

[23]The 50 states are not perfectly divisible by three so this normalization is arbitrary, but the results are the same moving the rounding error to any group.

and state agencies to school districts all use auctions to find underwriters, and the advisor plays a different role and has more control over the issue depending on the issuer's needs. I separate issuers into 5 categories: (1) Cities, towns, and villages, (2) Counties and parishes, (3) School districts, (4) water districts, and (5) states, state agencies, other districts, and universities, which I refer to jointly as "other." Panel (C) of Figure 7 shows the difference-in-differences treatment effect split by issuer type categories. The decrease in borrowing costs is concentrated among dual advisor issues from school districts, which experience a decrease of 16 basis points while no other category has a statistically significant coefficient. Given the importance of municipal bond financing for public school buildings in much of the US, school bonds make up 41% of the sample—the largest of all borrower types. School districts issue much less frequently than other entities, 4 times on average instead of 6 for the rest of the sample, and schools are much less likely to have different underwriters for different issues in the pre-period. School districts also pay higher interest costs than other municipalities. In the sample, school districts pay yields of 226bps while non-school districts only pay yields of 210bps on average.[24]

Panel (D) of Figure 7 splits the schools further to examine those who regularly received bids by their advisor before rule G-23, which I define as more than half of their issues. The issues where the dual advisor regularly participated are those where both their missing bid could be most important, and also where the dual advisor could be using their role to increase profitability of their underwriting business.[25] Strikingly, the decrease in borrowing costs is four times larger for schools who previously had regular bids by their advisors. The treatment effect for this subsample is a decrease of 45 bps.

It is new money issues from low auction participation issuers and school districts who appeared reliant on advisor bids that are experiencing the decrease in borrowing costs. These are particularly opaque issues where the importance of adverse selection dominates the importance of an additional competitor. The following section explores the specific mechanisms that can explain why the adverse selection channel dominates and participation is increasing when a dual advisor is no longer allowed to underwrite municipal bonds.

[24] While school districts do have a higher average yield to start with, Appendix C and Figure A.8 show that the larger impact for schools is true in levels and also in relative terms as a share of interest cost.

[25] Another way of thinking of the variation by preperiod advisor auction participation is that different advisors have different propensities to use their advising arms to push business to their underwriter. In this case, we can define $Dual_i \in [0,1]$ as the share of issues in which each advisor bid before 2011. A version of the difference-in-differences estimation with this definition of the treatment variable is included in Appendix C.4 and shows that a dual advisor who bid in all of their issues was associated with a 21.5bp decline in borrowing costs while the average dual advisor only saw a borrowing cost decline of 10.7bps. This suggests that the municipality reliance on dual advisor bids in the pre-period could be a function of the advisor and not necessarily a specific characteristic of the issuer.

5 Mechanism Evidence

The above analysis uses within-issuer variation to determine what happens to municipal bonds issued with dual advisors after those advisors are no longer allowed to act as the underwriter. Borrowing costs decrease by 11.4 basis points, 5.3% of the average yield, driven by more aggressive auction participation from non-advisor underwriters. This effect is largest for school districts that previously received lots of bids from their dual advisors, who experience a decrease in borrowing costs of 45 bps.

The question remains, why is removing the dual advisor from the underwriting auction effective at limiting the negative cost effect of the conflict of interest without limiting total auction participation? In the remainder of the paper, I enumerate additional evidence for two interrelated mechanisms through which the regulation could affect the market and borrowing costs: (1) dual advisor bonds lack standardization in a way that may accentuate adverse selection benefiting themselves in 2008-2011 and (2) non-advisor underwriters who outbid advisors for business in the pre-period have relatively lower gross spreads—evidence of the winner's curse. I then discuss how each affects the impact of such regulation aimed at an advisor conflict of interest.

5.1 Bond Standardization, Certification, and Secondary Market Liquidity

Schapiro (2010) notes that the conflict of interest for dual advisor-underwriters may manifest in trying to raise interest costs, but that there are other margins on which an advisor can "guide the municipality towards securities tailored to his firm's advantage." Dual advisors who also have an interest in underwriting may advise a municipality toward debt that is more personalized for their own portfolios. Customized bonds are not inherently bad for an issuer if that customization helps the municipality either match payments to governmental cash flows or deal with other idiosyncratic local needs. However, customized bonds can make it harder for investors to correctly judge the quality of the asset or to accurately price such bonds.[26]

I estimate the change in bond structure on several margins for dual advisor issues around the update of MSRB Rule G-23 using the difference-in-differences regression described by Equation 2. First, I estimate changes in bond series characteristics that could directly affect the pricing: years to maturity, principal value, call provisions, presence of credit ratings, and credit enhancements. The

[26]The notion of complexity in the structure of a municipal bond has multiple accepted definitions in the literature. One strand of literature including Brancaccio and Kang (2022) defines complexity of financial characteristics such as non-standard covenants like sinking funds, call functions, variable coupon rates, or non-standard interest frequency. Another literature studies textual complexity of disclosure. I focus on the former despite the potential difficulty in interpreting magnitudes. Farrell et al. (2023) develop a model of textual complexity where complexity can be valued differently across investor clienteles, which precludes me from making clear predictions about textual complexity in this scenario.

estimates for these outcomes are shown in Table 5. Column (1) shows that dual advisor issues on the whole are decreasing the number of years to maturity, and further that the effect is concentrated among school districts. School district bonds with dual advisors have 1.18 more years to maturity in the pre-period, but the length decreases by 0.59 years on average in the post-period, which is not statistically significant as a marginal impact relative to the rest of the dual advised issues. However, a joint test of the coefficient for Dual Advisor $\times$ Post plus Dual Advisor $\times$ School $\times$ Post has a p-value of 0.044, which is marginally significant and so I am careful that it could be a margin of endogenous response although the effect is small and messy. Similarly, dual advisor issues are 5.8 percentage points (coefficient p-value = 0.033, joint test p-value = 0.014) more likely to have credit ratings after regulation[27] and also 17.6 percentage points (p-value < 0.001) more likely to use a third-party credit enhancement, with both effects being concentrated exclusively in school districts. I find no evidence of changes in the average size of issues or in the use of call provisions. Changes in additional outcomes are shown and discussed in Appendix C.8.

Given the number of margins on which an advisor can make small changes to a bond issue that have effects on final investor demand, I also present a more general proxy for the general desirability of buying a bond: secondary market liquidity.[28] Liquidity is important in the municipal bond market where transactions with investors are done over-the-counter (OTC) by registered broker-dealers. The nature of the OTC municipal bond market makes measuring liquidity a challenge because most bonds only trade once every few months after the first month. The market for a given asset is very thin so measures such as bid-ask spreads are not directly available.

I follow Jankowitsch, Nashikkar and Subrahmanyam (2011) to create an accessible measure of liquidity in the municipal bond market.[29] If a bond is easy to trade and desirable for investors, it is easier for broker-dealers to find another investor to purchase the bond in the case that one investor wants to sell. I use the Municipal Securities Rulemaking Board (2019) EMMA database to define average prices for investor purchases relative to investor sales.[30] On average in this sample, municipal bond investors pay \$1.30 more for each \$100 of par value to purchase a bond

[27] This credit rating result is consistent with findings from Clarke (1997), which finds dual advisor issues are less likely to have credit ratings in Texas.

[28] The interpretation of liquidity in this manner is more in line with the arguments presented in Jankowitsch, Nashikkar and Subrahmanyam (2011) than in Glosten and Milgrom (1985). Asymmetric information among final investors is likely important in driving large differences in trading prices, but, in relation to the effects of MSRB Rule G-23, the asymmetry is driven by lack of standardization where some investors may have a harder time pricing bonds. I am not assuming that some investors necessarily have additional information about each issue and that this information changes with the regulation.

[29] Schestag, Schuster and Uhrig-Homburg (2016) and Schwert (2017) use variations of the same measurement concept.

[30] The average municipal bond in this sample trades less than ten times in the first full year after issue, which precludes measurement of intra-day price variation. The average prices paid by investors for municipal bonds are calculated for each bond for the first year of trading, omitting trades in the first month where prices vary widely. Average buying and selling prices for investor trades are pooled for the remaining 11 months.

than they receive when they sell it back to the broker-dealer. I refer to this gap as the buy-sell spread.[31]

Regression estimates of the buy-sell spread on advisor type using the difference-in-differences design described in Equation 2 are shown in Table 6. These regressions are estimated at the bond level instead of the bond issue (auction) level in order to add controls for modified duration. Consistent with Schwert (2017), longer duration bonds are less liquid. Conditional on all bond observables, a 1 unit increase in modified duration increases the buy-sell spread by 6.3 cents. Notably, dual advisor issues are less liquid (higher buy-sell spread) before 2012, but such issues see a notable increase in liquidity after MSRB Rule G-23. The liquidity increase is comparable in effect size to decreasing the modified duration of each bond by 2.5 years. The buy-sell spread for dual advisor issues drops by 15.4 cents (p-value 0.056) in the post-reform period according to the preferred specification in column (5).

As a falsification test, I compare price dispersion for the dual advised bonds treated by the regulation to the bonds issued by the same advisors in the pre-period. Overall, liquidity in the municipal bond market is increasing and price dispersion is decreasing during the sample. I compare the concurrent price dispersion in 2012-2015 for bonds issued with dual advisors in the pre-period to the price dispersion of dual advisor bonds issued after regulation and show the results in Figure A.13. This comparison shows that the bonds issued with dual advisors have relatively less price dispersion than bonds issued from the same issuers with the same advisors in the pre-period that are trading at the same time. This gives further evidence that the observed change in price dispersion for dual advisor issues is not explained by the decrease in price dispersion for bonds that are not directly affected by Rule G-23.

The increase in standardization and liquidity for dual advisor issues after regulation has two complementary effects on issuers: (1) borrowing costs decrease directly because secondary market investors are willing to pay more for bonds, and (2) non-advisor underwriters participate in primary market auctions more actively because the bonds are be easier to sell.

5.2 Winner's Curse and Asymmetric Information

Auctions with a bidder who has more (valuable) information than other the other participants in the auction about the value of the item being auctioned may not be revenue maximizing for the seller because of the large adverse selection effect of allowing such a participant (Hendricks, Porter and Wilson, 1994). If the dual advisor has some additional inside information about a bond issue they are advising that makes their assessment of market value for the bond better than other potential

[31] The buy-sell spread is similar to the price dispersion measure included as part of the estimated liquidity spread in Schwert (2017) without including a consensus valuation around which dispersion is centered.

underwriters, then any other underwriter who wins the auction will have lower *ex post* profits—evidence of the winner's curse due to adverse selection. When non-advisor underwriters are more likely to have lower profits if they win in an auction against a dual advisor, they are less likely to enter an auction at all and will bid less aggressively conditional on entering.

Underwriter profits are observable in the municipal bond market as underwriter spreads: the interest cost paid by the municipality to the underwriter minus the yield to final investors. As a simple test for asymmetric information in dual advisor bond auctions before the MSRB Rule G-23 reform, I estimate a regression of gross spreads on bond characteristics and whether a dual advisor bids in or wins the competitive sale:

$$\text{spread}_{ijt} = \alpha \text{dual}_i + \beta_1 \text{dual bids}_i + \beta_2 \text{dual wins}_i + \Gamma X_{ijt} + \varepsilon_{ijt}. \tag{3}$$

I estimate equation 3 using competitive, general obligation tax exempt bond issues of more than \$1 million where X_{ijt} includes year fixed effects, flexible fixed effects for years to maturity from sale and refund status, the natural log of size interacted with years, credit rating fixed effects, financial market indices, fixed effects for use of funds, and flexible trends for different issuer types.[32]

Of particular interest, β_1 is the differential effect on underwriter profits of winning an auction that an advisor bids in if the advisor does not win.[33] If this estimate is negative, it is indicative of lower profits if an underwriter wins an auction against potentially better-informed advisor—evidence of the winner's curse. $\beta_1 + \beta_2$ is the effect of an advisor bidding on and winning their own issue.

Estimates of equation 3 are shown in Table 7. $\hat{\beta}_1$ is negative, and statistically significant at the 5% level in the preferred specification in column (4), while $\hat{\beta}_1 + \hat{\beta}_2$ is indistinguishable from zero. These results are suggestive of the winner's curse where non-advisor underwriters face a disadvantage bidding against an informed advisor and will bid less aggressively and be less likely to enter auctions where they have to bid against advisors. Non-advisor underwriters have a gross spread that is 3.5bps lower if they win an auction against a dual advisor. This is representative of 6% decrease relative to the mean gross spread of 56.7 basis points.[34]

Having an informed bidder in an auction decreases seller revenue because other market partic-

[32] Issuer fixed effects are omitted because there is insufficient identifying variation in whether an advisor bids and wins within the same issuer.

[33] Only dual advisors are able to bid in auctions they advise, so the dual bids$_i$ indicator is a proper subset of the dual$_i$ indicator.

[34] These estimates of gross spread are larger than traditional reports of gross spreads because I use the average yield in the first seven days of trading as the secondary market yield instead of the "offering price," which is a regulatory construct that is not always very close to the price at which bonds are actually sold. Yields on the first trade or reported as the offering price are usually substantially higher than the average yield at which a bond is sold by the underwriter.

ipants receive lower profits in the case that they do win the auction against the informed bidder. In the case of the dual advisors, they receive higher profits when they win an auction than non-advisors get if they win. Such asymmetric information deters the entry of non-advisors, which is consistent with the results presented in Section 4. After the informed advisor is taken out of the auction, the other potential underwriters are more likely to enter the auction and compete. Further, Internet Appendix C.4 shows that all participating underwriters, including the losing underwriters, bid more aggressively for dual advisor bonds after the regulation.

6 Potential for Net Benefits of Reform

The reform of MSRB Rule G-23 in November of 2011 is associated with a decrease in interest costs for municipalities and with more participation in primary market auctions. However, the interest cost benefits are not costless. A major remaining question is whether the associated costs are larger than the decrease in borrowing costs. There are three major ways in which issuers could be worse off given the interest cost decreases estimated above.

First, issuers hiring dual advisors may have valued the flexibility and non-standard characteristics of their issues with dual advisors before 2011. It may be that issuers have a large willingness to pay for other characteristics like lining up specific expenditures with specific revenues that dual advisors had more flexibility to offer when they could also serve as an underwriter of last resort in the auction stage. Quantifying the loss associated with less flexibility due to increased standardization is beyond the scope of this paper.

Second, dual advisors may increase the price of advising services after they can no longer be compensated in the second stage as underwriters. If the price of dual advising increases but issuers are relatively unable to substitute to other advisors whose costs do not increase, those municipalities that keep hiring dual advisors could be worse off.

Third, obtaining credit ratings or other third party certifications and enhancements definitely adds an additional cost to issuance. Data on the costs of third party credit certifications in the municipal bond market are notoriously opaque and are not available for individual bonds in general (Cornaggia, Cornaggia and Israelsen, 2018). However, it is possible to back out the average costs of different instruments on public filings from credit rating agencies and insurers.

While measuring price changes of advisory services and welfare losses due to standardization are beyond the scope of this paper, I can give an approximation of potential benefits net of these considerations by comparing the cost of credit ratings and enhancements to the change in borrowing costs. Joffe (2017) provides a review of the data that are available from public sources regarding the costs of credit ratings and credit enhancements.[35] On average, credit rating agency

[35] In the muni market, credit rating agencies make money from two sources: (1) initial payments from municipalities

revenues imply that the cost of credit ratings for municipalities are the equivalent of about 1 basis point in additional interest costs. Further, in 2014 Moody's published a list of prices for municipal bond credit ratings that spanned from $7.5k to $498k for the municipality. For very short term issues and very small issues, the costs of buying a credit rating are the largest proportionally because it is a fixed cost. An issuer paying $7.5k for a credit rating for a 10-year, million dollar bond with a 3% yield to maturity is the equivalent of adding 8.8 bp onto the interest cost, which is over 8 times larger than the average cost of a credit rating, but still smaller than the decrease in borrowing costs for the whole sample on average, but only a small subset of issues actually acquire a new credit rating.

Credit enhancements are more expensive than credit ratings and, according to Table 5, 17.6% of school districts with dual advisors add some sort of credit enhancement after regulation relative to issues with independent advisors. On average, Joffe (2017) notes that such enhancements are priced around 1% of par value on average based on aggregate statistics. For the 10-year, million dollar bond with a 3% TIC above where fixed costs are expected to be most substantial, such a contract is the same as adding 11.8 bp onto the interest cost. For the set of issuers for whom the regulation appears to have some bite, namely school districts who appeared reliant on bids from their dual advisors in the preperiod, true interest costs decrease by 45bps, so the subset that acquire credit enhancements on the margin would need to pay 4 times the price above for credit enhancements for this policy to have a net negative effect on their borrowing cost, but only a subset of these issuers have to acquire credit enhancements.

The school districts who acquire credit ratings and enhancements for the first time after their advisor is no longer allowed to underwrite do not appear to be systematically less credit worthy than the independently advised issuers who already used credit ratings and enhancements. I identify 191 school districts who exclusively employ dual advisors and never had credit ratings before November 2011 and graph the relative frequencies of credit ratings after November 2011 in Panel A of Figure 8. The median credit rating for newly rated schools with dual advisors is Aa2 by Moody's rating scale, which is the same as the population of school districts and the total population of issuers. While limiting to a subset of 73 school districts who also never buy a credit enhancement during the sample in Panel B, the newly rated schools are very similar in underlying credit worthiness to other school districts and non-school borrowers without credit enhancements during this period.

Prohibiting advisors from being able to underwrite adds some new costs in terms of acquiring third party credit certifications that increase available information to other parties in the market. The information revealed by these certifications suggests that the effect of regulation is not a marginal increase in credit worthiness, but that credit worthy borrowers were not successfully shar-

and (2) subscription services from investors.

ing that information with the market. These observable costs are smaller in net present value terms than the benefit received in lower borrowing costs for affected municipalities, but this hypothetical assumes that dual advisor prices are not changing and that issuers did not value the non-standard characteristics of their bonds before regulation.

Another caveat to this exercise in comparing some costs and benefits is that it does not address the long-run outcomes of the advising or underwriting markets, so a total and long-run impact of the new Rule G-23 on welfare could be negative if it causes enough firms to leave the advising or underwriting businesses. As some descriptive evidence that this is not happening, I show the pattern of participating advisors and underwriters in the market from 2008 to 2015, which are increasing and flat, respectively, in Figure A.3.

7 Conclusion

Municipal financial transactions are not immune from the conflicts of interest that are pervasive in other markets, and they provide a novel window into how information asymmetries can be propagated by intermediaries to create additional adverse selection. By studying the response to the reformulation of MSRB Rule G-23 after Dodd-Frank, this paper shows that financial advisors who also offer underwriting services have a conflict of interest that raised interest costs for municipalities in the absence of regulation. Removing the ability to both advise and underwrite the same municipal bond issue decreases municipal borrowing costs by decreasing asymmetric information and adverse selection, which winds up increasing total auction participation by potential underwriters.

Municipal financial advisors have wide breadth to affect the borrowing outcomes for cities and states in the US. Before Dodd-Frank and MSRB Rule G-23, municipal advisors who could also underwrite bonds give advice on issues that are less standard and less liquid in secondary markets, increase asymmetric information that benefits themselves, and scare away other potential underwriters.

These results also inform our understanding of conflicts of interest in other markets. Restricting the ability of advisors to underwrite changes the design of bonds dual advisors create as shown through increased standardization, sharing of inside information, and liquidity in secondary markets. This is consistent with a change in the advice that previously conflicted dual advisors are offering. Also, the fear of negative consequences regarding decreasing competition described in Bond Dealers of America (2019) and supported by existing literature in other markets does not manifest here. Allowing advisors to operate in both the advising and underwriting markets decreases participation in the underwriting market by deterring other underwriters from competing for business with an agent who can actively control the available information in the market and

create adverse selection. Removing the advisor from the primary market increases participation from other underwriters and drives down interest costs for municipalities, especially those municipalities that are most opaque and creating adverse selection is most possible.

