



Municipal Securities Rulemaking Board

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Primary Offerings of Municipal Securities: Impact of COVID-19 Crisis on Competitive and Negotiated Offerings

Chart 2. Median Primary Offering Spread (January 2019–December 2021)



Simon Z. Wu, Ph.D., Nicholas J. Ostroy
Municipal Securities Rulemaking Board

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Abstract¹

This paper examines the competitive and negotiated primary offerings of municipal securities between 2019 and 2021, which included the market distortion period in the spring of 2020 caused by the worldwide COVID-19 pandemic. It mainly focused on empirically investigating two aspects of the primary market: 1) the bidding activities for competitive offerings and the relationship between competitive bidding activities and the resulting primary offering spread as measured by the difference between winning bid yields and initial reoffering yields; and 2) the choice of using negotiated or competitive sale method based on the characteristics of issuance. The paper found that the COVID-19 worldwide market distortion impacted the primary offering market for municipal securities, particularly for competitive offerings. When compared to the Non-COVID Period in 2020, the total number of issuances as well as the average number of competitive bids received per issuance dropped significantly during the COVID Period from March through May 2020. In addition, competitive bid prices were more dispersed during the COVID Period, and primary offering spreads for winning bidders (winning underwriter or underwriter syndicate) were much wider.

Similar to a previous MSRB Report, the winning bidder's primary offering spread was found to be negatively correlated with the number of competitive bids received during the relevant period, after controlling for characteristics of each offering, such as offering size, time to maturity and yield, etc. Therefore, all things being equal, soliciting and receiving more competitive bids from underwriters does indeed improve an issuer's selling price and reduce the yield cost for the issuer. In addition, when comparing the initial reoffering yield with the weighted-average secondary market traded yield in the first 30 days, the median trade spread was marginally negative for competitive offerings, but was substantially positive for negotiated offerings, suggesting that negotiated offerings tend to trade at a higher level in the secondary market.

Finally, an issuer's choice of primary offering methods is associated with the characteristics of an issuance, as offerings with more complex features, such as insured bonds, variable rate bonds and offerings with many maturities tend to be negotiated offerings rather than competitive offerings, all else being equal.

¹ The views expressed in the research papers are those of the author(s) and do not necessarily reflect the views and positions of the MSRB Board and other MSRB staff.

Introduction and Background

Many investors acquire municipal securities either during the primary offering process or immediately after the start of trading in the secondary market.² Municipal bond issuers typically use one of three methods to issue bonds in the primary market: competitive offering, negotiated offering or private placement.³ In 2020, the MSRB released a research paper (“the 2020 MSRB Research Paper”) empirically examining the relationship between the competitive bidding activities and the resulting primary offering spread for the winning bidder from reselling.⁴ The 2020 MSRB Research Paper found that from 2009 to 2019 there was an increase in the number of competitive bids per each issuance from an average of 4.4 to 5.7 bids, and, all else being equal, concluded that more bids per issuance decreases the borrowing costs for the issuer.⁵

This paper builds upon the 2020 MSRB Research Paper by focusing on how the average number of competitive bids received by an issuer has evolved in recent years (2019–2021) and statistically testing and quantifying the impact of bidding competition on winning underwriters’ primary offering spread. In particular, we analyzed the impact on the primary market of municipal securities from the worldwide financial market distortion in the spring of 2020 as a result of the COVID-19 pandemic. Previous studies showed the municipal securities secondary market was affected by the market distortion substantially, as were many other financial markets worldwide.⁶ It is therefore important to find out whether a similar distortion also carried over to the primary offering market for municipal securities.

In addition, we also examined how the choice of employing the negotiated or competitive offering method is related to the characteristics of an offering, such as insurance status, taxation status, coupon rate structure and offering amount, among others. In the past, academic researchers offered insights into why a municipal issuer chooses one method of sale over the other, primarily because of the consideration of the overall cost of financing.

² Municipal securities investors, especially individual investors, tend to be “buy and hold” investors. Trading patterns for municipal securities typically involve relatively frequent trading during the initial period after issuance, such as the first 30 days, followed by infrequent or sporadic trading activity during the remaining life of the security. See Wu, Simon Z., John Bagley and Marcelo Vieira, “[Analysis of Municipal Securities Pre-Trade Data from Alternative Trading Systems](#),” Research Paper, Municipal Securities Rulemaking Board, October 2018.

³ It should be noted that private placements are similarly completed through a negotiated process but are distinctive from typical negotiated offerings. They are treated as a separate primary offering method in this analysis.

⁴ Wu, Simon Z., “[Competitive Bidding for Primary Offerings of Municipal Securities: More Bids, Better Pricing for Issuers?](#)” Research Paper, Municipal Securities Rulemaking Board, July 2020.

⁵ *Id.*

⁶ For example, see Wu, Simon Z. and Nicholas J. Ostroy, “[Transaction Costs During the COVID-19 Crisis: A Comparison between Municipal Securities and Corporate Bond Markets](#),” Research Paper, Municipal Securities Rulemaking Board, August 2021.

Municipal Securities Primary Offering Market

The municipal securities market in the United States is a major source of capital for state and local governments. Issuers of municipal securities include towns, cities, counties and states, as well as state and local government agencies and entities with authority to issue debt, in addition to conduit borrowers.⁷ At the end of 2021, the outstanding principal value of municipal securities was estimated to be approximately \$4.05 trillion.⁸ The annual issuance of municipal bonds amounted to approximately \$532 billion in 2020 and \$515 billion in 2021.⁹

Among the three methods of new issuances, competitive offerings, also referred to as “competitive bidding,” involves the issuer requesting that underwriters submit a firm bid to purchase a new issue of municipal securities in response to a Notice of Sale.¹⁰ The issuer dictates the structure of a competitive offering, such as call features, maximum/minimum dollar price, etc., up front with the municipal advisor, if one is involved, and identifies the date and time of the sale. Upon the completion of the bidding process, the issuer reviews the options and may select the underwriter or underwriter syndicate presenting the lowest interest rate cost according to stipulated criteria set forth in the Notice of Sale. The competitive bidding method is unique to the municipal bond market, as initial offerings of other types of securities, such as equity and corporate bonds, are usually conducted through the negotiated sale method.¹¹ For a more detailed description of the competitive bidding process, please refer to the 2020 MSRB Research Paper.¹²

By comparison, in a negotiated new issuance, the issuer selects an underwriter or underwriting syndicate without a public bidding process. The issuer may choose to retain a municipal advisor for advisory services. The issuer then works with the retained underwriter on structuring the deal, including maturities, coupon rates, yields, call features and purchase price of the issue but without public competitive bidding.¹³ The negotiated offering shares many of the same characteristics as a traditional initial public offering (IPO) process conducted in the equity market.

⁷ A borrower of bond proceeds in a conduit financing. See [Glossary of Municipal Securities](#) Terms published by the MSRB (Glossary).

⁸ Board of Governors of the Federal Reserve System. “Financial Accounts of the United States,” Table L-212, Federal Reserve Bank, March 10, 2022. When measured in market value, the outstanding amount of municipal securities was around \$4.36 trillion.

⁹ Refinitiv’s municipal market primary offering database. Refinitiv, formerly known as Thomson Reuters’ Financial and Risk unit, is currently a subsidiary of the London Stock Exchange Group.

¹⁰ See Glossary.

¹¹ In comparison, United States Treasury securities are sold via a single-price auction conducted by the Department of Treasury in the primary market.

¹² Wu, *supra* 2.

¹³ See Glossary.

Lastly, in a typical private placement offering, a placement agent sells a new issue of municipal securities on behalf of the issuer directly to investors on an agency basis, usually to a limited number of sophisticated investors through a negotiated process.¹⁴ For some private placement offerings, a municipal advisor may also be retained by the issuer to provide advisory services. With a private placement, issuers are not generally subject to the same disclosure requirements, such as the continuing disclosure requirements, as are public offerings.¹⁵

¹⁴ See Glossary.

¹⁵ See SEC Rule 15c2-12.

