

Conflicts of Interest in Municipal Bond Advising and Underwriting*

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June 2020

[Current Version Available](#)

Abstract

This paper shows that conflicts of interest between financial advisors and municipalities prevent markets from delivering an efficient outcome. I study a regulation that prohibits financial advisors from simultaneously acting as underwriters. Using a difference-in-differences approach, I compare bond issues with dual advisor-underwriters to other bond issues with independent advisors using within municipality variation. I find that bonds with dual advisors see interest costs fall by 11.4 basis points (5.3% on average) after the advisor is no longer allowed to serve as underwriter. Even though this policy limits competition from the advisor, I find an overall increase in competition for these bonds. I show that this increase in competition can be explained by the fact that, prior to the reform, non-advisors were subject to a winner's curse because advisors were able to design bond that were less standard and lacked third-party certification. As an unintended consequence of the regulation, limiting asymmetric information between underwriters increases competition and improves market outcomes.

*I thank my committee members Juan Carlos Suárez Serrato, Jimmy Roberts, David Robinson, and Pat Bayer for valuable guidance and support on this project. I also thank Manuel Adelino, Daniel Bergstresser, Allan Collard-Wexler, Brian Gibbons, Manju Puri, Nathan Seegert, Chris Timmins, Daniel Xu, and many seminar participants and discussants for feedback and suggestions. Special thanks to Daniel Bergstresser and Martin Luby for generously sharing their data. Any errors remain my own.

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This paper improves our understanding of the role of financial advice in the market for municipal bonds. I study whether market competition disciplines conflicts of interest between financial advisors and municipalities, and whether regulations that limit competition in this market have unintended consequences. As in other financial markets ([Campbell, 2016](#)), conflicts of interest arise because municipalities have less information than financial service firms about the market for their bonds. Financial advisors play a vital role in helping municipalities access bond markets. However, advisors that also underwrite municipal bonds have a conflict of interest between lowering municipal borrowing costs and increasing profits. I show that prohibiting advisors from also underwriting municipal debt limits this conflict of interest, implying that competition did not fully discipline conflicts of interest. As an unintended consequence of limiting participation of financial advisors, this regulation assuages the asymmetry of information between potential underwriters, which increases competition and lowers municipal borrowing costs.

To finance public projects, state and local governments in the United States issue \$400 billion of municipal bonds each year and regularly hire financial advisors to navigate the issuance process. These advisors help structure bonds, develop plans for how to spend and invest funds, prepare public documents, find an underwriter to sell bonds to final investors, and perform many other important functions. Financial advisors have a conflict of interest when they are part of a firm that also offers underwriting services.¹ Such “dual advisors”—which make up 25% of the advising market—can push a municipality to hire their firm as the underwriter. Underwriter firm profits are increasing in municipal borrowing costs since underwriter profit from the difference between the interest cost paid by the municipality and the yield paid to final investors.

This paper studies the effects of a policy that prevents municipal advisors from acting as both advisor and underwriter for a given bond issuance. [Schapiro \(2010\)](#) and [SEC \(2011\)](#) explain the reasoning behind this regulatory approach: since underwriters profit from higher interest costs, the advice provided by an advisor seeking to act as underwriter may be biased toward higher interest cost debt structures. Critics of the regulation worry that municipal costs will increase if municipal

¹This paper follows [Mehran and Stulz \(2007\)](#) who define a conflict of interest as “a situation in which a party to a transaction can potentially gain by taking actions that adversely affect its counterparty” (P.268).

advisors are prohibited from underwriting because the underwriter market suffers from a lack of competition ([Bond Dealers of America, 2019](#)).

I show that regulating this conflict of interest from municipal financial advisors lowers borrowing costs and increases underwriter competition. The regulation I study was a consequence of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 and was enacted by the Municipal Securities Rulemaking Board (MSRB) Rule G-23. Using a difference-in-differences research design, I compare the borrowing cost for bonds that employ an advisor who also offers underwriting services, “dual advisors,” to bonds that are issued with advice from an independent advisor—an advisor not associated with an investment bank—before and after November 27, 2011.² 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 corrects 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 primary specifications show that borrowing costs decrease by 11.4 basis points, or 5.3%, for dual advisor issues relative to independent advisor issues after November 2011.

The decrease in borrowing costs is driven by an increase in underwriter competition in auctions for underwriting rights. As advisors are no longer allowed to bid for underwriting privileges for bonds they advise, other bidders enter the auction in greater numbers such that the net effect on auction participation is positive. Identification in the difference-in-differences research design requires the assumption of parallel trends – that outcomes for dual advisor issues 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 first show that dual advised and independently advised issues have very similar trending outcomes during the great recession during 2008-09 and then I subject the primary results on borrowing costs and auction participation to a variety of robustness

²The particular policy is Subchapter H of Title IX of Dodd-Frank, formalized by an update to MSRB Rule G-23. 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 research design.

checks to test various threats to identification. First, I employ a different and complementary identification strategy using inverse probability reweighting as described by [Hirano, Imbens and Ridder \(2003\)](#) to estimate average treatment effects, which is shown in Appendix [C.1](#). Second, I show the robustness of the results to several different sample selection criteria and definitions of treatment in Appendix [C.2](#). Finally, I present a placebo test using four investment banks with advising arms that never underwrite debt issues they advise before 2011 and show that bonds issued with these advisors do not experience a change in borrowing costs after the reform in Appendix [C.3](#).

In order to fully understand the mechanisms behind the decrease in borrowing costs after regulation, I test three channels through which the regulatory restriction on advisors may increase competition and lower borrowing costs. First, I show that the characteristics of bonds change and secondary market liquidity increases for dual advisor issues after the advisor are no longer allowed to underwrite. The bonds with dual advisors become more similar to bonds with independent advisors after MSRB Rule-G-23 in that the maturities for similar sized issues become shorter and the bonds are more likely to use a credit rating or a credit enhancement. This increase in third-party certifications and standardization carries through to more liquid trading on secondary markets, which is consistent both with decreasing borrowing costs for the municipality and with increased auction participation by potential underwriters because the bonds will be easier to sell. Second, I test for evidence of the winner's curse in 2008-2011 when non-advisors win underwriting auctions when bidding against advisors. I find lower *ex post* gross spreads for non-advisor underwriters who win auctions when they are bidding against the informed financial advisor. The presence of the winner's curse for non-advisor underwriters drives away other potential underwriters. Non-advisor underwriters compete for bonds with dual advisors less in the pre-period, but competition rebounds after dual advisors are prohibited from bidding—consistent with increasing competition driving down borrowing costs. Finally, I test for changes in the quality of underwriting, proxied by 30-day underpricing, and find no evidence of a change on this margin. The ability of a dual advisor to act as underwriter causes a conflict of interest that manifests in deterring the use of third-party certifications, making less liquid securities, scaring away other potential underwriters, and failing

to increase the quality of underwriting.

This paper adds to the literature on conflicts of interest in financial transactions by characterizing a conflict of interest in the municipal bond market.³ Given the existing literature on municipal advisors, the direction of the effect of prohibiting advising and underwriting on the same bond issue is not immediately clear.⁴ The most prominent argument in favor of allowing advisors to underwrite is that the underwriting market is not very competitive and any decrease in competition is likely to raise costs for borrowing municipalities ([Bond Dealers of America, 2019](#)). In fact, [Garrett et al. \(2017\)](#) highlight how the lack of competition among underwriters for certain bonds drives borrowing costs and that competition is very sensitive to characteristics of bonds. Taking a firm out of the pool of potential underwriters could raise interest costs by increasing the market power of remaining potential underwriters. However, non-advisor underwriters are more likely to compete in auctions for underwriting privileges when the advisor is removed from the pool of underwriters to the point that overall auction participation increases after MSRB Rule G-23.

This paper shows how institutional characteristics of the municipal bond market including competition for underwriting business drive the ability of regulation to limit the negative effects of a conflict of interest. In some markets including many other investment banking services, situations with potential financial conflicts of interest seem to have zero or weakly positive effects on client outcomes ([Puri, 1996](#); [Duarte-Silva, 2010](#); [Drucker and Puri, 2005](#); [James, 1992](#); [Petersen and Rajan, 1994, 1995](#); [Yamori and Murakami, 1999](#); [Schenone, 2004](#); [Beck et al., 2018](#)). Meanwhile in other markets like credit rating agencies ([Jiang, Stanford and Xie, 2012](#); [Griffin and Tang, 2011](#)) financial service firms use their information advantage over clients to extract information rents.

The closest parallel to the municipality-financial advisor relationship is found in the market for

³[Mehran and Stulz \(2007\)](#) present a modern review of the literature on conflicts of interest from a variety of financial services providers. They succinctly state several empirical questions regarding conflicts of interest broadly as they will be addressed in this paper: “Does diversification of activities within financial institutions make conflicts of interest worse or better? Have legal and regulatory attempts to affect the impact of conflicts of interest made the customers of financial institutions better or worse off? Do these efforts have unintended consequences that make US capital markets less efficient and less competitive?” (P.268).

⁴The only existing paper, to my knowledge, that estimates the cost implication of this practice in the municipal bond market is [Clarke \(1997\)](#), which finds that interest costs are slightly higher when the advisor underwrites an issue and the effect is driven by dual advisor-underwriters taking unrated bonds to market.

consumer financial advice. The primary conflict of interest arises from the dual function of some financial advisors who both give advice about what securities or funds to buy and also directly manage these funds.⁵ The empirical literature has overwhelmingly shown that this conflict of interest drives financial advisors to give worse advice that lowers 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). This paper characterizes and quantifies a similar phenomenon in the municipal bond market. Financial advisors who also sell products to advisees can directly benefit from both offering sub-optimal advice and from deterring competition from other financial services firms.

This study also contributes to the literature that studies how market factors affect municipal borrowing costs and thus the cost of providing many public goods at the state and local level. Municipal borrowing costs vary widely across the country with true interest costs ranging from 0.1% to over 8% in SDC Platinum (2016). 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., 2017), market segmentation and illiquidity (Schultz, 2012; Babina et al., 2015; Schwert, 2017), racial bias (Dougal et al., 2019), and many other local characteristics and decisions (Poterba and Rueben, 2001; Levine, 2011; Cornaggia, Hund and Nguyen, 2019). The choice of financial intermediaries affects borrowing costs and these agents are often chosen poorly 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 through directly changing the structure of municipal bonds, through their different abilities to find underwriters, and through their reputations for working with municipalities to create successful issues (Clarke, 1997; Allen and Dudley, 2010; Liu,

⁵Bolton, Freixas and Shapiro (2007) creates a stylized model of conflicts of interest for financial firms selling different goods. Financial advisors can give worse advice by directing consumers to purchase the product they manage instead of the product that is best for the customer.

2015; Moldogaziev and Luby, 2016; Bergstresser and Luby, 2018; Daniels et al., 2018).