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Table 1: Difference-in-Differences Model Explaining Primary Market Interest Cost

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	6.085	5.248	5.314	7.308	3.764
	(6.667)	(6.637)	(6.621)	(4.845)	(3.804)
	0.361	0.429	0.422	0.132	0.323
Dual Advisor X Post	-12.500	-11.778	-11.296	-13.149	-11.382
	(3.453)	(3.425)	(3.424)	(2.720)	(1.970)
	0.000	0.001	0.001	0.000	0.000
Observations	20,051	20,051	20,051	20,051	20,051
Mean Interest Cost (BP)	216.759	216.759	216.759	216.759	216.759
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table shows the estimates from regressions of primary market issue outcomes on type of advisor before and after the MSRB Rule G-23 reform for all competitive, general obligation, tax-exempt issues matched between the SDC Platinum database and Bond Buyer that employ financial advisor. The dependent variable is the interest cost in basis points. All specifications control for year fixed effects issuer fixed effects, and state economic and policy controls. Column (2) adds controls for market conditions with SIFMA yields and 1- and 10-year swap spreads. Column (3) adds flexible trends for different types of issuers. The specification in column (4) adds controls for bond characteristics intrinsic to the project including size, refund status, and callability, while column (5), the preferred specification, adds fixed effect for years to maturity. See Section 4 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 2: Likelihood of Issuance 2012-2015 as a Function of Preperiod Dual Advisor Use

	(1)	(2)
Share Dual Advisor	0.030	0.031
	(0.060)	(0.057)
	0.623	0.597
Observations	4,528	4,524
Issuer Type FE		Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table shows the estimates of a linear probability model describing the likelihood of issuers observed in the pre-period of issuing at least one bond in the post period. The sample is restricted to the 4,528 issuers who are observed in the pre-period. The independent variable is the share of bond issues advised by a dual advisor by each issuer before 2011. The second column adds an issuer type fixed effect to capture trends in the types of municipal entities that are seeking financing. Both specifications show that increasing the share of issues with a dual advisor in the preperiod increases the likelihood of issues after regulation, although the effect is insignificant. This rules out the worry that issuers are losing access to the market as their advisors are regulated. See Section 4.3 for more information and discussion. Robust standard errors are shown in parentheses with p-values below.

Table 3: Difference-in-Differences Model Explaining Count and Volume of Bonds Issued

	(1)	(2)	(3)	(4)
Share Dual Advisor X Post	0.079	0.090	-0.000	0.004
	(0.100)	(0.100)	(0.041)	(0.041)
	0.433	0.368	0.997	0.928
Observations	5,762	5,758	5,762	5,758
Outcome	Count	Count	Volume	Volume
Period and Issuer FE	Y	Y	Y	Y
Period-by-Issuer Type FE		Y		Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table shows the estimates of a linear regression model describing the number and par value of bonds issued by each issuer as a function of pre-period dual advisor use. The sample is restricted to the 2,881 issuers who issue bonds in both periods. The independent variable is the share of bond issues advised by a dual advisor by each issuer before 2011. The independent variable is the number of issues in the first two columns and natural log of aggregate par value in the third and fourth columns. The second and fourth columns add an issuer type-by-period fixed effect to capture trends in the types of municipal entities that are seeking financing. All specifications show that increasing the share of issues with a dual advisor in the pre-period is not associated with a change in the equilibrium quantity of bonds issued. This rules out the worry that issuers are losing access to the market as their advisors are regulated. See Section 4.3 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 4: Difference-in-Differences Model Explaining Number of Bids Submitted

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	-0.647	-0.643	-0.614	-0.616	-0.612
	(0.166)	(0.167)	(0.169)	(0.166)	(0.166)
	0.000	0.000	0.000	0.000	0.000
Dual Advisor X Post	0.448	0.445	0.462	0.426	0.423
	(0.087)	(0.087)	(0.088)	(0.086)	(0.086)
	0.000	0.000	0.000	0.000	0.000
Observations	20,038	20,038	20,038	20,038	20,038
Mean Auction Participation	5.313	5.313	5.313	5.313	5.313
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table shows the estimates from regressions of primary market issue outcomes on type of advisor before and after the MSRB Rule G-23 reform for all competitive, general obligation, tax-exempt issues matched between the SDC Platinum database and Bond Buyer that employ financial advisor. The dependent variable is the total number of underwriters who submit bids in each competitive sale. All specifications control for year fixed effects issuer fixed effects, potential bidders, and state economic and policy controls. Column (2) adds controls for market conditions with SIFMA yields and 1- and 10-year swap spreads. Column (3) adds flexible trends for different types of issuers. The specification in column (4) adds controls for bond characteristics intrinsic to the project including size, refund status, and callability, while column (5), the preferred specification, adds fixed effect for years to maturity. See Section 4 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 5: Difference-in-Differences Model Explaining Bond Characteristics

	Years to Maturity	ln(Size)	Call	Rated	Enhanced
Dual Advisor	-0.216	0.046	-0.016	0.021	0.026
	(0.593)	(0.052)	(0.035)	(0.014)	(0.022)
	0.716	0.374	0.641	0.157	0.240
Dual Advisor X Post	-0.067	-0.005	0.022	-0.003	-0.031
	(0.302)	(0.036)	(0.021)	(0.014)	(0.013)
	0.825	0.892	0.291	0.830	0.015
Dual Advisor X School	1.178	-0.118	0.017	-0.095	-0.237
	(0.886)	(0.092)	(0.059)	(0.040)	(0.057)
	0.184	0.204	0.774	0.017	0.000
Dual Advisor X School X Post	-0.592	-0.055	-0.021	0.058	0.176
	(0.439)	(0.054)	(0.029)	(0.027)	(0.027)
	0.178	0.309	0.476	0.033	0.000
Observations	20,051	20,051	20,051	20,051	20,051
Dep. Mean	10.804	1.877	0.589	0.709	0.169
Schools Dep. Mean	10.727	1.831	0.513	0.611	0.316
Issuer and Year FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Size-by-Year Controls	Y		Y	Y	Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table shows the estimates from regressions of bond characteristics on type of advisor before and after the MSRB Rule G-23 reform for all competitive, general obligation, tax-exempt issues matched between the SDC Platinum database and Bond Buyer that employ financial advisor. The outcome in column (1) is the number of years to maturity. The outcome in column (2) is the natural log of size in millions of dollars of par value. The outcome in column (3) is an indicator equal to one if a bond package has a call provision. The outcome in column (4) is an indicator equal to one for bonds with a credit rating from S&P, Moody's, or Fitch. The outcome in the fifth column is an indicator equal to one if a bond has insurance or a guarantee. The upper panel includes all issuers in the sample, while the lower panel only includes school districts. The dual advisor bonds become marginally more likely to be rated and more likely to use a credit enhancement. However, there is not a statistically significant change in the maturity or size of the bonds nor in the use of call provisions. See Section 5.1 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 6: Difference-in-Differences Model Explaining Buy-Sell Spread

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	0.190	0.185	0.200	0.170	0.165
	(0.117)	(0.116)	(0.115)	(0.117)	(0.117)
	0.103	0.113	0.082	0.144	0.158
Dual Advisor X Post	-0.173	-0.188	-0.193	-0.156	-0.154
	(0.080)	(0.079)	(0.081)	(0.081)	(0.081)
	0.030	0.017	0.017	0.054	0.056
Average Trade Size ($\times 10^6$)	-0.074	-0.075	-0.076	-0.073	-0.072
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
	0.000	0.000	0.000	0.000	0.000
Modified Duration	0.066	0.065	0.065	0.064	0.063
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
	0.000	0.000	0.000	0.000	0.000
Observations	43,544	43,544	43,544	43,544	43,544
Mean Price Gap	1.356	1.356	1.356	1.356	1.356
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), Bergstresser and Luby (2018), and Municipal Securities Rulemaking Board (2019). This table shows the estimates from regressions of secondary market issue outcomes on type of advisor before and after the MSRB Rule G-23 reform for all competitive, general obligation, tax-exempt issues matched between the SDC Platinum database and Bond Buyer that employ financial advisor. The dependent variable is the gap between what investors pay to buy bonds and the price investors receive when they sell bonds to registered broker-dealers in the over-the-counter municipal bond market in dollars per $100 of par value. This gap is smaller for more-liquid securities. Observations are defined at the CUSIP level, instead of the issue level. All specifications control for year fixed effects issuer fixed effects, and state economic and policy controls. Column (2) adds controls for market conditions with SIFMA yields and 1- and 10-year swap spreads. Column (3) adds flexible trends for different types of issuers. The specification in column (4) adds controls for bond characteristics intrinsic to the project including size, refund status, and callability, while column (5), the preferred specification, adds fixed effect for years to maturity. See Section 5.1 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

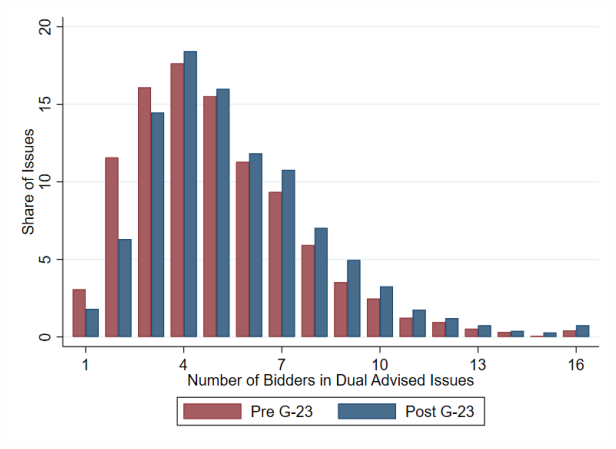
Table 7: Regression of Gross Spread on Dual Advisor Bidding Behavior, 2008-2011

	(1)	(2)	(3)	(4)
Dual Advisor	1.607	1.656	1.314	1.409
	(1.467)	(1.466)	(1.456)	(1.407)
	0.273	0.259	0.367	0.317
Dual Advisor Bids	-1.955	-2.217	-2.815	-3.547
	(1.566)	(1.569)	(1.547)	(1.485)
	0.212	0.158	0.069	0.017
Dual Advisor Wins Auction	4.989	5.354	5.153	4.627
	(1.834)	(1.839)	(1.843)	(1.862)
	0.007	0.004	0.005	0.013
Observations	8,422	8,422	8,422	8,422
Mean Spread (BP)	56.721	56.721	56.721	56.721
Year, State, and Maturity FE	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y
Issuer Type-by-Year FE			Y	Y
Size, Refund, and Call Controls				Y

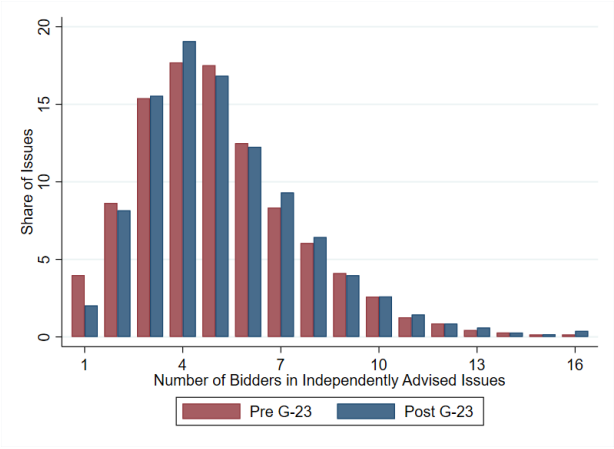
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), Bergstresser and Luby (2018), and Municipal Securities Rulemaking Board (2019). This table shows the estimates from regressions of secondary market issue outcomes on dual advisor bidding behavior before and after the MSRB Rule G-23 reform for all competitive, general obligation, tax-exempt issues matched between the SDC Platinum database and Bond Buyer that employ financial advisor. The dependent variable is the gross spread calculated using average yields in the first seven days after the bond is issued. All specifications control for year fixed effects, state controls, and maturity fixed effects. Column (2) adds controls for market conditions. The specification in column (3) includes year-by-issuer type fixed effects to allow flexible time trends, while column (4), the preferred specification, adds controls for size-by-year, refund status, and call provisions. See Section 5.2 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Figure 1: Distribution of *Ex Post* Submitted Bids by Advisor Type and Period

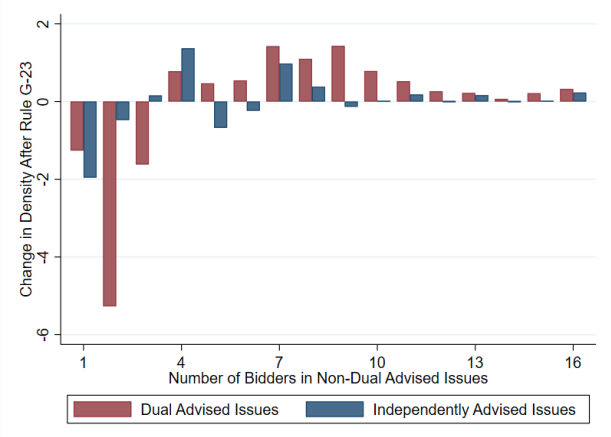
A. # Bids Density for Dual Advisor Issues



B. # Bids Density for Independent Advisor Issues

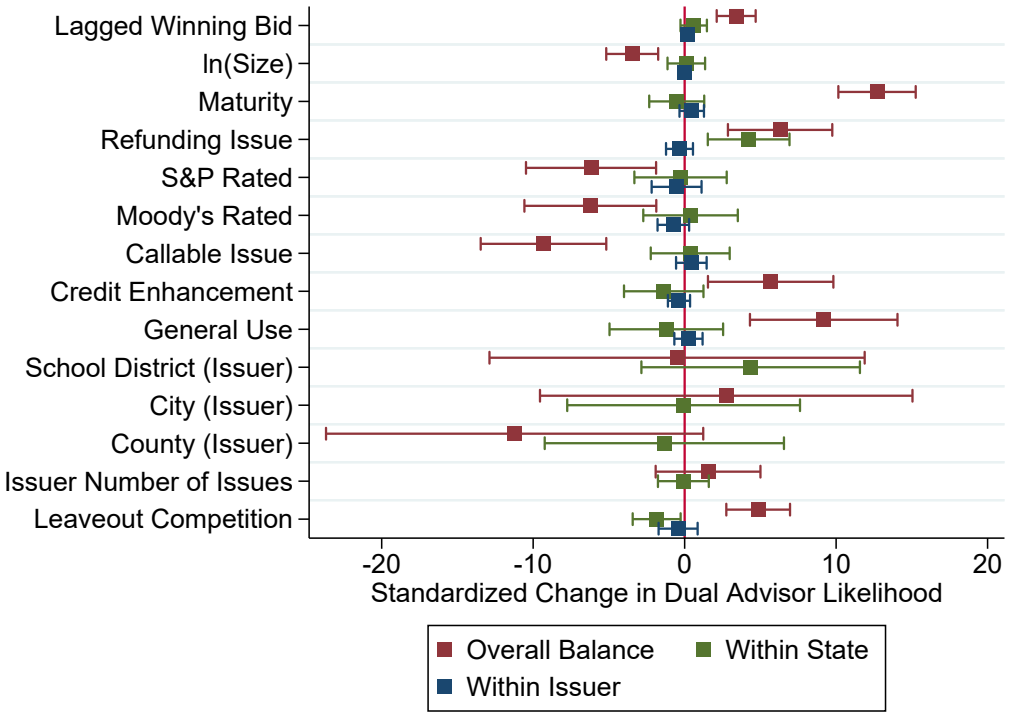


C. Change in # Bids Density after Rule G-23



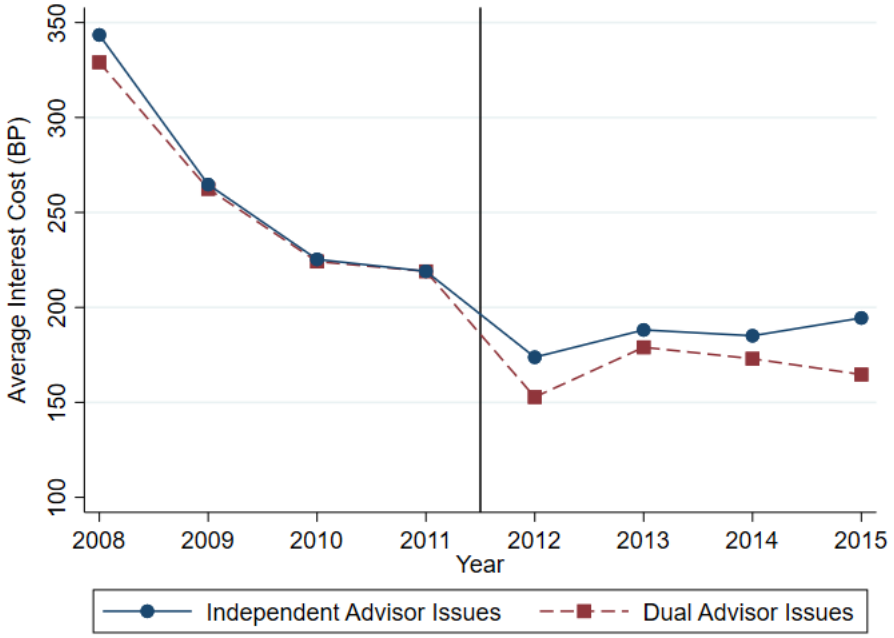
Note: Author's calculations using data from the The Bond Buyer (2016), SDC Platinum (2016), and Bergstresser and Luby (2018). This figure reports histograms of the number of bids submitted for issues with different types of advisors and in different time periods. Panel (A) shows the observed distribution of submitted bids for issues with dual advisors. The maroon bars refer to the period before November 27, 2011, and the navy bars refer to the period after once Rule G-23 is implemented. Panel (B) shows the same distributions for independently advised issues before and after Rule G-23. The difference between the pre- and post-period for each sample is displayed in panel (C). For dual advised issues, the share of auctions with 1-3 bidders declines by 8 percentage points, which matches the increase in the share of auctions with 4 or more bidders. For independently advised issues, the analogous decline in low participation auctions is only 2 percentage points.

Figure 2: Linear Probability Estimates Explaining Dual Advisor Choice, 2008-2011



Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure plots the point estimates and 95% confidence intervals from regressions of choice of dual advisor on issue and issuer characteristics for competitive auctions. Characteristics with continuous measurements are normalized to standard deviations. Numerical estimates and additional specifications are available in Table A.3. Overall Balance, corresponding to column (1) of Table A.3, shows that smaller issues, issues with longer maturities, refunding issues, unrated issues, and issuers with more participation in auctions are more likely to have dual advisors. Further, school districts, towns, cities, and county issuers are less likely to use dual advisors than states, state agencies, and special districts (the omitted category). Within State balance, corresponding to column (3) of Table A.3, replicates this regression including state fixed effects ans shows that most of the variation in observable characteristics for issues with dual advisors is explained by geographic variation, but refunding issues are less likely to choose dual advisors while bonds for general public improvement (General Use) are less likely to employ dual advisors. Within Issuer balance, corresponding to column (5) of Table A.3, shows that the bonds that use dual advisors are not observably different than bonds with independent advisors after accounting for average issuer characteristics. Standard errors are clustered at the issuer level and 95% confidence intervals are included.