Literature Review

While there is abundant academic literature on issues related to underwriting activities and primary offerings in the municipal securities market, most studies compare the choices of competitive and negotiated offerings, with very few studies focusing on the competitive bidding process.¹⁶ This section summarizes the relevant literature from recent years on the difference between the competitive and negotiated sale methods for municipal bonds and the relevant borrowing costs for issuers.¹⁷

Academic literature has not uniformly concluded whether an issuer's choice of primary offering method is economically rational. Some papers found that the method of sale had a significant impact on issuers' borrowing costs and issuers' selection of sale method may not be economically rational. For example, Moldogaziev and Guzman (2012) argue that overall, the competitive method provides the best results for the issuer, and the method of sale has a significant impact on an issuer's borrowing costs.¹⁸ Their analysis illustrates that negotiated sales lead to borrowing costs that are approximately 21 basis points higher than competitive sales.¹⁹ Liu (2018) proposes that issuers may simply follow the recommendation of the municipal advisor and choose the same method again when they issue another bond in the future.²⁰ He argues that the choice of the sale method is not a rational choice and may not be based on performance outcomes.²¹ He finds that competitive sales are a better method of sale and that issuers should take this into consideration before deciding on the negotiated method.²²

Other papers concluded that there are economic reasons why issuers choose the negotiated sale method over the competitive sale method despite the higher costs, and municipalities choose the sales method that is most beneficial to them. For example, Marlowe argues that the negotiated sale method allows an underwriter to become involved earlier in the issuance process when there is an information asymmetry,²³ and the process allows an underwriter time to better understand the conditions of a particular issuer before it comes to market. It also allows an underwriter to put more time and effort into finding the right investors, which would add additional transaction costs

¹⁶ For example, see Bergstresser, Daniel and Randolph Cohen, "Competitive Bids and Post-Issuance Price performance in the Municipal Bond Market," Brandeis University Working Paper, March 2015.

¹⁷ For other relevant studies on competitive bidding and primary offering costs, please refer to the 2020 MSRB Research Paper.

¹⁸ See Moldogaziev, Tima and Tatyana Guzman, "Which Bonds Are More Expensive? The Cost Differentials by Debt Issue Purpose and the Method of Sale: An Empirical Analysis," Public Budgeting and Finance, Fall 2012.

¹⁹ *ibid.*

²⁰ Liu, Gao, "Self-Selection Bias or Decision Inertia? Explaining the Municipal Bond 'Competitive Sale Dilemma.'" Public Budgeting and Finance, March 2018.

²¹ *ibid.*

²² *ibid.*

²³ Marlowe, Justin, "Method of Sale, Price Volatility, and Borrowing Costs on New Issue Municipal Bonds," Working Paper, January 26, 2009.

to the borrower.²⁴ Marlowe concludes that “investor learning” in negotiated sales allows issuers to mitigate information asymmetries.²⁵ Fruits, Booth, Pozdena and Smith (2008) examine the costs between the two methods of sale and discover that there is no general advantage of competitive over negotiated issuance processes.²⁶ Rather, there appears to be a strong tendency for issuers to select the method of issuance that best suits the nature of the issue at hand.²⁷ Finally, Krupa (2005) finds that riskier types of bonds, such as revenue, certificate of participation, lease, special assessment, tax allocation and limited tax obligation bonds might be better off if underwritten via negotiated method since they are not secured by the full pledge of tax revenue of the issuer and thus bear higher risk.²⁸ The negotiated sales method is chosen based on issue-specific factors such as market index and credit rating, as well as on the overall financial situation of the municipality.²⁹

²⁴ *ibid.*

²⁵ *ibid.*

²⁶ Fruits, Eric and James Booth, Randall Pozdena and Richard Smith, “A Comprehensive Evaluation of the Comparative Cost of Negotiated and Competitive Methods of Municipal Bond Issuance,” *Municipal Finance Journal*, January 2008.

²⁷ *ibid.*

²⁸ Krupa, Olha, “Is There a Reason for Higher-Cost Financing?” Working Paper, February 2005.

²⁹ *ibid.*

Empirical Analysis

The analysis in this paper concentrates on competitive bidding activities and their impact on the primary offering spread earned by underwriters for competitive municipal offerings during the period from January 2019 through December 2021 (“Relevant Period”), which included the market disruption period in the spring of 2020 precipitated by the worldwide COVID-19 pandemic. In addition, the paper analyzes the association between the various characteristics of an issuance and the issue’s choice of a competitive or a negotiated offering.

Data and Methodology

The data used in this paper were compiled from several sources. Issuance data for the Relevant Period of 2019 to 2021 was obtained from Ipreo, a unit of S&P Global Market Intelligence (“the S&P Global Market Intelligence Ipreo database”).³⁰ After filtering out all offerings with missing data fields, the S&P Global Market Intelligence Ipreo database used in this paper captures the bidding activities for 86% of all competitive offerings and 68% of all negotiated offerings when compared to Refinitiv’s municipal market primary offering data. The data fields include the name of the issuer, the state of the issuance, the amount of the total issuance, the amount of each security, the CUSIP number, the type of bond (bond or note), financing purposes (new financing, refunding or both), the taxable status, the date of the bidding process for competitive offerings, the identity of the underwriter making a bid either on behalf of itself or a syndicate, the net interest cost (NIC) or the true interest cost (TIC) of the bid made (expressed in yield) for competitive offerings, the winning bid for competitive offerings, the date of pricing for negotiated offerings, and the identity of the lead manager and syndicate members for negotiated offerings.³¹

We received the pricing information for primary offerings from the S&P Global Market Intelligence Ipreo database, which is only available for competitive offerings. For competitive offerings, all bids are priced based on TIC or NIC for the whole issue as opposed to the individual maturities (securities).³² As mentioned previously, a competitive bid is quoted either on a NIC or a TIC basis. Since NIC and TIC computations treat the time value of money differently and there is a slight variation in their respective calculated values, competitive offerings with NIC bids and TIC bids were grouped separately in analyses that compared the winning competitive bid yield to the initial reoffering yield. In addition, similar to the findings in the 2020 MSRB Research Paper, whether the competitive bids were solicited by an issuer on a NIC or a TIC basis is not random.

³⁰ S&P Global Market Intelligence Ipreo database provides an electronic order entry platform for underwriters bidding for competitive issues.

³¹ The Notice of Sale specifies the method used to calculate interest rates in a competitive offering, usually either the NIC or TIC method. NIC takes into account any premium or discount embedded in the issue, as well as the dollar amount of coupon interest payments over the life of the issue. In addition to this, TIC also takes into account the time value of money and discounts the future coupon interest payments to the present day. As a result, TIC produces a slightly different yield from the NIC method. Both NIC and TIC refer to the overall interest rate to be paid by the issuer over the life of the bonds.

³² Many municipal bond issuances could have 10 or more securities (CUSIP numbers), with each security representing a unique maturity with its own yield.

Table 1 shows that virtually all TIC-based competitive offerings (98%) were structured as a bond (with weighted-average maturity greater than one year) rather than as a note (with weighted-average maturity at one year or less), while more than half of the NIC-based competitive offerings (56%) were structured as a note. Similarly, almost all competitive offerings quoted on a TIC basis included more than one security (CUSIP number) in the issuance (97%), while more than half of the competitive offerings quoted on a NIC basis (59%) had only a single security in an issuance. As expected, TIC bidding rates were more often quoted for competitive offerings of bonds with multiple securities that had maturities longer than one year, where the time value of the money may matter more to an issuer.

Table 1. Types of Competitive Offering Bids and Issuance (January 2019–December 2021)

Bidding Rate Basis	Issuance Type		Number of Securities (CUSIP Numbers) per Issuance	
	Note	Bond	One Security	More Than One Security
NIC	55.8%	44.2%	58.8%	41.2%
TIC	1.7%	98.3%	2.8%	97.2%

Source: MSRB analysis with data obtained from S&P Global Market Intelligence.

In addition to the S&P Global Market Intelligence Ipreo database, we also used MSRB's Real-Time Transaction Reporting System (RTRS) data, the S&P Global Market Intelligence Ipreo database, as well as data from MSRB's security master database³³ for the analyses.

