Asymmetric Information and Receiving Investor Outcomes in the Block Market for Corporate Bonds

Stacey Jacobsen* Kumar Venkataraman*

Abstract

We examine two decades of block trading in corporate bonds to test theoretical predictions on receiving investors to whom the dealer distributes the block. Receiving investors lose on average from participating as a counterparty in the block trade. Nevertheless, participation is often optimal, even when asymmetric information is elevated (e.g., the block initiator is informed or in opaque markets), as receiver losses are smaller than initiating a similar-size trade. Across various settings that reduce asymmetric information, we show a substantial transfer in profits from the dealer to receiving investors. We exploit variations in trade reporting rules of maximum stipulated delay, showing that receiving investors obtain better terms on offsetting trades that occur after disclosure of the block trade. Our study adds nuance to existing evidence that customers benefit from transparency and helps explain the appeal of the block market for receiving investors.

---

* None of the authors received financial support specific to this project.

Kumar thanks Larry Harris, Ananth Madhavan and members of the FIMSAC transparency sub-committee. Jacobsen has no conflicts of interest to report. Venkataraman is a visiting economist at FINRA's Office of Chief Economist and acknowledges financial support for other projects.
Southern Methodist University. Email: staceyj@mail.cox.smu.edu and kumar@mail.cox.smu.edu.

Asymmetric Information and Receiving Investor Outcomes in the Block Market for Corporate Bonds

Abstract

We examine two decades of block trading in corporate bonds to test theoretical predictions on receiving investors to whom the dealer distributes the block. Receiving investors lose on average from participating as a counterparty in the block trade. Nevertheless, participation is often optimal, even when asymmetric information is elevated (e.g., the block initiator is informed or in opaque markets), as receiver losses are smaller than initiating a similar-size trade. Across various settings that reduce asymmetric information, we show a substantial transfer in profits from the dealer to receiving investors. We exploit variations in trade reporting rules of maximum stipulated delay, showing that receiving investors obtain better terms on offsetting trades that occur after disclosure of the block trade. Our study adds nuance to existing evidence that customers benefit from transparency and helps explain the appeal of the block market for receiving investors.

1. Introduction

Institutional investors account for a substantial fraction of trading volume in the corporate bond market. Trading has slowly migrated to electronic bond platforms, mostly through requests for quotations (RFQs); however, electronic venues cater mainly to retail investors and smaller institutional trades (O'Hara and Zhao, 2021). Institutions often transact in quantities substantially greater than a round lot of $1 million. Figure 1 shows that transactions that exceed $15 million account for about 13% of cumulative volume during the two decades with TRACE corporate bond data (i.e., 2002-2021). For these transactions, the over-the-counter (OTC) block market represents an important source of liquidity. In the block market, dealers facilitate the majority of these very large transactions in a principal capacity and then offset the block position with counterparties, termed as receiving investors, over time.

The objective of this article is to increase our understanding of the relatively-unstudied block market for corporate bonds, with particular focus on receiving investors. A block transaction causes the dealers' inventory to depart from the desired level which is costly because of the risk of an adverse price movement. Theoretical models argue that receiving investors play an important role in the block market by offsetting the dealers' added inventory risk;[1] yet receiving investors have received little attention in the empirical literature. While there is extensive empirical work on trading costs for large transactions in many markets, it is difficult to test hypotheses concerning specific investor-types.[2] Most publicly available databases do not identify investor-types, and the

[1] For the theoretical block market literature, see Burdett and O'Hara (1987), Seppi (1990), Grossman (1992), Madhavan (1995), Keim and Madhavan (1996), among others.

[2] For studies on the block market for equities, see Keim and Madhavan (1996), Madhavan and Cheng (1997), Smith et. al (2001), Booth et. al (2001), Bessembinder and Venkataraman (2004). For studies on institutional (large) trade execution costs for corporate bonds, see Schultz (2001), Bessembinder et al. (2006), O'Hara et al. (2018), Goldstein and Hotchkiss (2020), Hendershott et al. (2020), and for structured credit markets, see Bessembinder et al. (2013), Gao et al. (2017) and Schultz and Song (2019).

relation may be obscured in the available transactions data which represents a mixture of investors. As a result, even the most fundamental predictions about receiving investors in the block market remain untested.