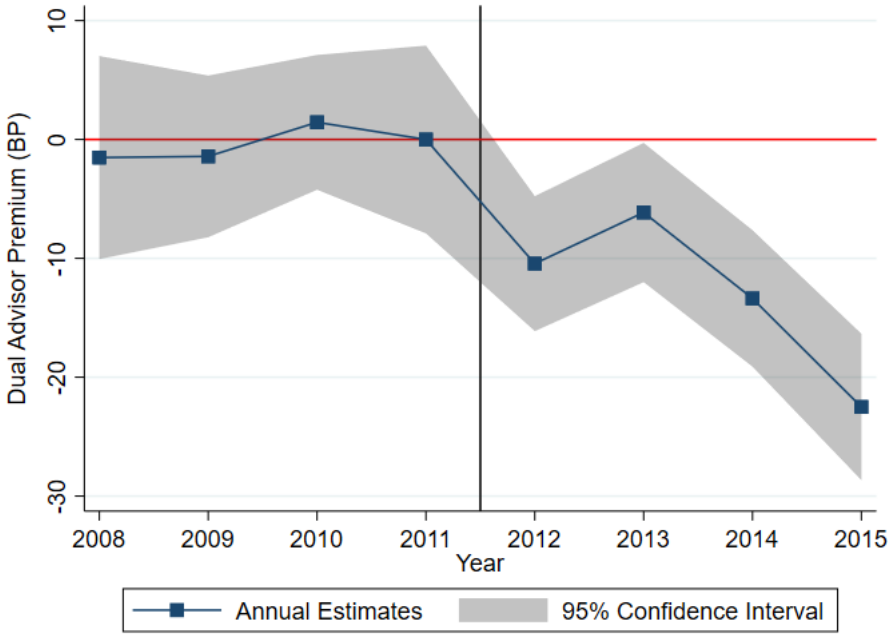
Figure 3: Average Borrowing Cost by Advisor Type, No Controls



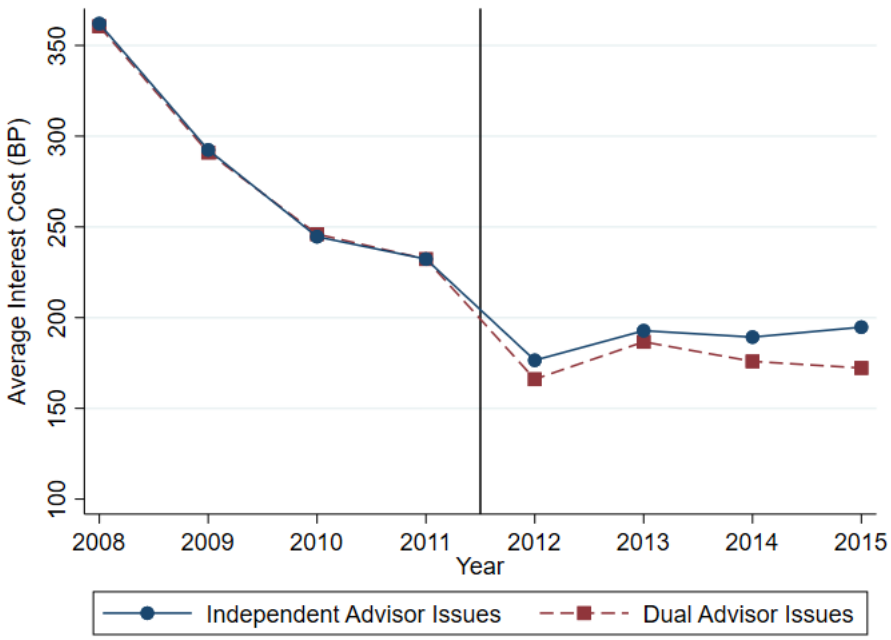
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure reports the annual average borrowing costs for dual advisor issues and independent advisors. The borrowing costs are residualized by removing issuer fixed effects. The level for dual advisor issues is normalized such that the mean borrowing cost is equal to the independent advisor level in 2011. See Section 4 for more information and discussion.

Figure 4: Treatment Effect of Dual Advisor on Winning Bid (Basis Points)

A. Differences

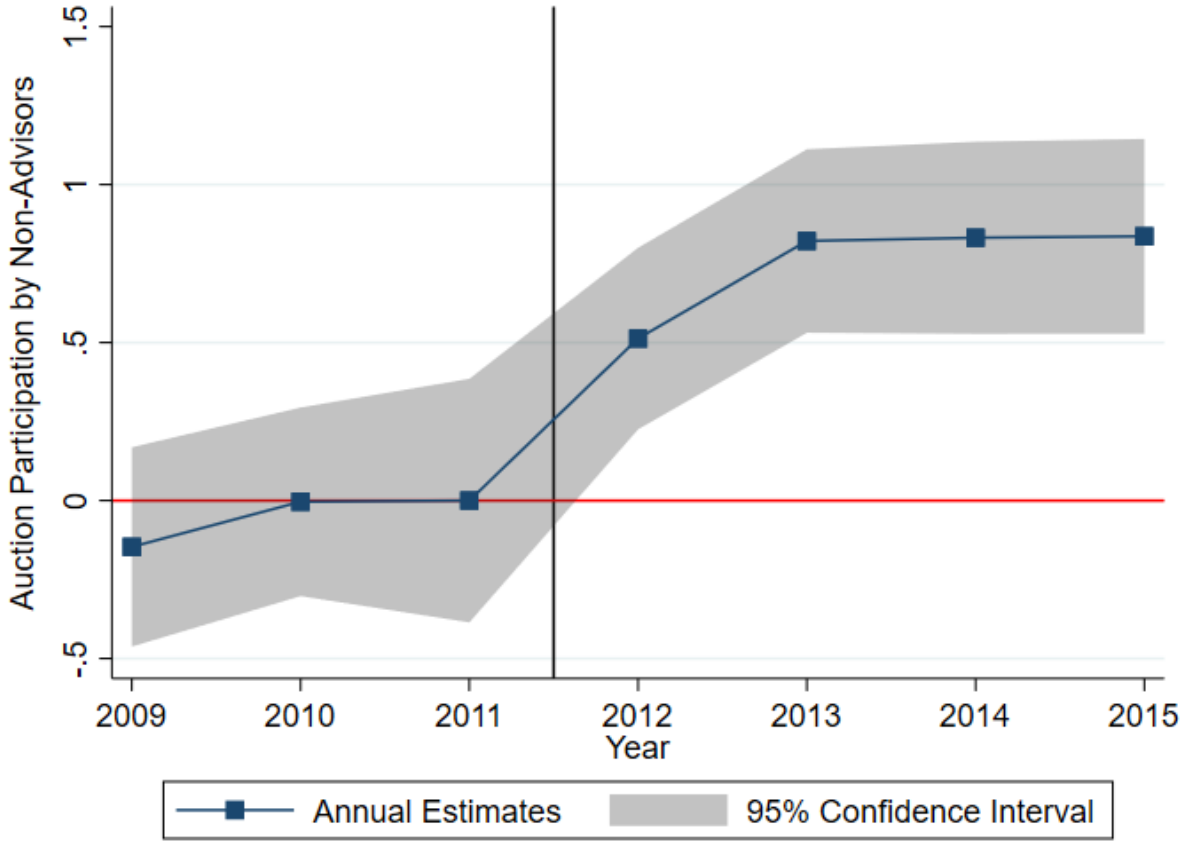


B. Levels



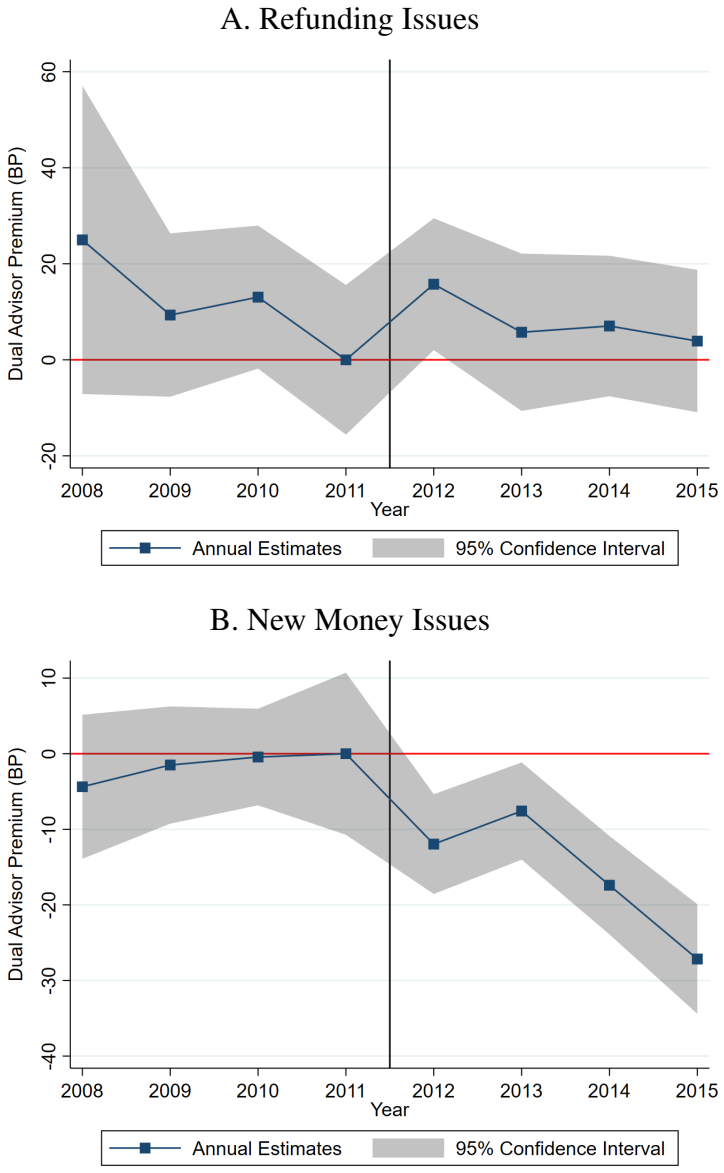
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure reports the annual effects of having a dual advisor on borrowing costs in basis points as estimated by equation 2. The levels in the graphs are scaled such that the mean effect in 2011 is zero. The specification reported in this figure corresponds to column (5) in Table 1 using all controls. See Section 4 for more information and discussion. Standard errors are clustered at the issuer level and 95% confidence intervals are included.

Figure 5: Treatment Effect of Dual Advisor on Number of Non-Advisor Auction Participants



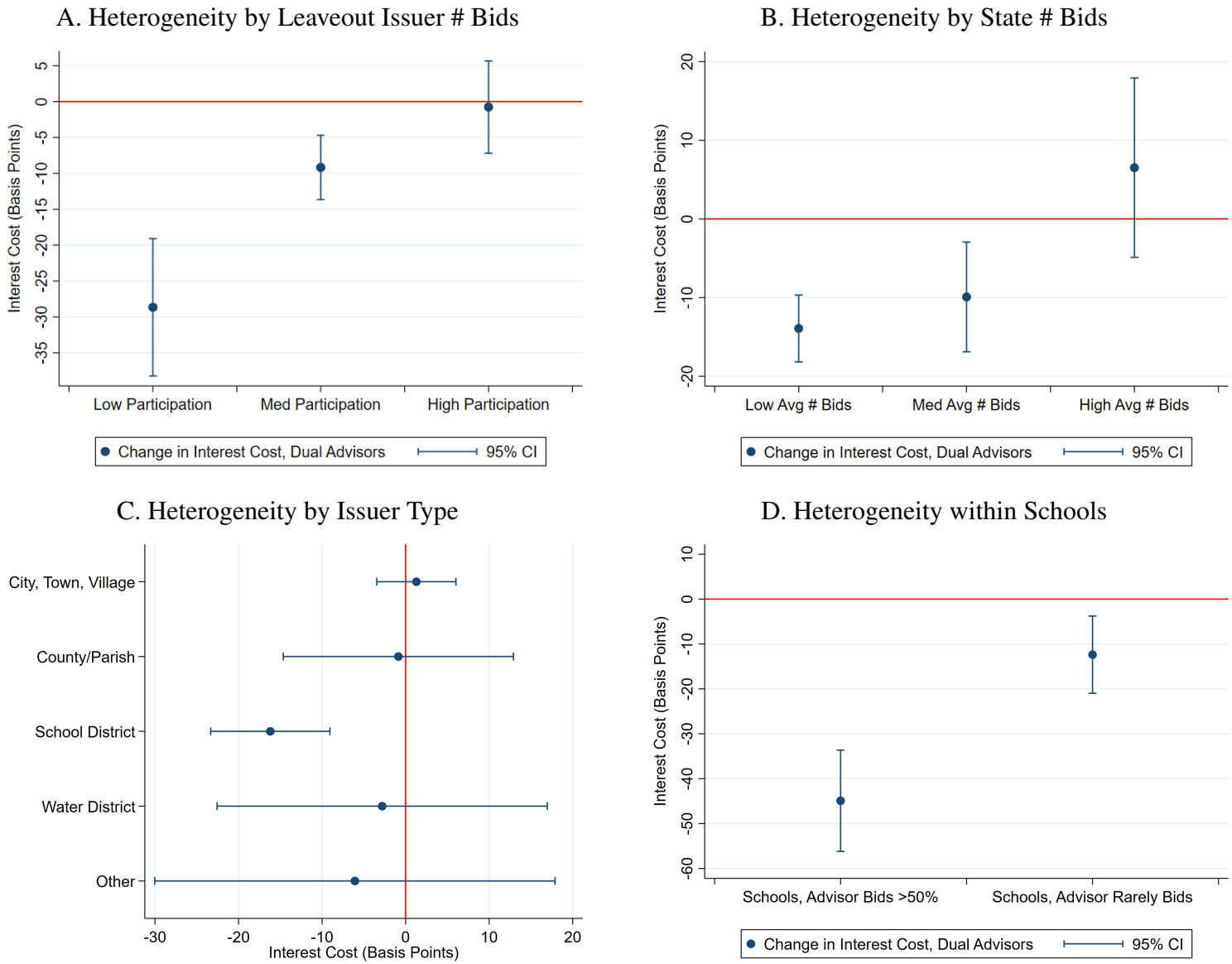
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure reports the annual effects of having a dual advisor on the number of non-advisor underwriters competing for underwriting business in competitive municipal bond sales as estimated by equation 2. The graph is scaled such that the mean effect in the pre-period is zero. The specification reported in this figure corresponds to column (5) in Table 4 using all controls. See Section 4 for more information and discussion. Standard errors are clustered at the issuer level and 95% confidence intervals are included.

Figure 6: Treatment Effect of Dual Advisor on Winning Bid (Basis Points), Refunding Heterogeneity



Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure reports the annual effects of having a dual advisor on TIC in basis points as estimated by equation 2. The levels in the graphs are scaled such that the mean effect in 2011 is zero. The specification reported in this figure corresponds to column (5) in Table 1 using all controls. Panel A limits the sample to refunding issues that are being issued to finance payments on outstanding bonds. Panel B restricts the sample to new money issues. The lack of effect in Panel A and the large negative effect in Panel B is suggestive of the regulation encouraging advisors to provide more information on new money issues that the market is already providing for outstanding issues. See Section 4 for more information and discussion. Standard errors are clustered at the issuer level and 95% confidence intervals are included.

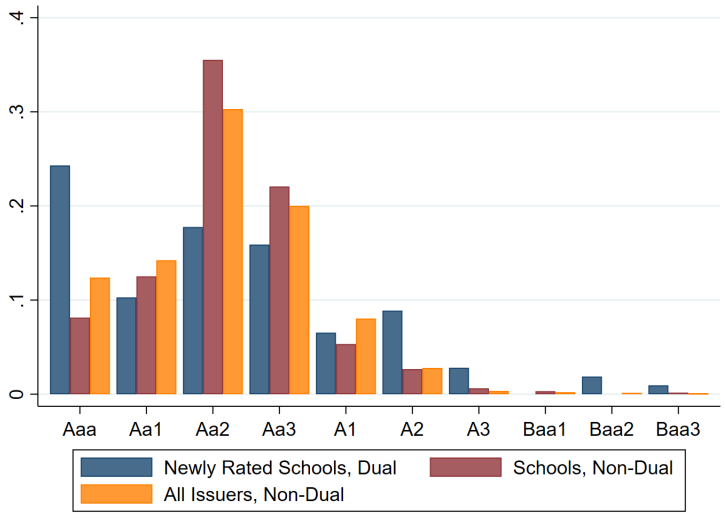
Figure 7: Estimates from Regressions of Bond Issue Outcomes on Dual Advisor X Post, Heterogeneity



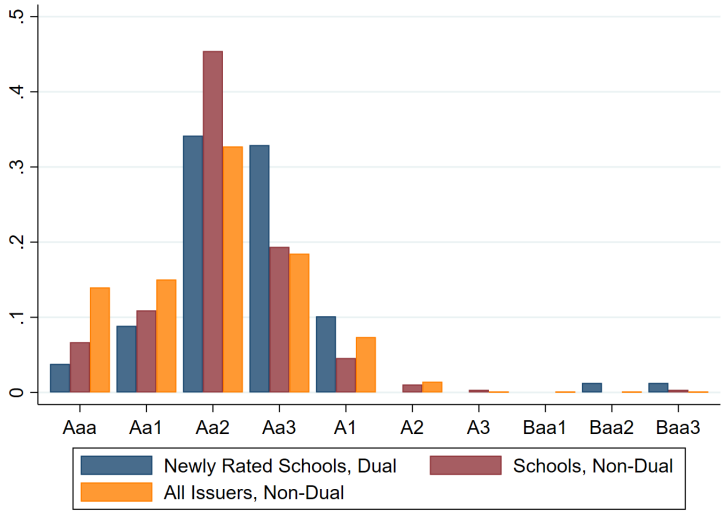
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure reports difference-in-differences estimates of borrowing costs as estimated by equation 2. The specification reported in this figure corresponds to column (5) in Table 1. In panel (A), low participation bonds are those bonds issued by issuers who have 4 or less underwriters submitting bids, medium participation is 4 to 6 bidders, and high participation is more than 6. The decrease in borrowing costs is driven by low participation issuers where the marginal increase in underwriter participation would have a larger effect on borrowing costs. Panel (B) shows the same pattern splitting states into thirds by the same metric. Panel (C) splits the treatment by issuer type and shows that school districts experience the largest impacts. Within Schools, the effect is concentrated among issuers who regularly received bids on their bonds from their advisors, with these previously reliant issuers seeing borrowing costs drop by 45 bp, which is shown in panel (D). See Section 4.3 for more information and discussion. Standard errors are clustered at the issuer level and 95% confidence intervals are included.

Figure 8: New Moody's Credit Rating Distribution, 2012-2015

A. New Credit Ratings, 191 Dual Advisor Schools



B. New Credit Ratings Omitting Enhanced Issuers, 73 Dual Advisor Schools



Note: Author's calculations using data from SDC Platinum (2016) and Bergstresser and Luby (2018). This figure reports the distribution of credit ratings separately for those school districts with dual advisors who acquire ratings for the first time after 2011, all school districts without dual advisors, and all issuers without dual advisors. Panel A includes issuers who ever purchase a credit enhancement (including insurance, guarantees, or letters of credit) while Panel B restricts to issuers who never purchase any sort of credit enhancement. Both figures highlight that the newly rated dual advisor bonds after MSRB Rule G-23 are not systematically rated lower than similar independently advised issuers, which suggests these borrowers were similarly credit worthy while issuing unrated debt in previous years.

Internet Appendix: Not For Publication

A Variable Definitions

Variable name	Definition
Bergstresser and Luby (2018) Combined with SDC Platinum (2016) Variables	
Dual Advisor	Advisors who are linked to an underwriting investment bank. I also restrict this definition to only those advisors whose underwriting arm does underwrite debt they advise between 2008 and 2011.
SDC Platinum (2016) Variables	
Issuer	Name, type, and state for entity issuing each bond package.
Sale Date	Date of the competitive auction for underwriting privileges.
Advisor	Name of the municipal financial advisor, linked with dual advisor indicator.
CUSIP	Unique 9-digit identifier to link bonds to secondary market trading data.
Bond size	Par value of bond package (millions of nominal USD).
Maturity	Years to maturity from sale date rounded to nearest integer.
Refunding	Index noting whether bond is new money or refund of existing debt.
Call	Indicator for whether a bond is callable.
Credit Enhancement	Index noting any credit enhancements (insurance, letter of credit, etc.)
Use of Funds	Index noting type of public asset financed by each bond.
The Bond Buyer (2016) Variables	
Interest Cost	Winning (lowest) interest cost bid submitted in each competitive bond sale.
Bidders	Identities of up to 16 underwriters who submit lowest bids to each auction. Lowest bidder is the underwriter or lead underwriter.
Leave-out Competition	Average number of bidders in all other issues by the same issuer.
Municipal Securities Rulemaking Board (2019) Variables	
Buy-Sell Spread	Average difference in dollars per $100 par value between the price investors pay to buy a bond to the price investors are able to sell a bond to a broker-dealer from the second month to the twelfth month of trading.
Gross Spread	Interest cost minus average yield in sales to investors in first 7 days of trading.
30-Day Underpricing	Percentage point price size weighted price increase from the first day of trading to 14-30 days after the first day of trading.
Other Variables	
State Controls	Log of state GDP, log of state spending, income tax rates, and unemployment rates gathered by Garrett et al. (2023).
SIFMA Swap	Swap rate index for AAA-rated municipal variable rate debt obligations (VRDOs) from SIFMA (2019).
Swap Rates	1-year and 10-year swap rates for the 3-month LIBOR from Board of Governors of the Federal Reserve System (2018)

B Other Notes on Municipal Debt

This appendix includes additional data descriptions and notes on the municipal bond market.