When comparing the primary offering yield³⁴ for competitive offerings to their respective initial reoffering yield and weighted-average yield for all secondary market trades within the first 30 calendar days after the initial offering ("traded yield"), weighted-average of reoffering yields and traded yields are calculated for each issue based on the weighting by time to maturity and par amount of each security in the issue to derive a comparable initial reoffering yield and traded yield (if all securities in an offering are traded) for the entire issue. Reoffering yield and traded yield, which are gathered from MSRB's RTRS database, are calculated in the same way for each negotiated offering.

Finally, when necessary, the analysis below segregates the "COVID Period" (March 2020–May 2020), which represents the peak market disruption caused by the pandemic, from the non-COVID months of 2020 ("Non-COVID Period in 2020") to show the comparative impact.

³³ The security master database includes data from ICE Data Services and CUSIP Global Services. CUSIP numbers and certain related descriptive information are copyrighted by the American Bankers Association.

³⁴ The primary offering yield is always quoted for the entire issue, not for each security in the issue.

Recent Landscape of Municipal Securities Primary Offerings

Table 2 shows the breakdown of all primary offerings between competitive, negotiated and private placement offerings. Prior to 2020, more than 90% of the reported municipal bond primary offerings were either competitive offerings or negotiated offerings, including more than 92% in 2019. However, the market disruption in 2020 appeared to temporarily increase the number of private placements, peaking at 13.4% during the COVID Period in 2020, before reverting back to 8% in 2021.³⁵ In addition, there was a corresponding decline in the market share for negotiated offerings to 45.7%, while the share for competitive offerings was similar to other periods.³⁶ While more research may be needed in this area, our findings in Table 2 as well as in later sections suggest that the Spring 2020 market distortion, likely caused by the increased difficulty for some issuers to access the market and uncertainty regarding the credit risks of issuers, impacted the primary market for municipal securities along with the secondary market.³⁷

Table 2. Primary Offerings by Offering Methods (January 2019–December 2021)

Year	Total Number of Primary Offerings	Market Share By Offering Methods		
		Competitive	Negotiated	Private Placement
2019	13,866	43.1%	49.3%	7.7%
2020	15,591	39.6%	50.3%	10.1%
Non-COVID Period in 2020	12,495	39.2%	51.5%	9.3%
COVID Period (March-May 2020)	3,096	40.9%	45.7%	13.4%
2021	14,930	39.3%	52.7%	8.0%
Total	44,387	40.6%	50.8%	8.6%
Percentage of Offerings with Municipal Advisors		94.2%	59.1%	34.5%

Source: MSRB analysis with data obtained from Refinitiv’s municipal market primary offering database.

For the same period, Table 2 also illustrates that the usage rate of a municipal advisor on an offering was not uniform across the three offering methods. Overall, 94% of the competitive offerings were advised by a municipal advisor during the Relevant Period. By comparison, only

³⁵ On average, negotiated offerings and private placements have a larger issuance size. However, if the market share is viewed by par value rather than by number of offerings, the market share for negotiated offerings and private placements would be higher than illustrated.

³⁶ The regression analysis later in the paper shows, however, after controlling for the characteristics of each issuance, issuers had 8.5% higher odds of choosing negotiated offerings during the COVID Period than during the Non-COVID Period, with a statistical significance at 10% level.

³⁷ For the COVID-19 impact on the secondary market trading, please refer to Wu, Simon. Z. and Nicholas J. Ostroy, “Transaction Costs During the COVID-19 Crisis: A Comparison between Municipal Securities and Corporate Bond Markets,” Research Paper, Municipal Securities Rulemaking Board, August 2021.

59% of negotiated offerings and less than 35% of private placement offerings were advised by a municipal advisor. As our regression analysis shows later in the paper, the usage of a municipal advisor is closely associated with issuers choosing competitive offerings as the method for placing municipal securities in the primary market, even after controlling for the idiosyncratic characteristics of an issuance.

Competitive Offerings

For competitive offerings, the S&P Global Market Intelligence Ipreo database identifies all the bids received for each deal, as well as the winning bid. Table 3 displays the total annual number of competitive offerings as well as the yearly average number of competitive bids received for competitive offerings from January 2019 through December 2021. The average number of bids received was consistently between five and six for bonds and around 4.5 bids for notes during the Relevant Period, except for the COVID Period where the average number was slightly below five bids for bonds (4.7 bids) and below four bids (3.9 bids) for notes. This finding is consistent with the expectation that the liquidity crunch likely affected both the primary and secondary markets during the COVID-19 market disruption.

Table 3. Average Number of Competitive Offering Bids³⁸ (January 2019–December 2021)

Year/Period	Number of Offerings	Average Number of Bids
Bond		
2019	4,048	5.7
2020	4,313	5.1
Non-COVID Period in 2020	3,400	5.2
COVID Period (March-May 2020)	913	4.7
2021	4,216	5.3
Note		
2019	1,546	4.7
2020	1,302	4.5
Non-COVID Period in 2020	1,086	4.6
COVID Period (March-May 2020)	216	3.9
2021	1,144	4.8

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database.

³⁸ The average number of bids is based on the average number of bids for each issue. For example, if an issue comprises 10 securities, with eight securities receiving six bids while the remaining two securities have only four bids, this analysis calculates an average of 5.6 bids for this issue, as opposed to six bids when using the highest number of bids. Using the highest number of bids for each issue would raise the average numbers slightly.

Next, similar to the 2020 MSRB Research Paper, an ordinary least squares regression analysis for pooled cross-sectional and time-series data points was used to test the correlation between various characteristics of a competitive offering and the number of competitive bids received. As stated in the previous report, the benefits of performing a regression analysis are manifold. One benefit is to be able to measure the correlation between one variable (dependent variable) and many other variables (independent variables or factors) simultaneously and statistically test the estimated impact for each factor while controlling for all other factors. Essentially, the estimated impact from each independent variable is conditioned on the economic principal of “all else being equal.”³⁹ The regression model for number of bids received is specified as follows:

$$\begin{aligned} \text{Number of Bids}_{it} &= \alpha + \beta_1 \text{Offering Amount}_{it} + \beta_2 \text{Maturity}_{it} + \beta_3 \text{Yield}_{it} + \beta_4 \text{General Purpose Bond}_{it} \\ &+ \beta_5 \text{Fixed Rate Bond}_{it} + \beta_6 \text{Bond or Note}_{it} + \beta_7 \text{Usage of Municipal Advisor}_{it} \\ &+ \beta_8 \text{Insured Bond}_{it} + \beta_9 \text{Callable Bond}_{it} + \beta_{10} \text{New Financing}_{it} + \beta_{11} \text{Taxable Bond}_{it} \\ &+ \beta_{12} \text{TIC Bid}_{it} + \beta_{13} \text{COVID Period}_{it} + \varepsilon_{it} \end{aligned}$$

In this model, Number of Bids, Offering Amount, Maturity (weighted-average for the entire issue) and Yield (weighted-average for the entire issue) are expressed in natural logarithm,⁴⁰ the 10 indicator variables (General Purpose Bond, Fixed-Rate Bond, Bond or Note, Usage of Municipal Advisor, Insured Bond, Callable Bond, New Financing, Taxable Bond,⁴¹ TIC Bid and COVID Period) carry essentially a yes-or-no value (a value of one if yes and zero if no),⁴² subscript *i* corresponds to a particular competitive offering and subscript *t* corresponds to a particular offering date.⁴³

The regression analysis found that, *ceteris paribus*, the number of bids received for a competitive offering correlates positively with the offering amount of an issuance and the fact that an issuance is composed of general obligation bonds, is a bond rather than a note, is used for new financing rather than refinancing,⁴⁴ is quoted on a TIC basis, and uses a municipal advisor during the offering process. Conversely, competitive offerings receiving fewer bids are correlated with a bond issue that has a higher yield,⁴⁵ has variable rate rather than fixed-rate structure, is insured, has

³⁹ Also known as the *ceteris paribus* assumption.

⁴⁰ The natural logarithm difference is used as a proxy for percentage difference for these variables in the equation.

⁴¹ For the purpose of this analysis, a municipal issuance is considered taxable if bonds are not exempt from the federal tax or the federal alternative minimum tax (AMT).