Receiving investors are vital to a well-functioning block market, and particularly so for the corporate bond market after the post-crisis banking regulations which led to a reduction in dealer's capital for market making.[3] In this study, we leverage unique features of the corporate bond market and available data to test several theoretical predictions on receiving investors. Unlike the equities Trade and Quote (TAQ) database, which does not identify the parties to a trade, the enhanced TRACE corporate bond transactions data capture the entire history of dealers' trades with counterparties. We present a methodology to identify both the block trade between initiator and dealer and offsetting trades of the dealer with receiving investors.[4] Building on the block market literature (e.g., Kraus and Stoll, 1972), we estimate the permanent (i.e., information effects) and temporary (i.e., liquidity effects) price impact of block trades, and further separate liquidity effects into compensation for dealers and receiving investors. We then study the effect of asymmetric information on the distribution of price effects in the block market. This topic is of particular relevance for regulatory initiatives concerning disclosure of trade information that are likely to benefit some participants at the expense of others (Harris, 1992).

We study a sample of 205,104 block trades, defined as those with transaction size of at least $15 million, in the corporate bond market over the period 2002 to 2021. We identify 690,418 receiving investor trades, suggesting that dealers typically offset a block position with about three

[3] See Schultz (2017), Bao et al. (2018), Bessembinder et al. (2018), Dick-Nielsen and Rossi (2019), Trebbi and Xiao (2019) for the impact of Dodd Frank Act on bank-affiliated dealers in the corporate bond market.

[4] Outside of the block market setting, it can be challenging to classify customer trades as initiators (i.e., trades that create the dealers' large inventory) versus receiving investors (i.e., trades that absorb the dealer's large inventory). Identifying the initiator trade is important for measuring price effects and its distribution among the different market participants.

trades. Block trades, on average, have little permanent price impact. The round-trip dealer spreads for intermediating block trades average 22 basis points (bp). Dealers charge a markup on both the initiator (18 bp) and receiving investor (3 bp) legs of their round-trip trades. That receiving investors pay a markup is notable, since they provide liquidity services to a dealer, and likely reflects dealer compensation for finding the 'other side' (Grossman, 1990). Markups paid by receiving investors are smaller for lower quality bonds and larger blocks, and for mega blocks in high yield bonds, the markups are negative. These patterns suggest that receiving investors get paid for liquidity services when inventory risk is significant.

The block market represents a setting where dealers have more information than receiving investors during bilateral negotiations (e.g., the dealer knows the identity of the block initiator and the price and size of the block trade).[5] We study how changes in relative information advantage of the dealer affects outcomes for receiving investors in two settings. First, we study changes to regulatory rules concerning the mandatory disclosure of trading information. Second, we exploit evidence from prior studies about asymmetric information effects of sustained buying versus selling activity in corporate bonds (Cai et al., 2019; Anand et al., 2021). This informs our analysis of receiving investor outcomes when the initiator may have private information that is partially observed by the dealer.

We first examine the effect on the block market from introducing post-trade transparency for public corporate bonds in 2003 and 2004 and non-public 144A corporate bonds in June 2014. Theoretical models (e.g., Madhavan, 1995; Green et al., 2007; Back et al., 2020) predict that mandatory trade disclosure reveals the dealer's private information to the market and thus reduces the dealer's ability to extract rents from receiving investors. In support of these predictions, we

[5] Naik et al. (1999) discuss how negotiations between the trade initiator and the dealer may reveal (at least partially) the investor's motivation for trade.

find that trade report initiation leads to smaller dealer profits for intermediating blocks, and the benefits accrue primarily to receiving investors while initiator costs appear unchanged. Block market activity does not change with transparency, suggesting that dealers do not withdraw from the market, but dealers offset the position at a faster rate with initiation of trade reporting.