B.1 The Use of Advisors in Competitive and Negotiated Sales

In this paper I focus exclusively on the competitive issuance market around the implementation of MSRB Rule G-23, but slightly over half of municipal bonds during the sample were issued via negotiation. In a negotiated sale, an issuer hires an underwriter directly to structure the bond instead of hiring an advisor to structure the bond that will be posted for auction to potential underwriters. Sorensen (1979) originally discusses the theoretical tradeoffs related to the choice negotiated or competitive sale in the municipal bond market while Cestau et al. (2021) review much of the modern empirical literature.

Municipal issuers may still hire an advisor for a negotiated sale, but the advisor will likely provide different services than if the deal were competitive, and the regulation of the advisor's role will be different. For example, the second largest municipal advisor in 2023, Hilltop Securities, states on their website that they provide the following "Transaction Management & Bond Pricing" advisory services for municipal entities:[36]

- *Developing a financing program*
- *Setting financing terms*
- *Coordinating related service providers*
- *Coordinating the rating & credit enhancement process*
- *Preparing issue documentation*
- *Navigating bond elections*
- *Conducting the marketing & sale of debt*

Several of these items are generally handled by the underwriter in a negotiated deal, including "Conducting the marketing & sale of debt" and "Setting financing terms" at the very least. In a competitive deal on the other hand, these are some of the most important roles of the financial advisor leading up to the auction. Even though an advisor may be employed in both types of sales, their role in the sale is usually substantially different and a bit more limited in the negotiated sale.

Further, negotiated deals historically were much less likely to employ an advisor, or at least less likely to list a financial advisor on their official statement, which is the primary way to robustly measure advisor activity before the Dodd Frank inspired registration and filing requirements (Bergstresser and Luby, 2018). Figure A.2 shows the share of competitive and negotiated deals that openly employ a financial advisor. Of bonds that meet the broad selection criteria for this paper (tax exempt general obligation bonds with more than $1 million in par value), less than half of negotiations employed an advisor as recently as 2011. For competitive sales, the share with a financial advisor increases from 84% in 2008 to 89% in 2015, a relative increase of 6%. Negotiations, on

[36] See https://www.hilltopsecurities.com/municipal-advisory/, accessed August 1, 2023. The largest advisor, Public Financial Management, describes offering a very similar set of services: https://www.pfm.com/what-we-do/financial-advisory.

the other hand, only employed a financial advisor in 34% of deals in 2008, which increased to 56% by 2015—a relative increase of nearly two thirds.

This massive increase in the share of negotiated deals that utilize financial advisors coincides with other regulatory and financial factors going on in the background that are unrelated to MSRB Rule G-23 and beyond the scope of this paper. One such rule change was a 2012 update to Rule G-17, titled "Conduct of Municipal Securities and Municipal Advisory Activities" and often referred to as the *fair dealing rule*. On August 2, 2012, the MSRB updated Rule G-17 to require underwriters in negotiated deals disclose that they are **not a financial advisor and not a fiduciary** to potential issuers. This rule change was intended to have similar impact as Rule G-23 did for the competitive market. MSRB Notice 2012-25 states:

> The Notice does not apply to selling group members and, unless otherwise specified, *applies only to negotiated underwritings and not to competitive underwritings*.
>
> The Notice provides for robust disclosure by an underwriter as to its role, its compensation, and actual or potential material conflicts of interest....
>
> [B]rokers, dealers, and municipal securities dealers ("dealers") must, in the conduct of their municipal securities activities, deal fairly with all persons and must not engage in any deceptive, dishonest, or unfair practice. This rule is most often cited in connection with duties owed by dealers to investors; however, it also applies to their interactions with other market participants, including municipal entities.
>
> -MSRB, May 7, 2012,[37] *(emphasis mine)*

The rule change affirmed the requirement for "fair and reasonable" pricing in primary market underwriting for negotiated deals, foreshadowing some of the language of the 2016 fair dealing regulations studied by Griffin, Hirschey and Kruger (2023). The 2012 G-17 update also forbids underwriters of negotiated deals from specifically advising an issuer not to obtain a financial advisor.

While Rule G-23 could conceivably change dynamics and outcomes in the negotiated market, the changing selection of who is using advisors in that market and the other simultaneously evolving regulation make it less ideal for study during the sample and it remains open for future research.

B.2 Additional Description of Advisors and Underwriters

- Figure A.1 shows the geographic distribution of the issues observed in the SDC data, the portion of sales with an advisor that are advised by a dual advisor, the portion of total issues that are sold via competitive auction, and the percent of auctions with a bid from the advisor in 2008-2011. The states that issue the most municipal bonds are generally the states with the largest population with the exception of Minnesota. Municipalities in California, Illinois, Minnesota, New Jersey, New York, Ohio, Pennsylvania, Texas, and Wisconsin all had more than 2,000 bond issues between January 1, 2008 and November 27, 2011 according to SDC

[37] This notice and the text of Rule G-17 are available at https://www.msrb.org/Rules-and-Interpretations/MSRB-Rules/General/Rule-G-17. An accessible interpretation of the rule is available at https://www.munibondadvisor.com/RuleG17.htm.

Platinum (2016). The states where dual advisors control a larger share of the market include Iowa, Kentucky, Massachusetts, North Dakota, New Hampshire, Rhode Island, South Carolina, Texas, and Utah, where more than 40% of their bonds are issued through a dual advisor, relative to the median state share of 13%.

- Table A.1 lists the largest 15 dual advisors by the number of issues they advise from 2008-2011 in the sample of general obligation, tax exempt bonds of over $1 million issued competitively.

- The underwriter and advisor markets are potentially evolving during the sample period through firm entry, exit, and growth. The SEC created a registration requirement for financial advisors in 2012, and it is very hard to figure out who the potential advisors and major players are in the space before then except for in the reflection of advised or underwritten deals (Bergstresser and Luby, 2018). Figure A.3 shows the count of materially participating underwriters and advisors in each year of the sample. Panel (A) displays the count of underwriters that bid on more than 10, 50, and 100 issues each year, while panel (B) displays the complementary statistics for advisors. The underwriter market is undergoing some minor contraction in the count of small players while the number of large players hovers around 50. The advisor market is increasing the number of active participants at all levels.

- Figure A.4 shows the market share of dual advisors over time in aggregate.

  - Panel (A) of Figure A.4 shows the breakdown of the type of bonds that independent advisors work on from 2008-2015. Competitive sales are the object of interest in this study. Negotiated sales are bonds for which issuers and underwriters directly negotiate over the terms. Private placements are bonds placed directly with parties that don't intend to resell them. The market shares for each type of sale for independent advisors are relatively stable over time.

  - Panel (B) of Figure A.4 shows the issue type breakdown for dual advisors. Dual advisors work on similar types of issues as independent advisors, and the trends of issue type are similarly stable over time. This does not appear to be a margin where advisors or issuers adjust after regulation. Dual advisors appear to specialize more in competitive sales than independent advisors, as 62% of their sales happen in competitive deals compared to only 50% for independent advisors. Dual advisors are, on average, part of larger and more diversified firms that may offer a larger set of the advisory services that are needed for a competitive sale, where a bit more is expected from the advisor on average than during a negotiated sale. Given that this may be an important fixed characteristic of the advisor, I also control for advisor and advisor-by-issuer fixed effects in Table A.7.

  - Panel (C) of Figure A.4 shows that dual advisors control about 25% of the market throughout the sample for all types of municipal bond issues.

  - Panel D of Figure A.4 zooms in on 2011 and 2012, showing the monthly share of the competitive market advised by a dual advisor. This figure informally shows that there was not unusual bunching of dual advised issues, either by count or by volume, in October 2011 before Rule G-23 was implemented in November. In fact, the gap between

October and November/December 2012 is larger than the gap in 2011, suggesting there was not bunching around the implementation of Rule G-23.

- Figure A.5 highlights the effect of the policy on auction participation from dual advisors according to the merged data. Before 2011, dual advisors bid in 48% of the bond issues they advised, winning 15.4% of the issues they advise or 32.3% of the time they bid, which is a rate slightly more than random chance probabilities implied by a $1/N$ win rate of 29.8% where N is the number of auction participants.[38] In 2012, dual advisors are no longer allowed to bid and the underwriting rate for these advisors drops to zero as expected. There is no statistically significant change in advising market share for dual advisors throughout the sample period. Discussion of consistent market share and sale type are discussed in Internet Appendix B.

- Table A.3 reports the coefficients from a regression of dual advisor choice on bond characteristics as described in Section 3.1.

B.3 Dual Advisor Choice Extension

The similarity of issues with dual advisors and independent advisors within the same issuer is not always an accident. Although many issuers use the same advisor for all issues, other issuers keep multiple advisors that they use in a a rotating style across issues where the chosen advisor for each issue is approximately random. Miller (1993), and later Robbins and Simonsen (2008), suggested that municipalities should change financial intermediaries across time to inspire creativity and care for each issue and to avoid complacency on the part of the intermediaries. This advice is also repeated in Moldogaziev and Luby (2016), who encourage municipalities to "regularly rotate their municipal advisors and under-writers and not rely on the same municipal advisors and municipal advisor/underwriter combinations repeatedly" (P.70). This "rotating" behavior is openly observed among many issuers, and further, when rotating across some dual advisors and some independent advisors this behavior helps identify the parameters of interest.

Table A.2 shows an example of the rotating choice of advisor for the North Carolina state government. North Carolina issued 15 competitive, general obligation, tax exempt bonds between 2008 and 2015 according to SDC Platinum (2016). Of these 15 issues, 6 are advised by Davenport & Company LLC, an independent advisor, while another 8 issues are advised by FirstSouthwest (or Hilltop Securities after the merger), a dual advisor with an underwriting arm, and the last issue did not have an advisor listed. The advisors are rotated between most of the issues with 8 of the issues not using the same advisor as the previous issue. The identification strategy I employ compares the relative interest costs of the FirstSouthwest issues to the Davenport & Company LLC issues in the pre-period and post-period to calculate the difference in the differences while accounting for all issue observables and issuer-specific unobservables.

The switching behavior provides some of the quasi-experimental variation I use to identify the relative borrowing costs of using different types of advisors across time. The other source of identifying variation comes from issuers who use the same advisor for all issues. The following section describes the difference-in-differences empirical design and the estimation results.

[38] N is endogenous with respect to the presence of a dual advisor and increases significantly after the reform. This is discussed in Section 4.2.

C Additional Results and Robustness

This section includes several robustness checks to the main results. First, additional specifications including granular time fixed effects and some endogenous controls are included in Appendix C.1. Appendix C.2 shows the primary results using Inverse Probability of Treatment Weights (IPTW) instead of issuer fixed effects. Appendix C.3 describes the measurement of interest costs and the robustness of results to different assumptions about the use of call provisions. Next, Appendix C.4 includes a variety of new sample and variable measurement decisions. Appendix C.5 replicates the results from Table 1 on a counterfactual set of advisors who could have been dual advisors if the underwriting arm of the business ever bid on debt they advised. Appendix C.9 tests whether underwriter quality as measured by underpricing is changing in response to MSRB Rule G-23.

C.1 Baseline Results with Extended Controls

The baseline analysis presented in Section 4 excludes several potentially natural controls because they either increase computational burden or because such controls are endogenous. Table A.4 builds on column (5) of Table 1, the preferred specification, by adding more control variables. First, the baseline controls for market outcomes including several swap rates force a particular effect of other market outcomes on municipal borrowing costs. Instead, it is possible to use more granular time fixed effects to allow the primary municipal bond market to behave in a way that is less restricted by market controls. In columns (1) to (3) of Table A.4 add monthly fixed effects to capture seasonality, month-by-year fixed effects, and daily fixed effects respectively. The estimates are stable and significant across all specifications.

Second, maturity is only accounted for in coarse bins while credit ratings and enhancements are omitted, since these are all margins that respond to the regulation of advisors. Column (4) of Table A.4 includes a control for the natural log of maturity interacted with years while column (5) adds fixed effects for credit ratings from Moody's and S&P and an indicator for the presence of a credit enhancement both interacted with year fixed effects. These specifications find coefficients of -8.2 bp and -10.7 bp, both of which are statistically significant at the 1% level.

C.2 Inverse Probability Weighting Approach

In this Appendix, I present the results of the difference-in-difference regressions using IPTW as described by Hirano, Imbens and Ridder (2003). This estimation takes place in several steps:

1. Estimate probabilities of using a dual advisor in the pre-period. Using a logit regression, I calculate the probability that each issue in the pre-period uses a dual advisor. The regression includes

    - Natural log of the par value of the issue
    - Issuer type-by-state fixed effects
    - Refund and maturity fixed effects
    - Credit rating fixed effects
    - Call and credit enhancement fixed effects

- Main use of funds fixed effects

2. Calculate a counterfactual probability of choosing a dual advisor for each bond based on observables and the results of the pre-period choice model. Probabilities are winsorized above by 0.999 and below by 0.001.

3. Create weights equal to the inverse probability of choosing the observed option:

$$\text{weight}_{ijt} = \frac{\text{DA}_{ijt}}{\Pr\{\text{DA}_{ijt} = 1\}} + \frac{1 - \text{DA}_{ijt}}{1 - \Pr\{\text{DA}_{ijt} = 1\}}$$

   where DA_{ijt} is equal to 1 for dual advisor issues and 0 otherwise.

4. Weighted least squares regression following Equation 2

The results of this estimation approach are shown in Table A.5. After the reformulation of MSRB Rule G-23, interest costs fall by 5.47 basis points for dual advisor issues relative to issues with independent advisors in the preferred specification in column (5). This result is shown in event study form in Figure A.6, which highlights the lack of differential trends before the regulation. Similarly, Figure A.7 shows the event study for non-advisor underwriter participation. The IPTW results show the same trends and magnitudes as the primary results presented in the paper: Borrowing costs are not trending differentially before the reform while they drop immediately in 2012. Underwriter participation, likewise, is not increasing prior to the reform but jumps by 0.9 non-advisor bidders competing for underwriting business in 2012.

C.3 Interest Costs and Call Provisions

One of the major weaknesses of true interest costs, and the related measure of net interest costs, is that the interest cost is calculated assuming that bonds are outstanding until maturity. Municipal bonds are almost always issued in series with many bonds that mature in different years issued as part of the same package. Further, 60% of competitive bonds sold between 2008 and 2015 have some type of call provision and it is likely that some portion of many bonds will be called before they reach maturity. Luby and Orr (2019) introduce a new conceptual measure of the cost of capital for municipal bonds that they name "refund adjusted yield," which is a combination of a true interest cost calculation that incorporates the risk that many municipal bonds will be refunded before they reach maturity. In their analysis, Luby and Orr (2019) calculate issuer-specific probabilities of refunding past issues to estimate future probabilities of refunding and to calculate interest costs that take this real option of refunding into account.

Instead of relying on past refunding probabilities to predict future refunding probabilities, I test the bounds of true interest cost measurements assuming either that all callable bonds are called on the first date allowed in their call provisions or that no callable bonds are called. This serves as a robustness check to the primary dependent variable definition of true interest costs as gathered from The Bond Buyer (2016) and imputed from SDC Platinum (2016) as needed.

In the primary definition of interest costs as a dependent variable directly taken from results reported in The Bond Buyer or imputed from SDC where applicable, it is assumed that all bonds will remain outstanding until their maturity. Historical trends in the municipal bond market show that this is not likely to be the case. In this Appendix, I use a bounding exercise to show that

the primary empirical results of decreased borrowing costs for issues with dual advisors after the revision of Rule G-23 are remarkably consistent whether I assume that no bonds are called or that all callable bonds are called on their first call date at the initial call price, which is referred to as the "yield-to-worst."

The definition of true interest cost, TIC, is the following:

$$\text{Proceeds} = \sum_{i=1}^{n} \frac{P_i + I_i}{\left(1 + \frac{TIC}{2}\right)^{t_i}},$$

where Proceeds is the amount of money loaned to the municipality, i is the date for each payment, n is the number of payment dates, P_i is the principal due on date i, I_i is the interest due on date i, and t_i is the number of 30-day months from the dated date until date i. As complement to the primary results, I calculate TIC assuming that there is a call on the first call date or that the bonds are outstanding until maturity for each bond using the available data on bond structure from SDC Platinum (2016).

The SDC data includes characteristics of the total bond package that are used in the primary regressions and also characteristics of individual bonds within each package at the CUSIP level. Unfortunately, there are missing observations in key variables in the SDC data at the CUSIP level that prohibits me from perfectly calculating TIC in both scenarios for every bond.

1. Many bonds are missing coupon rates for one or more of the bonds in the package.
2. Some packages are missing maturity dates for some CUSIPs.
3. Many bonds are missing dated dates, the date at which interest begins to accrue on each bond.
4. Some CUSIPs have outlying values for key variables (call price, principal payments, maturity dates, and proceeds) that are not consistent with regulations or the rest of the bond package.
5. Some bond packages do not include all CUSIPs within the package.
6. Many bond packages are missing dates of first interest payment.

Given the missing variables in the data, I make several assumptions to manually calculate TIC from the available bond data in SDC Platinum (2016) and calculate TIC twice: once assuming a call on the first available call date and once assuming the bond is outstanding until maturity. The restrictions on the data primarily cause me to drop short maturity securities (less than two years from sale to maturity), so the average interest costs are higher for the remaining sample of 18,206 bond issues. First, I drop all bond packages where one or more CUSIPs is missing maturity date, coupon, or dated date. Second, I restrict call prices to fall between \$100 and \$105 per \$100 of par value. Third, I drop all bonds where the sum of par value of CUSIPs does not add up to the sum reported in the aggregate statistics from both SDC and The Bond Buyer. Finally, I drop all bonds where the listed proceeds fall further than 5% away from par value.

Simonsen and Robbins (2002) explore many of the difficulties of making interest cost measures comparable across issues with missing data and different statutory requirements for reporting. After limiting the sample to 18,206 bonds with the relevant information to calculate TIC in the CUSIP

level data, I also make several normalizations to allow TIC to be calculated without dropping additional observations that are missing variables on timing of interest payments. First, I calculate TIC to the dated date instead of to the sale date. Second, I assume interest payments start 6 months after the dated date instead of allowing first interest payments to vary. Third, I assume interest payments are made every 6 months until redemption, whether by call or by reaching the final maturity. Finally, I pro-rate the final coupon payment to the percent of a usual 6-month period that passes before the final payment.

I re-estimate the primary regressions from Equation 2 and show the estimates in Table A.6. The first panel shows estimates from the regression where the dependent variable is TIC assuming that all bonds with call provisions are exercised on the first available date. The second panel shows estimates from regressions where the dependent variable is TIC assuming that no bonds are called at any point, which is the same definition of the primary results with different construction. All estimates fall between -11.2 and -14.8, which is clustered around the primary results displayed in Table 1 and the preferred estimate of -11.4. It does not appear that call provisions are a margin where dual advisors and issuer adjust their behavior, nor does the exclusion of refund risk from the primary results appear to bias estimates.

C.4 Alternative Variable Specifications

This Appendix shows robustness to Table 1 with different choices regarding variable and sample measurement.

- Table A.7 re-estimates Equation 2 with the inclusion of advisor fixed effects. These fixed effects absorb the α parameter. Overall, the estimates are very similar to Table 1 with slightly larger coefficients. The preferred specification with the additional controls has an estimated decline in borrowing costs of 12.5bps instead of 11.4bps in the primary specification without the advisor fixed effects. In column (6), I include issuer-by-advisor fixed effects and still find a nearly identical estimate of -11.9bps for dual-advised issues after Rule G-23, significant at the 1% level and slightly larger in magnitude than the baseline estimate of -11.4bps.

