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From Implicit to Explicit: The Impact of Disclosure Requirements on Hidden Transaction Costs

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ABSTRACT

This paper provides evidence that disclosing corporate bond investors' transaction costs (markups) affects the size of the markups. Until recently, markups were embedded in the reported transaction price and not explicitly disclosed. Without explicit disclosure, investors can estimate their markups using executed transaction prices. However, estimating markups imposes information processing costs on investors, potentially creating information asymmetry between unsophisticated investors and bond-market professionals. We explore changes in markups after bond-market professionals were required to explicitly disclose the markup on certain retail trade confirmations.

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We find that markups decline for trades that are subject to the disclosure requirement relative to those that are not. The findings are pronounced when constraints on investors' information processing capacity limit their ability to be informed about their markups without explicit disclosure.

JEL codes: D82, D83, G24, G28, M40, M42

Keywords: corporate bonds; retail transaction costs; information processing costs; information asymmetry; disclosure regulation; financial advisers

1. Introduction

The size and determinants of the cost of trading assets are critical questions for economists given the central role of frictions in financial markets (e.g., Stoll [2000]). Although the effect of information on transaction costs has been studied for decades for equities (since at least Bagehot [1971]), we know less about its effect for bonds, whose transaction costs are significantly higher (Bessembinder et al. [2020]). This paper explores the role of information about transaction costs themselves in corporate bond investors' transaction costs (markups).

Until recently, markups were embedded in the reported transaction price and not explicitly disclosed. For example, if a dealer purchased a bond for $100 and a financial adviser offered it to an investor for $102.50, the trade confirmation simply showed that the bond's cost was $102.50. This lack of transparency can create information asymmetry between bond-market professionals (financial advisers and dealers) and retail investors about the markups' size. To address the potential information asymmetry, FINRA[1] proposed an amendment to its customer confirmation rule, requiring corporate bond-market professionals to disclose the markup on certain retail trade confirmations. The SEC approved the amendment on November 17, 2016, and FINRA implemented it on May 14, 2018.

Ex ante, the effect of explicit markup disclosure on markups is unclear. Without the disclosure, bond investors can estimate the markup using historical price information from TRACE.[2] The investor in our example above, who bought a bond for $102.50, can see that someone recently bought the bond for $100 and infer that the markup is roughly $2.50. Prior literature shows that access to this historical price information through TRACE helps investors, particularly those that are small, to negotiate lower markups (e.g., Edwards et al. [2007], Goldstein et al. [2007]). If investors

[1] FINRA is a self-regulatory organization that acts on behalf of the SEC to regulate member brokerage firms.

[2] The Transaction Reporting and Compliance Engine is the FINRA-developed vehicle that facilitates the mandatory reporting of over-the-counter (OTC) secondary market transactions in eligible fixed-income securities. It can be accessed here: http://finra-markets.morningstar.com/MarketData/Default.jsp.

are already informed about the size of their markups, then explicit disclosure does not reduce information asymmetry and should not reduce markups.[3]

However, estimating markups imposes information processing costs on investors. Information processing costs in this context include the cost of learning that the information exists and acquiring it (Blankespoor et al. [2020]). Anecdotally, some bond investors are unaware that they incur any transaction costs at all in the bond market (Piwowar [2018]).[4] Other investors are aware that they pay markups but do not use TRACE to estimate the size of the markup. If information processing costs prevent corporate-bond investors from being informed about the size of their markups, explicit disclosure should reduce information asymmetry and lead bond-market professionals to reduce markups.

Unique aspects of the markup disclosure rule enable us to use a triple difference design to estimate the effect of explicit disclosure on markups. The rule only applies to retail transactions and, even more specifically, only when the dealer executes an offsetting trade on the same day. We study how the difference between same-day and non–same-day markups changes in the post-disclosure period for small (retail) versus large (institutional) trades. This design helps to ensure that our results are attributable to the rule change, enables us to rule out alternative explanations, and mitigates concerns about potential violations of the parallel trend assumption (Gruber [1994], Rauh [2006], Butler and Cornaggia [2011], Kim [2018]).

We use trade-level information from TRACE beginning six months before and ending six months after the rule change to conduct our analyses. We calculate markup as the total round-trip cost that investors of similar size (small or large) pay to buy and sell a bond. If a purchase and sale of the same bond in the same size group occur on the same day, we label the markup a same-day markup. If a purchase and sale do not occur on the same day, we adopt a seven-day retrospective window to identify the offsetting trade and label the markup a non–same-day markup. We find that small same-day trade markups decline by 4.4 basis points relative to other trades in the six months following the rule change, representing a 5% decrease in markups compared to the pre-period average. We conclude that bond-market professionals charge lower markups when they are required to explicitly disclose the markups.

Because investors could have estimated their markups without the disclosure, we posit the likely mechanism that drives our results is reduced information processing costs. To provide evidence supporting this mechanism, we explore cross-sectional variation in the supply and demand for information processing capacity. On the supply side, the least sophisticated investors have the lowest capacity to bear information processing costs and

[3] Markups will also not change if investors are uninformed about their markups, but accept them as fair compensation for intermediation and investment advice (e.g., Choi et al. [2010]).

[4] See also: http://www.sagharboradvisors.com/bond_proposal.pdf.

are thus most likely to be uninformed about their markups. Assuming investor sophistication decreases in trade size, we expect the markup reduction to be largest for the smallest transactions. Consistent with our expectations, we find a larger reduction in markups for smaller trades.

On the demand side, we use variation in liquidity to identify bonds that require significant information processing capacity to infer markups. In particular, it is difficult for investors to use TRACE to infer the markup on illiquid bonds.[5] Therefore, we expect the markup reduction to be greatest for illiquid bonds. Consistent with expectations, we find that the reduction in markups for small same-day trades is pronounced for bonds with characteristics that are typically associated with illiquidity (high-yield, long-duration, and small) and for bonds that trade less often.

Overall, we provide robust evidence that explicit markup disclosure reduces small investors' markups by reducing their information processing costs. As such, we contribute to the market microstructure literature that studies how various types of disclosure affect transaction costs. For example, disclosure of fundamental accounting information lowers transaction costs by reducing information asymmetry among market participants (Leuz and Verrecchia [2000], Verrecchia [2001]). Specifically related to the corporate-bond setting, several studies show that post-trade price transparency lowers transaction costs by reducing information asymmetry between bond-market professionals and investors (Bessembinder et al. [2006], Edwards et al. [2007]). We extend this literature by showing that explicit disclosure of transaction costs themselves reduces information asymmetry, and therefore transaction costs.

We also contribute to the information processing literature, which offers mixed findings on the effect of reducing unsophisticated investors' and consumers' processing costs. For example, reducing the cost of processing fundamental accounting information can change equity investors' behavior (Ahmed et al. [2006], Michels [2017]), but not when the investors are unsophisticated (Blankespoor et al. [2019]). More closely related to our setting, some studies find that reducing the cost of processing fee-related information affects unsophisticated consumers' and investors' behavior (Barber et al. [2005], Bertrand and Morse [2011], Anagol and Kim [2012]), whereas others do not (Shaffer [1999], Agarwal et al. [2015]). We show that reducing the cost of processing information about markups affects unsophisticated corporate-bond investors.

These investors' markups are large because frictions in the OTC bond market enable market professionals to take advantage of uninformed investors (e.g., Green et al. [2007], Duffie et al. [2007], Egan [2019]). Therefore, our study contributes to the recent and growing literature documenting gatekeepers' role in constraining firms' and financial

[5] This difficulty stems from two sources. First, markups for these bonds are large, which induces significant variation in the reported trade prices (Bessembinder et al. [2006]). Second, investors have to rely on historical prices for these bonds that may be several days or weeks old.

professionals' opportunistic behavior (Egan et al. [2019], Honigsberg [2019], Law and Mills [2019], Kowaleski et al. [2020], Christensen et al. [2020]). Our findings support the idea that disclosure requirements function as a regulatory tool to mitigate frictions and constrain financial professionals' opportunistic behavior (Agarwal et al. [2009], Campbell et al. [2011], Cuny [2018]).