This study adds a novel finding to the municipal finance literature that conflicting financial incentives of advisors also negatively affect outcomes for municipal bonds. Further, the decrease in borrowing costs is driven by an increase in market competition in the imperfectly competitive municipal bond underwriting market.

This paper proceeds as follows. Section 1 describes the municipal bond issuance process, the involvement of the financial advisor, and the context surrounding the change in MSRB Rule G-23 while Section 2 discusses the data that are employed in the analysis. The empirical design is described in Section 3 along with several robustness checks, alternative identification strategies, and heterogeneity of treatment effects. Channels behind the observed effect are described and measured in Section 4. Section 5 concludes.

1 Financial Advisors and MSRB Rule G-23

Municipalities issue over \$400 billion dollars of bonds each year to finance public goods such as water treatment plants, schools, and other services that require large up-front investments. The municipal bond market currently has \$3.7 trillion of debt outstanding, making interest payments on this debt one of the largest public expenditures for state and local governments—paid for with tax dollars. Many of the investments financed by municipal debt raise property values and tend to be associated with other positive economic outcomes (Adelino, Cunha and Ferreira, 2017; Cellini, Ferreira and Rothstein, 2010). However, several characteristics of the market for municipal bonds raise borrowing costs. First, the market to hire underwriters is not perfectly competitive (Garrett et al., 2017). Second, municipalities often lack the financial sophistication to navigate the bond-issuing process on their own because they issue debt infrequently in a fragmented market (U.S. Securities and Exchange Commission, 2012; Schultz, 2012; Bergstresser and Luby, 2018). This study examines the interaction between municipalities that sell bonds and the financial advisors they hire to interface with financial markets.

A city that wishes to invest in a new public project is likely imperfectly informed about the demand for their debt from final investors and other market factors that may influence the cost of their debt. To solve this lack of information, the city hires a municipal financial advisor (henceforth, “advisor”). The advisor helps an issuer develop a financial plan to raise funds through a bond offering or other debt instrument and then how they will pay for it. After a municipality decides to issue debt, the advisor helps structure the debt and makes a plan to find an underwriter who will certify the debt issue and sell the debt to investors on a secondary market. The underwriter is responsible for certifying the quality of the bond issue to the financial markets and then for selling the bonds to investors or other broker-dealers. Before 2011, advisors could follow three paths to find an underwriter: (1) Post a Request for Proposals (RFP) to find an underwriter willing to negotiate a price, (2) Host a first-price, sealed bid auction to solicit bids in interest costs for underwriting privileges (and the advisor could bid), or (3) Offer to underwrite the bond issue directly.

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 issues they advised before 2011. The underwriter and municipality have different and potentially opposing goals when issuing debt: the municipality wants a low interest cost but the underwriter wants higher profits, which increase with interest costs (holding investor demand and other factors constant). [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, Chairman of the Securities and Exchange Commission, May 7, 2010

The process of issuing municipal debt 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. In response to the financial crisis, Congress passed the Dodd-Frank

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

The first new regulation from MSRB after Dodd-Frank was a restatement of Rule G-23, which previously gave guidelines for financial advisors to provide transparency and clarity to issuers regarding the advisor's contractual role. On May 31, 2011, MSRB announced final language 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.

2 Municipal Bond Market Data and Outcomes

I use four datasets to examine the primary and secondary markets for municipal bond issues in granular detail.

The first and primary dataset is the SDC Platinum Global Public Finance database (SDC Platinum, 2016). SDC lists all municipal bond issues with a full description of the specifics of the issue. The data include the sale date, the size of the principal, an account of individual bonds in each bond issue with individual coupons, maturity dates, CUSIP numbers, and many other bond characteristics. See Appendix A for definitions of all variables from SDC. These data provide the basic information to estimate a pricing model of municipal bond issues in the primary market, but they do not include additional information about the financial intermediaries involved or about participation in competitive sales beyond the names of the financial advisor and underwriter.

In order to closely examine primary market competitive issues of municipal debt with dual

advisors, I match the SDC data with auction results from [The Bond Buyer \(2016\)](#). 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 BondBuyer 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 in nominal USD, those funded by general obligation,⁶ issues that employ an advisor,⁷ and those with federal tax exemption to find a final set of 20,051 auctions, of which 5,735 employ dual advisors.

The third dataset provides a description of networks of municipal advisors, investment banks, and financial holding companies that provide municipal underwriting developed by [Bergstresser and Luby \(2018\)](#). This list allows me to identify municipal advisors in the SDC data that are associated with an underwriting entity. Many advisors are associated with an underwriting entity, so the firm can offer both services to a municipality. I call such advisors who also offer broker-dealer services through another arm of the same business “dual advisors.” 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. Any advisor who is associated with a firm that underwrites municipal bonds that they advise from 2008-2011 is considered a dual advisor for the remainder of the sample. Four investment banks have advising arms but never underwrite the debt they advise. The advising branches of these firms are used in a placebo test

⁶Bonds back 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 will be used to pay off the debt if the project does not generate revenue of its own.

⁷Restricting on having an advisor eliminates many 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. However, the empirical results are not sensitive to this sample construction decision.

that shows no treatment effect for advisors who never engaged in dual advisor behavior.⁸

I manually merge the financial advisor data from [Bergstresser and Luby \(2018\)](#) with the SDC platinum data to identify bond issues sold using the services of a dual advisor. Figure 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 issued more than 2,000 bonds between January 1, 2008 and November 27, 2011 according to [SDC 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%.

The market for municipal financial advice is made up of many types of firms, from companies that operate on very large scales with 500 competitive issues per year down to advisors that advise less than one issue per year on average. The 15 largest dual advisors from 2008 to 2011 are shown in Table 1. The largest of these advisors is FirstSouthwest, which merged with Hilltop and Southwest Securities in 2014. Before the 2011 reform, FirstSouthwest advised almost a third of the observed dual advisor issues with 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. The associated investment banks also vary in how often they bid on issues they advised. FirstSouthwest bids in 49% of issues they advise, very close to the average, while other major dual advisor UniBank Fiscal Advisory Services only bid in 15.5% of the issues that they advised.

Figure 2 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 (32.3% of the time they bid), which is a rate slightly more

⁸See Appendix C.3 for more information and results of the placebo test.

than random chance probabilities implied by a $1/N$ win rate of 29.8% where N is the number of auction participants. In 2012, dual advisors are no longer allowed to bid and the underwriting rate for these advisors drops to zero. Discussion of consistent market share and sale type are discussed in Appendix B.

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 trade was to a final investor or a broker-dealer.

2.1 Selecting a Dual Advisor for a Particular Competitive Sale

With data on a large number of competitive bond issues in the US from February 2008 to December 2015, I examine what sort of issuers choose to hire dual advisors and what sort of issues dual advisors may specialize in. Issuers that select dual advisors are different than other issuers, but there is no selection on observable characteristics within each issuer. I begin by estimating a linear probability regression explaining the choice of dual advisor for each bond issue,

$$\mathbb{1}\{dual_{ijt} = 1\} = \eta_t + X_{ijt}\beta + \varepsilon_{ijt}, \quad (1)$$

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 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 3 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 B2. Without any control for issuer type or geographic location, decreasing the size of an issue by one standard deviation is associated with a 3.1 percentage point decrease in the likelihood of using a dual advisor. Similarly, longer lasting bonds—as measured by standard deviations of years to maturity at issue—are associated with a 9.5 percentage point increased chance of choosing a dual advisor. Refunding issues, issues with credit enhancements like bond insurance, and issues from more competitive issuers are more likely to be issued using a dual advisor. The definition for more competitive issues in this case is “leave-out competition,” or average number of bids solicited from underwriters for other issues by the same issuer normalized to standard deviations. In the other direction, bonds with ratings, callable bonds, bonds issued by school districts, towns, cities, and counties are less likely to employ a dual advisor than the omitted category including states, state agencies, and special districts.

The results from the regression without any geographic controls suggests that municipalities select advisors based on characteristics of issues. Figure 3 shows that variation is primarily explained, but not fully explained, when state fixed effects are included. 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, and the effect of competition where less competitive issuers within states are those choosing to use dual advisors. Further, the issues from issuers with more auction participation on average also less likely to choose dual advisors after controlling for state differences, reversing the overall effect.

Finally, Figure 3 shows estimates of Equation 1 using issuer fixed effects. In this specification, variation 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.

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 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 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.

3 Borrowing Costs After Regulating Conflicts of Interest

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):

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

where b_1 is the winning bid, which is measured as the true interest cost. Subscript i indicates the issue,⁹ 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 baseline controls include issuer fixed effects, year fixed effects, and controls for state economic conditions and fiscal policies.¹⁰ Additional specifications add controls for market conditions, fixed effects for refund status, fixed effects for callable bonds, a control for natural log of size that is allowed to vary by year, flexible time trends for different types of municipal entities, and fixed effects for three bond maturity bins¹¹. 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 based on 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 are shown in Figure 4. This figure highlights the difference-in-differences assumption of parallel trends in the raw 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 way in the preperiod.

⁹In the case of municipal bonds between 2008 and 2015, the issue is usually a set of individual bonds issued in series.

¹⁰The 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.

¹¹One of the margins that

The primary estimates of α and β from Equation 2 using the winning bid (true interest cost) as the dependent variable are shown in Table 3. The question the first regression answers is whether the policy-relevant outcome—borrowing costs—change 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 baseline results 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.¹² 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 issues with independent advisors.

The primary identifying assumption behind this result is that 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 intrinsic to the bond issue that could conceivably drive this result.

The second column of Table 3 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 the fact that different advisors may have 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 issuer type—school districts, counties and special districts, states and state agencies, townships, cities, and other issuers—interacted with year fixed effects. The trends are intended to capture 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

¹²Issues 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.

as the Rule G-23 reform. However, the inclusion of flexible time trends does not have a material effect on the estimates.

Column (4) of Table 3 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 refund status of the bond,¹³ a control for the natural log of the dollar value of the principal 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 are able to influence the time to maturity as I will show in Section 4.1, which makes precise fixed effects for time to maturity bad controls.¹⁴ My preferred estimates in column (5) indicate that borrowing costs for dual advisor issues fall by 11.4 bp (p-value<0.001), which is 5.3% on average in the sample, relative to the interest costs for comparable issues with independent advisors. This result is very stable across specifications, suggesting that observable changes in bond characteristics and other market trends are not driving results.

The event study with annual coefficients associated with the specification in column (5) of Table 3 is shown in Figure 5. The graph is 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.¹⁵ In the pre-period, dual advisor issues were consistently slightly more expensive than issues with independent advisors, and there is a drop of 10 basis points immediately in 2012. The following

¹³The primary categories for this variable are refunding, advanced refunding, and new money.