⁴² In statistics and econometrics, particularly in regression analyses, an indicator (dummy) variable is one that takes the value of zero or one to indicate the absence or presence of some categorical effect that may be expected to shift the outcome.

⁴³ Each issue’s credit rating at the time of the issuance could also be correlated with the number of competitive bids received in the model. However, the historical credit rating data are either not available for many issues or are contractually prohibited from being used in this analysis. The regression model does incorporate the yield variable, which can be viewed as a measure of riskiness for an issue, all else being equal.

⁴⁴ For the purpose of this paper, if an issuance contains both new financing and refinancing components, it is considered “refinancing.”

⁴⁵ The regression analysis employed both the initial reoffering yield and the first 30-day secondary market traded yield as a proxy for “yield” in the model, and the results are generally similar regardless of the proxy used.

callable features, and is taxable. Furthermore, after controlling for all issuance characteristics, the regression analysis found competitive offerings received fewer bids during the COVID Period—about 12% less—than the Non-COVID Period. In addition to fewer bids received, Table 3 above also illustrates that on average there were 20% fewer competitive offerings per month during the COVID Period than the Non-COVID Period.

None of the regression analysis findings are counterintuitive, as municipal issuances with more complex features (variable rates, insurance status, call features and taxability) or being viewed as relatively riskier (higher yield) tend to receive fewer bids after controlling for the issuance size, maturity and other characteristics.⁴⁶ For the detailed estimates of parameters and their statistical significance from the regression analysis, see Appendix B.

Price Competitiveness of Bids

Table 4 explores the price competitiveness of bids by capturing the median of two measures of bid spread for all competitive offerings: the median bid spread between the winning bid and the cover bid (second best bid) and the median bid spread between the winning bid and the “worst” bid.⁴⁷ The table shows that for both measures of the median bid spread, the COVID Period experienced a noticeably wider spread than the non-COVID periods for both bond and note offerings, with the median spread for short-maturity notes during the COVID Period more than doubling the median spreads in non-COVID periods. The differences were less pronounced for longer-maturity bonds but still significant. The results are not surprising, as the market events in the Spring of 2020 likely brought uncertainty to the pricing of primary offerings because of general market risk, credit risks for municipalities and concerns for investor demand, causing a wide dispersion in competitive bidding prices.

⁴⁶ The negative correlation between fixed-rate bond issuance and the number of bids received may be surprising, as variable-rate securities are generally considered to be more complex than fixed-rate securities. It should be noted that only about one percent of all issuances during the Relevant Period contained variable-rate securities.

⁴⁷ For example, if there are four competitive bids received for a deal, the winning bid would be the bid with the lowest yield, the cover bid would be the bid with the second-lowest yield, and the least bid would be the bid with the highest yield.

Table 4. Median Bid Spread from Winning Bids (January 2019–December 2021)

Year/Period	Number of Competitive Offerings	In Basis Points	
		Median Spread Between Winning Bids and Worst Bids	Median Spread Between Winning Bids and Cover Bids
Bond			
2019	4,044	16.1	3.0
2020	4,311	20.7	4.0
Non-COVID Period in 2020	3,398	19.4	3.7
COVID Period (March-May 2020)	913	27.1	5.6
2021	4,213	16.0	3.0
Note			
2019	1,546	21.4	3.4
2020	1,302	22.2	4.2
Non-COVID Period in 2020	1,086	20.2	3.9
COVID Period (March-May 2020)	216	46.5	8.1
2021	1,144	11.7	1.9

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database.

Aside from the COVID Period, the bid spread continues to shrink over time. When compared to the 2020 MSRB Research Paper’s findings, the median spread for all competitive offerings was lowered to 15.1 basis points between the winning bid and the least bid and 2.8 basis points between the winning bid and the cover bid as of 2021. As alluded to in the 2020 MSRB Research Paper, there is a possibility that with the ongoing improvement of technology and information transparency in the marketplace, combined with the overall low volatility environment throughout most of the period between 2010 and 2021, underwriters may be increasingly submitting more informed bids so that competitive bids from different underwriters have become more clustered together.

Underwriter Primary Offering Spread and Bidding Activities

Primary offering yield spread, or simply primary offering spread, represents the winning underwriter's (or the winning underwriter syndicate's) gross underwriting spread.⁴⁸ The primary offering spread could also be viewed as an expense that issuers incur to place the newly issued bonds with investors via underwriters.⁴⁹ Ceteris Paribus, an issuer would aim to sell the securities at the most advantageous price, or the lowest yield.⁵⁰ For the purpose of this analysis, we used the initial reoffering yield to calculate the primary offering spread as expressed in yield (the difference between the winning bid yield and the initial reoffering yield), as opposed to the actual transacted reoffering yield, as not all securities in an offering are sold by an underwriter.⁵¹ As stated in the 2020 MSRB Research Paper, a competitive offering receiving more underwriter bids is generally viewed as more advantageous to an issuer, as presumably the issuer would benefit from the price competition by the bidders. On the other hand, a winning bidder facing more competition would likely have to accept a narrower primary offering spread to be the winning firm. This section investigates the relationship between the number of competitive bids received and the primary offering spread for winning bidders.

Table 5 presents the median of the yield spread across all competitive offerings during the Relevant Period.⁵² Because of the difference in deriving a NIC yield and a TIC yield, the median yield spread is presented separately for competitive offerings quoted on a NIC basis and on a TIC basis. The non-weighted median spread for all competitive offerings was 13.3 basis points, while the weighted median spread by par amount was 8.6 basis points, considerably lower than the non-weighted median, suggesting that competitive offerings with a larger offering size (by par amount) had a lower primary offering spread.

⁴⁸ See Wu, Simon Z., "Competitive Bidding for Primary Offerings of Municipal Securities: More Bids, Better Pricing for Issuers?" Research Paper, Municipal Securities Rulemaking Board, July 2020. Also, see Glossary.

⁴⁹ Underwriter gross spread is only one component of issuance costs for an issuer, which may also include bond counsel fees, municipal advisor fees, credit rating fees and CUSIP fees, etc.

⁵⁰ Issuers only aim for the lowest yield or the highest price when evaluating the competitive bids, rather than the amount of the primary offering spread.

⁵¹ This calculation assumes all securities are sold at the initial reoffering yield. The initial reoffering yield does not necessarily factor in the underwriter's spread or potential market movements, though it appears in most cases (over 90%), the initial reoffering yield is the same as the list offering yield (primary offering yield) for customer purchases.

⁵² An average of the yield spread was also calculated, but only the median numbers were presented because the median is less affected by outliers than the average. In addition, an analysis of the median primary offering spread by year over the Relevant Period did not reveal any discernable trend; therefore, the analysis in this section would focus only on the cross-sectional impact.

When segregating the results by the COVID Period and the Non-COVID Period, Table 5 shows the primary offering spread was noticeably wider during the COVID Period than the Non-COVID Period for both bonds and notes, regardless of whether the median is weighted or non-weighted by an issuance' principal amount. The results for primary offering spread are in line with those for the secondary market customer trade effective spread during the COVID Period when the effective spread widened significantly for municipal securities (and for corporate bonds).⁵³

Table 5. Median Primary Offering Spread by Bidding Rate Basis (January 2019–December 2021)

		Number of Offerings	Median (In Basis Points)	
			Non-Weighted	Weighted by Principal Amount
All Competitive Offerings		15,455	12.6	8.6
NIC	Non-COVID Period	6,374	13.3	4.5
	COVID Period	465	20.2	12.0
TIC	Non-COVID Period	8,021	11.9	9.6
	COVID Period	595	14.0	12.6

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB's RTRS and security master database.