We study the primary mechanism envisioned in theoretical models (e.g., Naik et al., 1999; Back et al., 2020) on how transparent regimes level the information playing field in the market. When the block trade is publicized to market participants, theory predicts that receiving investors will incorporate its potential adverse price move as the dealer continues to offset the position. We are able to exploit variations in trade reporting rules in effect in the corporate bond market during our sample period to provide empirical support for this mechanism.

TRACE reporting procedures allow dealers a delay between the execution time of a trade and the report time of the trade to the TRACE system. Thus, dealers have the ability to offset the block position, at least in part, before the block trade is reported to the market. Between 2003 and 2006, FINRA shortened the maximum stipulated reporting delay for corporate bonds in three stages, from 75 minutes, to 45 minutes, to 30 minutes, to the current 15 minutes. Back et al. (2020) present a model of trade disclosure, offering the prediction that receiving investors obtain better terms on offsetting trades that occur after the disclosure of the block trade. We study the terms of the offsetting trades of a block position before and after the block trade report, which allows us to control for trade-, issue-, and market-specific variables that could potentially also impact costs.

In each reporting regime, receiving investor obtain economically large cost reductions of 5 bp to 11 bp on offsetting trades of a block position that occur after relative to before the report of block trade. Changes in dealer spreads mirror those observed for receiving investors with an opposite sign. These patterns are reversed during periods of elevated market stress suggesting that

dealers offer more favorable terms to quickly offset the position when capital is constrained. These results highlight the mechanism by which greater transparency reduces rents that better-informed dealers extract from less-informed counterparties.

Our second setting studies the effect of asymmetric information by separately examining blocks initiated by buyers and sellers. Prior corporate bond studies show that sustained customer buying is associated with price discovery while sustained customer selling is associated with price reversals. In line with these patterns, for our sample of block trades, the permanent price impact is positive (7 bp) for block buys while slightly negative (-4 bp) for block sells. Both dealer spreads and initiator costs are lower for block buys than block sells. Thus, the adverse selection costs of block buys are absorbed entirely by receiving investors (-12 bp); in contrast, for block sells, which do not have information effects, receiving investors earn a small positive spread (1 bp).

Notably, even with information effects, we show that receiving investors obtain better (for building a position) or at least no worse (for liquidating a position) outcomes by participating in offsetting trades than initiating a similar-size trade. These results help explain the appeal of the block market for receiving investors who desire to either establish or liquidate a large position. Our findings provide empirical support for the Burdett and O'Hara (1987) prediction that receiving investors lose money on informed blocks, but despite such losses, participation can be optimal.

The topic of trade disclosure lies at the heart of many recent policy debates concerning the structure of securities markets. In October 2022, Financial Industry Regulatory Authority (FINRA) invited comments on a proposal to reduce trade reporting delay from the current 15-minute timeframe to no later than one-minute from the time of execution in several OTC markets.[6] We provide relevant evidence from prior regulatory experiments, showing that, as stipulated maximum

[6] The proposal covers trade reporting in corporate bonds, agency debt securities, asset backed securities and agency pass-through mortgage-backed securities (MBS). See https://www.finra.org/rules-guidance/notices/22-17.

delay shortens in three stages from 75 minutes to 15 minutes, over 90% of the TRACE corporate bond trades continue to be compliant in each regime. As reporting delay shortens, dealers offset their block positions at a faster rate, likely to earn higher profits on offsetting trades before block trade disclosure. Non-compliance with reporting rules is observed more often for mega blocks ($30 million or larger), which suggests that dealers strategically exercise late-trade reporting when the value of non-public trading information is substantial.

Despite the overall movement towards greater transparency in fixed income markets, regulators have considered proposals in recent years to delay reporting of block trades in several markets.[7] Dealers and industry groups have argued that real-time block trade reporting has made it difficult to unwind a block position over time, leading to a decline in block activity and higher trade execution costs for block initiators. Although the block market has received attention from regulators, relatively little is known about how block trading has evolved over time, and to what extent, industry concerns are actually borne out in data.