2. *Institutional Setting*

The U.S. corporate bond market is economically important, with approximately $9 trillion of outstanding principal and $30 million in daily trade volume.[6] Despite its size and importance, the corporate bond market is opaque. The lack of transparency, in part, emanates from the structure of the bond market. Bonds trade OTC through dealer networks. Broker-dealers market bonds to their customers and charge a "markup" (or "markdown") over (under) the market price on each trade.[7] This markup generally consists of two components for retail investors: the dealer's component and the financial advisers' component.[8]

The dealer's component serves as compensation for making a market in the bonds. Similar to equity markets, the dealer's costs of intermediation include: (1) order processing (Roll [1984]), (2) inventory risk (Ho and Stoll [1981]), and (3) the cost of adverse selection incurred when transacting with better informed traders (Glosten and Milgrom [1985]). The financial adviser's component, known as "sales credit," serves as compensation for selling the securities and providing financial advice. Conversations with industry professionals indicate that the adviser's component contributes significantly to the markup retail investors incur. To the authors' knowledge, this is the first academic paper to recognize that bond markups are related not only to the costs of intermediation but also to the cost of investment advice.

Dealers and financial advisers (collectively, bond-market professionals) observe order flow and are knowledgeable about the bonds they trade (Green et al. [2007]), giving them an information advantage over investors in opaque, illiquid, decentralized markets like the corporate bond market. Moreover, retail investors lack the sophistication and resources to assess the fairness of price quotes (Duffie et al. [2007]). Bond-market professionals' information advantage enhances their ability to charge unsophisticated (retail) investors a premium to purchase and sell bonds.

Figure 1 describes the detailed trade process for the example transaction we mentioned in the Introduction. Retail customer A contacts their financial adviser (FA1) because they want to sell a bond. FA1 obtains a bid

[6] See: https://www.sifma.org/resources/research/bond-chart/.

[7] Hereafter, we collectively refer to markups and markdowns as "markups."

[8] Because most institutional customers transact with dealer desks directly, they do not incur financial advisory fees.

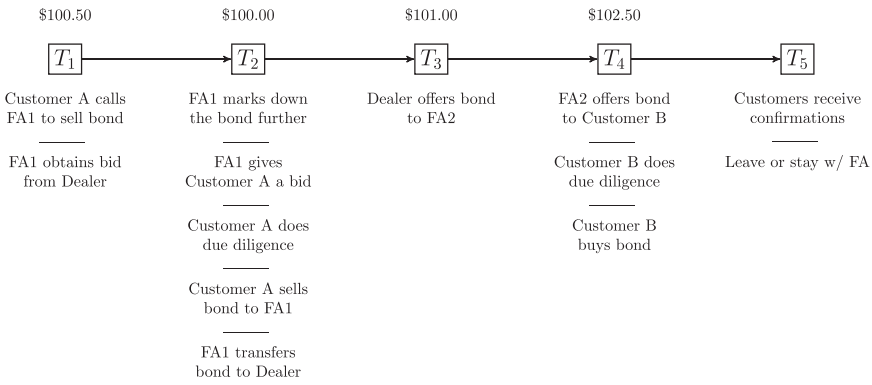


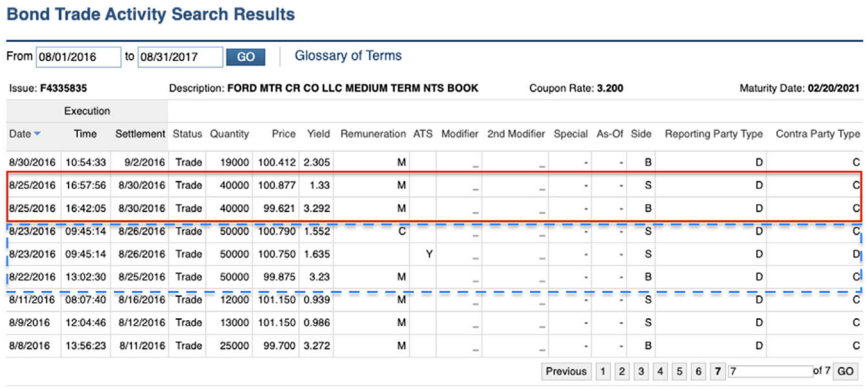
FIG. 1.—Timeline of trade. This figure provides a timeline of the trade process for a bond that is sold by a retail customer at T_2 and bought by a retail customer at T_4. Customer A contacts their financial adviser (FA1) because they want to sell a bond. FA1 obtains a bid from a dealer to purchase the bond for $100.50. FA1 marks the bond down further and offers to buy the bond from Customer A for $100.00. Customer A now has the opportunity to do due diligence (evaluating issuer fundamentals, checking recent prices on TRACE, soliciting additional bids, etc.) and negotiate the price. Customer A sells the bond for $100.00. FA1 transfers the bond to the dealer for $100.50 and earns $0.50 of sales credit for intermediating the transaction. The dealer now offers the bond to FA2 for $101.00, which implies a bid/offer spread of $0.50. FA2 offers the bond to Customer B for $102.50, earning $1.50 over the dealer's price. Customer B decides whether they are willing to pay this price and buys the bond for $102.50. The dealer, FA1, and FA2 collectively earn $2.50 on these transactions. The gross markup on this sample trade is 250 basis points ([102.50 −100.00]/100.00).

from a dealer to purchase the bond for $100.50. FA1 marks the bond down further and tells customer A they can sell the bond for $100.00. Customer A now has the opportunity to do due diligence (evaluating issuer fundamentals, checking recent prices on TRACE, soliciting additional bids, etc.) and negotiate the price. Customer A sells the bond for $100.00. FA1 transfers the bond to the dealer for $100.50 and earns $0.50 of sales credit for intermediating the trade.[9]

The dealer now offers the bond to FA2 for $101.00, which implies a bid/offer spread of $0.50. Retail customer B decides whether they are willing to pay this price and buys the bond for $102.50 from FA2, who earns $1.50 in sales credit. The dealer, FA1, and FA2 collectively earn $2.50 on these transactions.

For decades, corporate bond trades were only reported to the parties directly involved in them. They were not made public, making it impossible for bond investors to compare their own execution prices to those of other investors. Moreover, pre-trade price quotations (which indicate prices at

[9] The financial advisers never actually hold inventory (nor do they have the ability to do so). They simply act as an intermediary, facilitating the transaction between the end retail investor and the dealer. The transfer between the retail investor and dealer happens in the back office upon trade execution.



Bond Trade Activity Search Results

From 08/01/2016 to 08/31/2017 GO Glossary of Terms

Issue: **F4335835** Description: **FORD MTR CR CO LLC MEDIUM TERM NTS BOOK** Coupon Rate: **3.200** Maturity Date: **02/20/2021**

Date	Execution Time	Settlement	Status	Quantity	Price	Yield	Remuneration	ATS	Modifier	2nd Modifier	Special	As-Of	Side	Reporting Party Type	Contra Party Type
8/30/2016	10:54:33	9/2/2016	Trade	19000	100.412	2.305	M		_	_	-	-	B	D	C
8/25/2016	16:57:56	8/30/2016	Trade	40000	100.877	1.33	M		_	_	-	-	S	D	C
8/25/2016	16:42:05	8/30/2016	Trade	40000	99.621	3.292	M		_	_	-	-	B	D	C
8/23/2016	09:45:14	8/26/2016	Trade	50000	100.790	1.552	C		_	_	-	-	S	D	C
8/23/2016	09:45:14	8/26/2016	Trade	50000	100.750	1.635		Y	_	_	-	-	S	D	D
8/22/2016	13:02:30	8/25/2016	Trade	50000	99.875	3.23	M		_	_	-	-	B	D	C
8/11/2016	08:07:40	8/16/2016	Trade	12000	101.150	0.939	M		_	_	-	-	S	D	C
8/9/2016	12:04:46	8/12/2016	Trade	13000	101.150	0.986	M		_	_	-	-	S	D	C
8/8/2016	13:56:23	8/11/2016	Trade	25000	99.700	3.272	M		_	_	-	-	B	D	C

Previous 1 2 3 4 5 6 7 7 of 7 GO

FIG. 2.—Assessing markups using TRACE. This figure presents the methodology that retail investors can use to assess markups using the FINRA Market Data Center. Highlighted in the solid red box is an example of a same-day small trade. On August 25, 2016, at 16:42:05, a customer sells 40,000 in par value for a price of 99.621 ($39,848.40). Fifteen minutes later, a customer buys the same bond and quantity from a dealer for a price of 100.877 ($40,350.80). The difference in price implies a markup of 1.26% (about $502.40). Highlighted in the dashed blue box is an example of a non–same-day small trade. On August 22, 2016, a customer sells 50,000 in par value for a price of 99.875 ($49,937.5). The next day, the dealer sells the same bond and quantity to another dealer, who immediately sold to another customer at 100.790. Using our methodology, we would record this as a non–same-day small trade with a gross markup of 91.5 basis points.

which dealers are willing to transact) were available only to bond-market professionals by telephone. This lack of pre-trade and post-trade transparency is particularly disadvantageous to unsophisticated retail investors (Edwards et al. [2007]).