The 2020 MSRB Research Paper did not examine how the secondary market traded yields change immediately after the primary offering compared with the initial reoffering yields. Table 6 therefore goes one step further by examining the trade spread between the initial reoffering yield and the weighted-average trade yield based on trades in the first 30 days after the primary offering. Since not all securities in an offering have secondary market trades in the first 30 days, Table 6 focuses on a subset of offerings with securities traded in the first 30 days using two different methods: the left side of Table 6 compares all offerings with all of the securities (CUSIP numbers) in an offering traded in the first 30 days, while the right side of Table 6 compares all securities traded in the first 30 days regardless of whether all securities in an offering were traded. Table 6 shows that out of 15,455 competitive offerings, only 847 offerings had trades for all securities in an offering in the first 30 days.⁵⁴ Overall, the median primary offering spread weighted by principal amount for the subset of competitive offerings was 3.1 basis points, and the median trade spread was -1 basis point for the 847 competitive offerings and -0.4 basis point for the 40,644 securities. It appears that the median trade spread results were similar regardless of which method used. By comparison, using the same two methods, all negotiated offerings with trades in the first 30 days have the median trade spread of 11.4 basis points for the 632 offerings with all securities traded

⁵³ See Wu, Simon. Z. and Nicholas J. Ostroy, "Transaction Costs During the COVID-19 Crisis: A Comparison between Municipal Securities and Corporate Bond Markets," Research Paper, Municipal Securities Rulemaking Board, August 2021.

⁵⁴ Since the same size is reduced dramatically, the breakdown by TIC/NIC yield pricing and the COVID and non-COVID periods is not presented in Table 6 because of the limited data points in some categories. However, even with the small sample size, when using both methods, median primary offering spread and median trade spread during the COVID Period were both much wider than those during the non-COVID Period, regardless of yield pricing with NIC or TIC.

in an offering, and 25.4 basis points for the 46,380 traded securities.⁵⁵ This analysis shows that, regardless of which method we used, secondary market trades in competitive offerings in the first 30 days were at slightly higher yields when compared to the initial reoffering yields, resulting in a marginally negative median trade spread, while the yields for secondary market trades in negotiated offerings were substantially lower, resulting in a positive median trade spread.

Table 6. Primary Offering Spread and Trade Spread by Offering Method—In Basis Points, Weighted by Principal Amount (January 2019–December 2021)

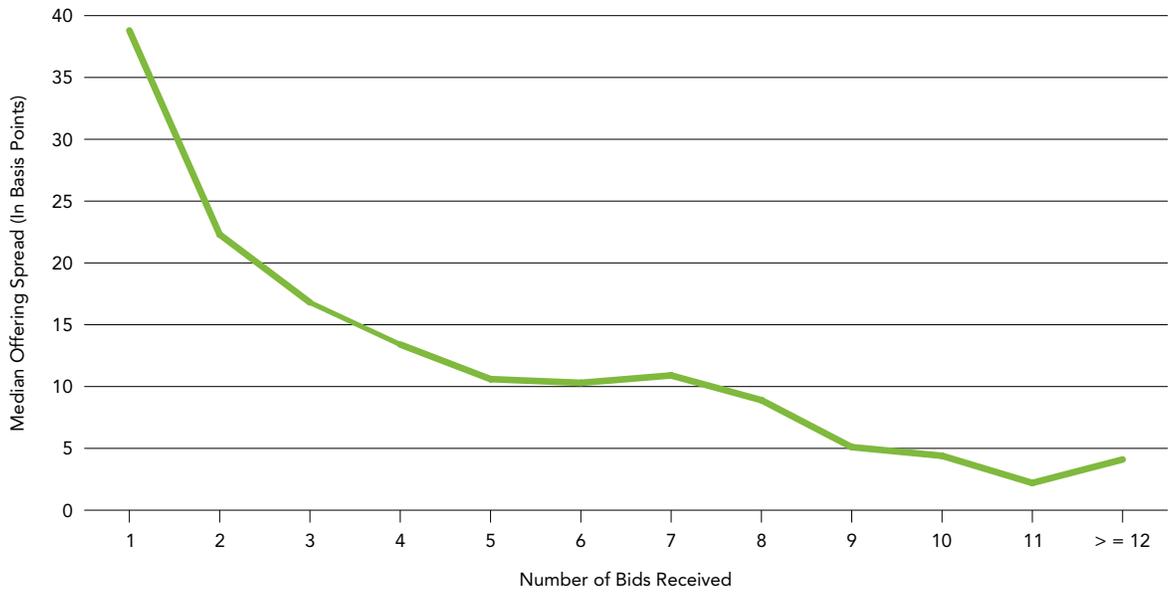
	Offering-Level			Security (CUSIP)-Level	
	Number of Offerings	Median Primary Offering Spread	Median Trade Spread	Number of CUSIPs	Median Trade Spread
All Competitive Offerings	847	3.1	(1.0)	40,664	(0.4)
All Negotiated Offerings	632		11.4	46,380	25.4

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB’s RTRS and security master database.

As mentioned in the 2020 MSRB Research Paper, characteristics such as the offering size, offering structure, issuance purpose, bond maturities, interest rate structure, financing purpose, taxable status, call features, insurance status and the decision to use a municipal advisor are generally determined before the publication of a Notice of Sale and the initiation of a competitive bidding process. Once the structure of an offering is set and the competitive bidding process begins, the number of competitive bids received becomes an additional factor that would have an impact on the primary offering yield spread. Charts 1 and 2 both show there is a negative correlation between the number of competitive bids received and the winning bidder’s primary offering spread, regardless of whether the bids were quoted on a NIC or a TIC basis. For competitive offerings with NIC yield bids, the primary offering spread declines from 38.8 basis points with one competitive bid to around 2.2 basis points with 11 competitive bids. For competitive offerings with TIC yield bids, the primary offering spread declines from 20.5 basis points with one competitive bid to less than 5.3 basis points with 17 competitive bids.

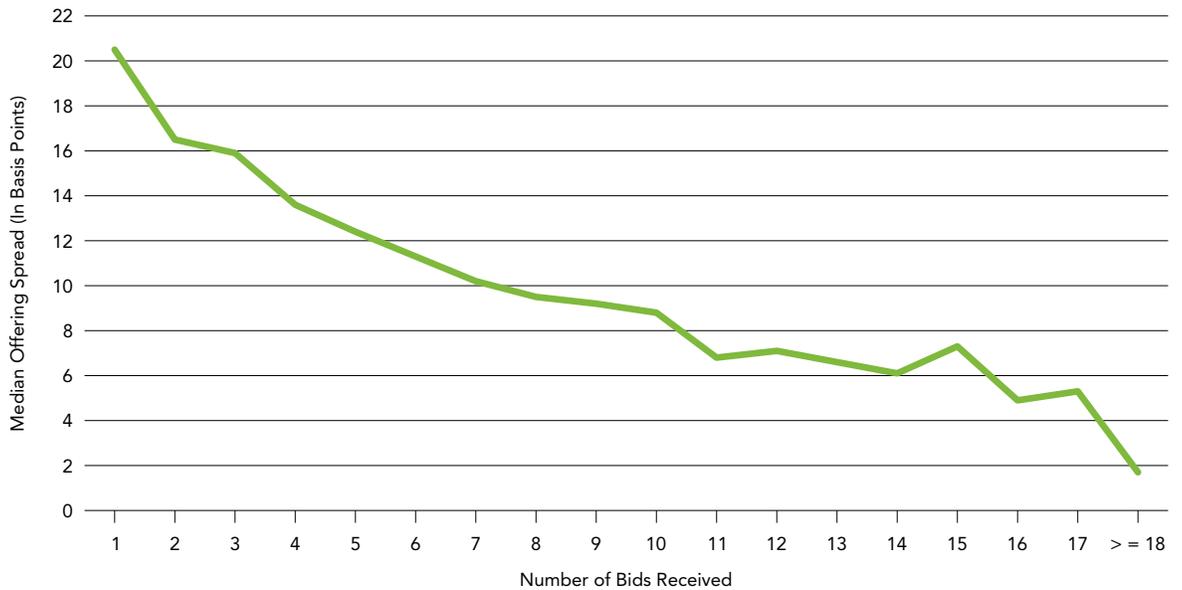
⁵⁵ The S&P Global Market Intelligence Ipreo database does not contain the price nor the yield for negotiated offerings; therefore, we are able to calculate the primary offering spread.

Chart 1. Median Primary Offering Spread and Number of NIC Bids
(January 2019–December 2021)



Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB's RTRS and security master database.