We examine two decades of block trading in corporate bonds and do not find support for the concerns expressed by industry groups. Across all settings that reduce the relative information advantage of the dealer, we show that receiving investors benefit, while dealers are worse off in the block market. While past transparency proposals have focused on block initiators and dealers, our results highlight that regulators need to consider the potential impact on receiving investors. Our study is relevant for regulatory efforts to disclose aggregate trading volume data of U.S. Treasury securities and OTC U.S. equity markets.[8]

---

[7] FINRA and the CFTC proposed pilot programs to delay reporting of block trades in corporate bonds and swaps, respectively from 15 minutes to 48 hours (see https://www.finra.org/rules-guidance/notices/19-12 for FINRA proposal and https://www.cftc.gov/LawRegulation/FederalRegister/finalrules/2020-21568.html for CFTC proposal).

[8] On March 10, 2020, FINRA began posting on its website weekly, aggregate data on the trading volume of U.S. Treasury Securities reported to TRACE. The Department of Treasury is currently seeking comments on reducing the trade reporting delay from one day to no later than 60 minutes after execution for treasury securities. https://www.sec.gov/rules/sro/finra/2022/34-95003.pdf

2. Literature Review

The block market represents a trading setting where information asymmetry and inventory risk are particularly elevated. Because a larger trade size may signal information-motive (Easley and O'Hara, 1987), dealers must discern whether the customer initiating the block trade is informed or transacting for liquidity purposes. Dealers must also consider the difficulty (i.e., cost) of locating receiving investors and the price at which the block can be distributed.

Madhavan (2000) surveys the literature on block trading in the equity markets and notes that prior studies have primarily focused on benefits to the block initiator. As per theory, the block market can lower the initiator's trade execution costs by mitigating adverse selection risk (Seppi, 1990), locating counterparties (Grossman, 1992), and facilitating risk sharing (Keim and Madhavan, 1996). Grossman (1992) argues that dealers have information on unexpressed trading interests of receiving investors, thereby lowering liquidity costs to the block initiator.[9] Seppi (1990) argues that, because the block market is not anonymous, dealers can credibly screen out (at least imperfectly) informed block participants. Madhavan and Cheng (1997) and Booth et al. (2001) model the venue choice of an initiator and report smaller permanent price impact in the "upstairs" block market (relative to the "downstairs" organized exchange). Bessembinder and Venkataraman (2004) provide empirical support for smaller temporary price impact in the upstairs block market.

Like the block market for equities, customers and dealers negotiate large trades in the over-the-counter market for corporate bonds. Hollifield et al. (2022) find that large trades are more likely to be intermediated by central dealers who tolerate longer inventory holding periods relative

[9] Searching for block counterparties can be costly for the initiator if some participants front-run the block (see Keim and Madhavan (1996) and Brunnemeier and Pedersen (2007) for models on predatory trading). Other studies argue that liquidity-motivated traders can lower trading costs by preannouncing a block trade if they can credibly signal their trade motivation (see Admati and Pfleiderer (1991) and Bessembinder et. al (2016) for models on sunshine trading).

to peripheral dealers. Goldstein and Hotchkiss (2020) show that dealers' holding period declines with illiquidity and bond risk, indicating that dealers balance inventory and search costs when managing large trades. Choi et al. (2023) differentiate between "types" of customers when computing transaction costs for large trades. They focus on a sample of short-horizon matched trades (that do not require dealer inventory capacity) to differentiate between liquidity demanding and liquidity providing customers and show that traditional measures underestimate costs due to the aggregation of customer types. O'Hara et al. (2018) document that dealers exercise market power – more active institutions receive superior prices for trades than less active institutions.