¹⁴Several other potentially natural controls that could influence borrowing costs are not included because they are also bad controls. As found by Clarke (1997), advisors can influence many characteristics that could be useful for controlling for time variant issuer-specific shocks, particularly credit ratings. I do not include controls for credit rating or credit enhancements in the baseline specification because these are margins over which dual advisors can change behavior as shown in Section 4.1. 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 likely show up in the pretrends during 2008 and 2009 when markets were much more volatile. However, to 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 Appendix C.2.

¹⁵Dates after November 26, 2011 are combined with 2012, since the updated MSRB Rule G-23 came into effect on November 27, 2011.

years in the post-reform period show borrowing costs continue decreasing for dual advisor issues with estimates ranging from -6 basis points in 2013 to -22 basis points in 2015. Figure 5 also serves as an informal check to the assumption of parallel trends. The graph visually shows that there are no observable pre-trends in the treatment effect of hiring a dual advisor instead of an independent advisor since the pre-period estimates are all within 3 basis points of each other. Further, 2008 to 2010 were very volatile years for municipal bonds in general, and the lack of differential trends in those years shows that general market unease does not affect dual advised and independently advised issues differently.

The preferred results are robust across specifications. In Appendix C.1, 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. Appendix C.3 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. Finally, Appendix C.2 discusses the selection of the sample by showing results are unchanging when dropping issuers who don't stop using dual advisors after the regulation.

The following subsection describes the heterogeneity of the primary borrowing cost results by average number of underwriters at the issuer level and by issuer "sophistication" as proxied by the issuer type.

3.1 Treatment Effect Heterogeneity

A marginal underwriter submitting a bid for business has a larger affect on lowering costs if the underwriter is the second bidder instead of the tenth bidder. MSRB Rule G-23 takes the advisor out of the pool of potential underwriters, which municipalities and industry groups worried would

decrease competition for dual advisor bonds on the primary (underwriter) market. One may expect the effect of restricting municipal advisors' ability to underwrite to manifest differently in markets that are relatively less competitive.¹⁶ To examine this potential relationship, I split bonds into bins based on market competition.

To define market competition, I reintroduce the concept of "leave-out competition," or average underwriter competition for other issues by the same issuer, and separate the sample half based on leave-out competition. The low competition issues come from issuers who have one to five underwriters competing for business, while the high competition issues come from issuers who have between five and 16 underwriters bidding in their auctions on average. The measurement of underwriter competition based on leave-out competition eliminates part of the endogeneity problem of auction participation being a function of advisor choice.

I estimate the difference-in-differences regression from Equation 2 while adding interactions for relative underwriter competition split at the median. Panel A of Figure 7 shows that the low competition issuers are the ones for whom borrowing costs are actually decreasing. Low competition issues with dual advisors see a 22 basis point decrease in borrowing costs while high competition issues with dual advisors see an insignificant decrease in borrowing costs relative to similar bond auctions with independent advisors.

Municipal issuers range in terms of size of the entity from states and state agencies to school districts. Given the importance of municipal bonds for public school buildings in much of the US, school bonds make up 41% of the sample of bonds used in this study. School districts, in particular, issue much less frequently than other municipalities, 4 times on average instead of 6 in the rest of the sample, and 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 this sample, school districts pay an average interest cost of 226 basis points while non-school districts only pay 210 basis points on average. On average, school districts are less financially sophisticated issuers than other types of municipalities and this shows in their worse borrowing outcomes.

¹⁶Garrett et al. (2017) show that additional underwriter competition has the largest effect on borrowing costs in bond sales where there are relatively few expected underwriter bidders.

Panel B of Figure 7 shows the difference-in-differences treatment effect split by school districts and non-school districts. Dual advisor issues from school districts experience the largest drop in borrowing costs—29 basis point, or 12.8% on average. Other issuers don't have any change in borrowing costs around regulation.

Given that it is low competition issuers, and school districts in particular, that are experiencing the decrease in borrowing costs, the next section explores the effect of updating MSRB Rule G-23 on auction participation by potential underwriters.

3.2 Underwriter Competition

The largest concern of [Bond Dealers of America \(2019\)](#) is that removing the dual advisor from the set of potential underwriters will decrease competition 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 competition is decreasing, the policy-relevant outcome is improving for municipalities. However, if competition is also decreasing then it may indicate that the policy of prohibiting advisors from underwriting is potentially not the most effective way of limiting this particular conflict of interest. Below, I use the difference-in-difference regression stated in Equation 2 to measure the change in auction participation, the number of bids submitted in the underwriter auction, to test what happens to competitive forces in the underwriter market.

I start by using the same controls as above in a regression explaining the number of bids submitted 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. Although there is not an observable set of firms that necessarily make up all potential bidders in the context of municipal bond auctions, I follow the methods of [Roberts and Sweeting \(2016\)](#) and [Athey, Levin and Seira \(2011\)](#). 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. In the municipal bond auctions in this study, I define potential underwriters as all

underwriters who submit bids for bond issues that are in the same state-issuer type bin (i.e. 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.¹⁷ 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 results of the regressions of number of bidder 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 as measured by underwriter auction participation 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 to 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). The median bond issue has five underwriters submit bids to buy underwriting privileges, so an increase of 0.42 underwriters represents a 8.4% increase in the number of underwriters competing for business. Not only is auction participation not decreasing when the advisor is removed from the set of potential bidders, but underwriter competition increases such that dual advisor issues and independent advisor issues have the same amount of underwriter competition after the reform.

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 5. Bonds with dual advisors have 1.03 to 1.06 less 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% level in all specifications and represents a 17.6% increase in the number of non-advisors

¹⁷The 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 the bond.

ving for underwriting business. Figure 6 showcases an event study version of the preferred specification in column (5) of Table 5 that is normalized such that the effect 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.

Underwriter market competition is increasing after the reform because the competition that would have been coming from the advisor is totally replaced and then some by additional competition from non-advisors. This increase in competition is a driving force for lowering municipal interest costs through regulating the conflict of interest from dual advisors.

The following section explores potential mechanisms for why competition is increasing when a potential market participant is no longer allowed to submit bids. First, I show that bonds with dual advisors become more standardized on a variety of margins as dual advisors encourage issuers to use credit ratings and credit enhancements at rates similar to independent advisors. This increased standardization leads to improved secondary market liquidity, which is consistent with more underwriter competition and with lower borrowing costs. Second, I show that non-advisor underwriters had a disadvantage in auctions with dual advisor participants before the regulation. Non-advisor underwriters receive lower profits when bidding against informed advisors—evidence of the winner’s curse. And finally I show that hiring a dual advisor does not lead to having a better underwriter in terms of more accurate pricing in secondary markets.

4 Evidence of Multiple Channels for Conflict of Interest

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% on average, driven by an increase in competition

from other underwriters despite scope for unintended consequences of harming competition in an already imperfectly competitive market. The increasing competition has the most benefit for low competition issuers who experience borrowing costs for dual advisor issues decrease by nearly 15 basis points.

The question remains, why is the updated version of MSRB Rule G-23 particularly effective at limiting the negative effects of the conflict of interest that arises from dual advising and underwriting without harming competition? In the remainder of the paper, I enumerate three channels through which the regulation could affect the market and borrowing costs. I discuss how each affects the efficacy of the regulation: (1) dual advisor bonds are less standardized and much less liquid in secondary market trading in 2008-2011 and this effect dissipates after regulation, (2) non-advisor underwriters who outbid advisors for business in the pre-period have relatively lower gross spreads—evidence of the winner’s curse, and (3) underwriter quality as measured by average underpricing is unchanging around the regulation.

4.1 Bond Standardization and Increased 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 portfolio. 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 make it harder for investors to correctly judge the quality of the asset or to accurately price such bonds.

I estimate the change in bond structure on several margins for dual advisor issues around the update of MSRB Rule G-23 using the regression described in Equation 2. First, I estimate changes in bond package characteristics for the characteristics used in Equation 2. The estimates for 5 of these outcomes are shown in Table 6. Column (1) shows that dual advisor issues on the whole are

decreasing the number of years to maturity, and further that the effect is really concentrated among school districts. School district bonds with dual advisors have 1.13 more years to maturity in the pre-period, but the length decreases by 0.76 years on average (p-value 0.023) in the post-period. Similarly, dual advisor issues are more likely to have credit ratings after regulation¹⁸ and also more likely to use credit enhancements, with both effects being concentrated in school districts. I find no evidence of changes in the average size of issues or in the use of other financial controls like call provisions.

Table 7 presents estimates for 4 outcome variables on characteristics not included in Equation 2. The first outcome is whether a bond has a maturity for a common number of years. Most bonds have maturities in multiples of 5: 5, 10, 15, 20, 25, or 30 years.¹⁹ 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.

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 measure a sufficient statistic for the general desirability of buying a bond: secondary market liquidity.²⁰ Asset liquidity is important in the municipal bond market where transactions with investors are done over-the-counter (OTC) by registered broker-

¹⁸This credit rating result is consistent with findings from [Clarke \(1997\)](#) who finds dual advisor issues are less likely to have credit ratings in Texas.

¹⁹The outcome also include bonds with 1 year maturities.

²⁰The 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.

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 develop an accessible measure of liquidity in the municipal bond market.²¹ 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. The difference between the lowest observed price and highest price will be closer together for more liquid assets. I use the [Municipal Securities Rulemaking Board \(2019\)](#) EMMA database to define average prices for investor purchases relative to investor sales.²² On average in this sample, municipal bond investors pay \$1.30 more for each \$100 of par value to purchase a bond than they receive when they sell it back to the broker-dealer. I refer to this gap as the buy-sell spread.²³

Regression estimates of the buy-sell spread on advisor type using the difference-in-differences design described in Equation 2 are shown in Table 8. These regressions are estimated at the bond level instead of the bond issue level in order to add controls for bond maturity in years and bond coupon rate in percentage points. Consistent with [Schwert \(2017\)](#), longer maturity bonds are less liquid with one additional year of maturity increasing the buy-sell spread by \$0.093. Conditional on all bond package observables, a 1 percentage point increase in coupon rate decreases the buy-sell spread by 15.2 cents. Notably, dual advisor issues are less liquid (higher buy-sell spread) before 2012, but such issues see an increase in liquidity after MSRB Rule G-23. The liquidity increase is comparable in effect size to increasing the coupon on each bond in the package by 1 percentage point or to decreasing the maturity of each bond by 1.5 years. The buy-sell spread for dual advisor issues drops by 12.8 cents, significant at the 10% level, in the post-reform period

²¹[Schestag, Schuster and Uhrig-Homburg \(2016\)](#) and [Schwert \(2017\)](#) use variations of the same measurement concept.

²²The average municipal bond in this sample trades less than ten times in the first full year after issue, which does not allow me to measure 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 more. Average buying and selling prices for investor trades are pooled for the remaining 11 months because trades are infrequent.

²³The buy-sell spread is very similar to the price dispersion measure included as part of the estimated liquidity spread in [Schwert \(2017\)](#) without estimating a consensus valuation around which dispersion is centered.