Pre-trade price transparency remains limited in the corporate bond market. However, post-trade price transparency improved in 2002, when NASD (the National Association of Security Dealers) required all secondary market bond transactions to be reported through TRACE. Following the introduction of TRACE, bond investors can use executed trade prices to assess the competitiveness of their own trade prices in the same or similar bonds and negotiate better terms before executing the trade.

Figure 2 provides a snapshot from TRACE. It illustrates how an investor can see the price at which someone (likely the dealer) recently purchased the bond and use this information to negotiate their own price.[10] Despite this improvement in transparency, some retail investors are not aware that

[10] Highlighted in the solid red box is an example of a small same-day trade. On August 25, 2016, at 16:42:05, a customer sells 40,000 in par value for a price of 99.621 ($39,848.40). Fifteen minutes later, a customer buys the same bond and quantity from a dealer for a price of 100.877 ($40,350.80). The difference in price implies a markup of 1.26% (about $502.40). Highlighted in the dashed blue box is an example of a non-same-day small trade. On August 22, 2016, a customer sells 50,000 in par value for a price of 99.875 ($49,937.5). The next day, the dealer sells the same bond and quantity to another dealer, who immediately sold to

they pay transaction costs. As former SEC Commissioner Michael Piwowar observed, "customers who pay hidden markups and markdowns, instead of explicitly disclosed commissions, may mistakenly conclude that they are not incurring any trading costs" (Piwowar [2018]). This lack of awareness impedes competition. If investors are unaware of the scale of the markups they incur when making trades, lower markup bond-market professionals cannot credibly communicate to investors that they charge less than their competitors.

The SEC has been concerned for many years about retail fixed-income investors' limited ability to understand the size of the transaction costs associated with their trades. For example, the SEC's 2012 Financial Literacy Study concluded that "U.S. retail investors lack basic financial literacy" and specifically highlighted disclosure of markups that intermediaries earn as a mechanism to increase their literacy (SEC [2012]). FINRA subsequently amended its customer confirmation rule (Rule 2232) on May 14, 2018. These amendments were the result of a multi-year process during which FINRA solicited feedback twice (in 2014 and 2015). The SEC approved FINRA's amendments on November 17, 2016.[11]

The amended rule requires bond-market professionals to disclose markups (and markdowns) on customer confirmation statements whenever a bond is bought from (or sold to) a retail customer on the same day as the bond is sold (bought) by the dealer.[12] Figure 3 describes the information bond investors receive on their trade confirmations after this regulation and compares it to the information received before the regulation. In particular, we show the trade confirmations for the two retail customers in the sample transaction we described in figure 1.

We assume that the trades are executed on the same day and that the par value traded is $100,000. In the pre-disclosure period, customer A's trade confirmation shows that they sold the bond for $100,000. Customer B's confirmation shows that they bought the bond for $102,500.

After the rule change, each customer's trade confirmation details the prevailing market price of the bond and the markup/markdown on the trade. For illustrative purposes, we assume the prevailing market price is the midpoint between the dealer's bid and the dealer's offer: $100.75. Customer A's confirmation shows that they received $100,000 for the sale, the

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another customer at 100.790. Using our methodology, we would record this as a non–same-day small trade with a gross markup of 91.5 basis points.

[11] The MSRB concurrently amended rule G-15, requiring markup/markdown disclosures on retail customers' municipal bond trade confirmations when an offsetting principal trade occurs on the same day. The institutional setting is sufficiently different in corporate bonds that a combined study would be inappropriate. As such, we caution readers that our study's results may not generalize to other market settings.

[12] All trades executed by a retail investor, regardless of whether a financial adviser intermediates the trade, are subject to markup disclosure if the dealer executes an offsetting trade on the same day.

	Customer A		Customer B	
	Pre-Regulation	Post-Regulation	Pre-Regulation	Post-Regulation
Transaction Price	$100,000	$100,000	$102,500	$102,500
Market Price	–	$100,750	–	$100,750
Markup/Markdown	–	$750	–	$1,750

FIG. 3.—Comparison of customer trade confirmations. This figure presents the information that bond investors receive on their trade confirmations after the rule change in comparison to that received before the rule change. For illustrative purposes, we show the trade confirmations for the two customers in the sample transaction described in figure 1. Assume that the trades are executed on the same day and that the par value is $100,000. In the pre-disclosure period, customer A's trade confirmation shows that they sold the bond for $100,000. Customer B's confirmation shows that they bought the bond for $102,500. After the rule change, each customer's trade confirmation provides the prevailing market price of the bond (assume this is the midpoint between the dealer's bid and the dealer's offer: $100.75) and the markup/markdown on the bond. Customer A's confirmation shows that they received $100,000 for the sale, the market price of the bond was $100,750, and the dealer and adviser collectively earned $750 on the trade. Customer B's confirmation shows that they paid $102,500 for the bond, the market price of the bond was $100,750, and the dealer and adviser collectively earned $1,750 on the trade.

market price of the bond was $100,750, and the dealer and adviser collectively earned $750 on the trade. Customer B's confirmation shows that they paid $102,500 for the bond, the market price of the bond was $100,750, and the dealer and adviser collectively earned $1,750 on the trade.

If customers A and B were previously unaware of the size of the markups they incur to trade, receiving the trade confirmation in the post-disclosure period could provide new information that causes them to reevaluate their brokerage relationship. To avoid this adverse outcome, financial advisers could proactively reduce markups on the trades they think will trigger the disclosure rule.[13] Although expressly prohibited by FINRA, market professionals could circumvent the disclosure rule by avoiding executing same-day trades. We study this possibility in internet appendix IA-1 and do not find evidence of it.

3. Data

3.1 SAMPLE

To examine changes in markups associated with corporate bond trades in the period around the amended Rule 2232, we rely on the TRACE

[13] This selective transaction cost reduction requires that the adviser knows before executing the trade whether it will trigger the rule or not. If the adviser and dealer work for the same brokerage firm, the internal system will display a "New" flag, signaling to the adviser that the bond recently came into the dealer's inventory. If the adviser and dealer do not work for the same firm, the adviser can typically see that the bond is an "outside" offering, which will trigger the disclosure rule.

database. The OTC corporate bond transaction data available through TRACE's Bond Trade Dissemination Service (BTDS) database include the following relevant information: CUSIP, date, time, price, yield, quantity, an indication of whether the trade is a purchase or a sale, and an indication of the counterparty type (i.e., customer or dealer). We use the Mergent Fixed Income Securities Database (FISD) to supplement TRACE with a comprehensive set of bond issue characteristics (including bond issue size, issue date, bond features, bond ratings, coupon rate, and frequency of payment).

Similar to Bessembinder et al. [2006], who study the effect of TRACE's introduction on markups in the corporate bond market, we restrict our sample to six months before and six months after the disclosure rule change.[14] Our sample period begins on November 7, 2017, and ends on November 21, 2018, to allow for six months in the pre-treatment and post-treatment periods. To avoid an overlap between the pre- and post-periods when calculating markups, we drop the week before and the week after May 14, 2018.[15]

As shown in panel A of table 1, TRACE reports 15,819,975 trades over 40,902 bonds during our sample period. We apply several standard cleaning techniques to correct previously identified errors in the TRACE data. We begin by dropping all trades with missing CUSIP information. Following prior studies (e.g., Schestag et al. [2016]), we also eliminate duplicated, corrected, and cancelled trades.