- Table A.8 presents regression estimates of Equation 2 where Dual_i is redefined to be the share of their own issues in which each dual advisor bid in the pre-period. This variable is rescaled by the mean participation rate for dual advisors in the pre-period (48%). The preferred specification in column (5) is interpreted in the following way: issues with a dual advisor who bid in 48% of their own issues before regulation see borrowing costs decrease by 10.7 basis points after regulation, while issues with a dual advisor who bid in 100% of their own issues before regulation see borrowing costs decrease by 22.3 basis points. Dual advisors who engaged in more dual advising-underwriting are those with with largest cost decreases after regulation.

- Table A.9 presents regression estimates of Equation 2 where the Dual_i is redefined to be the share of issues in which a given issuer hired any dual advisor in the pre-period. This reformulation of the treatment variable prevents potentially changing issuer selection into dual advisors from driving results. Issuers who hired dual advisors in the pre-period are, by and large, the same issuers hiring dual advisors in the post period and this manifests in the results being almost identical in this specification.

- Table A.10 replicates Table 1 with a more restrictive sample to only focus on municipalities where borrowing behavior is consistent over time. For the sake of the sample, issuers are only included if they borrow in both pre and post period, don't increase or decrease borrowing in the post period by more than 50%, and borrow for the same modal purpose in both periods (general improvement, education, health care, utilities, etc.). These conditions limit the sample to 1,107 issuers who issue 6,628 bonds. The idea behind this regression construction is that it should leave out municipal entities with changing underlying fiscal conditions included in the main regressions. The effects are larger because the remaining issuers are smaller on average and more likely to be school districts, however, the signs and statistical significance are in-line with the preferred results.

- Table A.11 presents regression estimates of Equation 2 where the outcome of interest is the mean of all submitted bids. The mean bid is decreasing in a similar manner as the winning bid. Table A.12 presents regression estimates of Equation 2 where the outcome of interest is the median of all submitted bids. The median bid is decreasing in a similar manner as the winning bid. The combination of these results suggests that the change in outcomes is not driven by increasing the value of the affected issue to a single bidder, but the value is increasing for all of the participating bidders.

- Figure A.8 displays regression estimates from Equation 2 with additional interactions for the type of issuer. "Other" includes states, state agencies, groups of counties, universities, and other local authorities. The treatment and treatment $\times$ post regressors are multiplied by mean borrowing costs within type categories, so the resulting coefficients can be interpreted as percentage changes in outcomes within category. Even put into context of average type borrowing costs, a statistically significant impact only arises for school districts who experience an 8.3% decrease in borrowing costs with dual advisors after the implementation of Rule G-23.

C.5 Placebo Test

As a placebo test to the results presented in Section 4, this Appendix presents the difference-in-differences results using a fake treatment–advisors that are associated with an underwriting arm that never bid on their own issues. Four advisors offer underwriting services to municipalities but never bid on any issues they advise before 2011:

- BOSC Inc.
- Dougherty & Company Inc.
- Seattle-Northwest Securities Corp.
- Webster Bank

Given that these advisors do not engage in any municipal dual advising-underwriting behavior before the regulation according the the SDC data, the update of MSRB Rule G-23 in 2011 should not affect their behavior or the outcomes of bonds that they advise. I create a new variable, "Non-bidding dual advisor," that is equal to 1 for issues these 4 entities advise and 0 otherwise. These

advisors are not captured by the primary dual advisor variable, so this new variable is not a subset of the original. Table A.13 shows a the estimates of Equation 2 with the inclusion of new controls for non-bidding dual advisor and non-bidding dual advisor interacted with the post indicator as well as all original controls. In the preferred specification in column (5), the placebo dual advisors have no change in outcomes after the regulation.

C.6 Extended State Heterogeneity

Figure 7, panel (B), shows the primary difference-in-differences coefficients interacted with the state outcome of how many bids there average municipal bond auction receives in the sample. The relationship is monotonic—states with the lowest number of bids on average have the largest impacts of Rule G-23 and states with the the most bids on average have no impact. States in the middle third also see a drop in borrowing costs for dual advised issues, which is statistically significant at the 5% level but smaller in magnitude than the impact on the states with the lowest number of observed bids.

This Appendix takes this same approach to splitting states into thirds based on six additional margins to highlight the type of states that impacted borrowers reside in. For each state outcome, states are ranked from lowest to highest with interactions added to the treatment and treatment $\times$ post variables in Equation 2. The regressions are all estimated with the same controls as column (5) of Table 1 and coefficients and 95% confidence intervals are shown in Figure A.9. These state characteristics are equilibrium outcomes from many market forces, and thus the coefficients based on these splits are intended to be descriptive.

First, I separate states based on the relative variation across auction outcomes within each state. In panel (A) of Figure A.9, I split states into thirds based on the variance in the number of bids submitted across borrowers. The high variance states are those with the variance of submitted bids larger than 2.74 relative to a sample average of 2.35. I find that the treatment effects are monotonically larger for groups of states with more variable participation. The estimated coefficient is only statistically significant for the third of states with the highest variance in number of bids submitted. Panel (B) shows a similar patten when states are split according to the interquartile range (IQR) of submitted bids (75th percentile minus 25th percentile). States in the low IQR group have a measurement of 2 or less, the middle group has an IQR of 3 submitted bids, while the high IQR states have IQRs of 4 or greater. Again, the estimated coefficient increases in magnitude monotonically as the number of submitted bids becomes more variable within the state. The coefficients for the medium and high groups of states are both statistically distinguishable from zero at the 5% level.

Continuing to separate states by variance in auction outcomes, I next split states according to variance in the resulting yield to maturity across auctions within each state. The split points of winning bid variance to split states into thirds are 90.67 and 112.60 basis points. Again, the magnitudes of estimated difference-in-differences coefficients are monotonic in this state characteristic, with states with the highest outcome variance being those where the largest changes in yield outcomes are observed. Panels (A) through (C) all show that the borrowers in states with more variable outcomes are more impacted by rule G-23.

Second, I sort states according to share of bonds that go to market without a credit rating within the sample. Most smaller states issue exclusively rated bonds, and this manifests in the 33rd percentile of the share rated characteristic to be equal to zero. On the other end of the spectrum, 16 states have more than 8.75% of municipal bond competitive sales issued withtout a credit rating.

Panel (D) shows difference-in-differences estimates for the model with separate interactions for each type of state and 95% confidence intervals. The states that issue no unrated debt, which only make up 7% of the total sample by issuance count, have a coefficient of -4.8bps, which is not statistically significantly different than zero. The states with between 0% and 8.75% of issues unrated have a coefficient of -4.2bps, which is smaller in magnitude than the completely rated group, but is still statistically insignificant. Most large states issue a material share of unrated bonds, and this final group has a coefficient of -13.5bps, which is significant at the 1% level. While the coefficients are not monotonic, the impact of Rule G-23 is only statistically showing up in states with a material amount of unrated debt where third party certifications are not always being used already.

Finally, I split states into thirds according to the deal count Herfindahl-Hirschman Index (HHI) for underwriting and advising business separately. HHI in this context is the sum of squared market shares multiplied by 10,000 for underwriters and advisors, respectively, in terms of deal count. HHI is often considered as a measure of market concentration, where a pure monopolist has an HHI of 10,000 and a market of infinitesimal suppliers would have an HHI of zero. HHI is not often comparable across markets because it is an equilibrium outcome from many factors including market definition. If a market is defined in such a way that it includes many not-quite substitutable products (maybe a fragmented market like market municipal bond underwriting), then it may have a very low HHI despite firms having lots of latitude to exercise market power over certain buyers. For this reason, HHI is not always a good indicator of market power especially when comparing across markets (Miller et al., 2022), although a common rule of thumb is that an HHI above 1,500 suggests a *concentrated market*.[39]

The results of the splits by underwriter and advisor HHI are shown in panels (E) and (F) of Figure A.9. For underwriter HHI, the categories low, medium, and high have HHI below 828, 828 to 1,190, and above 1,190, respectively. For advisor HHI, the categories low, medium, and high have HHI below 2,735, 2,735 to 4,030, and above 4,030, respectively, which indicates the municipal financial advising market is quite concentrated according to traditional heuristics. The impact of Rule G-23 is much larger in states with lower HHI, monotonically attenuating with increases in both definitions of HHI. Panel (E) shows coefficients that are negative and statistically significant for low and medium underwriter HHI states, but with a much larger magnitude for the lowest HHI states. I show a similar pattern in panel (F) where low, medium, and high advisor HHI coefficients are all negative and statistically significant at the 5% level, but still show larger effects in lower advisor HHI states. This pattern of low HHI markets—the most "competitive" at first glance—being the most responsive to Rule G-23 is consistent with the interpretation of HHI picking up the inverse of market segmentation instead of measuring something related to market power in this comparison across states.

Across all six state splits, the magnitudes of the Rule G-23 dual advisor difference-in-differences coefficients are largest for the states with characteristics consistent with being the most segmented markets, or having the most variance in outcomes across bond auctions, which is consistent with auctions having the most scope for adverse selection. With the exception of the share unrated split in panel (D), this relationship is monotonic across the states split into thirds. Borrowers in states with a market with sufficient segmentation and variance in outcomes for private information to

[39] See guidance from the US Department of Justice: https://www.justice.gov/atr/herfindahl-hirschman-index.

matter seem to be those that benefit the most in terms of lower financing costs after Rule G-23.

C.7 Leave-one-out tests

This appendix presents three sets of "leave-one-out" tests that re-estimate the most saturated regression models while omitting different aggregations of units from the analysis. The analysis proceeds by dropping one large advisor at a time, then one large underwriter at a time, and finally by dropping each state one at a time and showing the coefficients that result. Across all 80 additional subsample specifications, all estimates are negative and maintain statistical significance at the 1% level.

First, I estimate the regression corresponding to column (6) of Table A.7 separately while dropping each of the 15 largest dual advisors and show the coefficients in Figure A.10. The 15 largest dual advisors are sorted in reverse order of share of the estimation sample with FirstSouthwest, the largest dual advisor, listed at the bottom. Of the dual advisor sample, FirstSouthwest was the advisor for almost 40% of the dual advised issues. Dropping 40% of the treatment sample lowers the estimated coefficient from -11.9bps to -10.1bps, which is still significant at the 1% level. No single dual advisor is responsible for the estimates.

Next, I repeat this analysis for the 15 largest underwriters, ordered in the same manner. Note that the matching of a given underwriter to any given bond issue happens through the auction, so this is dropping observations based off of an endogenous outcome. However, Figure A.11 shows that the relative inclusion of all of the auctions won by any given underwriter does not drive the results. All coefficients are larger in magnitude than -10bps and are all statistically significant at the 1% level.

Finally, I repeat the analysis for each of the 50 states in the US and show the coefficients and 95% confidence intervals in Figure A.12. States are sorted reverse alphabetically using their Census acronyms. All coefficients are negative and statistically significant at the 1% level (p-value = 0.006 with Texas omitted, which is the least significant result). Omitting Texas, New York, or Minnesota lowers the estimate magnitude below 10bps but ultimately does not eliminate the effect. That omitting any of these three states has an attenuating impact on the coefficient of interest is unsurprising because of the heterogeneity nested by the estimate. The most impacted borrowers, school districts with regularly bidding dual advisors, have an impact of -45bps as panel (D) of Figure 7 indicates. Minnesota, New York, and Texas make up 40% of the total estimation sample by count, but 66% of the sample of these most impacted districts with regular bidders. Removing states with relatively more of the borrowers who experience the largest impacts tilts the composition of issues toward borrowers who have relatively smaller treatment effects, which mechanically attenuates the coefficient. However, this test shows that the headline result of decreasing borrowing costs for dual advised issues survives the removal of large, compositionally important states with the estimated difference-in-differences coefficient still significant at the 1% level.

C.8 Additional Margins of Adjustment

Table A.15 presents estimates for 4 outcome variables that are not directly connected to bond pricing for school district issues, but are margins over which advisors could potentially exert influence. The first outcome is whether a bond has a maturity for a common number of years. Most bonds have standard maturities: 1, 5, 10, 15, 20, 25, or 30 years. Standard maturities are associated with

easier pricing because there are more comparable securities both within the municipal bond market and in other markets. Before Rule G-23, dual advisor issues are 9.9 percentage points less likely to have a common maturity, with the effect attenuating slightly after regulation. The second and third measures are the standard deviation of bond size and bond maturity for bonds within a bond issue. After regulation, the bonds within a package become more similar to each other. The fourth characteristic of bond structure is the number of bonds in a package conditional on maturity. Most bond issues contain one bond for each year of maturity. Before regulation, dual advisor bonds had 5.6 log points less bonds in each issue and this difference goes away after regulation.

C.9 Underwriter Quality and 30-day Underpricing

The shift in auction participation and borrowing costs that is caused by the reform of Rule G-23 could change the quality of underwriting if the municipality loses access to an informed underwriter. A common measure of underwriting quality is the underpricing of a security on a secondary market. A high quality underwriter is able to price a security close to the actual market value, which keeps interest costs low for issuers. An underwriter who underprices a security relative to what the market is willing to pay causes issuers to pay interest costs that are higher than what final investors need to be compensated with to hold the risk associated with owning the bonds.

In order to measure changes in underwriter quality, I create a measure of underpricing of municipal bond issues by matching Municipal Securities Rulemaking Board (2019) EMMA data with the SDC Platinum bond issues by their CUSIP numbers. For each issue, I calculate the trade size-weighted average price of sales to final investors at issuance and 30 days after issuance. The price at issuance is calculated using only sales on the day of issuance. Because most municipal bonds do not trade every day, for the price 30 days after issuance, I average all transaction prices from 15 days to 30 days after issuance. Even taking the average price across 15 days, about one third of the bond issues are not traded in the 30 day price window and those issues are omitted from the following regressions.

Estimates of Equation 2 with the dependent variable of 30-day underpricing in the secondary market are shown in Table A.16. I fail to reject the null hypothesis that reforming Rule G-23 did not change underwriter quality for affected issues. Although municipalities lose access to an underwriter who may be better informed than other underwriters about the quality of the issue, the ability of the underwriter to accurately price an issue for the secondary market is not diminished.

Table A.1: 15 Most Active Dual Advisors by Issues Advised in 2008-2011

Advisor Name	Issues Advised	Bids on Own Issues	Bidding %	Wins on Own Issues	Winning %
FirstSouthwest	1229	602	49.0 %	168	27.9 %
Ross Sinclaire & Associates	431	219	50.8 %	121	55.3 %
Piper Jaffray & Co	265	86	32.5 %	18	20.9 %
UniBank Fiscal Advisory Svcs	232	36	15.5 %	1	2.8 %
Stephens Inc	229	100	43.7 %	7	7.0 %
RBC Capital Markets	223	136	61.0 %	42	30.9 %
Robert W Baird & Co Inc	185	133	71.9 %	45	33.8 %
Morgan Keegan & Co Inc	139	107	77.0 %	44	41.1 %
George K Baum & Company Inc	114	15	13.2 %	5	33.3 %
Southwest Securities	103	83	80.6 %	14	16.9 %
Northland Securities	91	18	19.8 %	6	33.3 %
Eastern Bank	70	54	77.1 %	23	42.6 %
Zions Bank	56	41	73.2 %	9	22.0 %
D A Davidson & Co	39	22	56.4 %	14	63.6 %
GMS Group LLC	39	35	89.7 %	14	40.0 %

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table lists the 15 dual advisors with the largest number of bonds advised from 2008 until November 26, 2011. Most dual advisors regularly submit bids to serve as underwriter on debt they advise during this period. For more information, see Section 3.

Table A.2: North Carolina Advisor Choice Example

Sale Date	Issuer Name	Advisor	Dual Advisor	Size (Millions)	Primary Purpose
October 6, 2009	North Carolina	Davenport & Company LLC	0	371.92	General Purpose/ Public Imp
March 31, 2010	North Carolina	None	0	292.62	General Purpose/ Public Imp
September 28, 2010	North Carolina	Davenport & Company LLC	0	302.15	General Purpose/ Public Imp
February 2, 2011	North Carolina	FirstSouthwest	1	500	General Purpose/ Public Imp
October 5, 2011	North Carolina	FirstSouthwest	1	367.35	General Purpose/ Public Imp
November 9, 2011	North Carolina	FirstSouthwest	1	400	General Purpose/ Public Imp
January 16, 2013	North Carolina	FirstSouthwest	1	250	General Purpose/ Public Imp
January 30, 2013	North Carolina	Davenport & Company LLC	0	319.26	General Purpose/ Public Imp
February 20, 2013	North Carolina	FirstSouthwest	1	339.235	General Purpose/ Public Imp
February 20, 2013	North Carolina	FirstSouthwest	1	349.955	General Purpose/ Public Imp
March 12, 2013	North Carolina	Davenport & Company LLC	0	299.785	General Purpose/ Public Imp
April 16, 2014	North Carolina	Davenport & Company LLC	0	306.685	General Purpose/ Public Imp
April 30, 2014	North Carolina	FirstSouthwest	1	199.57	General Purpose/ Public Imp
November 5, 2014	North Carolina	FirstSouthwest	1	299.02	General Purpose/ Public Imp
April 8, 2015	North Carolina	Davenport & Company LLC	0	231.36	General Purpose/ Public Imp

Note: Author's calculations using data fromSDC Platinum (2016) and Bergstresser and Luby (2018). This table shows an example of the within-issuer identifying variation using the case of North Carolina. For more information, see Section 3 and Appendix B.3.