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 8. This comparison shows that the bonds issued after regulation of dual advisors have less price dispersion than bonds issued with the same advisors in the pre-period that are trading at the same time. This indicates 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 2 complementary effects on municipal issuer: (1) borrowing costs decrease directly because secondary market investors are willing to pay more for bonds, and (2) more underwriters will compete for underwriting privileges in first stage auctions because the bonds will be easier to sell.

4.2 Winner's Curse and Asymmetric Information in Auctions

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 are not revenue maximizing for the seller (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 underwriters, then any other underwriter who wins the auction will have lower *ex post* profits—evidence of the winner's curse. 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:

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

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, a control for natural log of size that is allowed to vary by year, credit rating fixed effects, financial market indices, fixed effects for use of funds, and flexible trends for different issuer types.²⁴

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.²⁵ 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 9. $\hat{\beta}_1$ 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 3.5 basis points lower if they win an auction against a dual advisor. This is representative of 6% decrease in profits relative to the mean gross spread of 56.7 basis points.²⁶

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

²⁴Issuer fixed effects are omitted because there is insufficient identifying variation in whether an advisor bids and wins within the same issuer for identification.

²⁵Only 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.

²⁶These 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 “initial price,” which is not always very close to the price at which bonds are actually sold. Yields on the first trade 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 3. After the informed advisor is taken out of the auction, the other potential underwriters are more likely to enter the auction and compete. Further, Appendix C.2 shows that all participating underwriters, including the losing underwriters, bid more aggressively for dual advisor bonds after the regulation.

4.3 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 10. 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.

5 Conclusion

Municipal financial transactions are not immune from the conflicts of interest that are pervasive in other financial markets. 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 negatively affects municipalities. Removing the ability to both advise and underwrite the same municipal bond issue decreases municipal borrowing costs by increasing competition among 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, they scare away other potential underwriters, and they do not increase the quality of underwriting in terms of secondary market underpricing.

These results inform how conflicts of interest can be thought about in other markets as well. Restricting the ability of advisors to underwrite changes the design of bonds dual advisors create as shown through increased standardization and liquidity in secondary markets. This is consistent with an increase in the quality of advice. Also, the fear of unintended consequences described in [Bond Dealers of America \(2019\)](#) are unfounded in this market. Allowing advisors to operate in both the advising and underwriting markets hurts competition in the underwriting market by deterring less-informed underwriters from competing for business. Removing the advisor has the unintended consequence of increasing competition from other sources and drives down borrowing costs for municipalities.

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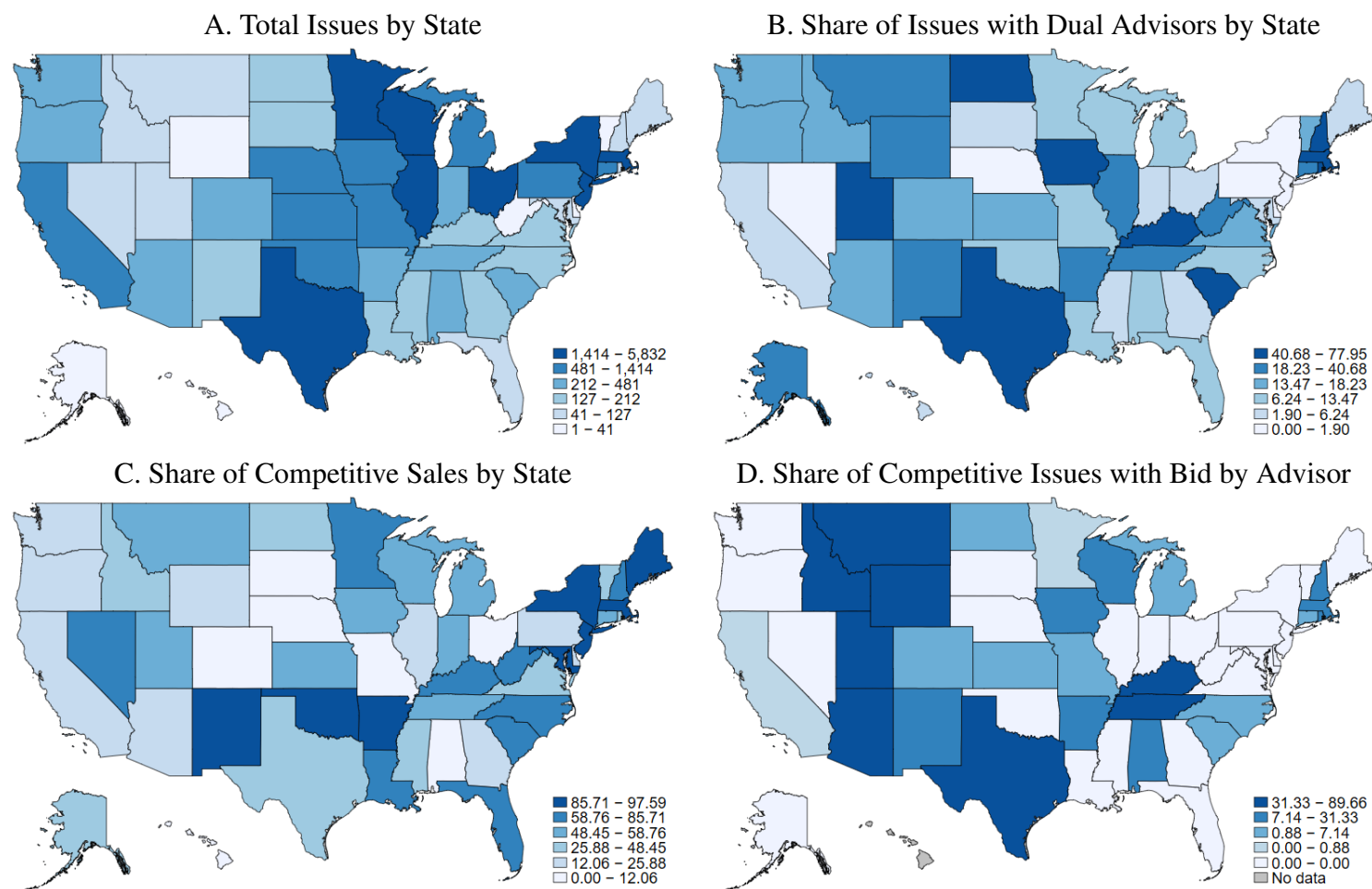
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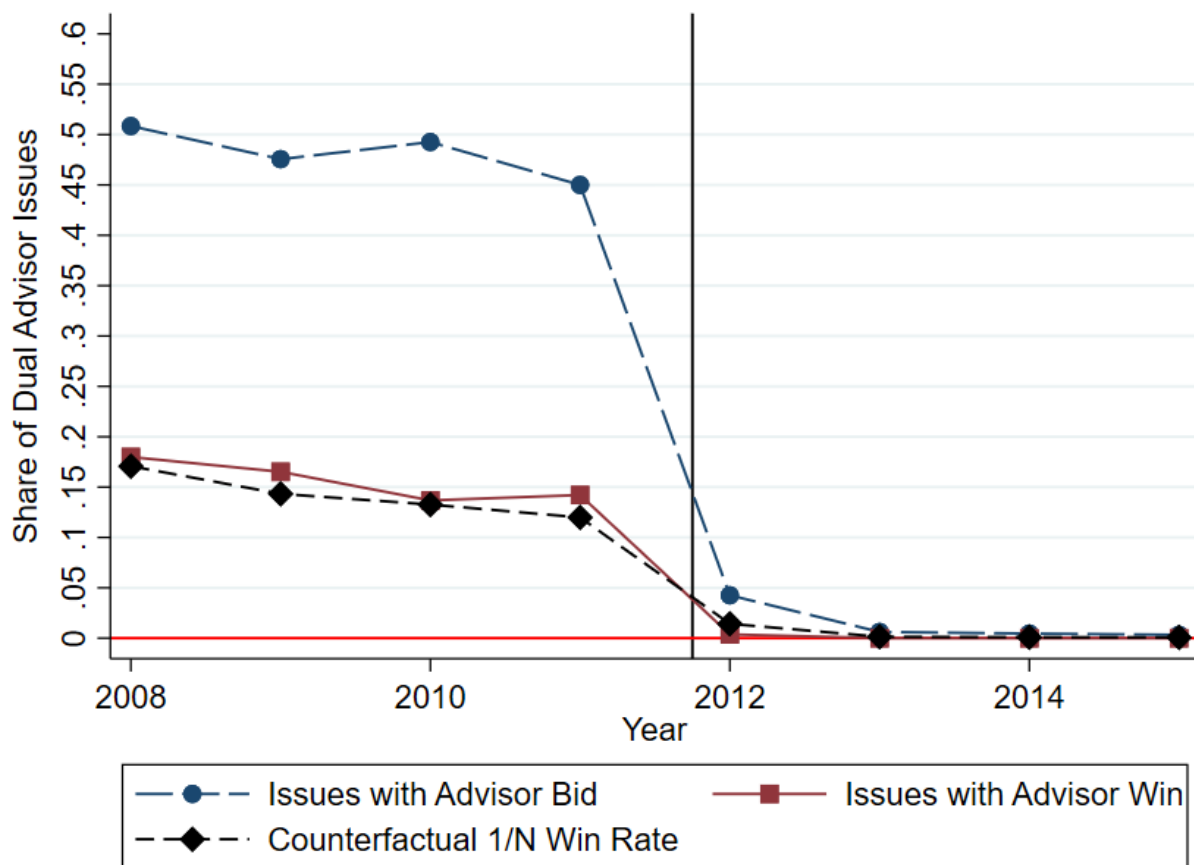
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Figure 1: Geographic Distribution of Bond Sales, Dual Advisors, and Competitive Sales



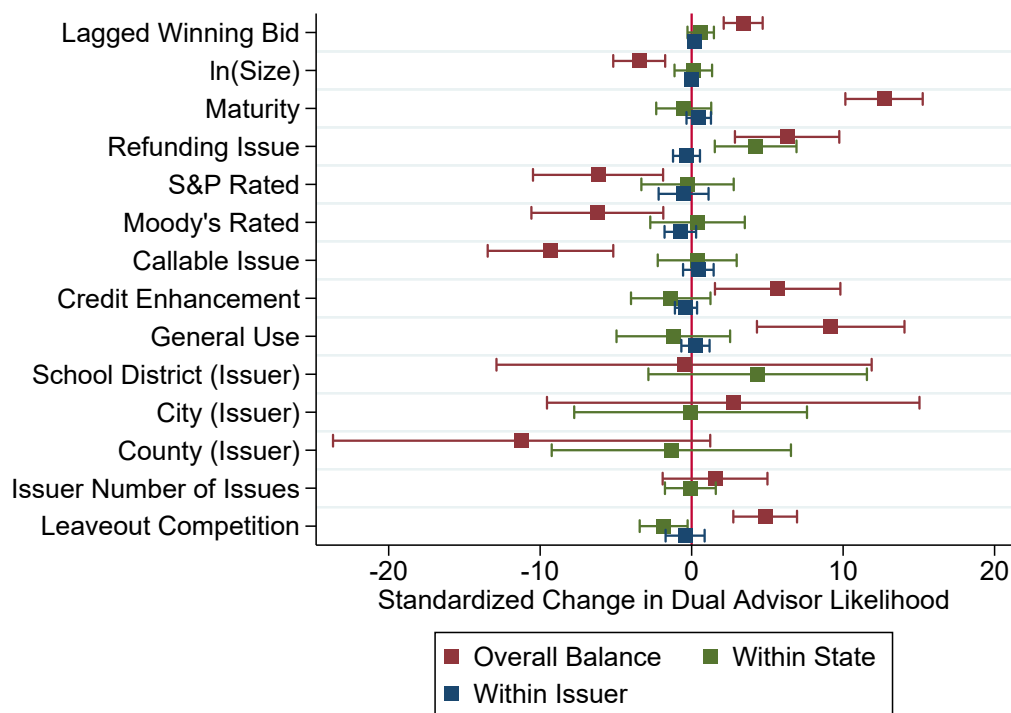
Note: Author's calculations using data from SDC Platinum. This figure tabulates four moments from the SDC Platinum Global Public Finance data from January 1, 2008 to November 26, 2011 for all sales of any size and type. Panel A displays the total number of issues observed in each state. Panel B shows 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 2 for more information and discussion.