Next, we merge the TRACE data with the Mergent FISD bond characteristic data. We drop all privately issued and 144A securities because these are only traded by qualified institutional investors. Next, we remove all adjustable rate, foreign denominated, perpetual, and convertible bonds (e.g., Bessembinder et al. [2006]). To remove obvious data entry errors, we remove transactions with odd trade denominations (i.e., trades in increments other than $1,000). To eliminate securities in extreme distress, we drop trades with dollar prices above 150 (i.e., 150% of face value) or below 50 (e.g., Schwert [2017]). Finally, we drop all trades within 90 days of the issuance date and bonds with less than a year remaining to maturity (e.g., Even-Tov [2017]). These steps yield a sample that consists of 10,927,422 trades over 16,128 individual bonds.

Panel B of table 1 summarizes the bond and transaction characteristics of the sample. The average (median) bond has approximately 7.36 (5.07) years remaining to maturity and is 4.56 (3.58) years from the issuance date. The mean (median) coupon rate for the bonds in our sample is 4.36% (4.12%), which reflects the low interest rate environment of our sample period. The typical issue size of the bonds is large, with a mean (median) of $1.20 billion ($1.00 billion). Finally, the mean (median)

[14] Internet appendix IA-2 shows that our results are robust to extending the sample period to one-year before and after the rule change.

[15] Our results are not sensitive to the inclusion of these dropped weeks.

TABLE 1

Sample Selection and Descriptive Statistics of Bond Characteristics

Panel A: Sample selection

	Bonds	Trades
Full TRACE sample	40,902	15,819,975
Drop trades with missing CUSIP info	40,901	15,811,632
Removal of duplicated/corrected/cancelled trades	40,901	15,464,794
Mergent match	32,494	14,510,752
Drop privately issued and 144A securities	32,302	14,411,151
Drop adjustable rate, foreign denominated, perpetual, and convertible bonds	20,790	12,694,664
Drop trades with odd trade denominations	20,617	12,677,292
Remove trades with dollar prices greater than 150 or less than 50	20,362	12,635,033
Exclude trades within one year of bond maturity or 90 days of bond issuance	16,128	10,927,422

Panel B: Bond and trade characteristics

	Mean	*StDev*	$p^{25\%}$	$p^{50\%}$	$p^{75\%}$
Years to maturity	7.36	6.91	3.01	5.07	8.15
Years from issue	4.56	4.03	1.97	3.58	5.83
Coupon (%)	4.36	1.65	3.10	4.12	5.38
Issue amount ($ BN)	1.20	1.00	0.50	1.00	1.50
Transaction amount ($ 000s)	249.07	744.59	10.00	25.00	100.00

Panel A describes the sample selection process. The sample period spans November 7, 2017, through November 21, 2018. See section 3 for a detailed description of the sample construction. Panel B summarizes the fundamental characteristics of the 16,128 bonds.

trade size is $249.07 ($25) thousand, implying a significantly right-skewed distribution.

3.2 VARIABLE CONSTRUCTION

Our proxy for transaction costs, *Gross Markup*, is the total round-trip cost that an investor of size group s (small or large) pays to buy and sell bond i on date t. We define trade size s as small if the trade is less than or equal to $100,000 and large otherwise (Edwards et al. [2007]).

To calculate markups, we begin with customer purchases and look for customer sales in the same bond in the same trade-size group.[16] If a sale does not occur on the same date t in the same size category s as the customer purchase, we look seven calendar days back for a customer sale of

[16] We start with customer purchases for several reasons. First, customer purchases are more common than sales, allowing us to calculate our measure for more bond-day observations. Second, markups tend to be larger on customer purchases than markdowns on customer sales. Third, when a financial adviser sells a bond to a customer, they likely know whether the bond came into the dealer's inventory on the same day. Thus, the adviser knows whether the trade will trigger the disclosure rule or not. In internet appendix IA-3, we show that our results are robust to beginning with customer sales and looking forward to customer purchases.

the same bond in the same size category. We formally define gross markup as:

$$Gross\ Markup^{s}_{i,t} = \frac{P^{Ask}_{i,t,s} - P^{Bid}_{i,t-j,s}}{P^{Bid}_{i,t-j,s}}.$$

$P^{Ask}_{i,t,s}$ is the par-weighted average customer purchase price of bond i on date t in trade size category s. $P^{Bid}_{i,t-j,s}$ is the par-weighted average customer sale price of bond i on date $t-j$ in trade size category s. $P^{Ask}_{i,t,s}$ is matched with the nearest associated $P^{Bid}_{i,t-j,s}$ in prior trade dates (j) up to a maximum of seven calendar days.

For trades that have a same-day offset, our measure is similar to Schestag et al. [2016] and Hong and Warga [2000], who compare the par-weighted average price of customer purchases to the par-weighted average price of customer sales on the same day. For trades taking place across different days, our measure borrows from Green et al. [2007]. For a $P^{Ask}_{i,t,s}$ that has no same-day $P^{Bid}_{i,t-j,s}$, we look back in time to find a $P^{Bid}_{i,t-j,s}$.[17]

As shown in panel A of table 2, we can measure *Gross Markup* for 1,134,773 bond-day-size groups. To remove markups created from data errors, we eliminate all entries with an implied markup that is negative or zero.[18] Finally, we require at least two valid observations of our *Gross Markup* measure to ensure a consistent sample when including bond-level fixed effects. All continuous variables are Winsorized at the 1st and 99th percentiles to mitigate the impact of outliers. Our final sample of gross markup is 1,034,468 bond-day-size groups across 11,239 bonds. These markups include 88% of all customer purchases and 74% of all customer sales during the sample period.

Bond-market professionals are only required to disclose markups on retail trades executed on the same day as an offsetting trade in the same bond by the same dealer. We create an indicator, *Same Day*, equal to one if *Gross Markup* is calculated using a customer purchase and a customer sale that take place on the same day. We cannot be certain that trades that appear to be offsetting (in the same bond on the same day) are executed by the same dealer because we do not have dealer identifiers. However, approximately 62% of our gross markups are measured using trades that are executed on the same day as an offsetting trade. This percentage comports with FINRA's estimate of the percentage of trades with a same-day offset of 60%.[19]

We also cannot observe whether a transaction is executed by a retail investor using TRACE data. Therefore, we follow prior literature and use

[17] Once we find a $P^{Bid}_{i,t-j,s}$, we disregard sales on previous days.

[18] Removing negative or zero markups (which are negative or zero bid-ask spreads) is common in both the fixed income literature (e.g., Schestag et al. [2016], Feldhütter [2012], Hong and Warga [2000]) and the equities literature (e.g., Chordia et al. [2008]). Our results are not sensitive to excluding these negative and zero markups.

[19] See https://www.finra.org/rules-guidance/notices/14-52.

TABLE 2

Descriptive Statistics of Gross Markups and Pairwise Correlations

Panel A: Markup sample selection

	N	Cust. Purchases (%)	Cust. Sales (%)
Full compiled sample	1,134,773	93.70	77.50
Drop observations w/zero or negative spreads	1,035,447	88.36	74.02
Limit to bonds w/two or more observations	1,034,468	88.32	73.97

Panel B: Descriptive statistics

	N	*Mean*	*StdDev*	$p^{25\%}$	$p^{50\%}$	$p^{75\%}$
Gross markup (bps)	1,034,468	70.32	80.64	18.02	39.12	90.47
Same day	1,034,468	0.62	0.48	0.00	1.00	1.00
Small trade	1,034,468	0.65	0.48	0.00	1.00	1.00
High tield	1,034,468	0.28	0.45	0.00	0.00	1.00
Years to maturity	1,034,468	7.61	7.27	3.00	5.07	8.35
Issue amount ($ BN)	1,034,468	1.02	0.80	0.50	0.75	1.30
Trading activity	1,034,468	11.80	11.64	4.00	8.00	15.00

Panel C: Pairwise correlations

	GM	SD	ST	HY	YTM	IA	TA
Gross markup (GM)		−0.11	0.40	0.07	0.32	−0.31	−0.06
Same day (SD)	−0.11		0.05	0.06	−0.02	0.21	0.41
Small trade (ST)	0.33	0.05		−0.09	−0.08	−0.16	0.01
High yield (HY)	0.07	0.06	−0.09		0.05	−0.12	0.03
Years to maturity (YTM)	0.28	−0.04	−0.12	−0.03		0.00	−0.13
Issue amount (IA)	−0.25	0.20	−0.14	−0.12	0.08		0.45
Trading activity (TA)	−0.06	0.30	−0.02	0.01	−0.11	0.43	

Panel A shows the total percentage of unique customer purchases and sales in our sample period represented in the markup calculation, and the total number of observations by data filtering step. Panel B provides descriptive statistics for the variables used in the paper. The unit of observation is the bond-day-size category. Our primary variable of interest, *Gross Markup*, is measured for each bond-day-size category in which a customer buy transaction can be matched to a customer sell transaction within seven calendar days. All other variables are defined in appendix A. Panel C provides the pairwise Pearson (Spearman) correlations among these variables in the upper (lower) triangular region. All correlations are statistically significant at the 5% level of significance. The sample period spans November 7, 2017, through November 21, 2018, excluding the two-week window surrounding the date FINRA amended its customer confirmation rule (May 14, 2018).

transaction size to proxy for investor type (Edwards et al. [2007], Green et al. [2007], Feldhütter [2012]). We create an indicator, *Small Trade*, equal to one if *Gross Markup* is constructed using trades that are less than or equal to $100,000 in par value. Smaller trades account for most transactions in corporate bond markets (approximately 65% of our sample of gross markups), consistent with prior studies (e.g., Schestag et al. [2016]).