Chart 2. Median Primary Offering Spread and Number of TIC Bids
(January 2019–December 2021)



Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB's RTRS and security master database.

Chart 1 and Chart 2 illustrate the relationship between the number of bids received and the primary offering spread but do not control for idiosyncratic characteristics of each competitive offering. Therefore, a cross-section regression analysis is employed to statistically test for the relationship between the number of competitive bids received and the primary offering spread after controlling for other characteristics of a competitive offering.

$$\begin{aligned}
 \text{Primary Offering Spread}_{it} &= \alpha + \beta_1 \text{Number of Bids}_{it} + \beta_2 \text{Offering Amount}_{it} + \beta_3 \text{Maturity}_{it} \\
 &+ \beta_4 \text{Yield}_{it} + \beta_5 \text{General Purpose Bond}_{it} + \beta_6 \text{Fixed Rate Bond}_{it} \\
 &+ \beta_7 \text{Bond or Note}_{it} + \beta_8 \text{Usage of Municipal Advisor}_{it} + \beta_9 \text{Insured Bond}_{it} \\
 &+ \beta_{10} \text{Callable Bond}_{it} + \beta_{11} \text{New Financing}_{it} + \beta_{12} \text{Taxable Bond}_{it} \\
 &+ \beta_{13} \text{TIC Bid}_{it} + \beta_{14} \text{COVID Period}_{it} + \varepsilon_{it}
 \end{aligned}$$

Similar to the regression analysis on page 12, Primary Offering Spread, Number of Bids, Offering Amount, Maturity (weighted-average for the entire issue) and Yield (weighted-average for the entire issue) are expressed in natural logarithm,⁵⁶ the ten indicator variables⁵⁷ are represented by a yes-or-no value (a value of one if yes and zero if no), subscript *i* corresponds to a particular competitive offering and *t* corresponds to a particular date of an offering.⁵⁸ When specifying Primary Offering Spread in natural logarithm, which is an approximation of the percentage change in yield spread, the regression analysis acknowledges that the *relative* yield spread matters.⁵⁹

Our regression analysis found that, all else being equal, competitive offerings sold during the COVID Period experienced over 17% wider primary offering spread than competitive offerings sold during the Non-COVID Period, which confirms the findings in Table 6 statistically. This result is as expected given the increased volatility and risk in the market during the COVID Period. In addition, the regression analysis also tests the correlation between Number of Bids and Primary Offering Spread and found that, after controlling for the other factors, the primary offering spread is lower when the number of competitive bids received for a competitive offering rise, and the correlation is statistically significant at the 1% level. As to the magnitude of the correlation between the two variables, Table 7 presents the regression model-predicted impact on the primary offering spread based upon the hypothetical scenario of doubling the number of competitive bids received, such as from two bids to four bids, holding everything else constant. Hypothetically, when doubling the number of competitive bids received, the model-predicted primary offering spread would decrease to 0.08% from a hypothetical spread of 0.1%, and to 0.17% from a hypothetical spread of 0.2%. In the case of the 0.2% hypothetical primary offering spread, holding everything else constant, the decrease in the primary offering spread indicates \$15,625 in yield cost savings annually for an issuer if the total offering principal amount is \$50 million and the initial reoffering yield stays the same.

⁵⁶ The natural logarithm difference is used as a proxy for percentage difference for these variables in the equation.

⁵⁷ General Purpose bond, Fixed-Rate Bond, Bond or Note, Usage of Municipal Advisor, Insured Bond, Callable Bond, New Financing, Taxable Bond, TIC Bid and COVID Period.

⁵⁸ Each issue's credit rating at the time of the issuance could also be correlated with the primary offering spread in the model. However, historical credit rating data are either not available for many issues or are contractually prohibited from being used in this analysis.

⁵⁹ For example, in a relative sense, a 10 basis-point yield spread for an issue with a weighted-average yield of 1% may be viewed as a more substantial spread than the 10 basis-point yield spread for an issue with a weighted-average yield of 3%.

Table 7. Change in Primary Offering Spread When Doubling Number of Bids Received

Hypothetical Primary Offering Spread	Model-Predicted Primary Offering Spread When Doubling Number of Bids Received
0.100%	0.084%
0.200%	0.169%

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB’s RTRS and security master database.

Aside from the number of bids received and the COVID Period indicator, the correlation between the primary offering spread and other independent variables are mostly as expected. All else being equal, the primary offering spread was found to be positively correlated with an offering that has a higher weighted-average yield⁶⁰, is a bond rather than a note, is insured, is callable and is for the purposes of new financing, but negatively correlated with an offering with a higher issuance amount, longer weighted-average maturity, that is taxable and engages a municipal advisor during the offering process. As stated in the 2020 MSRB Research Paper, the usage of municipal advisors being associated with a downward statistically significant impact on the primary offering spread seems to be supported by previous studies on this issue.⁶¹

For detailed estimates of parameters and their statistical significance from the regression analysis, please refer to Appendix B.

Choice of Negotiated or Competitive Offerings by Issuers

As mentioned above, academic literature has not uniformly concluded whether an issuer’s choice of primary offering method is economically rational. While there are likely many factors that contribute to an issuer’s decision, this section explores statistically how an issuance’s characteristics are associated with the choice of a primary offering method.

⁶⁰ A higher yield may be indicative of an issuer with a lower credit rating after controlling for other offering characteristics, such as average maturities and whether an offering was sold during the COVID-19 Period.

⁶¹ For example, Daniels and Vijayakumar (2006) found that municipal advisors have a significant impact on borrowing costs, reoffering yields and underwriter gross spreads because municipal advisors provide important and useful services, including monitoring the issuance process and relevant information on behalf of issuers, therefore reducing information asymmetry between issuers and other market participants. See Daniels, Kenneth and Jayaraman Vijayakumar, “The Role and Impact of Financial Advisors in the Market for Municipal Advisors,” *Journal of Financial Services Research*, February 2006. Other previous research indicated that there is a positive role played by municipal advisors in terms of reducing issuance costs, though the extent of cost reduction may depend on the quality of a municipal advisor and the interaction between municipal advisor and underwriting firms. See Moldogaziev, Tima and Martin Luby, “Too Close for Comfort: Does the Intensity of Municipal Advisor and Underwriter Relationship Impact Borrowing Costs?” *Public Budgeting and Finance*, 2016; Allen, Arthur and Donna Dudney, “Does the Quality of Financial Advice Affect Prices?” *The Financial Review* 45, 2010; and Daniels, Kenneth and Jayaraman Vijayakumar, “The Role and Impact of Financial Advisors in the Market for Municipal Bonds,” *Journal of Financial Services Research*, 2006.

Traditionally, it is believed that in many instances, the negotiated offering method is chosen for issuers with lower credit quality, when structuring a complex bond offering or during times of extreme market volatility. The regression analysis below – a logistic regression model – tests the probability of an issuer selecting the negotiated offering method relative to the competitive offering method, based on various idiosyncratic characteristics of an issuance, such as offering amount, weighted-average yield, weighted-average maturity, issuance purpose, financing purpose, interest rate structure, taxable status, insurance status, callable status, usage of a municipal advisor, etc. Essentially, the regression model measures the likelihood of an issuer choosing the negotiated offering over the competitive offering, with statistical inference for a given issuance with given characteristics.

$$\begin{aligned}
 & \textit{Probability of Choosing Negotiated Over Competitive Offering}_{it} \\
 & = \alpha + \beta_1 \textit{Offering Amount}_{it} + \beta_2 \textit{Maturity}_{it} + \beta_3 \textit{Yield}_{it} \\
 & + \beta_4 \textit{General Purpose Bond}_{it} + \beta_5 \textit{Fixed Rate Bond}_{it} + \beta_6 \textit{Bond or Note}_{it} \\
 & + \beta_7 \textit{Usage of Municipal Advisor}_{it} + \beta_8 \textit{Insured Bond}_{it} \\
 & + \beta_9 \textit{Callable Bond}_{it} + \beta_{10} \textit{New Financing}_{it} + \beta_{11} \textit{Taxable Bond}_{it} \\
 & + \beta_{12} \textit{COVID Period}_{it} + \varepsilon_{it}
 \end{aligned}$$

Similar to the regression analyses on pages 12 and 19, the nine indicator variables⁶² are represented by a yes-or-no value (a value of one if yes and zero if no), subscript i corresponds to a particular competitive offering and subscript t corresponds to a particular offering date. In addition, offering amount is expressed as par value in natural log, while yield and maturity are expressed in level. Finally, a positive (negative) coefficient means that an increase in the predictor leads to an increase (decrease) in the predicted likelihood of choosing the negotiated offering method over the competitive offering method.