2.1. Testable Predictions on Receiving Investors in the Block Market

Every block trade involves receiving investors who, in due course, absorb the large position from the dealer. The surplus that dealers extract from receiving investors in bilateral negotiations depends on the trading environment. In settings where asymmetric information is elevated (e.g., when the initiator has private information or in opaque markets with limited trade disclosure), dealers enjoy a relative information advantage, leading to worse trade terms for receiving investors. Receiving investors provide liquidity services to the dealer by absorbing the block position (see Stoll, 1978; Amihud and Mendelson, 1980). In settings where dealers face significant inventory risk, such as illiquid bonds, mega-size blocks, or during periods of market stress, receiving investors could potentially earn a liquidity premium for offsetting the dealers' position.

Madhavan (2000) argues that the primary benefits of the block market may not be to initiators but to the receiving investors. Grossman (1992) describes receiving investors as natural counterparties with opposite trading interests of the initiator. Burdett and O'Hara (1987) present a model wherein receiving investors face uncertainty about the existence and the size of a yet-to-be-reported block trade. In equilibrium, receiving investors are not able to fully anticipate the

block's information effects, implying it is costly for receiving investors to participate in offsetting trades, but despite their losses due to adverse selection, participating can still be optimal when they desire to establish or liquidate a large position.

Theoretical models describe many benefits to receiving investors such as: avoid paying the premium for initiating a large trade at the prevailing market price; lower adverse selection risk by trading with relationship dealer; smaller execution delay and smaller opportunity cost of a failed search[10]; trade at a known price today than potentially a worse price in the future; among others.

These discussions lead to the following testable predictions:

TP1: Receiving investors are worse off when asymmetric information is elevated and better off when inventory risk is significant.

TP2: Participating as receiving investors lowers the trading costs relative to initiating a similar-size large trade.

2.2. Testable Predictions on Trade Disclosure and Receiving Investors

FINRA adopted a phased approach to corporate bond trade dissemination that began in 2002 with the most actively traded and liquid bonds. All secondary market transactions in non-144A corporate bonds were reported to the market beginning in 2006 and those in 144A corporate bonds in June 2014.[11] Dealers are allowed a delay between the execution time of the trade and the report of the trade to FINRA's TRACE system. Current TRACE procedures require dealers to report immediately to the TRACE system but in no case later than 15 minutes after trade time, but TRACE rules shortened the reporting delay in three stages, from 75 minutes when TRACE was

[10] See Hendershott et. al (2020b) and Jurkatis et. al (2022) for evidence on the value of trading relationships; Hendershott et. al (2020a) for evidence that trade failures are frequent and costly; and Kargar et. al (2022) for the cost of execution delay.

[11] FINRA currently applies dissemination caps to large-size trades in corporate bonds. Reports for trades at or below the dissemination caps includes both the price and trade size while reports for trades above the dissemination caps include the price and capped trade size ("5MM+" (for IG) and "1MM+" (for non-IG)). The uncapped trade size is later published as part of a historical dataset six months after the calendar quarter in which they are reported. Hollifield et al. (2020) conclude that reporting caps are not particularly important in the presence of price reports.

initiated in 2002, to 45 minutes, to 30 minutes, to the current 15 minutes in 2006. In all four regimes, FINRA disseminates the trade report to the market immediately upon receipt from a dealer. In October 2022, FINRA invited comments on a proposal to shorten trade reporting delay in many fixed income markets to no later than one minute after trade execution.

In opaque markets, ex-post details on completed transactions are unavailable to all market participants.[12] Introducing trade reporting diminishes the dealers' advantage over receiving investors by making public valuable trade information, but it also makes dealers with recently acquired blocks more vulnerable to adverse price movements from front-running strategies. Thus, dealers may incur higher costs with transparency, which can reduce incentives for dealers to intermediate blocks, or cause dealers to offer worse terms to initiators (e.g., Madhavan, 1995; Naik et al., 1998). The experimental evidence from Bloomfield and O'Hara (1999) suggests that dealers prefer not to disclose their trades and that non-disclosing dealers earn substantially higher profits than disclosing dealers.