Importantly, the measurement error associated with identifying retail trades with a same-day offset exists in both the pre-period and the post-period. The error is unlikely to lead to spurious inferences in our setting because the difference-in-differences and triple difference research designs control for common time-invariant measurement error. Nonetheless, we

provide some robustness tests around trade size cutoffs (in section 4.5) and identifying offsetting trades (in internet appendix IA-3). Our primary inferences are unchanged both economically and statistically when considering alternative methods.

3.3 DESCRIPTIVE STATISTICS

Panel B of table 2 reports descriptive statistics for the primary variables of our constructed sample. The mean *Gross Markup* for bonds in our sample is 70.32 basis points. The median is only 39.12, and the standard deviation is 80.75, illustrating the substantial variability and skewness of these markups.

To provide some context for *Gross Markup*, we benchmark against prior literature. Edwards et al. [2007] show that an average round-trip markup for a $50,000 trade is 92 bps.[20] These estimates are based on same-day matches. Our average *Gross Markup* for same-day small trades is 86 bps in the pre-treatment period, which is roughly similar.[21] Edwards et al. [2007] show that an average round-trip markup for a $500,000 trade is 28 bps. Our estimate of 30 bps in the pre-treatment period is similar.

Panel B of table 2 also describes the characteristics for the sample of bonds for which we can calculate *Gross Markup*. The maturities and issue sizes are quite similar to those reported in panel B of table 1 for the full sample of trades. The average time remaining to maturity is 7.61 years, and the average issue size is $1.02 billion. Twenty-eight percent of our sample bonds are rated below investment grade by Moody's and Standard & Poor's and the average bond trades 11.8 times per day.[22]

Panel C of table 2 presents pairwise Pearson and Spearman correlations between *Gross Markup* and bond characteristics. *Gross Markup* is negatively correlated with *Same Day* because inventory holding costs are lower for these transactions. Many of these transactions occur in short time-intervals and do not require the dealer to take any risk (i.e., riskless principal transactions).

The correlation between *Gross Markup* and *Small Trade* is strongly positive, which is consistent with prior studies that show small investors pay substantially more in bond markets (e.g., Edwards et al. [2007]). Also consistent with prior studies (e.g., Bessembinder et al. [2006]), markups are higher for high yield (non-investment grade) securities and those with more time remaining to maturity, and lower for large issues. Finally, on days with higher trading activity, markups tend to be lower, which reflects greater liquidity.

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[20] Table 4 of Edwards et al. [2007] shows an average one-way markup on a $100,000 trade of 46 bps. To estimate the round-trip cost, we multiply this markup by two.

[21] See table 3.

[22] Our sample is skewed toward bonds that trade relatively frequently because we require a buy and a sell within seven calendar days in order to measure *Gross Markup*.

4. *Research Design and Results*

4.1 IDENTIFICATION

Our objective is to determine whether explicit markup disclosure on customer trade confirmations affects markups. Because the markup disclosure only applies to retail trades and only if an offsetting transaction occurs on the same day, we employ both a difference-in-differences and a difference-in-differences-in-differences research design (also known as a triple-difference or DDD specification). We explore the following three differences: before versus after the rule change, trades with a same-day offset versus those with a non–same-day offset, and small versus large trades.

We first limit the sample to small trades. We compare the changes in markups on small trades with a same-day offset to those that do not have a same-day offset. This design uses non–same-day trades as a control for trends in small trade markups. Next, we limit the sample to same-day trades. We compare changes in markups on same-day small trades to changes in markups on same-day large trades. This design uses large trades as a control for general trends in same-day markups.

Each of the control samples (large trades and non–same-day trades) could be affected by unrelated changes. For example, changes in market conditions could impact large trades differently than small trades. Similarly, changes in inventory holding costs could affect non–same-day trades differently than same-day trades. However, these changes are unlikely to affect all four sub-groups differently simultaneously.

Therefore, in our primary specifications, we use all three levels of differences simultaneously to ensure that our results are attributable to the rule change (Gruber [1994], Rauh [2006], Butler and Cornaggia [2011], Kim [2018]). Our main focus is on comparing the difference in markups between same-day small trades and non–same-day small trades with the difference in markups between same-day large trades and non–same-day large trades. If disclosure reduces bond-market professionals' ability to charge high markups, we should observe a stronger effect on small trades executed on the same day as an offsetting trade than on other trades.

4.2 TIME-SERIES VARIATION IN GROSS MARKUPS

We plot gross markups for each of the four groups in our analyses (same-day small, non–same-day small, same-day large, non–same-day large) in figure 4. To help visualize trends, the plot begins four calendar quarters before the quarter of the rule change and ends four calendar quarters after. This plot serves two purposes. First, it provides preliminary visual evidence about the effect of the rule change. Second, it provides support for the key identifying assumption required for our triple difference research design: that the treatment and control outcomes would have followed parallel trends in the absence of the treatment (Bertrand et al. [2004], Bourveau

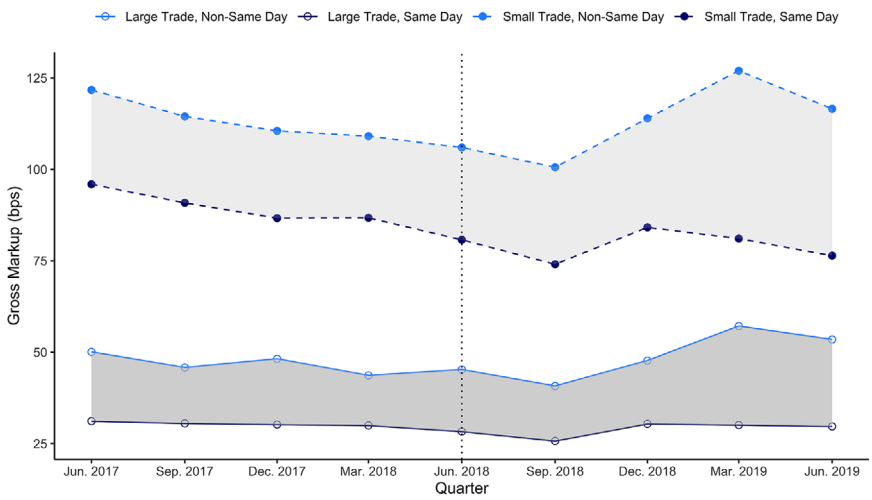

FIG. 4.—Time series of corporate bond markups around markup disclosure.
This figure presents the time series of *Gross Markup*, in basis points, by calendar-quarter beginning in April 2017 and ending in June 2019. The dark-solid (dark-dashed) line represents the average quarterly value of all large (small) same-day markups. The light-solid (light-dashed) line represents the average quarterly value of all large (small) non-same-day markups. The vertical line represents the calendar-quarter FINRA amended its customer confirmation rule (in May 2018).

et al. [2018], Gow et al. [2016]). We provide additional support for the parallel trends assumption with linear time trends and a placebo test in internet appendix IA-2.

As described in section 4.1, we first focus on small trades and compare the markups on same-day trades (the dashed dark blue line) to those on non–same-day trades (the dashed light blue line). These two lines appear to follow parallel trends in the pre-period and start diverging from one another during the quarter of the rule change.[23] The lightly shaded region, which is the difference between markups on non–same-day small trades and markups on same-day small trades, continues to widen throughout the year following the rule change.