Empirically, the logistic model finds a statistically⁶³ and economically significant⁶⁴ positive impact on the odds of choosing the negotiated offering method over the competitive offering method based on the following municipal securities characteristics (see Table 8): An offering that has a higher par amount, has a higher weighted-average yield, is a bond rather than a note, is insured and is taxable. For example, Table 8 shows that an offering that is insured has 116.8% higher odds of being a negotiated offering than a competitive offering, while a bond offering has 2,066.6% higher odds of being a negotiated offering than a competitive offering when compared to a note offering. These findings are not surprising since a bond offering would likely have many maturities for placement and therefore would be much more complex than a note offering. The same logic can also be applied to an offering with an insurance component when compared to a non-insured offering. In addition, insured bond offerings are likely to have a lower underlying rating than non-insured bond offerings, as, for example, AAA-rated offerings would not benefit from a credit-rating enhancement through the insurance because those offerings already achieve the best rating. Therefore, the logistic model indicates that an issuer with weaker credit rating would be more likely to pursue the negotiated offering method. On the other hand, an offering that is for general purpose, has a fixed-rate structure rather than a variable rate structure, uses municipal advisory services and has callable bond components has *lower* odds of choosing the negotiated offering method relative to the competitive offering method.

⁶² General Purpose bond, Fixed-Rate Bond, Bond or Note, Usage of Municipal Advisor, Insured Bond, Callable Bond, New Financing, Taxable Bond and COVID Period.

⁶³ At the 99 % confidence level.

⁶⁴ An impact on odds of 10% or more, or -10% or less.

Lastly, unlike the previous findings on competitive bids and competitive offering spread, the COVID Period did not have a strong impact on the choice of a negotiated offering or a competitive offering method. Table 8 shows that while the primary issuance during the COVID Period had 8.5% higher odds of choosing negotiated offerings over competitive offerings after controlling for the characteristics of each offering, the impact was statistically significant only at the 10% confidence level, as opposed to the standard 5% or lower confidence level threshold. It should be noted that private placements, which normally are also completed through a negotiated process but were not included in this analysis, had a significant increase in market share during the COVID Period, presumably gained from negotiated offerings, as illustrated in Table 2.⁶⁵

Table 8. Choice of Primary Offering Method—Likelihood of Choosing Negotiated Offerings Relative to Competitive Offerings (January 2019–December 2021)

Variable	Statistical Significance at 1% Level?	Impact on Odds
Offering Amount	Yes	53.4%
Maturity	Yes	10.1%
Yield	Yes	22.4%
General Purpose Bond	Yes	-62.1%
Fixed-Rate Bond	Yes	-98.9%
Bond or Note	Yes	2,066.6%
Usage of Municipal Advisor	Yes	-95.5%
Insured Bond	Yes	116.8%
Callable Bond	Yes	-66.9%
New Financing	No	3.3%
Taxable Bond	Yes	120.8%
COVID Period	No	8.5%

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB’s RTRS and security master database.

Please refer to Appendix B for detailed logistic regression analysis results.

⁶⁵ This finding may seem to be counterintuitive to the results from Table 2, where the market share for negotiated offerings declined relative to competitive offerings during the COVID Period. The analysis indicates that the characteristics of primary offerings during the COVID Period are different from those offerings during the Non-COVID Period. For example, there is a possibility of self-selection bias during the COVID Period for issuers, where issuers with lower credit rating or no credit rating who would normally prefer the negotiated offering method might have avoided bond issuance altogether when facing the market dislocation. Therefore, we would have witnessed an overall decline in the number of negotiated offerings even with a slight preference for using the negotiated offering method.

Overall, the results presented in this section are consistent with some of the past findings that offerings with more complex features and/or that are more difficult to sell to investors, such as insured bonds, variable rate bonds and offerings with many maturities, tend to choose negotiated offerings than competitive offerings. In contrast, a more common, less complex tax-exempt offering would more likely choose the competitive offering method. For example, as mentioned previously, both Fruits, Booth, Pozdena and Smith (2008) and Krupa (2005) find a difference in types of bonds placed with the negotiated method and competitive method. Unlike those studies, this paper cannot assess the relative costs of negotiated and competitive methods after controlling for the idiosyncratic characteristics of each offering because the Ipreo data do not contain the sale price for negotiated offerings.

Conclusions

The analyses in this paper show that the global COVID-19 market distortion severely impacted the primary offering market for municipal securities, particularly for competitive offerings. When compared to the Non-COVID Period, the total number of primary offerings as well as the average number of competitive bids received per competitive issuance dropped significantly during the COVID Period. In addition, competitive bid prices were more dispersed during the COVID Period, and primary offering spreads for winning bidders (winning underwriter or underwriter syndicate) were much wider. These findings were also statistically significant after controlling for idiosyncratic characteristics of each competitive offering. On the other hand, all else being equal, the COVID Period had only a weak impact on issuers choosing the negotiated offering method over the competitive offering method, both economically and statistically, though it should be noted that private placements gained the most market share during the COVID Period, likely at the expense of negotiated offerings. While the COVID-19 pandemic was a unique event, the impact from the market dislocation on the primary and secondary markets may serve as a useful indicator for similar future market events, such as the current 2022 market volatility.

Similar to the 2020 MSRB Research Paper, primary offering spread was found to be negatively associated with the number of competitive bids received, regardless of whether the bids were quoted on a NIC or a TIC basis, after controlling for characteristics of each offering. Therefore, all things being equal, soliciting more competitive bids would indeed improve an issuer's selling price and reduce the yield cost for the issuer. In addition, this paper also investigated the trade spread by comparing the initial reoffering yield with the weighted-average secondary market traded yield in the first 30 days and found that while the median trade spread was marginally negative for competitive offerings, the median trade spread for negotiated offerings was substantially positive, suggesting that negotiated offerings tend to trade at a higher level in the secondary market.

Lastly, an issuer's choice of primary offering method is associated with the characteristics of an issuance, as offerings with more complex features and/or that are more difficult to sell to investors, such as insured bonds, variable rate bonds and offerings with many maturities, tend to be negotiated offerings rather than competitive offerings, all else being equal.

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Appendix A—About the Authors

Simon Wu, Ph.D., Chief Economist—Mr. Wu is the Chief Economist for the Municipal Securities Rulemaking Board (MSRB). With two decades of experience applying economic expertise to securities policymaking and regulation, Mr. Wu oversees economic analysis of MSRB rulemaking and municipal market transparency initiatives, and leads related statistical, econometric and financial economic analysis. Before joining the MSRB, Mr. Wu served as a financial economic expert on securities trading, market structure, best execution, investment management and financial institution risk management at several economic consulting firms. Mr. Wu also served as Chief Economist at the Federal Housing Finance Agency (FHFA), Office of Inspector General, where he was involved in regulatory oversight on mortgage-backed securities issuance and trading, capital market risk management and unsecured lending by banks. He began his career as senior economist at the Financial Industry Regulatory Authority (FINRA) where he led economic studies in support of securities rule proposals and policy impact analysis. Mr. Wu has a doctorate and master's degree in economics from Vanderbilt University and a bachelor's degree in economics from Belmont University.

Nicholas Ostroy, Senior Market Structure Specialist—Mr. Ostroy is a Senior Market Structure Specialist for the Municipal Securities Rulemaking Board. Mr. Ostroy supports the work of the Chief Economist in addition to work on MSRB's market transparency products and programs. After joining the MSRB as Product Operations Representative in 2012, Mr. Ostroy worked with external users to enhance interactions with MSRB systems, including the Electronic Municipal Market Access (EMMA®) website. Mr. Ostroy has a master's degree in international affairs from American University and a bachelor's degree from State University of New York at Plattsburgh.