Figure 2: Share of Dual Advisor Issues with Advisor Participation



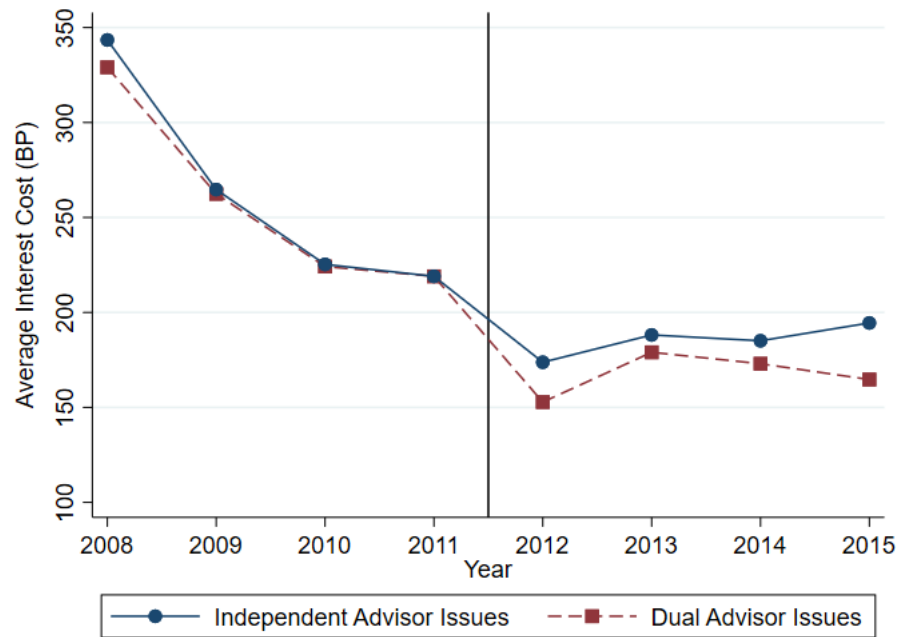
Note: Author’s calculations using data from [SDC Platinum \(2016\)](#), [The Bond Buyer \(2016\)](#), and [Bergstresser and Luby \(2018\)](#). This figure tabulates average shares of dual advisor auctions that have a bid from the dual advisor from 2008-2015. Before November 27, 2011, dual advisors were 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 2 for more information and discussion.

Figure 3: Linear Probability Estimates Explaining Dual Advisor Choice, 2008-2011



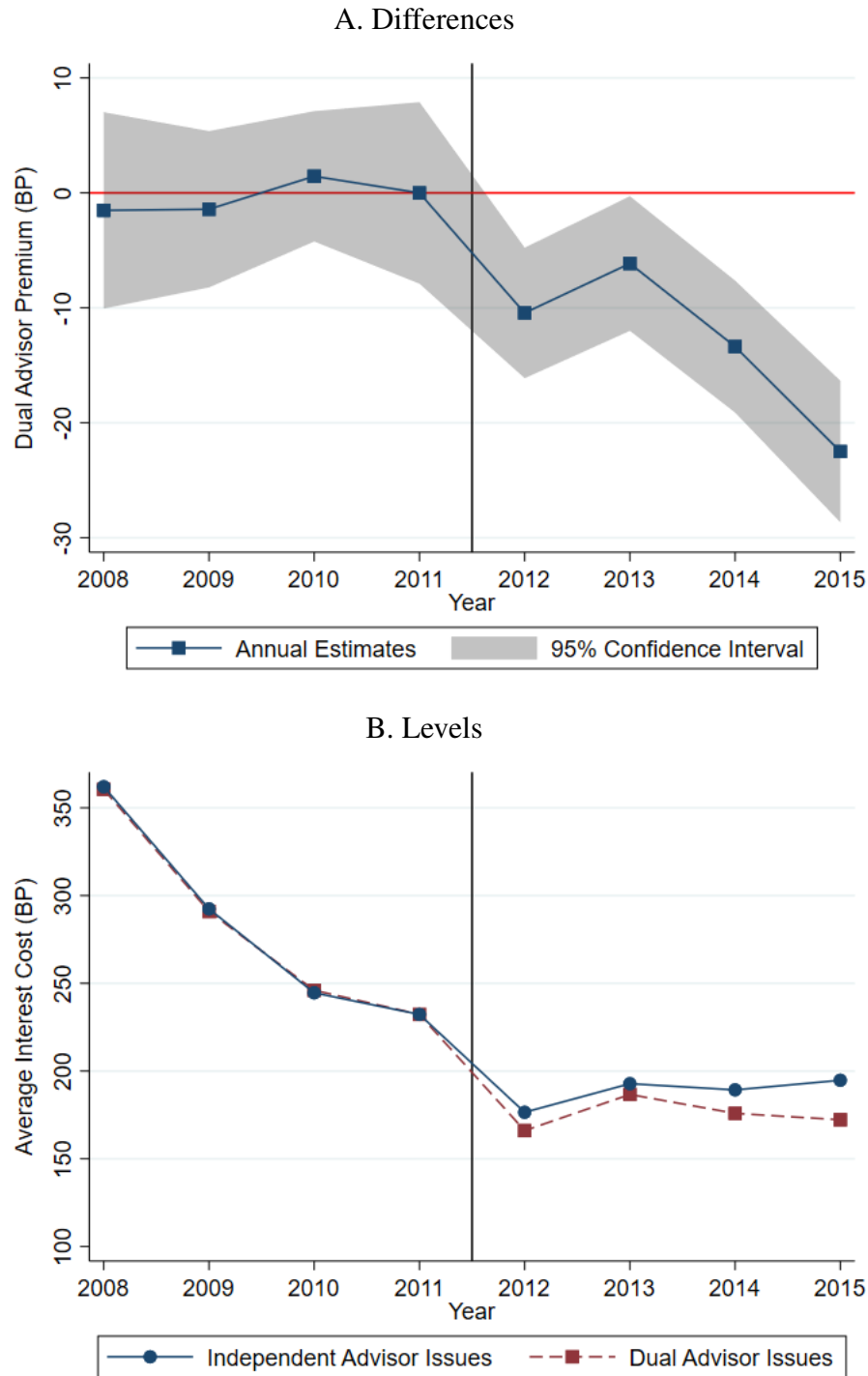
Note: Author’s calculations using data from [SDC Platinum \(2016\)](#), [The Bond Buyer \(2016\)](#), and [Bergstresser and Luby \(2018\)](#). This figure plots the point estimates and 95% confidence intervals from regressions of choice of dual advisor on issue and issuer characteristics for competitive auctions. Characteristics with continuous measurements are normalized to standard deviations. Numerical estimates and additional specifications are available in [Table B2](#). Overall Balance, corresponding to column (1) of [Table B2](#), 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 B2](#), replicates this regression including state fixed effects and 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 B2](#), 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 4: Average Borrowing Cost by Advisor Type



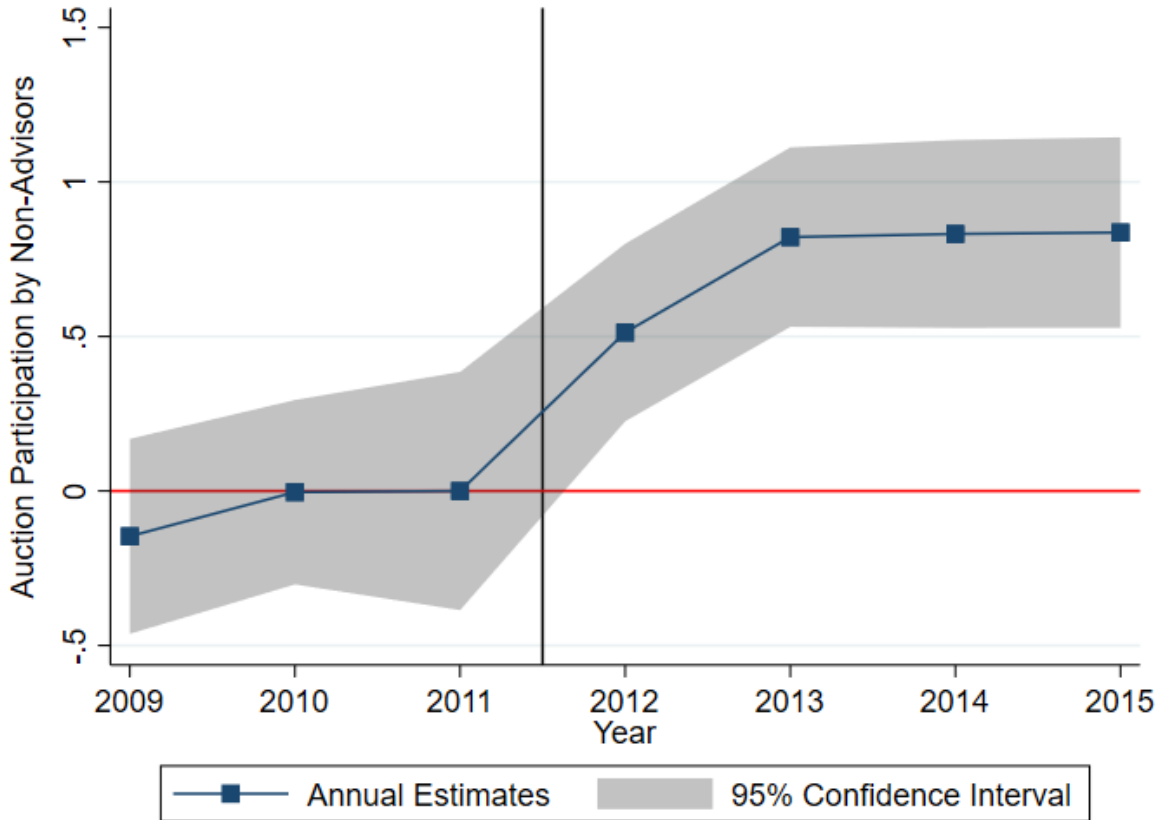
Note: Author's calculations using data from [SDC Platinum \(2016\)](#), [The Bond Buyer \(2016\)](#), and [Bergstresser and Luby \(2018\)](#). This figure reports the annual average borrowing costs for dual advisor issues and independent advisors. The borrowing costs are residualized by removing issuer 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 3 for more information and discussion.