Table A.3: Probability of Choosing a Dual Advisor Conditional on Observables, 2008-2011

	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Bid	3.403		0.599		0.166	
	(0.655)		(0.445)		(0.139)	
	0.000		0.178		0.231	
ln(Size)	-3.461	-3.780	0.109	-0.023	-0.026	-0.023
	(0.874)	(0.790)	(0.633)	(0.584)	(0.198)	(0.181)
	0.000	0.000	0.863	0.968	0.896	0.897
Maturity	12.700	13.566	-0.522	-0.572	0.469	0.289
	(1.302)	(1.233)	(0.926)	(0.848)	(0.412)	(0.326)
	0.000	0.000	0.573	0.500	0.255	0.376
Refund Issue	6.303	3.433	4.226	3.418	-0.340	-0.048
	(1.757)	(1.569)	(1.376)	(1.217)	(0.453)	(0.408)
	0.000	0.029	0.002	0.005	0.454	0.907
S&P Rated	-6.179	-5.434	-0.271	0.530	-0.530	-0.202
	(2.190)	(1.972)	(1.554)	(1.386)	(0.840)	(0.609)
	0.005	0.006	0.862	0.702	0.528	0.740
Moody's Rated	-6.226	-5.282	0.390	0.659	-0.747	-0.072
	(2.220)	(2.006)	(1.591)	(1.401)	(0.531)	(0.450)
	0.005	0.009	0.806	0.638	0.160	0.873
Callable	-9.319	-7.860	0.367	0.258	0.443	0.247
	(2.114)	(1.962)	(1.329)	(1.218)	(0.514)	(0.489)
	0.000	0.000	0.782	0.832	0.389	0.613
Credit Enhancement	5.680	4.888	-1.380	-1.052	-0.373	-0.653
	(2.111)	(1.810)	(1.338)	(1.180)	(0.373)	(0.319)
	0.007	0.007	0.302	0.372	0.317	0.041
General Use	9.181	8.343	-1.210	-1.264	0.253	0.546
	(2.483)	(2.190)	(1.912)	(1.684)	(0.475)	(0.384)
	0.000	0.000	0.527	0.453	0.595	0.156
School District	-0.500	-0.732	4.358	3.567		
	(6.316)	(5.857)	(3.678)	(3.278)		
	0.937	0.901	0.236	0.277		
City	2.746	-0.272	-0.067	-0.824		
	(6.271)	(5.918)	(3.919)	(3.504)		
	0.661	0.963	0.986	0.814		
County	-11.224	-11.255	-1.340	-1.091		
	(6.350)	(6.016)	(4.027)	(3.674)		
	0.077	0.061	0.739	0.766		
Number of Issues	1.546	2.007	-0.084	-0.341		
	(1.764)	(1.765)	(0.856)	(0.805)		
	0.381	0.256	0.922	0.672		
Leaveout Competition	4.855	4.749	-1.848	-1.611	-0.431	-0.041
	(1.072)	(0.910)	(0.807)	(0.677)	(0.657)	(0.315)
	0.000	0.000	0.022	0.017	0.512	0.896
Year Fixed Effects	Y	Y	Y	Y	Y	Y
State Fixed Effects			Y	Y	Y	Y
Issuer Fixed Effects					Y	Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table shows the estimates from a linear probability regression of dual advisor choice on bond characteristics. See Section 3.1 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.4: Difference-in-Differences Model Explaining Primary Market Interest Cost, Extended Controls

	(1)	(2)	(3)	(4)	(5)	(6)
Dual Advisor X Post	-11.382	-11.332	-10.070	-10.202	-8.202	-10.739
	(1.970)	(1.953)	(1.830)	(1.855)	(2.049)	(1.994)
	0.000	0.000	0.000	0.000	0.000	0.000
Observations	20,051	20,051	20,051	19,917	20,051	19,711
Mean Interest Cost (BP)	216.759	216.759	216.759	216.898	216.759	214.856
Baseline Controls	Y	Y	Y	Y	Y	Y
Month FE		Y				
Month-by-Year FE			Y			
Sale Date FE				Y		
ln(Maturity)-by-Year Controls					Y	
Credit Certification-by-Year FE						Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). The estimates in this table build on column (5) in Table 1. The first column adds month FE to capture seasonality in the primary market not captured by secondary market controls. Column (2) adds month-by-year FE while column (3) adds sale date fixed effects, which removes 134 bonds that are sold on dates without any other bond sales. Column (4) adds a control for the natural log of years to maturity interacted with years and Column (5) adds fixed effects for the level of credit rating and type of credit enhancement both interacted with years. See Section 4 and Appendix C.1 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.5: Difference-in-Differences Model Explaining Primary Market Interest Cost, IPTW

	(1)	(2)	(3)	(4)
Dual Advisor	6.157	5.628	6.909	5.648
	(4.038)	(3.896)	(3.948)	(3.405)
	0.127	0.149	0.080	0.097
Dual Advisor X Post	-8.264	-7.992	-8.186	-7.057
	(3.840)	(3.810)	(3.900)	(3.548)
	0.031	0.036	0.036	0.047
Year, State, and Maturity FE	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y
Issuer Type-by-Year FE			Y	Y
Size, Refund, and Call Controls				Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). See Section 4 and Appendix C.2 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.6: Difference-in-Differences Model Explaining Primary Market Interest Cost, With and Without Calls

	(1)	(2)	(3)	(4)	(5)
TIC Assuming Call on First Available Call Date					
Dual Advisor X Post	-12.645	-14.636	-14.175	-13.785	-14.807
	(2.268)	(3.334)	(3.306)	(3.306)	(2.700)
	0.000	0.000	0.000	0.000	0.000
TIC Assuming No Call					
Dual Advisor X Post	-11.268	-13.421	-12.949	-12.514	-13.586
	(2.194)	(3.392)	(3.362)	(3.362)	(2.678)
	0.000	0.000	0.000	0.000	0.000
Observations	18,201	18,201	18,201	18,201	18,201
Median Interest Cost Assuming Call (BP)	224.3	224.3	224.3	224.3	224.3
Median Interest Cost Assuming No Call (BP)	229.2	229.2	229.2	229.2	229.2
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). The estimates in this table are a replication of Table 1. The True Interest Costs (TIC) are calculated manually from available CUSIP-level data from SDC. The upper panel shows estimates assuming that all bonds with call provisions are called on the first available call date. The lower panel shows estimates assuming that all bonds are outstanding until maturity, which is the same assumption as the preferred estimates with the sample of bonds for which I am able to calculate TIC. The change in borrowing costs for dual advisors relative to independent advisors is estimated to be between -11.2 and -14.8 basis points. All of the estimates are statistically significant at the 1% level and none of the estimates are able to reject the preferred estimate of -11.4 basis points. See Section 4 and Appendix C.3 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.7: Difference-in-Differences Model Explaining Primary Market Interest Cost with Advisor FE

	(1)	(2)	(3)	(4)	(5)	(6)
Dual Advisor X Post	-15.169	-14.253	-14.037	-14.859	-12.455	-11.912
	(3.547)	(3.517)	(3.507)	(2.805)	(2.046)	(2.066)
	0.000	0.000	0.000	0.000	0.000	0.000
Observations	20,006	20,006	20,006	20,006	20,006	19,281
Mean Interest Cost (BP)	216.639	216.639	216.639	216.639	216.639	214.949
Year and Issuer FE	Y	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y	Y
Advisor FE	Y	Y	Y	Y	Y	
Market Climate Controls		Y	Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y	Y
Size, Refund, and Call Controls				Y	Y	Y
Maturity Terciles					Y	Y
Advisor-by-Issuer FE						Y

Note: This table is a replication of Table 1 with advisor fixed effects added to all columns. The final column also adds advisor by issuer FE to further sharpen identification. See Section 4 and Appendix C.4 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.8: Continuous Difference-in-Differences Model Explaining Primary Market Interest Cost

	(1)	(2)	(3)	(4)	(5)
Dual Advisor Intensity	8.737	8.279	8.625	7.793	5.252
	(5.658)	(5.618)	(5.606)	(4.103)	(3.134)
	0.123	0.141	0.124	0.058	0.094
Dual Advisor Intensity X Post	-12.319	-11.681	-11.104	-12.509	-10.675
	(3.440)	(3.413)	(3.401)	(2.566)	(1.880)
	0.000	0.001	0.001	0.000	0.000
Observations	20,051	20,051	20,051	20,051	20,051
Mean Interest Cost (BP)	216.759	216.759	216.759	216.759	216.759
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). The main independent variable in these regressions is redesigned to be equal to the share of their own auctions in which each advisor bids in the preperiod, divided by the sample mean (0.48). The coefficients change interpretation to the difference-in-differences effect of increasing the share of auctions the advisor participates in from 0 to the average of 48%. See Section 4 and Appendix C.4 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.9: Difference-in-Differences Model Explaining Primary Market Interest Cost, Pre-Period Treatment Assumed

	(1)	(2)	(3)	(4)	(5)
Dual Advisor Share X Post	-11.684	-11.156	-10.653	-12.857	-11.315
	(3.444)	(3.415)	(3.408)	(2.698)	(1.951)
	0.001	0.001	0.002	0.000	0.000
Observations	18,073	18,073	18,073	18,073	18,073
Mean Interest Cost (BP)	217.817	217.817	217.817	217.817	217.817
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This regression assigns each issuer a measure of Dual Advisor Share equal to the average amount of issues that an issuer used a dual advisor for before the reform. See Section 4 and Appendix C.4 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.10: Difference-in-Differences Model Explaining Primary Market Interest Cost, Only Consistent Issuers

	(1)	(2)	(3)	(4)	(5)
Dual Advisor X Post	-14.743	-15.408	-14.552	-19.201	-16.509
	(5.062)	(5.003)	(5.038)	(4.023)	(2.996)
	0.004	0.002	0.004	0.000	0.000
Observations	6,628	6,628	6,618	6,618	6,618
Mean Interest Cost (BP)	212.781	212.781	212.796	212.796	212.796
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table is a replication of Table 1 with the sample restricted to only include issuers who borrow a similar amount in the years before and after regulation, and who borrow for the same purpose before and after regulation. See Section 4 and Appendix C.4 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.11: Difference-in-Differences Model Explaining Mean Interest Cost among Submitted Bids

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	4.357	3.577	3.719	5.551	2.112
	(6.593)	(6.578)	(6.600)	(4.909)	(3.992)
	0.509	0.587	0.573	0.258	0.597
Dual Advisor X Post	-10.206	-9.500	-8.906	-10.603	-8.885
	(3.408)	(3.377)	(3.371)	(2.701)	(1.991)
	0.003	0.005	0.008	0.000	0.000
Observations	20,051	20,051	20,051	20,051	20,051
Mean Interest Cost (BP)	232.822	232.822	232.822	232.822	232.822
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). The estimates in this table are a replication of Table 1 with the dependent variable equal to the mean bid instead of the winning bid. See Section 4 and Appendix C.4 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.12: Difference-in-Differences Model Explaining Median Interest Cost among Submitted Bids

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	4.950	4.167	4.379	6.228	2.759
	(6.655)	(6.642)	(6.645)	(4.960)	(3.980)
	0.457	0.530	0.510	0.209	0.488
Dual Advisor X Post	-10.382	-9.669	-9.116	-10.867	-9.134
	(3.421)	(3.392)	(3.387)	(2.719)	(2.004)
	0.002	0.004	0.007	0.000	0.000
Observations	20,051	20,051	20,051	20,051	20,051
Mean Interest Cost (BP)	230.710	230.710	230.710	230.710	230.710
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). The estimates in this table are a replication of Table 1 with the dependent variable equal to the median bid instead of the winning bid. See Section 4 and Appendix C.4 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.13: Placebo Difference-in-Differences Model Explaining Primary Market Interest Cost

	(1)	(2)	(3)	(4)	(5)
Non-Bidding Dual Advisor	-18.401	-19.048	-17.787	-20.804	-8.980
	(12.157)	(12.131)	(11.475)	(6.928)	(4.465)
	0.130	0.116	0.121	0.003	0.044
Non-Bidding Dual Advisor X Post	0.911	3.594	3.436	-1.042	-1.183
	(13.914)	(13.444)	(12.917)	(8.642)	(5.228)
	0.948	0.789	0.790	0.904	0.821
Dual Advisor	4.674	3.850	4.040	5.700	3.053
	(6.595)	(6.564)	(6.573)	(4.796)	(3.846)
	0.478	0.558	0.539	0.235	0.427
Dual Advisor X Post	-12.521	-11.711	-11.244	-13.259	-11.455
	(3.486)	(3.457)	(3.457)	(2.753)	(1.991)
	0.000	0.001	0.001	0.000	0.000
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). See Section 4 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.14: Difference-in-Differences Model Explaining Number of Non-Advisor Bids Submitted

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	-1.064	-1.060	-1.033	-1.033	-1.030
	(0.169)	(0.171)	(0.173)	(0.170)	(0.170)
	0.000	0.000	0.000	0.000	0.000
Dual Advisor X Post	0.906	0.903	0.920	0.883	0.880
	(0.086)	(0.086)	(0.087)	(0.085)	(0.085)
	0.000	0.000	0.000	0.000	0.000
Observations	20,038	20,038	20,038	20,038	20,038
Mean Non-Advisor Participation	5.251	5.251	5.251	5.251	5.251
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table shows the estimates from regressions of primary market issue outcomes on type of advisor before and after the MSRB Rule G-23 reform for all competitive, general obligation, tax-exempt issues matched between the SDC Platinum database and Bond Buyer that employ financial advisor. The dependent variable is the number of non-advisor underwriters who submit bids in each competitive sale. All specifications control for year fixed effects issuer fixed effects, potential bidders, and state economic and policy controls. Column (2) adds controls for market conditions with SIFMA yields and 1- and 10-year swap spreads. Column (3) adds flexible trends for different types of issuers. The specification in column (4) adds controls for bond characteristics intrinsic to the project including size, refund status, and callability, while column (5), the preferred specification, adds fixed effect for years to maturity. See Section 4 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table A.15: Difference-in-Differences Model Explaining Term Structure Characteristics, School Districts

	(1)	(2)	(3)	(4)
Dual Advisor	-0.099**	-0.259	0.013	-0.056
	(0.049)	(0.222)	(0.151)	(0.053)
Dual Advisor X Post	0.013	-0.126**	-0.118*	0.045**
	(0.027)	(0.062)	(0.068)	(0.022)
Observations	8,233	5,083	5,084	8,232
Dep. Mean	0.561	0.647	4.380	1.529
Baseline Controls	Y	Y	Y	Y
N. Bonds in Package	Y	Y	Y	Y

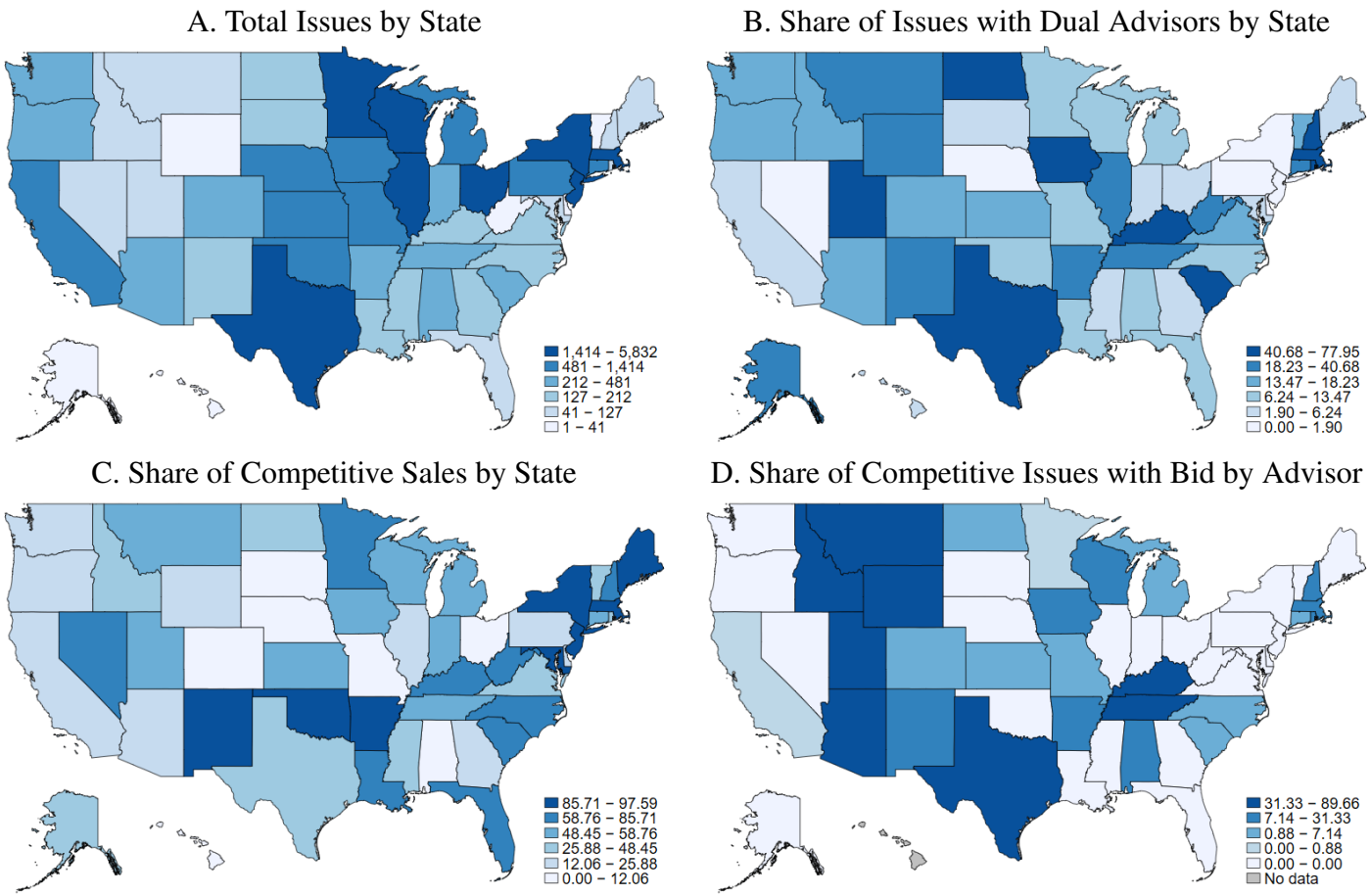
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This table shows the estimates from regressions of bond structure on type of advisor before and after the MSRB Rule G-23 reform for all competitive, general obligation, tax-exempt issues matched between the SDC Platinum database and Bond Buyer that employ financial advisor. The outcome in column (1) is a dummy variable equal to 1 if the years to maturity are common (1, 5, 10, 15, 20, 25, or 30 years). The outcome in column (2) is the standard deviation of the size of bonds in a bond package, where the sample is restricted to bond issues containing more than one bond. The outcome in column (3) is the standard deviation of the years to maturity of bonds in a bond package, where the sample is restricted to bond issues containing more than one bond. The outcome in column (4) is the natural log of the number of bonds in a package conditional on years to maturity. See Section 5.1 and Appendix C.8 for more information and discussion. Standard errors are clustered at the issuer level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.16: Difference-in-Differences Model Explaining Secondary Market Underpricing

	(1)	(2)	(3)	(4)	(5)
Effect of Dual Advisor on 30-day Underpricing					
Dual Advisor	0.466	0.436	0.291	0.162	0.159
	(0.331)	(0.328)	(0.321)	(0.322)	(0.319)
	0.160	0.184	0.365	0.614	0.619
Dual Advisor X Post	-0.077	-0.054	0.113	0.177	0.161
	(0.219)	(0.220)	(0.220)	(0.220)	(0.220)
	0.725	0.807	0.607	0.420	0.463
Year and Issuer FE	Y	Y	Y	Y	Y
State Economic and Policy Controls	Y	Y	Y	Y	Y
Market Climate Controls		Y	Y	Y	Y
Issuer Type-by-Year FE			Y	Y	Y
Size, Refund, and Call Controls				Y	Y
Maturity Terciles					Y

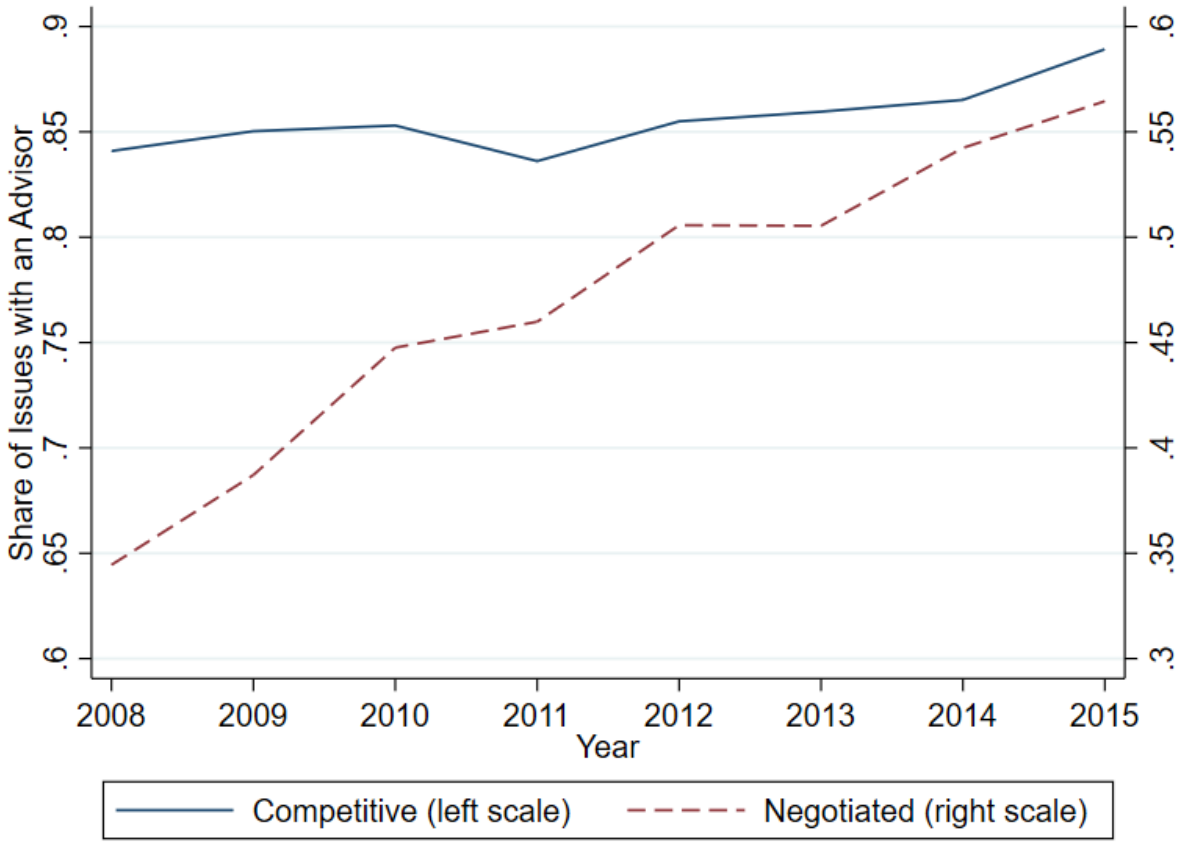
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), Bergstresser and Luby (2018), and Municipal Securities Rulemaking Board (2019). This table shows the estimates from regressions of secondary market issue outcomes on type of advisor before and after the MSRB Rule G-23 reform for all competitive, general obligation, tax-exempt issues matched between the SDC Platinum database and Bond Buyer that employ financial advisor. The dependent variable is percentage point increase in price from the average price on the first day of trading to the average price 14-30 days after the first day of trading. All specifications control for year fixed effects issuer fixed effects, and state economic and policy controls. Column (2) adds controls for market conditions with SIFMA yields and 1- and 10-year swap spreads. Column (3) adds flexible trends for different types of issuers. The specification in column (4) adds controls for bond characteristics intrinsic to the project including size, refund status, and callability, while column (5), the preferred specification, adds fixed effect for years to maturity. See Section C.9 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Figure A.1: Geographic Distribution of Bond Sales, Dual Advisors, and Competitive Sales



Note: Author's calculations using data from SDC Platinum. This figure tabulates four moments from the SDC Platinum Global Public Finance data from January 1, 2008 to November 26, 2011 for all sales of any size and type. Panel A displays the total number of issues observed in each state. Panel B shows the share of issues in each state that list a financial advisor who also offers underwriting services. Panel (C) shows the percent of issues in each state that are sold via competitive auction. Panel D. shows the percent of competitive auctions in which the advisor also bids for underwriting business. See Section 3 for more information and discussion.