The figure also shows that markups generally increase at the end of 2018. The increase continues into the beginning of 2019 for non–same-day trades. The increase is likely driven by a global spike in volatility in December of 2018, which caused market liquidity to decline during this

[23] Because we measure markups at the calendar-quarterly level in figure 4, the reduction in markups during the quarter ending June 30, 2018 (the quarter of the rule change), could start sometime between April 1 and May 14, prior to the rule change. Such an anticipatory effect could happen as bond-market professionals prepare their internal systems to implement the rule. In internet appendix IA-2, we show that our regression results are economically and statistically similar when we exclude the month and a half before the rule change.

TABLE 3
Univariate Changes in Gross Markup Around Markup Disclosure

		Same-Day			Non–Same-Day			Difference
		(a) Pre	(b) Post	(c) (b)-(a)	(d) Pre	(e) Post	(f) (e)-(d)	(g) (c)-(f)
(i)	Small trades	86.13	76.36	−9.77***	108.89	101.77	−7.12***	−2.65***
(ii)	Large trades	30.02	27.13	−2.89***	45.71	41.97	−3.74***	0.85
(i)-(ii)	Difference	56.11***	49.23***	−6.88***	63.18***	59.98***	−3.38***	−3.50***

FINRA amended its customer confirmation rule on May 14, 2018. The amendment applied to retail trades executed on the same day as an offsetting trade. Columns a through c summarize *Gross Markup*s, measured in basis points, on same-day trades and columns d through f summarize *Gross Markup*s on non–same day trades, depending on whether the size of the trade is small (less than or equal to $100,000 in row (i)) or large (greater than $100,000 in row (ii)). The pre-disclosure period in columns a and d spans November 7, 2017, through May 7, 2018, whereas the post-disclosure period in columns b and e spans May 21, 2018, through November 21, 2018. Appendix A defines all variables. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

period.[24] This spike has limited overlap with our empirical tests because the sample period ends on November 21, 2018. Nonetheless, this shift in liquidity illustrates the importance of using non–same-day small trades *and* same-day large trades as controls.[25]

Next, we focus on same-day trades and compare the markups on small trades (the dashed dark blue line) and large trades (the solid dark blue line). Markups on same-day small trades trend downward throughout the nine quarters, whereas markups on same-day large trades are relatively stable. This pre-period difference in trends violates the parallel trend assumption and again illustrates the importance of using same-day large trades *and* non–same-day small trades as controls.

Our primary focus is on the triple difference. Thus, we compare the difference in markups between same-day small trades and non–same-day small trades (the lightly shaded region) with the difference in markups between same-day large trades and non–same-day large trades (the heavily shaded region). The lightly shaded region and the heavily shaded region appear to follow parallel trends in the pre-period. Beginning in the quarter of the rule change, the lightly shaded region widens relative to the heavily shaded region. In sum, figure 4 supports the parallel trend assumption and provides preliminary evidence that the disclosure requirement for same-day retail trades contributes to reduced markups.

4.3 UNIVARIATE ANALYSIS

Table 3 summarizes markups before and after the rule change. Columns a through c examine changes in small and large trade markups when a buy and sell occur on the same day. Columns d through f examine changes in

[24] For instance, see https://www.guggenheiminvestments.com/perspectives/sector-views/investment-grade-corporate-bonds-liquidity-s-worth.

[25] Date fixed effects in the regression specifications also help to address general trends.

small and large trade markups when the buy and sell do not occur on the same day.[26]

Focusing on small trades, row (i) shows that markups on trades with a same-day offset decline 9.77 bps, whereas those without a same-day offset decline 7.12 bps. Because our design uses non–same-day trade markups as a control, we treat the 7.12 bps decline as unrelated to markup disclosure. However, the decline may be attributable to a spillover effect of markup disclosure if some financial advisers lower the markups on all retail trades, regardless of whether a same-day offsetting trade occurs.

Focusing on trades with a same-day offset, column c shows that small trade markups decline 9.77 bps, whereas large trade markups decline 2.89 bps. We attribute the 2.89 bps decline in large trade markups to a general decline in markups in the post-period. However, as we discussed in section 3.2, some treated observations are likely classified as control observations and vice versa (e.g., some large trades are executed by retail investors). If such misclassifications exist, we are underestimating the effect of markup disclosure by limiting our inferences to the 6.88 bps greater decline in same-day small trade markups.

Considering both difference-in-differences together, Column g shows that the gap between same-day and non–same-day small trade markups falls 3.50 bps more than the gap between same-day and non–same-day large trade markups. This difference is economically meaningful, representing a 4.1% reduction in markups, relative to the cost of a small trade in the pre-disclosure period.[27] The reduction is similar to the 5 bp decline in markups that Edwards et al. [2007] document after the introduction of transaction reporting through TRACE. These univariate findings corroborate the preliminary evidence described in section 4.2 that the requirement to disclose markups on same-day retail trades contributes to reduced markups.

4.4 MULTIVARIABLE ANALYSIS

We examine the relation between markup disclosure and markups in a regression framework. The regressions include several time-varying controls that prior literature shows are related to markups (e.g., Harris and Piwowar [2006], Cuny [2018]). We also include date fixed effects to absorb market-wide changes and bond fixed effects to absorb time-invariant characteristics that correlate with bond markups. In all specifications, we two-way cluster our standard errors by bond and by date

[26] Consistent with standard difference-in-differences approaches (i.e., Angrist and Pischke [2009]), our identifying assumption is that in the absence of treatment, the difference in levels (and not the percentage changes) would remain the same across groups. The triple difference (i.e., simultaneously using the variation in small versus large trades and same-day vs. non–same-day trades) also helps to support this assumption.

[27] Calculated using the average pre-disclosure period markup for same-day small trades of 86.13 basis points.

to account for both the cross-sectional and time-series dependence of variables.[28]

First, we limit the sample to small trades and examine changes in markups on trades with a same-day offset relative to trades without a same-day offset. We estimate the following regression:

$$Gross\ Markup_{i,t} = \beta_0 + \beta_1 Post_t + \beta_2 Same\ Day_{i,t} + \beta_3 Post_t \times Same\ Day_{i,t} + \alpha_{1i} + \alpha_{2t} + \sum \gamma Controls_{i,t} + \varepsilon_{i,t}. \quad (1)$$

Columns 1 and 2 of table 4 present the results. The coefficient of interest in column 1, on *Post* × *Same Day*, indicates that same-day small trade markups decline 2.33 bps more than non–same-day small trade markups in the post-disclosure period. The results are economically and statistically similar in column 2, when we add bond and date fixed effects. The coefficients on the control variables are generally consistent with prior literature. Markups increase with time remaining to maturity, years since issuance, and dealer activity. Markups decrease with trade volume.

Next, we limit the sample to same-day trades and examine changes in markups on small trades relative to large trades. We estimate the following regression:

$$Gross\ Markup^s_{i,t} = \beta_0 + \beta_1 Post_t + \beta_2 Small\ Trade^s_{i,t} + \beta_3 Post_t \times Small\ Trade^s_{i,t} + \alpha_{1i} + \alpha_{2t} + \gamma Controls_{i,t} + \varepsilon^s_{i,t}. \quad (2)$$

Columns 3 and 4 of table 4 present the results. The coefficient of interest in column 3, is *Post* × *Small Trade*, shows that same-day small trade markups decline 5.67 bps more than same-day large trade markups in the post-disclosure period.

Finally, we use the full sample of gross markups in a DDD framework and estimate the following regression:

$$\begin{aligned} Gross\ Markup^s_{i,t} = {} & \beta_0 + \beta_1 Post_t + \beta_2 Same\ Day^s_{i,t} + \beta_3 Small\ Trade^s_{i,t} \\ & + \beta_4 Post_t \times Same\ Day^s_{i,t} + \beta_5 Post_t \times Small\ Trade^s_{i,t} \\ & + \beta_6 Same\ Day^s_{i,t} \times Small\ Trade^s_{i,t} + \beta_7 Post_t \\ & \times Same\ Day^s_{i,t} \times Small\ Trade^s_{i,t} \\ & + \alpha_{2t} + \gamma Controls_{i,t} + \varepsilon^s_{i,t}. \end{aligned} \quad (3)$$

Columns 5 and 6 of table 4 present our primary results. The coefficient of interest, *Post* × *Same Day* × *Small Trade*, is negative and significant in both columns. In terms of economic magnitude, the coefficients on *Post* × *Same Day* × *Small Trade* (−2.10 in column 5 and −4.36 in column 6) show that small trade markups executed on the same day as an offsetting trade decline 2.4% and 5.1%, respectively, relative to other trades. We attribute this reduction to explicit markup disclosure.