Figure 5: Treatment Effect of Dual Advisor on Winning Bid (Basis Points)



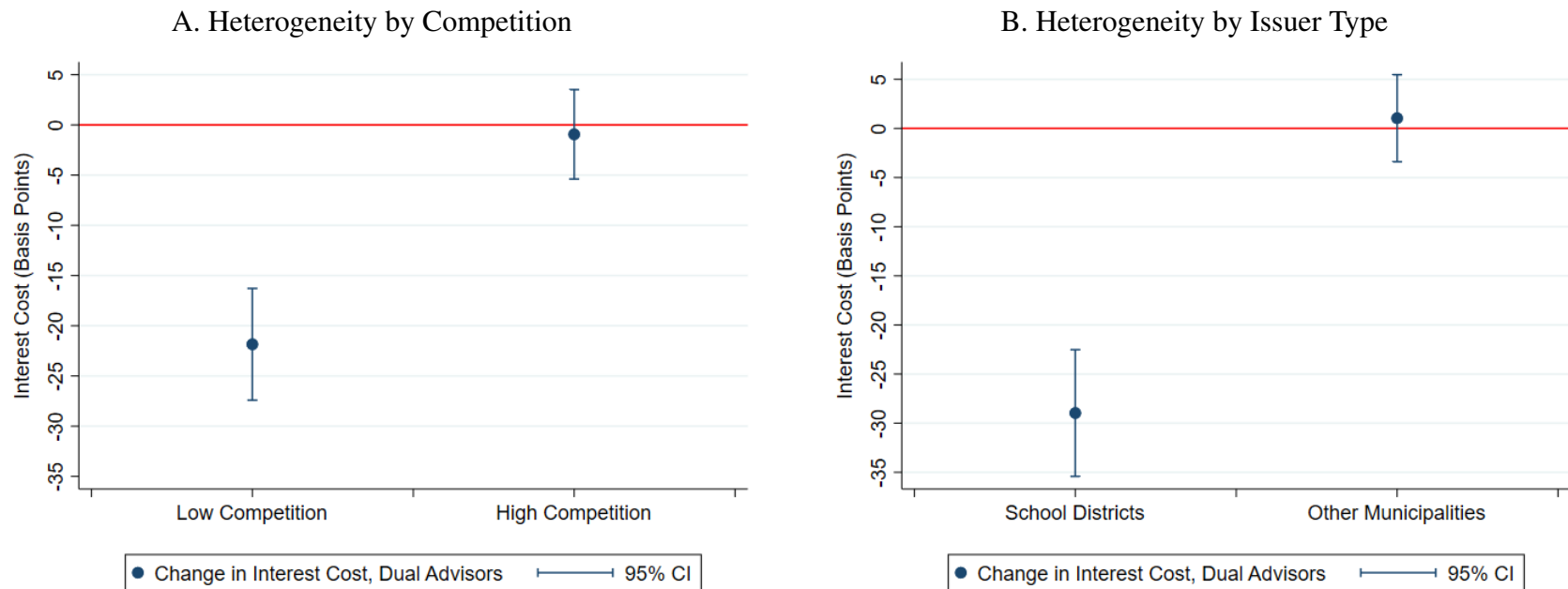
Note: Author’s calculations using data from [SDC Platinum \(2016\)](#), [The Bond Buyer \(2016\)](#), and [Bergstresser and Luby \(2018\)](#). This figure reports the annual effects of having a dual advisor on borrowing costs in basis points as estimated by equation 2. The graphs are scaled such that the mean effect in 2011 is zero. The specification reported in this figure corresponds to column (5) in Table 3 using all controls. See Section 3 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 Number of Non-Advisor Auction Participants



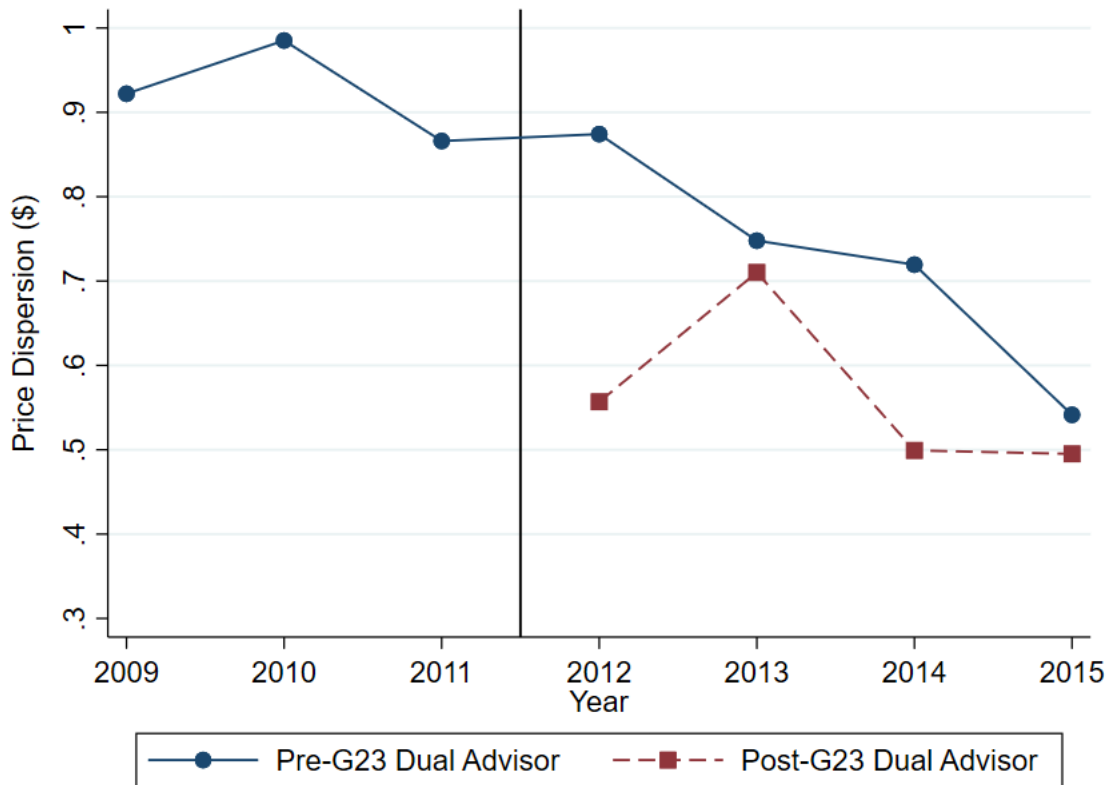
Note: Author’s calculations using data from [SDC Platinum \(2016\)](#), [The Bond Buyer \(2016\)](#), and [Bergstresser and Luby \(2018\)](#). This figure reports the annual effects of having a dual advisor on the number of non-advisor underwriters competing for underwriting business in competitive municipal 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 3 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 by Competition



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 changes in borrowing costs in both panels as estimated by equation 2. The specification reported in this figure corresponds to column (5) in Table 3 using all controls with additional interactions with leave-out competition and issuer type. Low competition bonds are those bonds issued by issuers who have 5 or less underwriters competing for underwriting business on average. This figure highlights that the decrease in borrowing costs is driven by low competition issues where the marginal increase in underwriter competition would have a larger effect on borrowing costs. Further, school districts, which are relatively less financially sophisticated issuers, are driving the treatment effect. See Section 3.1 for more information and discussion. Standard errors are clustered at the issuer level and 95% confidence intervals are included.

Figure 8: 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 4.1 for more information and discussion.

Table 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 Sinclair & 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 2.

Table 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 from [SDC 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 2.

Table 3: Regression of Primary Market Winning Bid on Advisor Type

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	6.085 (6.667)	5.248 (6.637)	5.314 (6.621)	7.308 (4.845)	3.764 (3.804)
Dual Advisor X Post	0.361 (3.453)	0.429 (3.425)	0.422 (3.424)	0.132 (2.720)	0.323 (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 aggregated into terciles. See Section 3 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 4: Regression of Primary Market Auction Participation on Advisor Type

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	-0.647 (0.166)	-0.643 (0.167)	-0.614 (0.169)	-0.616 (0.166)	-0.612 (0.166)
	0.000	0.000	0.000	0.000	0.000
Dual Advisor X Post	0.448 (0.087)	0.445 (0.087)	0.462 (0.088)	0.426 (0.086)	0.423 (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 aggregated into terciles. See Section 3 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 5: Regression of Primary Market Auction Participation by Non-Advisors on Advisor Type

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	-1.064 (0.169)	-1.060 (0.171)	-1.033 (0.173)	-1.033 (0.170)	-1.030 (0.170)
	0.000	0.000	0.000	0.000	0.000
Dual Advisor X Post	0.906 (0.086)	0.903 (0.086)	0.920 (0.087)	0.883 (0.085)	0.880 (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 aggregated into terciles. See Section 3 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 6: Regressions of Bond Characteristics on Dual Advisor

	YTM	ln(Size)	Call	Rated	Enhanced
Dual Advisor	-0.216 (0.593)	0.046 (0.052)	-0.016 (0.035)	0.021 (0.014)	0.026 (0.022)
	0.716	0.374	0.641	0.157	0.240
Dual Advisor X Post	-0.067 (0.302)	-0.005 (0.036)	0.022 (0.021)	-0.003 (0.014)	-0.031 (0.013)
	0.825	0.892	0.291	0.830	0.015
Dual Advisor X School	1.178 (0.886)	-0.118 (0.092)	0.017 (0.059)	-0.095 (0.040)	-0.237 (0.057)
	0.184	0.204	0.774	0.017	0.000
Dual Advisor X School X Post	-0.592 (0.439)	-0.055 (0.054)	-0.021 (0.029)	0.058 (0.027)	0.176 (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				

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 shorter, marginally more likely to be rated, and more likely to use a credit enhancement. However, there is not a change in the size of the bonds nor in the use of call provisions. See Section 4.1 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 7: Regressions of Bond Term Structure Characteristics on Dual Advisor