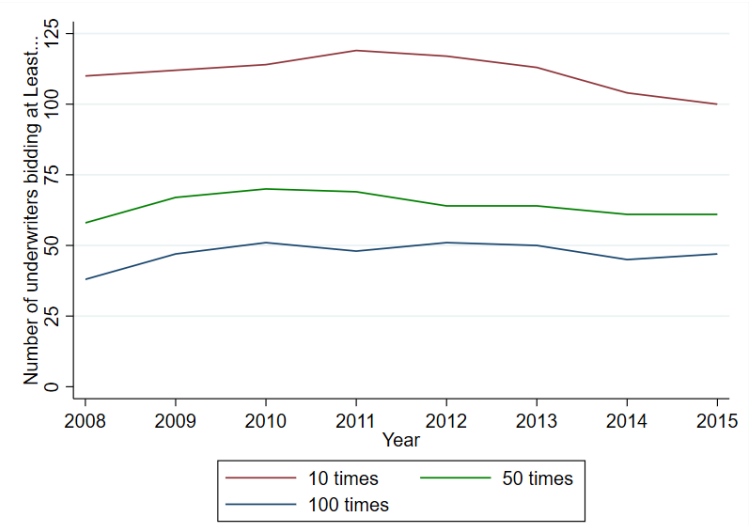
Figure A.2: Share of Competitive and Negotiated Issues with Advisor Participation



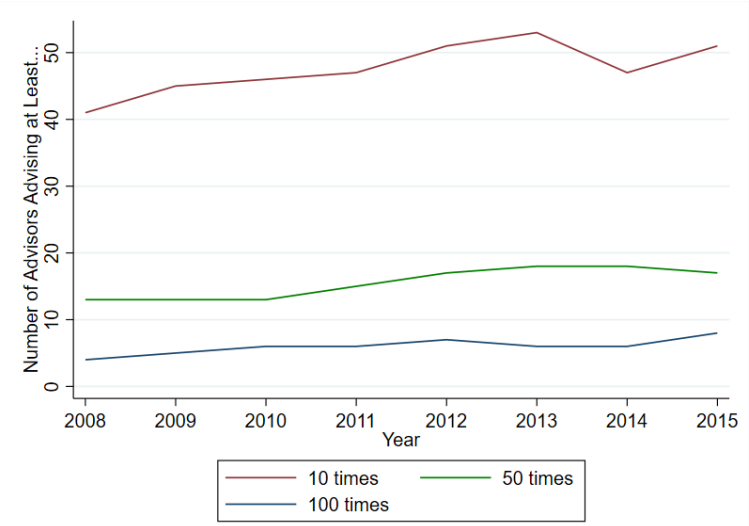
Note: Author's calculations using data from SDC Platinum (2016). This figure shows the share of competitive (left scale) and negotiated (right scale) deals that list a municipal financial advisors on their official statements. See Section B.1 for more information and discussion.

Figure A.3: Trends in the Number of Material Underwriters and Advisors

A. Number of Participating Underwriters

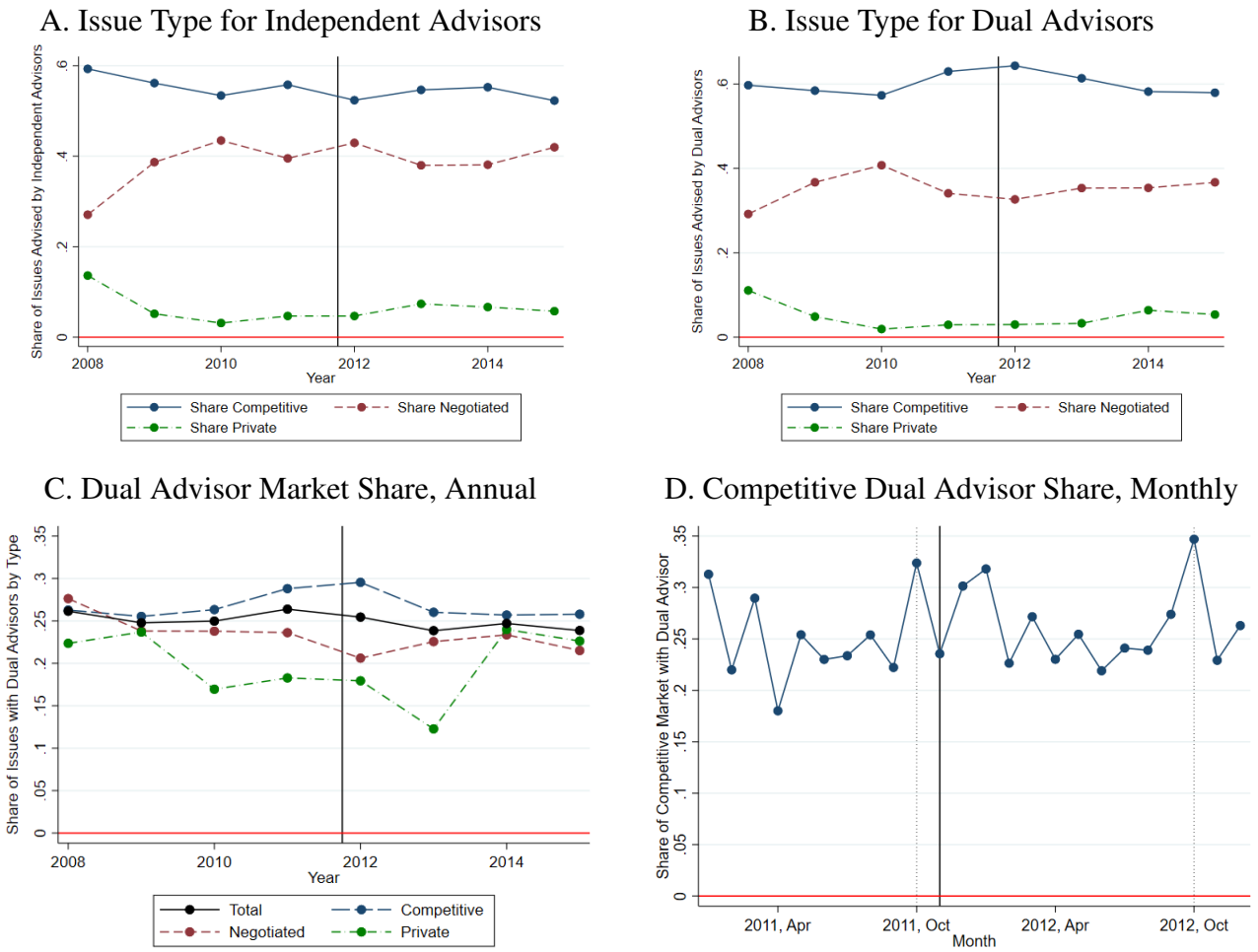


B. Number of Participating Advisors



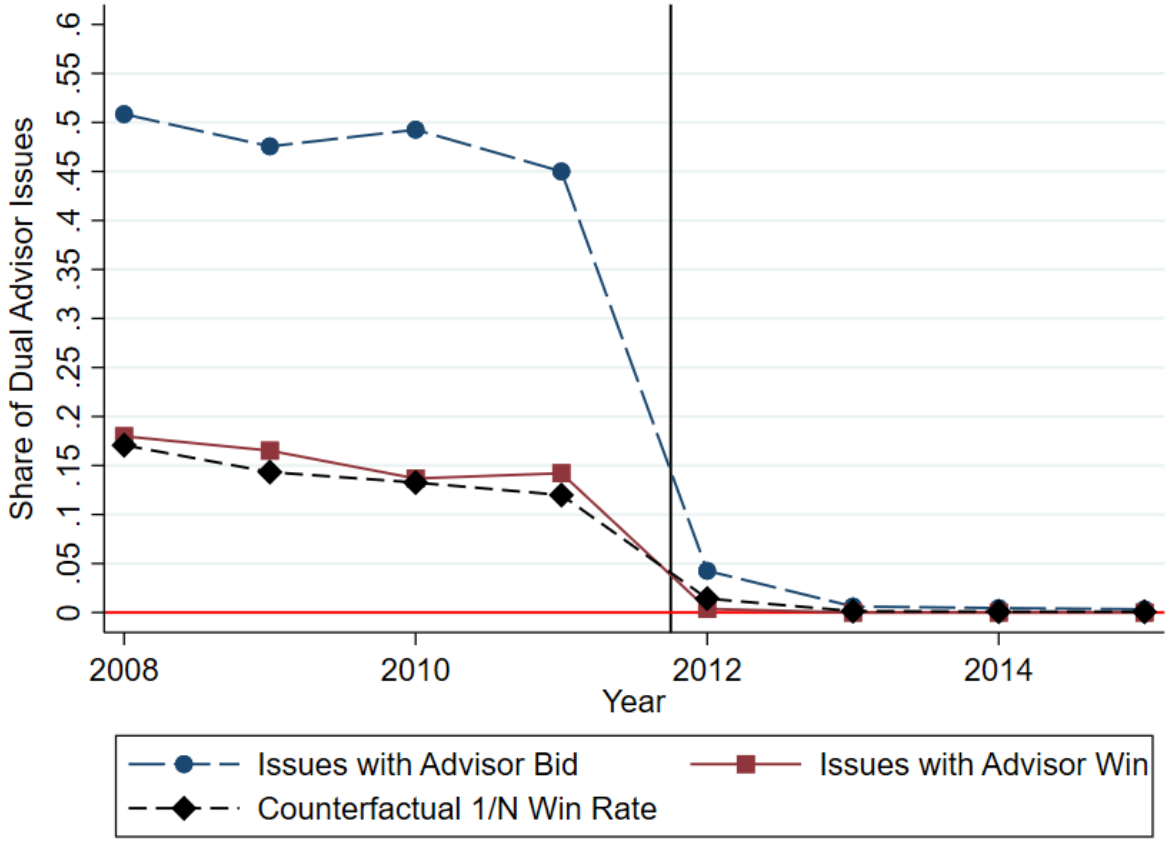
Note: Author's calculations using data from SDC Platinum (2016) and The Bond Buyer (2016). This figure displays the number of underwriters (panel A) and advisors (panel B) who show up a certain number of times in the sample data. The thresholds to show up in panel (A) are bidding 10, 50, or 100 times. The thresholds to show up in panel (B) are advising 10, 50, or 100 different issues. See Section B.2 for more information and discussion.

Figure A.4: Issue Type Mix Over Time by Type of Advisor



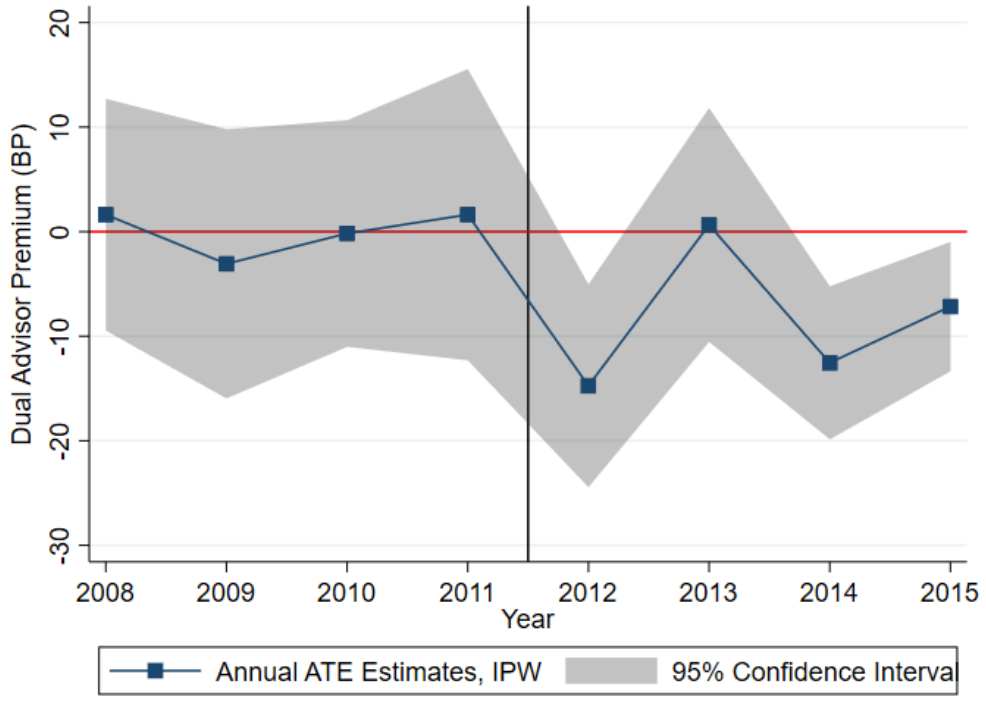
Note: Author's calculations using data from SDC Platinum. This figure tabulates average shares of sales by type of advisor from the SDC Platinum Global Public Finance data from 2008 to 2015 for all sales. Panel (A) displays the shares of issues by sale type for issues not advised by dual advisors. Issues with independent advisors are over 50% negotiated, around 38% competitive auctions, and 12% private placements. The same moments are shown for issues with dual advisors in panel (B): 62% competitive auction, 34% negotiated, and 4% private placements. Panel (C) shows the share of issues originated by each type of sale that is advised by a dual advisor. Panel (D) zooms in on the competitive deals from panel (C) for 2011 and 2012 at the monthly frequency. Dual advisor deals make up a share that is relatively consistent around the November 27, 2011, implementation of Rule G-23 and don't show any material bunching. See Section B.2 for more information and discussion.

Figure A.5: Share of Dual Advisor Issues with Advisor Participation



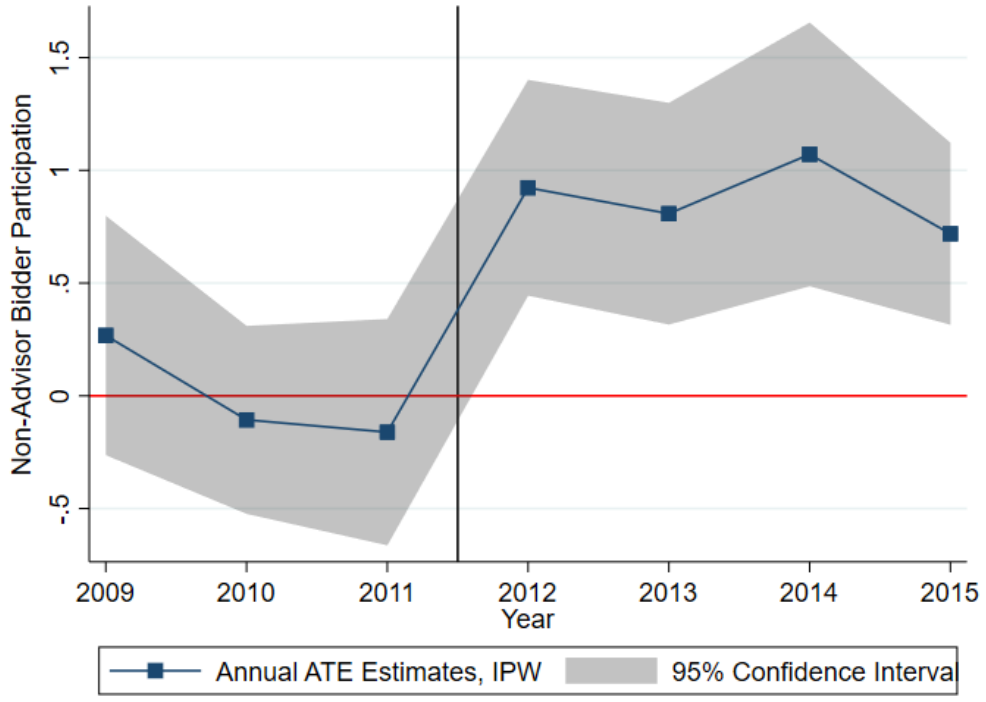
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure tabulates average shares of dual advisor auctions that have a bid from the dual advisor from 2008-2015. Before November 27, 2011, dual advisors were permitted to submit underwriting bids on issues they advise. During this time, dual advisors submit bids on 48% of issues they advise and win 32% of the time. This practice of serving as both advisor and underwriter is prohibited by MSRB Rule G-23 starting on November 27, 2011. See Section 3 for more information and discussion.

Figure A.6: Average Treatment Effect of Dual Advisor on Winning Bid (Basis Points), IPTW



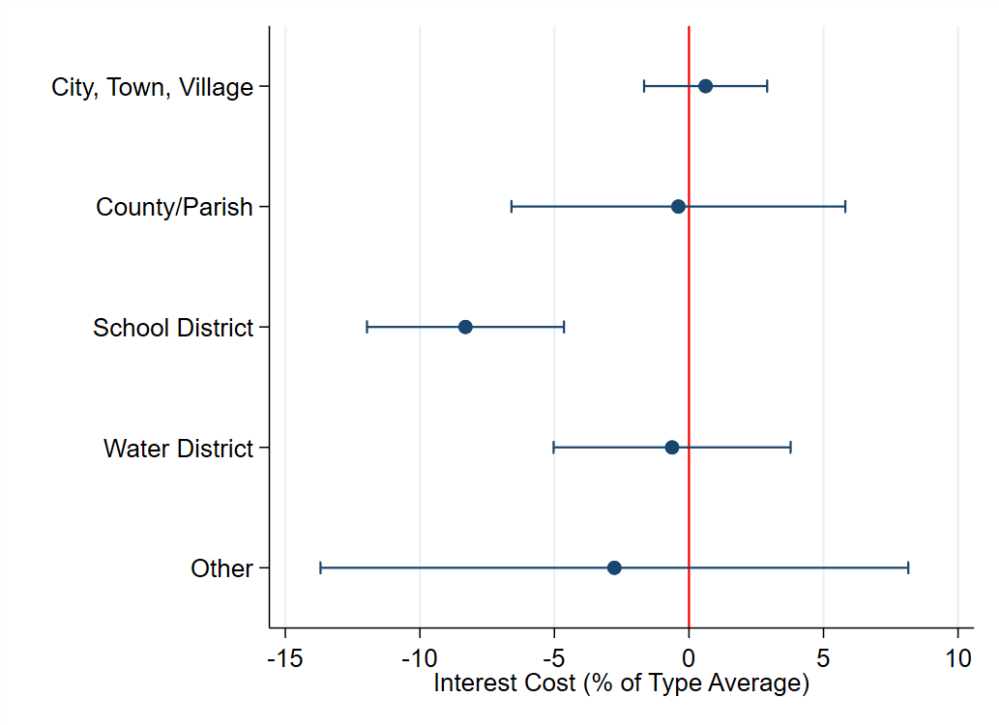
Note: Author's calculations using data from SDC Platinum and Bond Buyer. This figure reports the annual effects of having a dual advisor on borrowing costs in basis points as estimated by equation 2 using IPTW. The average effect in the pre-period is normalized to 0. The specification reported in this figure corresponds to column (5) in Table A.5 using all controls. See Section 4 and Appendix C.2 for more information and discussion.