Appendix B—Regression Analyses (Period: January 2019–December 2021)

Model 1: Ordinary Least Squares (OLS) Regression for Number of Bids Received⁶⁶

$$\begin{aligned}
 \text{Number of Bids}_{it} &= \alpha + \beta_1 \text{Offering Amount}_{it} + \beta_2 \text{Maturity}_{it} \\
 &+ \beta_3 \text{Yield}_{it} + \beta_4 \text{General Purpose Bond}_{it} + \beta_5 \text{Fixed Rate Bond}_{it} \\
 &+ \beta_6 \text{Bond or Note}_{it} + \beta_7 \text{Usage of Municipal Advisor}_{it} + \beta_8 \text{Insured Bond}_{it} \\
 &+ \beta_9 \text{Callable Bond}_{it} + \beta_{10} \text{New Financing}_{it} + \beta_{11} \text{Taxable Bond}_{it} \\
 &+ \beta_{12} \text{TIC Bid}_{it} + \beta_{13} \text{COVID Period}_{it} + \varepsilon_{it}
 \end{aligned}$$

Variable	Parameter Estimate	Standard Error	t Value	Statistical Significance at 1% Level?
Intercept	(1.164)	0.070	(16.54)	Yes
Offering Amount	0.184	0.003	66.75	Yes
Maturity	0.011	0.011	0.99	No
Yield	(0.029)	0.006	(4.92)	Yes
General Purpose Bond	0.089	0.009	9.97	Yes
Fixed-Rate Bond	(0.453)	0.049	(9.15)	Yes
Bond or Note	0.144	0.020	7.14	Yes
Usage of Municipal Advisor	0.086	0.012	6.92	Yes
Insured Bond	(0.060)	0.012	(4.91)	Yes
Callable Bond	(0.295)	0.019	(15.16)	Yes
New Financing	0.030	0.007	4.24	Yes
Taxable Bond	(0.056)	0.013	(4.43)	Yes
TIC Bid	0.146	0.010	14.59	Yes
COVID Period	(0.117)	0.013	(8.69)	Yes
Adjusted R-Square	0.33			
Number of Observations	15,455			

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB's RTRS and security master database.

⁶⁶ Note: All variables are in natural logarithm form except for the indicator variables (general purpose bond, fixed-rate bond, bond or note, usage of municipal advisor, insured bond, taxable bond and TIC bid) and trend term.

Model 2: Ordinary Least Squares (OLS) Regression for Winning Underwriter’s Primary Offering Spread⁶⁷

$$\begin{aligned}
 \text{Primary Offering Spread}_{it} &= \alpha + \beta_1 \text{Number of Bids}_{it} + \beta_2 \text{Offering Amount}_{it} + \beta_3 \text{Maturity}_{it} \\
 &+ \beta_4 \text{Yield}_{it} + \beta_5 \text{General Purpose Bond}_{it} + \beta_6 \text{Fixed Rate Bond}_{it} \\
 &+ \beta_7 \text{Bond or Note}_{it} + \beta_8 \text{Usage of Municipal Advisor}_{it} + \beta_9 \text{Insured Bond}_{it} \\
 &+ \beta_{10} \text{Callable Bond}_{it} + \beta_{11} \text{New Financing}_{it} + \beta_{12} \text{Taxable Bond}_{it} \\
 &+ \beta_{13} \text{TIC Bid}_{it} + \beta_{14} \text{COVID Period}_{it} + \varepsilon_{it}
 \end{aligned}$$

Variable	Parameter Estimate	Standard Error	t Value	Statistical Significance at 1% Level?
Intercept	0.916	0.142	6.44	Yes
Number of Bids	(0.245)	0.016	(15.37)	Yes
Offering Amount	(0.206)	0.006	(33.18)	Yes
Maturity	(0.289)	0.022	(13.45)	Yes
Yield	0.154	0.012	13.13	Yes
General Purpose Bond	(0.005)	0.018	(0.28)	No
Fixed-Rate Bond	0.129	0.101	1.28	No
Bond or Note	0.803	0.040	20.20	Yes
Usage of Municipal Advisor	(0.084)	0.025	(3.41)	Yes
Insured Bond	0.183	0.024	7.60	Yes
Callable Bond	0.742	0.039	19.12	Yes
New Financing	0.048	0.014	3.37	Yes
Taxable Bond	(0.210)	0.025	(8.44)	Yes
TIC Bid	(0.050)	0.020	(2.53)	No
COVID Period	0.173	0.027	6.47	Yes
Adjusted R-Square	0.27			
Number of Observations	15,255			

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB’s RTRS and security master database.

⁶⁷ Note: All variables are in natural logarithm form except for the indicator variables (general purpose bond, fixed-rate bond, bond or note, usage of municipal advisor, insured bond, taxable bond and TIC bid).

Model 3: Logistic Regression for Choice of Primary Offering Method

$$\begin{aligned}
 & \text{Probability of Choosing Negotiated Over Competitive Offering}_{it} \\
 & = \alpha + \beta_1 \text{Offering Amount}_{it} + \beta_2 \text{Maturity}_{it} + \beta_3 \text{Yield}_{it} \\
 & + \beta_4 \text{General Purpose Bond}_{it} + \beta_5 \text{Fixed Rate Bond}_{it} + \beta_6 \text{Bond or Note}_{it} \\
 & + \beta_7 \text{Usage of Municipal Advisor}_{it} + \beta_8 \text{Insured Bond}_{it} \\
 & + \beta_9 \text{Callable Bond}_{it} + \beta_{10} \text{New Financing}_{it} + \beta_{11} \text{Taxable Bond}_{it} \\
 & + \beta_{12} \text{COVID Period}_{it} + \varepsilon_{it}
 \end{aligned}$$

Variable	Parameter Estimate	Standard Deviation	Wald Chi-Square	Statistical Significance at 1% Level?	Impact on Odds ^{Note}
Intercept	(3.317)	0.238	193.74	Yes	
Offering Amount	0.428	0.012	1,319.69	Yes	53.4%
Maturity	0.096	0.005	356.25	Yes	10.1%
Yield	0.202	0.027	57.58	Yes	22.4%
General Purpose Bond	(0.969)	0.033	877.00	Yes	-62.1%
Fixed-Rate Bond	(4.468)	0.156	824.27	Yes	-98.9%
Bond or Note	3.076	0.085	1,297.89	Yes	2,066.6%
Usage of Municipal Advisor	(3.106)	0.058	2,905.46	Yes	-95.5%
Insured Bond	0.774	0.042	344.79	Yes	116.8%
Callable Bond	(1.107)	0.080	189.99	Yes	-66.9%
New Financing	0.033	0.033	0.99	No	3.3%
Taxable Bond	0.792	0.048	274.99	Yes	120.8%
COVID Period	0.082	0.060	1.85	No	8.5%
Adjusted R-Square	0.41				
Max Re-scaled R-Square	0.54				
Number of Observations	30,446				

Source: MSRB analysis with data obtained from the S&P Global Market Intelligence Ipreo database and MSRB’s RTRS and security master database.

Note: For trade size and original offered amount, the impact on odds reflects the scenario of doubling in size. For maturity and yield, the impact on odds reflects the scenario of a one-unit increase, while for the offering amount, the impact on odds reflects the scenario of doubling the amount of issuance. For the other indicator variables, the impact on odds reflects the “yes” indicator. In addition, R-Square for a non-linear regression model such as the multinomial logistic regression model is considered “pseudo” as the model attempts to provide information similar to that provided by R-squared in an Ordinary Least Square (OLS) regression. However, it cannot be interpreted exactly as R-squared in an OLS regression is interpreted, which is the proportion of variance of the dependent variable explained by the independent variables.

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CORPORATE OFFICE
Municipal Securities
Rulemaking Board
1300 I Street NW, Suite 1000
Washington, DC 20005
202-838-1500

MSRB SUPPORT
202-838-1330
MSRBsupport@msrb.org

ONLINE
MSRB.org
EMMA.MSRB.org
EMMALabs.MSRB.org
Twitter: @MSRB_News