	(1)	(2)	(3)	(4)
Dual Advisor	-0.099** (0.049)	-0.259 (0.222)	0.013 (0.151)	-0.056 (0.053)
Dual Advisor X Post	0.013 (0.027)	-0.126** (0.062)	-0.118* (0.068)	0.045** (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 4.1 for more information and discussion. Standard errors are clustered at the issuer level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Regression of Buy-Sell Spread on Dual Advisor

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	0.209 (0.117)	0.203 (0.117)	0.219 (0.115)	0.187 (0.117)	0.180 (0.117)
	0.075	0.083	0.056	0.110	0.123
Dual Advisor X Post	-0.171 (0.080)	-0.185 (0.079)	-0.191 (0.081)	-0.155 (0.081)	-0.154 (0.081)
	0.033	0.019	0.018	0.055	0.057
Modified Duration	0.067 (0.002)	0.067 (0.002)	0.067 (0.002)	0.065 (0.002)	0.064 (0.002)
	0.000	0.000	0.000	0.000	0.000
Observations	43,549	43,549	43,549	43,549	43,549
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 aggregated into terciles. See Section 4.1 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 9: Regression of First Week Gross Spread on Dual Advisor Bidding Behavior, 2008-2011

	(1)	(2)	(3)	(4)
Dual Advisor	1.607 (1.467)	1.656 (1.466)	1.314 (1.456)	1.409 (1.407)
Dual Advisor Bids	0.273 -1.955 (1.566)	0.259 -2.217 (1.569)	0.367 -2.815 (1.547)	0.317 -3.547 (1.485)
Dual Advisor Wins Auction	0.212 4.989 (1.834)	0.158 5.354 (1.839)	0.069 5.153 (1.843)	0.017 4.627 (1.862)
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 terciles. 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 4.2 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table 10: Regression of Secondary Market Underpricing on Advisor Type

	(1)	(2)	(3)	(4)	(5)
Effect of Dual Advisor on 30-day Underpricing					
Dual Advisor	0.466 (0.331)	0.436 (0.328)	0.291 (0.321)	0.162 (0.322)	0.159 (0.319)
	0.160	0.184	0.365	0.614	0.619
Dual Advisor X Post	-0.077 (0.219)	-0.054 (0.220)	0.113 (0.220)	0.177 (0.220)	0.161 (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 aggregated into terciles. See Section 4.3 for more information and discussion. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Online 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.

<u>Variable name</u>	<u>Definition</u>
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Municipal Securities Rulemaking Board (2019) Variables

<i>Investor Buy-Sell Price Gap</i>	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.
<i>Gross Spread</i>	Interest cost minus average yield in sales to investors in first 7 days of trading.
<i>30-Day Underpricing</i>	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

<i>State Controls</i>	Log of state GDP, log of state spending, income tax rates, and unemployment rates gathered by Garrett et al. (2017) .
<i>SIFMA Swap</i>	Swap rate index for AAA-rated municipal variable rate debt obligations (VRDOs) from SIFMA (2019) .
<i>Swap Rates</i>	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 Additional Description of Dual Advisors

Dual advisors are advisors who operated as both advisors and underwriters on municipal bond issues before 2012. The following are extra exhibits with extra information about dual advisors.

- Table **B1** lists the largest 15 dual advisors by the number of issues they advise from 2008-2015 in the sample of general obligation, tax exempt bonds of over \$1 million issued competitively.
- Figure **B1** shows the market share of dual advisors over time.

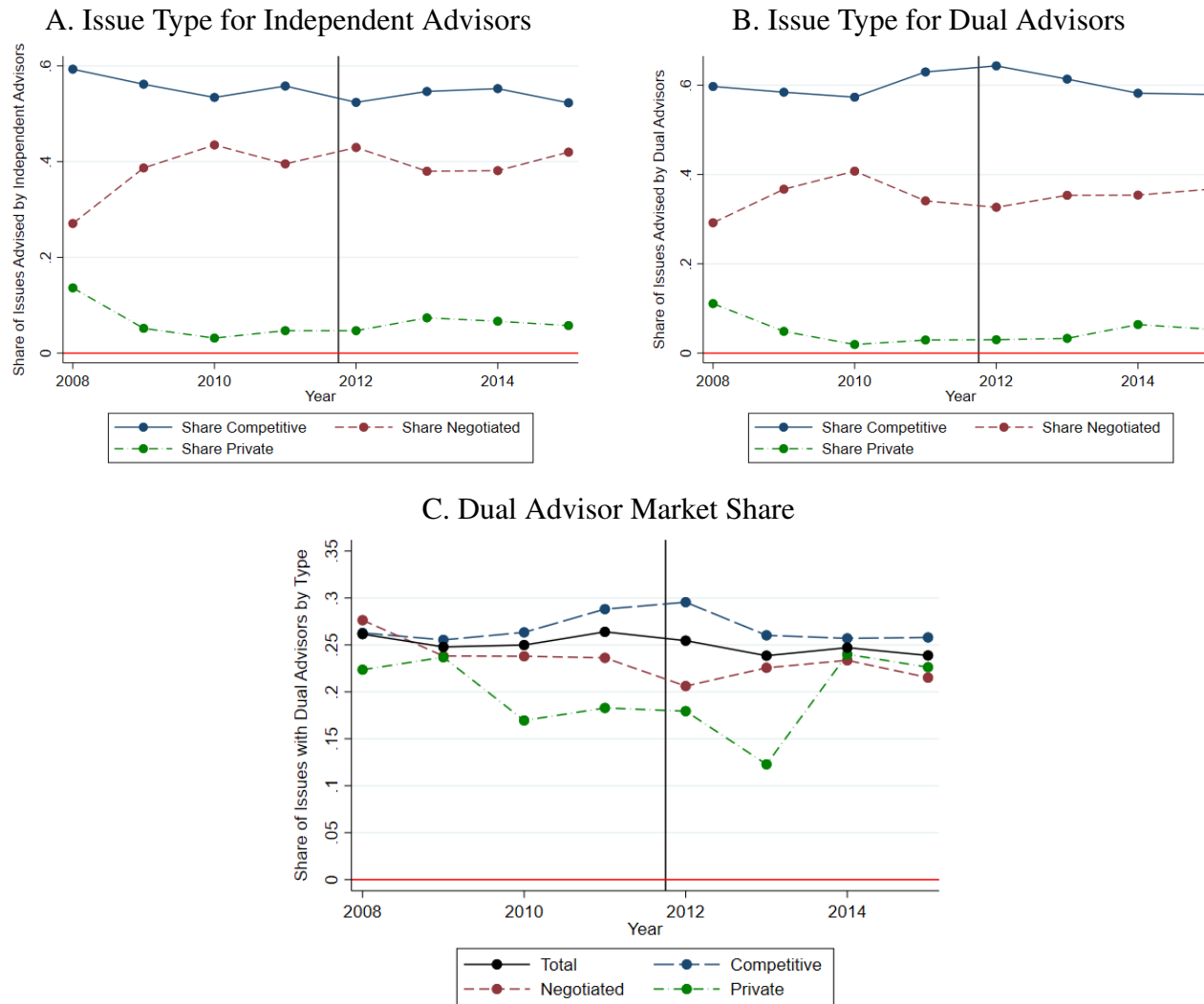
- Panel A of Figure B1 shows the breakdown of the type of bonds that independent advisors work on from 2008-2015. Competitive sales are the object of interest in this study. Negotiated sales are bonds for which issuers and underwriters directly negotiate over the terms. Private placements are bonds placed 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 B1 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.
- Panel C of Figure B1 shows that dual advisors control about 25% of the market throughout the sample for all types of municipal bond issues.
- Table B2 reports the coefficients from a regression of dual advisor choice on bond characteristics as described in Section 2.1.

Table B1: List of Major Dual Advisors, 2008-2011 Issues

Advisor Name	Issues Advised	Bids on Own Issues	Bidding %	Wins on Own Issues	Winning %
FirstSouthwest	1229	602	49.0 %	168	27.9 %
Ross Sinclair & 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. For more information, see Section 2.

Figure B1: 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: 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. See Section 2 for more information and discussion.

Table B2: Probability of Choosing a Dual Advisor Conditional on Observables, 2008-2011

	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Bid	3.403 (0.655)		0.599 (0.445)		0.166 (0.139)	
	0.000		0.178		0.231	
ln(Size)	-3.461 (0.874)	-3.780 (0.790)	0.109 (0.633)	-0.023 (0.584)	-0.026 (0.198)	-0.023 (0.181)
	0.000	0.000	0.863	0.968	0.896	0.897
Maturity	12.700 (1.302)	13.566 (1.233)	-0.522 (0.926)	-0.572 (0.848)	0.469 (0.412)	0.289 (0.326)
	0.000	0.000	0.573	0.500	0.255	0.376
Refund Issue	6.303 (1.757)	3.433 (1.569)	4.226 (1.376)	3.418 (1.217)	-0.340 (0.453)	-0.048 (0.408)
	0.000	0.029	0.002	0.005	0.454	0.907
S&P Rated	-6.179 (2.190)	-5.434 (1.972)	-0.271 (1.554)	0.530 (1.386)	-0.530 (0.840)	-0.202 (0.609)
	0.005	0.006	0.862	0.702	0.528	0.740
Moody's Rated	-6.226 (2.220)	-5.282 (2.006)	0.390 (1.591)	0.659 (1.401)	-0.747 (0.531)	-0.072 (0.450)
	0.005	0.009	0.806	0.638	0.160	0.873
Callable	-9.319 (2.114)	-7.860 (1.962)	0.367 (1.329)	0.258 (1.218)	0.443 (0.514)	0.247 (0.489)
	0.000	0.000	0.782	0.832	0.389	0.613
Credit Enhancement	5.680 (2.111)	4.888 (1.810)	-1.380 (1.338)	-1.052 (1.180)	-0.373 (0.373)	-0.653 (0.319)
	0.007	0.007	0.302	0.372	0.317	0.041
General Use	9.181 (2.483)	8.343 (2.190)	-1.210 (1.912)	-1.264 (1.684)	0.253 (0.475)	0.546 (0.384)
	0.000	0.000	0.527	0.453	0.595	0.156
School District	-0.500 (6.316)	-0.732 (5.857)	4.358 (3.678)	3.567 (3.278)		
	0.937	0.901	0.236	0.277		
City	2.746 (6.271)	-0.272 (5.918)	-0.067 (3.919)	-0.824 (3.504)		
	0.661	0.963	0.986	0.814		
County	-11.224 (6.350)	-11.255 (6.016)	-1.340 (4.027)	-1.091 (3.674)		
	0.077	0.061	0.739	0.766		
Number of Issues	1.546 (1.764)	2.007 (1.765)	-0.084 (0.856)	-0.341 (0.805)		
	0.381	0.256	0.922	0.672		
Leaveout Competition	4.855 (1.072)	4.749 (0.910)	-1.848 (0.807)	-1.611 (0.677)	-0.431 (0.657)	-0.041 (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 2.1 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

B.2 Municipal Bond Risk

Although municipal bonds are generally considered to be a very safe investment, Moody's Investor Service reports that there were six municipal bond defaults from 2008 to 2014 (Tudela, Jacoby and Medioli, 2015). These defaults are shown in Table B3. Tudela, Jacoby and Medioli (2015) argues that the rate of defaults in the municipal sector is comparable to the rate of defaults in the corporate sector for similarly rated issues. The total liabilities for these defaults comes primarily from pension-related costs instead of debt service, but there was a bond default in each case. However, bonds are generally senior to pension liabilities and will be paid first.