[28] Our results are also robust to clustering at a higher level (issuer and month) and to aggregating our daily-bond data to the monthly-bond level.

TABLE 4
Gross Markup Changes Around Markup Disclosure

	Dependent Variable: *Gross Markup*					
	Small Trades		Same Day		Full	
	(1)	(2)	(3)	(4)	(5)	(6)
Post	−6.40***		−3.75***		−3.33***	
	(1.22)		(0.45)		(1.15)	
Same Day	−15.32***	−7.02***			−9.55***	−17.60***
	(0.94)	(0.83)			(0.88)	(0.88)
Small Trade			45.19***	47.33***	51.54***	39.05***
			(0.88)	(0.86)	(0.87)	(0.70)
Same Day × *Small Trade*					−6.28***	9.57***
					(0.99)	(0.74)
Post × *Same Day*	−2.33**	−3.91***			−0.46	0.35
	(1.11)	(1.09)			(1.10)	(1.15)
Post × *Small Trade*			−5.67***	−5.81***	−3.38***	−1.32*
			(0.73)	(0.61)	(0.96)	(0.80)
Post × *Same Day* × *Small Trade*					−2.10**	−4.36***
					(1.03)	(0.84)
Years to Maturity	5.43***	8.84	3.32***	−1.26	3.72***	−4.49
	(0.13)	(7.49)	(0.10)	(5.37)	(0.09)	(5.69)
Years from Issue	3.43***	18.73***	3.15***	22.51***	3.11***	16.29***
	(0.16)	(5.77)	(0.17)	(7.25)	(0.14)	(5.41)
Total Daily Volume	−9.40***	−0.62***	−8.09***	−1.65***	−8.56***	−1.26***
	(0.25)	(0.08)	(0.26)	(0.10)	(0.21)	(0.08)
Total Dealer Trades	2.48***	1.08***	1.83***	1.02***	1.93***	1.03***
	(0.11)	(0.04)	(0.09)	(0.03)	(0.09)	(0.03)
Constant	158.68***		100.67***		113.14***	
	(3.57)		(3.85)		(3.06)	
Date FEs	No	Yes	No	Yes	No	Yes
Bond FEs	No	Yes	No	Yes	No	Yes
Observations	668,307	668,307	643,826	643,826	1,034,468	1,034,468
Adjusted R^2	0.25	0.53	0.27	0.51	0.29	0.52

This table examines the relation between explicit markup disclosure and gross markups on corporate bonds. The sample period spans November 7, 2017, to November 21, 2018, excluding the two-week window surrounding the date FINRA amended its customer confirmation rule (May 14, 2018). The amendment applied to retail trades executed on the same day as an offsetting trade. The dependent variable, *Gross Markup*, is the total round-trip cost that investors incur to buy and sell a bond, as a percentage of the purchase price (measured in basis points). Columns 1 and 2 are limited to small trades. The variable of interest is *Post* × *Same Day*. *Post* is an indicator equal to one after May 14, 2018. *Same Day* is an indicator equal to one if gross markup is calculated using a buy and a sell that take place on the same day. Columns 3 and 4 are limited to same-day trades. The variable of interest is *Post* × *Small Trade*. *Small Trade* is an indicator equal to one if the par value traded is less than or equal to $100,000. Columns 5 and 6 report results for the full sample. The variable of interest is *Post* × *Same Day* × *Small Trade*. Appendix A defines all variables. Robust standard errors, two-way clustered by bond and trade date, are reported in parentheses. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

4.5 MECHANISM

The likely mechanism that links explicit markup disclosure to reduced markups is reduced information processing costs. We provide evidence to support this mechanism by exploring cross-sectional variation in the supply and demand for information processing capacity.

TABLE 5
Cross-Sectional Variation in Gross Markup Changes, by Trade Size

	Dependent Variable: *Gross Markup*			
	(1)	(2)	(3)	(4)
Post × *Same Day* × 0−50*K*	−4.49***	−4.31***	−4.26***	−4.05***
	(0.91)	(0.95)	(0.96)	(0.96)
Post × *Same Day* × 50*K*−100*K*		−2.70**	−2.66**	−2.46**
		(1.09)	(1.11)	(1.14)
Post × *Same Day* × 100*K*−150*K*			−2.23	−2.05
			(1.68)	(1.72)
Post × *Same Day* × 150*K*−200*K*				0.81
				(1.68)
Coef. Diff. (1) – (2)	-	−1.61**	−1.60**	−1.59**
Sample	Full	Full	Full	Full
Lower-order effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes	Yes
Bond FEs	Yes	Yes	Yes	Yes
Observations	1,040,588	1,040,588	1,040,588	1,040,588
Adjusted R^2	0.51	0.52	0.52	0.52

This table examines the relation between explicit markup disclosure and gross markups on corporate bonds using various trade cut-off sizes. The sample period spans November 7, 2017 to November 21, 2018, excluding the two-week window surrounding the date FINRA amended its customer confirmation rule (May 14, 2018). The amendment applied to retail trades executed on the same day as an offsetting trade. The dependent variable, *Gross Markup*, is the total round-trip cost that investors incur to buy and sell a bond, as a percentage of the purchase price within each trade size group (measured in basis points). Variables of the form $L - U$ are indicators taking a value of one if the markup observation was created from trades falling in par sizes between the lower bound, L, and upper bound, U. *Post* is an indicator equal to one after May 14, 2018. *Same Day* is an indicator equal to one if gross markup is calculated using a buy and a sell that take place on the same day. The variable of interest is *Post* × *Same Day* × $L - U$. Appendix A defines all variables. Differences in coefficients are presented with *p*-values based on *F*-tests using a cluster robust covariance matrix. Robust standard errors, two-way clustered by bond and trade date, are reported in parentheses. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

Assuming investor sophistication increases in trade size, the investors that execute the smallest transactions likely have the lowest information processing capacity. We partition trades into five tranches based on trade size: those less than $50,000, those between $50,000 and $100,000, those between $100,000 and $150,000, those between $150,000 and $200,000, and those greater than $200,000. Following the process described in section 3.2, we calculate bond markups within each tranche size. We then estimate the regression specification in equation (3) where *s* now indicates each of the trade size tranches defined above.

Table 5 reports the results. For brevity, we only report the coefficients and test statistics for our main variables of interest. We begin in column 1 by comparing the change in markups on same-day trades smaller than $50,000 to the change in markups on all other trades. We find a reduction of 4.49 bps. In column 2, we add the next-largest trade size category ($50,000 to $100,000). The 2.70 bps reduction in markups on these trades is statistically and economically smaller than the 4.31 bps reduction in markups for the smallest trade size category. This difference remains statistically

significant at the 5% level of significance across all specifications. In columns 3 and 4, when we add the larger trade size categories, we find no statistical change in markups on these trades. Thus, our findings reveal that the largest reduction in same-day trade markups occurs for the smallest trades. These trades are likely executed by unsophisticated investors who have a limited supply of information processing capacity.

Next, we explore cross-sectional variation in demand for information processing capacity. When a bond is illiquid, it is difficult for an investor to infer their markups using TRACE for two reasons. First, markups for these bonds are large, which induces substantial variation in the reported trade prices (Bessembinder et al. [2006]).[29] Second, the transaction history available to investors for these bonds may be several days or weeks old. Therefore, information processing costs are particularly large when a bond's liquidity is low.

To test this cross-sectional prediction, we employ four different proxies for illiquidity. Three of these proxies are exogenous bond characteristics associated with illiquidity and one measures actual trade activity. First, we follow Bessembinder et al. [2006] and consider the bond's credit rating. High yield bonds (those rated below BBB- by both Moody's and Standard & Poor's, HY) trade less often than investment-grade bonds (IG). Second, we consider the bond's maturity. Bonds with a longer maturity tend to be less liquid than shorter maturity bonds. Long duration bonds (*Long Dur.*) are those in the top quartile of our sample in maturity. Third, we consider issue size. Small bonds (*Sm Size*) are less liquid than large bonds (*Lg Size*). We follow Bessembinder et al. [2006] and classify *Lg Size* bond issues as those above $500 million. Fourth, we partition the sample based on the number of trades executed during the sample period. $Hi\ Num.\ Trds$ are bonds with above-median trade activity and $Lo\ Num.\ Trds$ are those with below-median trade activity.