Figure A.7: Average Treatment Effect of Dual Advisor on Non-Advisor Auction Participation, IPTW



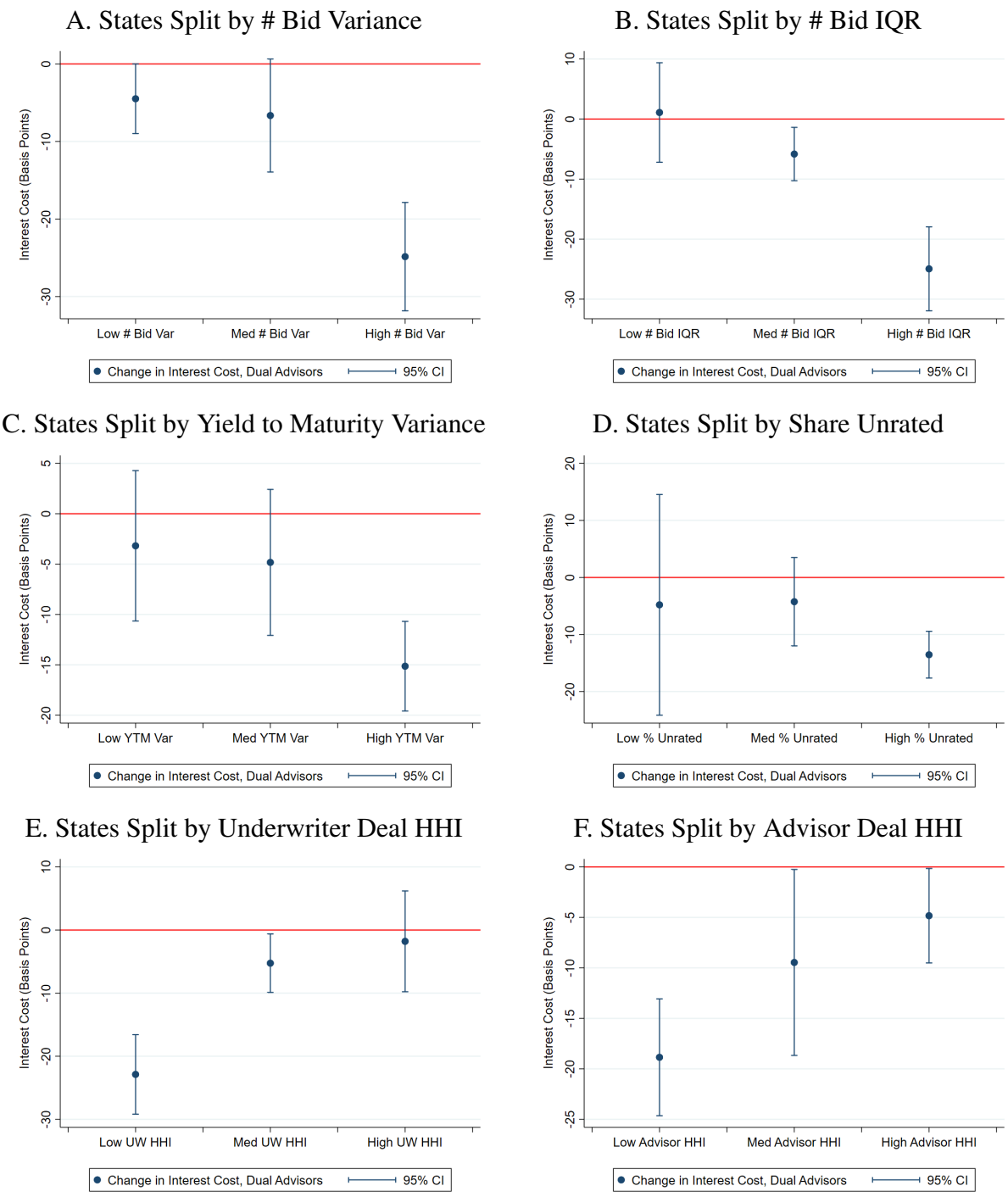
Note: Author's calculations using data from SDC Platinum and Bond Buyer. This figure reports the annual effects of having a dual advisor on non-advisor auction participation as estimated by equation 2 using IPTW. The average effect in the pre-period is normalized to 0. The specification reported in this figure corresponds to the controls in column (5) in Table A.5 using all controls. See Section 4 and Appendix C.2 for more information and discussion.

Figure A.8: Estimates from Regressions of Bond Issue Outcomes on Dual Advisor X Post, Type Heterogeneity Scaled



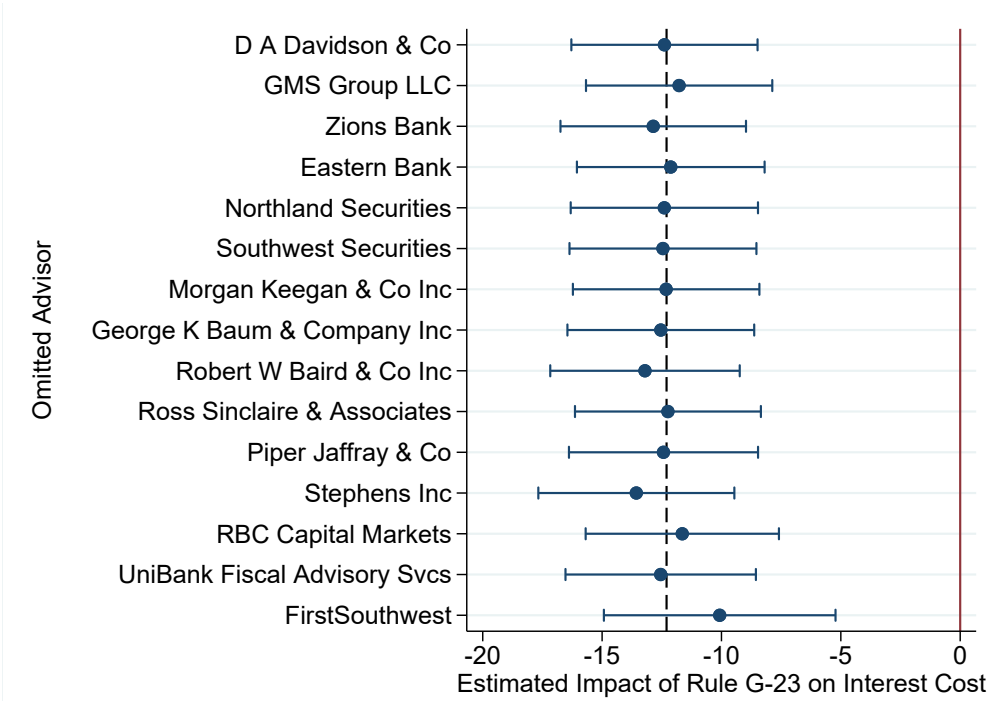
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure replicates panel (C) of Figure 7 where the coefficients are scaled by average interest cost of each type of borrower. The displayed coefficients are interpreted as percentage, instead of basis point, changes in borrowing costs for each type of borrower. Schools experience an 8.3% decline in borrowing costs, which is statistically significant at the 1% level. No other borrower category has a statistically significant decline in borrowing costs. Standard errors are clustered at the issuer level and 95% confidence intervals are included.

Figure A.9: Estimates from Regressions of Bond Issue Outcomes on Dual Advisor X Post, Extended State Heterogeneity



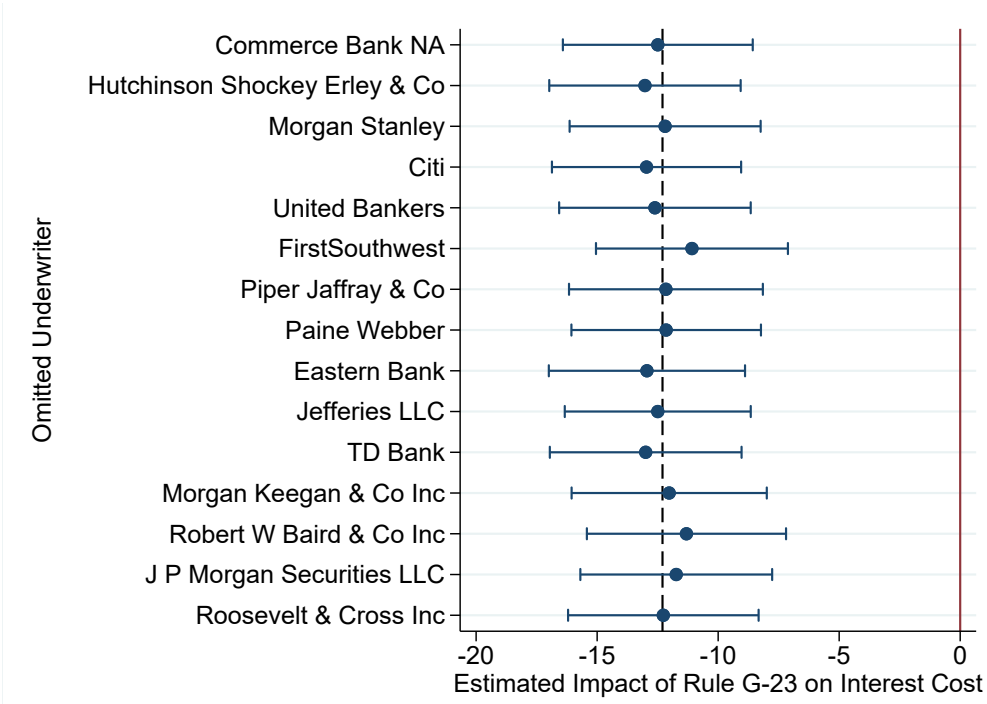
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure reports difference-in-differences estimates of borrowing costs as estimated by equation 2 with interactions for states split into thirds using the specification of column (5) in Table 1. Each panel splits states into thirds based on a characteristic of average issues within a state in-sample. Panels (A) and (B) split states according to the variance and the interquartile range (75^{th}-25^{th} percentile) in the number of bids submitted attempting to measure market bifurcation. The larger impacts are found in states with more variable participation across auctions. Panel (C) shows a similar pattern using variance in winning bid (yield to maturity) outcomes and finding that states with more variance in outcomes experienced larger impacts. Panel (D) shows that the effects are concentrated in the top third of states with the most unrated bonds in general, which is more than 8% of bonds in sample. Finally, panels (E) and (F) split states according to deal count HHI of underwriters and advisors, respectively, and show larger impacts in lower HHI markets. See Appendix C.6 for more discussion. Standard errors are clustered at the issuer level and 95% confidence intervals are included.

Figure A.10: Primary Borrowing Cost Outcome Leave-One-Out Test: Dual Advisors



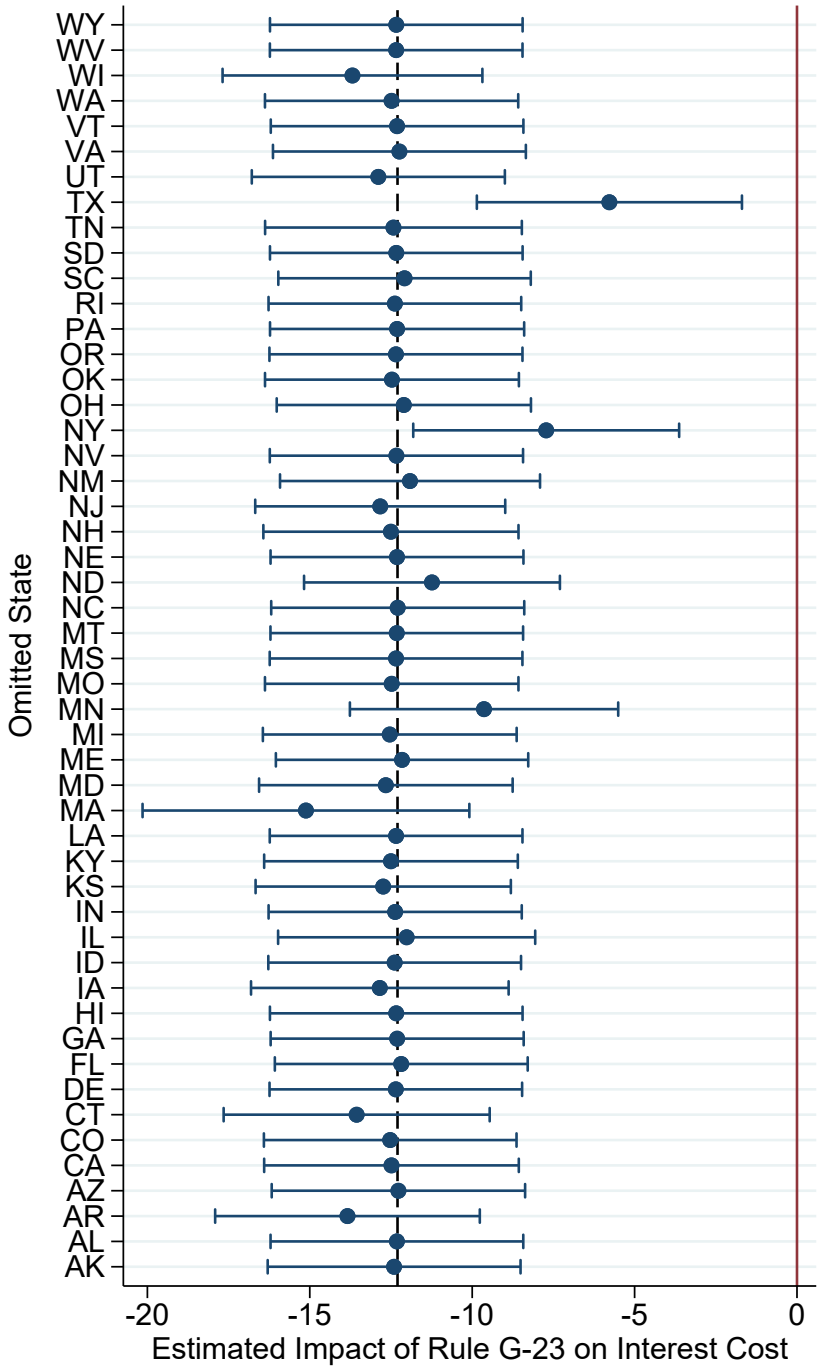
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure replicates column (6) of Table A.7 across different subsamples leaving one of the top 15 dual advisors out at a time, matching Table A.1. Each estimate is from a regression that omits all bond issues that employed the listed financial advisor. Standard errors are clustered at the issuer level with 95% confidence intervals shown. All coefficients are statistically significant at the 1% level. See Appendix C.7 for more discussion.

Figure A.11: Primary Borrowing Cost Outcome Leave-One-Out Test: Underwriters



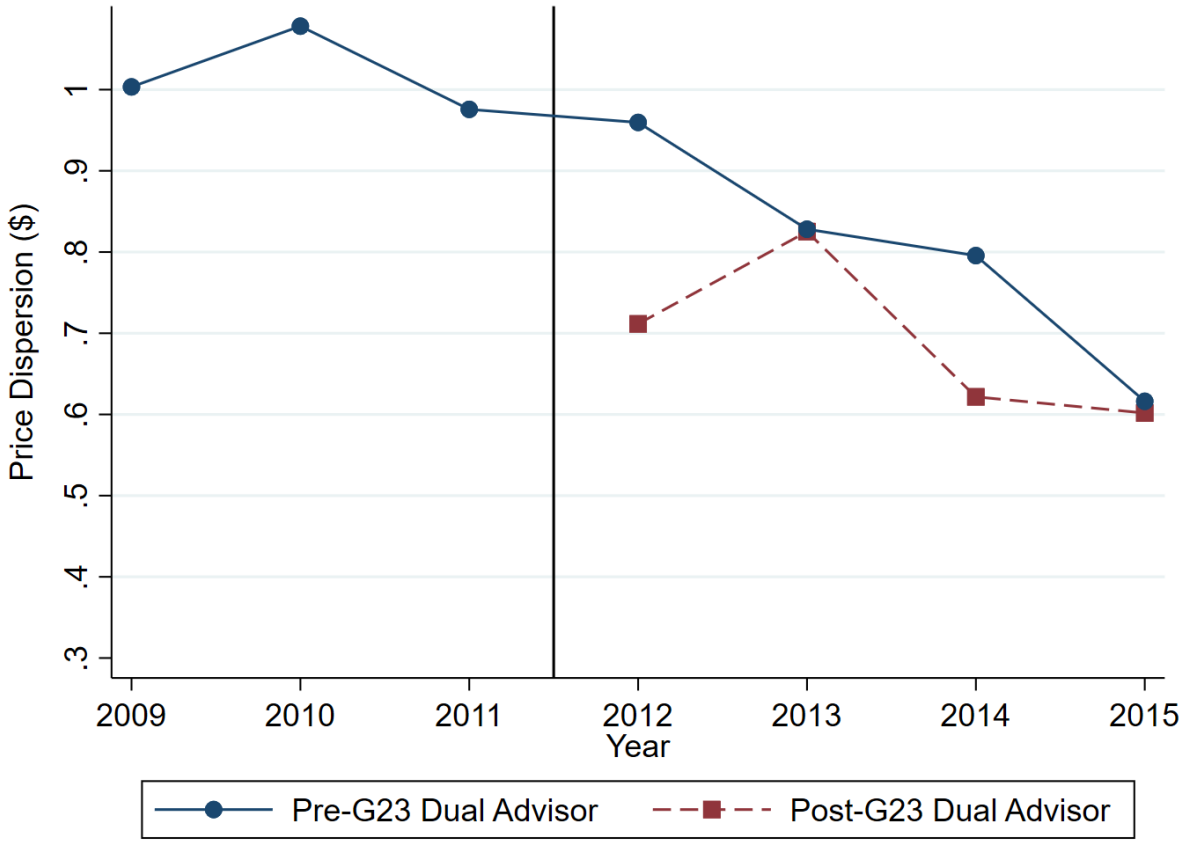
Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure replicates column (6) of Table A.7 across different subsamples leaving one of the top 15 underwriters out at a time. Each estimate is from a regression that omits all bond issues that the listed underwriter won at auction. Standard errors are clustered at the issuer level with 95% confidence intervals shown. All coefficients are statistically significant at the 1% level. See Appendix C.7 for more discussion.

Figure A.12: Primary Borrowing Cost Outcome Leave-One-Out Test: States



Note: Author's calculations using data from SDC Platinum (2016), The Bond Buyer (2016), and Bergstresser and Luby (2018). This figure replicates column (6) of Table A.7 across 50 different subsamples leaving one state out at a time. Each estimate is from a regression that omits all bond issues from the listed state. Standard errors are clustered at the issuer level with 95% confidence intervals shown. All coefficients are statistically significant at the 1% level. See Appendix C.7 for more discussion.

Figure A.13: Price Dispersion for Dual Advised Bonds Issued Before and After G-23



Note: Author's calculations using data from SDC Platinum (2016), Bergstresser and Luby (2018), and Municipal Securities Rulemaking Board (2019). This figure reports the annual average price dispersion for bonds issued with dual advisors before MSRB Rule G-23 and after the rule. Following the sample creation from Schwert (2017), this figure calculates average price dispersion by using trades of bonds that are more than one month past issuance and have more than one year remaining before maturity. The averages are weighted by trade volume. Price dispersion is residualized by removing issuer fixed effects. The pre-G23 bonds include all bonds issued with a dual advisor before November 27, 2011, and the post-G23 sample includes all dual advisor bonds issued since November 27, 2011. The figure shows that bonds issued after G-23 exhibit less price dispersion than bonds issued with the same advisors that are trading concurrently, which highlights that the liquidity regressions are picking up real changes in market perceptions of the post regulation bonds. See Section 5.1 for more information and discussion.