In the sample period, there was one municipal bankruptcy that did not result in a debt default. Central Falls, Rhode Island entered bankruptcy on August 1, 2011 with \$110 million dollars in outstanding liabilities. Of these liabilities, less than \$25 million were debt related and these liabilities never entered default.

Table B3: List of Municipal Bankruptcies, 2008-2014

Municipality	Initial Bankruptcy Date	Total Liabilities
Vallejo, CA	May 6, 2008	\$659 million
Jefferson County, AL	April 1, 2008	\$4.4 billion
Harrisburg, PA	June 1, 2009	\$719 million
Stockton, CA	June 28, 2009	\$2.2 billion
Detroit, MI	June 18, 2013	\$14.6 billion
San Bernardino, CA	August 1, 2008	\$1.2 billion

Note: This table presents a list of municipal bankruptcies that resulted in bond defaults between 2008 and 2014 and the associated total liabilities. The primary source of the liabilities is pension costs instead of debt costs. Data come from Tudela, Jacoby and Medioli (2015).

C Additional Results and Robustness

This section includes several robustness checks to the main results. First, Appendix C.1 shows the primary results using Inverse Probability of Treatment Weights (IPTW) instead of issuer fixed effects. Next, Appendix C.3 replicates the results from Table 3 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. Finally, Appendix C.2 includes a variety of new sample and variable measurement decisions.

C.1 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:

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

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

4. Weighted least squares regression following Equation 2

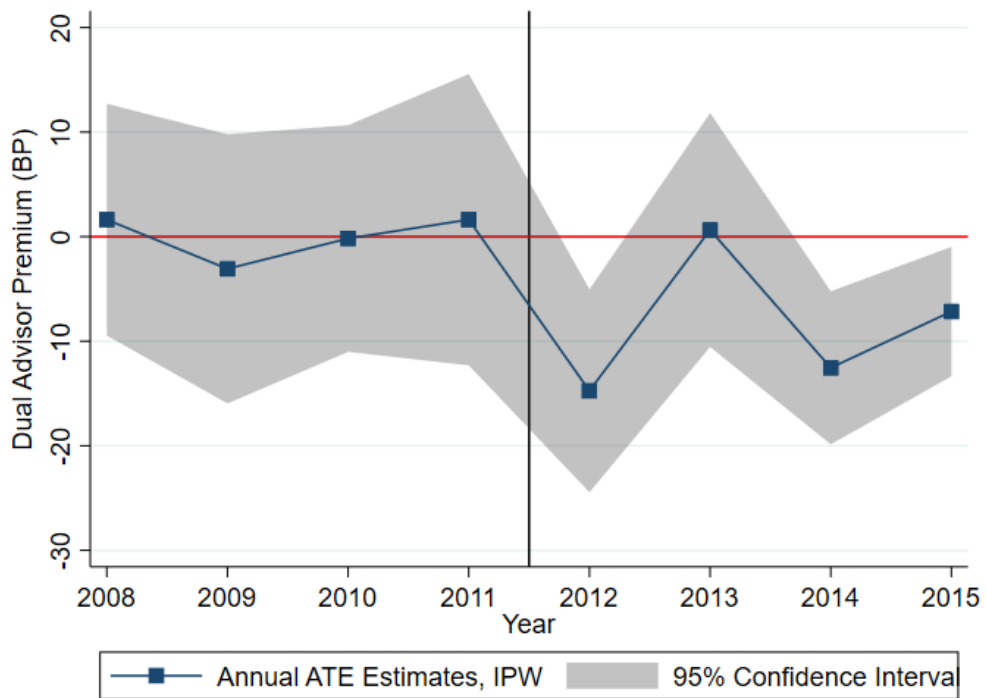
The results of this estimation approach are shown in Table C1. After the reformulation of MSRB Rule G-23, interest costs fall by 5.47 basis points for dual advisor issues relative to issues with independent advisors in the preferred specification in column (5). This result is shown in event study form in Figure C1, which highlights the lack of differential trends before the regulation. Similarly, Figure C2 shows the event study for non-advisor underwriter competition. 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 competition, likewise, is not increasing prior to the reform but jumps by 0.9 non-advisor bidders competing for underwriting business in 2012.

Table C1: Regression of Primary Market Winning Bid on Advisor Type, IPTW

	(1)	(2)	(3)	(4)
Dual Advisor	6.157 (4.038)	5.628 (3.896)	6.909 (3.948)	5.648 (3.405)
Dual Advisor X Post	0.127 (3.840)	0.149 (3.810)	0.080 (3.900)	0.097 (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

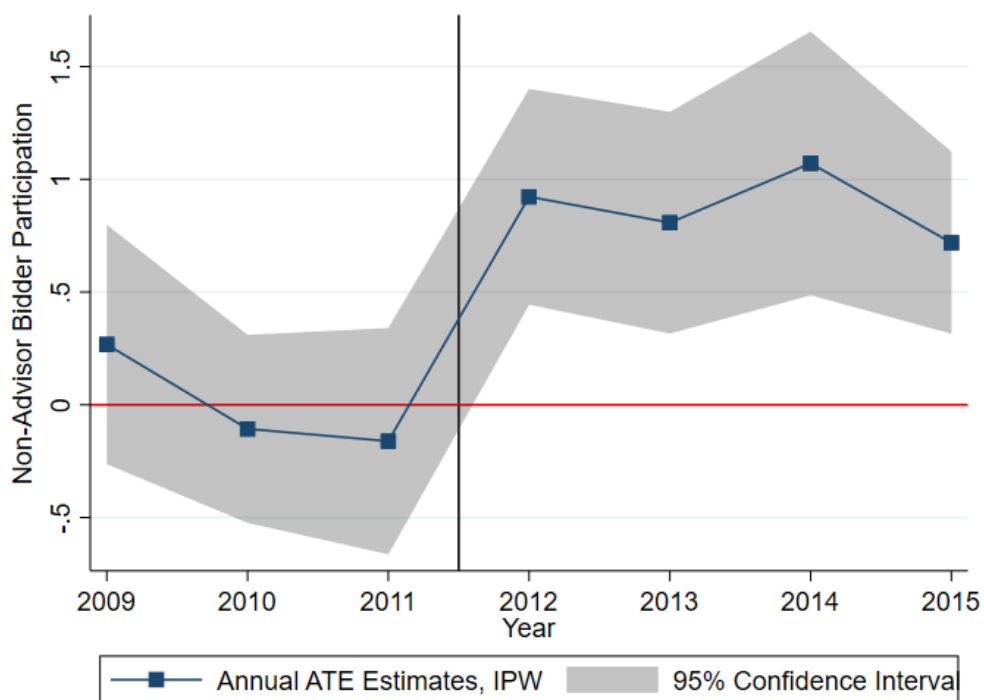
Note: Author's calculations using data from [SDC Platinum \(2016\)](#), [The Bond Buyer \(2016\)](#), and [Bergstresser and Luby \(2018\)](#). See Section 3 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Figure C1: 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 C1 using all controls. See Section 3 for more information and discussion.

Figure C2: 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 C1 using all controls. See Section 3 for more information and discussion.

C.2 Alternative Variable Specifications

This Appendix shows robustness to Table 3 with different choices regarding variable and sample measurement. However, the May 2020 version of these appendices refers to an old version of Table 3 that included credit ratings and credit enhancements, which have been pointed out to be bad controls. New versions are forthcoming.

- Table C2 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 C3 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 C4 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 C5 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.

Table C2: Regression of Primary Market Winning Bid on Dual Advisor Intensity

	(1)	(2)	(3)	(4)	(5)
Dual Advisor Intensity	8.737 (5.658)	8.279 (5.618)	8.625 (5.606)	7.793 (4.103)	5.252 (3.134)
	0.123	0.141	0.124	0.058	0.094
Dual Advisor Intensity X Post	-12.319 (3.440)	-11.681 (3.413)	-11.104 (3.401)	-12.509 (2.566)	-10.675 (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 \(2018\)](#). See Section 3 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table C3: Regression of Primary Market Winning Bid on Pre-Period Average Advisor Type

	(1)	(2)	(3)	(4)	(5)
Dual Advisor Share X Post	-11.684 (3.444)	-11.156 (3.415)	-10.653 (3.408)	-12.857 (2.698)	-11.315 (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 3 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table C4: Regression of Primary Market Mean Bid on Advisor Type

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	4.357 (6.593)	3.577 (6.578)	3.719 (6.600)	5.551 (4.909)	2.112 (3.992)
	0.509	0.587	0.573	0.258	0.597
Dual Advisor X Post	-10.206 (3.408)	-9.500 (3.377)	-8.906 (3.371)	-10.603 (2.701)	-8.885 (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 \(2018\)](#). See Section 3 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

Table C5: Regression of Primary Market Median Bid on Advisor Type

	(1)	(2)	(3)	(4)	(5)
Dual Advisor	4.950 (6.655)	4.167 (6.642)	4.379 (6.645)	6.228 (4.960)	2.759 (3.980)
	0.457	0.530	0.510	0.209	0.488
Dual Advisor X Post	-10.382 (3.421)	-9.669 (3.392)	-9.116 (3.387)	-10.867 (2.719)	-9.134 (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 \(2018\)](#). See Section 3 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.

C.3 Placebo Test

As a placebo test to the results presented in Section 3, 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 dual advising-underwriting behavior before the regulation, 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 C6 shows 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.

Table C6: Regression of Primary Market Interest Cost on Placebo Dual Advisor

	(1)	(2)	(3)	(4)	(5)
Non-Bidding Dual Advisor	-18.401 (12.157)	-19.048 (12.131)	-17.787 (11.475)	-20.804 (6.928)	-8.980 (4.465)
	0.130	0.116	0.121	0.003	0.044
Non-Bidding Dual Advisor X Post	0.911 (13.914)	3.594 (13.444)	3.436 (12.917)	-1.042 (8.642)	-1.183 (5.228)
	0.948	0.789	0.790	0.904	0.821
Dual Advisor	4.674 (6.595)	3.850 (6.564)	4.040 (6.573)	5.700 (4.796)	3.053 (3.846)
	0.478	0.558	0.539	0.235	0.427
Dual Advisor X Post	-12.521 (3.486)	-11.711 (3.457)	-11.244 (3.457)	-13.259 (2.753)	-11.455 (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 3 for more information. Standard errors clustered at the issuer level are shown in parentheses with p-values below.