Table 6 provides results based on the partition of our sample along each of the four aforementioned dimensions. For brevity, we only report the coefficients and test statistics for our main variables of interest. The results are consistent with our expectations. Comparing columns 1 and 2, the coefficients on $Post \times Same\ Day \times Small\ Trade$ show a greater reduction in markups for HY bonds than IG bonds. Similarly, Columns 3 and 4 show a larger markup reduction for long-maturity bonds than short-maturity bonds. Columns 5 and 6 show a greater markup reduction for *Sm. Size* bonds than *Lg. Size* bonds. Columns 7 and 8 show a greater markup reduction for $Lo\ Num.\ Trds$ bonds than $Hi\ Num.\ Trds$ bonds. All of these differences are statistically significant at conventional levels. In sum, these results are consistent with explicit disclosure having the greatest effect on markups when the demands on investors' information processing capacity are high (and thus the potential for information asymmetry is large).

[29] This is partially because of internal policies at broker-dealers that often allow for higher markups for longer maturity and high yield securities.

TABLE 6

Cross-Sectional Variation in Gross Markup Changes, by Liquidity Characteristics

	Dependent Variable: *Gross Markup*							
	Rating		Maturity		Size		Trade Activity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Small Trade	33.65***	53.80***	33.10***	57.54***	36.32***	51.17***	38.43***	42.60***
	(0.77)	(1.29)	(0.60)	(1.62)	(0.74)	(1.29)	(0.71)	(1.85)
Same Day	−12.91***	−24.04***	−12.04***	−28.96***	−15.61***	−31.20***	−16.71***	−25.25***
	(0.94)	(1.21)	(0.63)	(2.03)	(0.90)	(1.33)	(0.83)	(1.91)
Small Trade × *Same Day*	6.28***	11.64***	6.75***	16.65***	8.88***	21.26***	10.06***	2.17
	(0.79)	(1.30)	(0.66)	(1.63)	(0.77)	(1.40)	(0.75)	(1.96)
Post × *Small Trade*	−0.73	−4.71***	−1.75***	0.42	−2.70***	1.24	−2.06***	3.37
	(0.89)	(1.37)	(0.61)	(1.97)	(0.80)	(1.35)	(0.76)	(2.24)
Post × *Same Day*	−0.94	3.47***	−0.60	2.34	−0.04	2.24	0.23	1.40
	(1.28)	(1.28)	(0.71)	(2.71)	(1.16)	(1.50)	(1.03)	(2.52)

(Continued)

TABLE 6—*Continued*

	Dependent Variable: *Gross Markup*							
	Rating		Maturity		Size		Trade Activity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post × *Same Day* × *Small Trade*	−3.19***	−6.06***	−2.96***	−8.03***	−2.85***	−7.84***	−3.65***	−9.73***
	(0.93)	(1.41)	(0.69)	(2.05)	(0.80)	(1.76)	(0.81)	(2.64)
Coef. Diff.	2.87*		5.08**		4.99***		6.08**	
Sample	IG	HY	Short Dur.	Long Dur.	Lg. Size	Sm. Size	Hi Num. Trds	Lo Num. Trds
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	745,154	289,314	775,839	258,629	784,908	249,560	941,662	92,806
Adjusted R^2	0.55	0.48	0.44	0.52	0.42	0.52	0.50	0.57

This table examines cross-sectional variation in the relation between explicit markup disclosure and gross markups on corporate bonds. The sample period spans November 7, 2017, to November 21, 2018, excluding the two-week window surrounding the date FINRA amended its customer confirmation rule (May 14, 2018). The amendment applied to retail trades executed on the same day as an offsetting trade. The dependent variable, *Gross Markup*, is the total round-trip cost that investors incur to buy and sell a bond, as a percentage of the purchase price (measured in basis points). *Post* is an indicator equal to one after May 14, 2018. *Small Trade* is an indicator equal to one if the par value traded is less than or equal to $100,000. *Same Day* is an indicator equal to one if gross markup is calculated using a buy and a sell that take place on the same day. In columns 1 and 2, all estimates are calculated using the sample of investment grade and non-investment grade bonds, respectively. In columns 3 and 4, all estimates are calculated using the sample of bonds with short maturities, defined to be in the bottom three quartiles of the sample, and long maturities, respectively. In columns 5 and 6, all estimates are calculated using the sample of large bond issues, if the bond issue is equal to or above $500 million, and small bond issues, respectively. In columns 7 and 8, estimates are calculated using the sample bonds in the upper median of trade activity, and lower median of trade activity, respectively. Appendix A defines all variables. Differences in coefficients are presented with *p*-values based on Z-tests using a cluster robust covariance matrix. Robust standard errors, two-way clustered by bond and trade date, are reported in parentheses. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

5. Conclusion

Significant debate accompanied FINRA's decision to require bond-market professionals to disclose markups on retail trade confirmations. The proponents (e.g., the Consumer Federation of America) argued that the long-overdue rule change "would result in retail investors' receiving more and better disclosure that would allow them to make better informed investment decisions, and it would foster increased price competition in fixed income markets." The opponents (e.g., FIF and SIFMA) argued that the costs of implementation (including the cost of inquiries from investors and regulators about markups) would be significant.

Assuming that the costs of implementation are passed along to customers, the change in markups that we observe is the net effect of the rule change. We find that markups on trades subject to markup disclosure (small trades with a same-day offset) decline by 5% relative to the pre-period average in the six months following the rule change.

Given that many studies show reducing information asymmetry reduces transaction costs (e.g., Verrecchia [2001], Edwards et al. [2007]), our results may seem unsurprising. However, even without explicit disclosure of transaction costs, retail investors had the ability to estimate their transaction costs using executed trade prices in TRACE. Thus, it is through their limited information processing capacity that retail investors were uninformed about the size of their transaction costs. Our results highlight the important role of disclosure requirements in the presence of information processing costs.

APPENDIX A: VARIABLE DEFINITIONS

Coupon	The stated coupon rate of the bond, in percent.
Gross Markup	The total round-trip cost that investors incur to buy and sell a bond, as a percentage of the purchase price. We define the daily gross markup as: $$Gross\ Markup_{i,t,s} = \frac{P^{Ask}_{i,t,s} - P^{Bid}_{i,t-j,s}}{P^{Bid}_{i,t-j,s}}$$ $P^{Ask}_{i,t,s}$ is the par-weighted average customer purchase price of bond i on date t in trade size category s. $P^{Bid}_{i,t-j,s}$ is the par-weighted average customer sale price of bond i on date $t-j$ in trade size category s. Each daily customer purchase, $P^{Ask}_{i,t,s}$, is matched with the nearest associated customer sale in prior trade dates up to a maximum of seven calendar days in the past. Measured in basis points.
High Yield	An indicator variable equal to one if the security is rated below investment grade by both Moody's (below Baa3) and Standard and Poor's (below BBB-).

(Continued)

APPENDIX—*(Continued)*

Issue Amount	The total par value of bond i on the date of issuance.
Post	An indicator variable equal to one after May 14, 2018, when FINRA amended its customer confirmation rule to require markup disclosures on retail investors' trade confirmations if an offsetting trade occurs on the same day.
Same Day	An indicator equal to one if the *Gross Markup* is calculated using a buy and a sell that take place on the same day. Specifically, this variable takes a value of one if there are offsetting customer buy and sell transactions of the same security (i), on the same day (t), in the same trade size category (s).
Small Trade	An indicator equal to one if the trade size is less than or equal to $100,000 in par value.
Total Daily Volume	The natural logarithm of the total par value of all trades in bond i on date t.
Total Dealer Trades	The number of inter-dealer transactions in bond i on date t.
Trade Activity	The total number of transactions in bond i on date t.
Trade Size	The par value traded.
Years from Issue	The time between the date of trade and the bond's initial issuance date. Measured in years.
Years to Maturity	The time remaining to maturity on the date of the trade. Measured in years.

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