Shortening the reporting delay could make it harder for dealers to manage the inventory position. Once a block trade is publicly reported, dealer positions may be more vulnerable to price movements that negatively impact profits. The framework in Back et al. (2020) further suggests that dealers obtain worse prices on offsetting trades that occur after block trade disclosure. Thus, shorter reporting delay may incentivize dealers to offset the block at a faster rate. To the extent that dealers are unable to distribute the position quickly, they would offer less attractively priced quotes to block initiators.[13] These discussions lead to the following testable predictions:

[12] Pagano and Roell (1996), Green et al. (2007) and Back et al. (2020), among others, show theoretically that opaque markets offer advantages to dealers in negotiations with less informed customers. Duffie et al. (2017) show that the publications of benchmark prices reduce the information advantage of dealers over customers.

[13] Gemmill (1996) studies the effect of changes in trade reporting requirements between 1986 and 1996 on the London Stock Exchange, and finds that the bid-ask spreads did not materially change across the disclosure regimes.

TP3: Initiation of trade reporting benefits receiving investors while making dealers worse off in the block market.

TP4: Receiving investors obtain better terms on offsetting trades that occur after relative to before the disclosure of the block trade.

2.3. Our Study versus the Literature on Trading Costs in Bond Markets

Our study is related to prior academic work showing that trade execution costs in corporate bonds depend on customer attributes, such as trade size (Edwards et al., 2007; Goldstein et al., 2007), trading relationship with dealers (O'Hara et al., 2018; Hendershott et al., 2020; Nikolova and Wang, 2020; Goldstein et al., 2021), and trading style (Anand et al., 2021; Wang et al., 2021; Choi et al., 2023).

Empirical research generally has found that customer trade execution costs have improved while dealer spreads have declined with mandatory trade reporting in corporate bonds (Edwards et al., 2007; Goldstein et al., 2007).[14] For institutions, prior studies report a decline in trade execution costs and smaller differences in execution costs across large and small institutions after TRACE initiation (see Bessembinder et al., 2006; O'Hara et al., 2017). For municipal bonds, Schultz (2012) finds a sharp reduction in dispersion in purchase prices around bond issuance. Chalmers et al. (2021) examine the reduction in the delay in reporting for municipal bonds and find reductions in average trading costs. For agency mortgage-backed securities, Schultz and Song (2019) report that trading costs fell for institutional investors, along with a decline in dealer's capital commitment, with post-trade transparency.

Our study is distinguished from prior empirical work in part because we test fundamental predictions on receiving investors in the block market, but also because we demonstrate the effects of asymmetric information on block market participants. We add nuance to the existing literature

[14] See Bessembinder and Maxwell (2008) for a survey article on transparency in the corporate bond market.

by establishing the type of customers that benefit from transparency. Further, we present direct evidence on the primary mechanism envisioned in theoretical models on how timely disclosure of trading data levels the information playing field in the market.

3. Data and Sample Characteristics

3.1. Data Sources and Sample Construction

We use the Mergent Fixed Income Securities Database (FISD) to select our initial sample of corporate bonds. We identify non-puttable or convertible U.S. Corporate Debentures and U.S. Corporate Bank Notes (bond type=CDEB or USBN) with complete issuance information (offering date, amount, and maturity), resulting in an initial sample of 55,842 bonds.[15]

For corporate bond transactions, we use the enhanced version of the Trade Reporting and Compliance Engine (TRACE) data provided by FINRA that include dealer identification numbers, unmasked trade sizes, and trade data disseminated to the public as well as (144A bond) trades not so disseminated between July 2002 and November 2021. We match the FISD data to TRACE using the CUSIP identifier, which reduces the sample to 39,801 bonds and 147.9 million trades.

Table I reports the effects of additional data filters that we implement. We exclude all bonds with less than five trades during the almost twenty-year sample period. We also exclude trades with reported size that exceeds the bond's offering amount, trades reported after the bond's outstanding amount is reported as zero, and trades with execution dates prior to July 2002. We exclude trades in newly issued bonds, including those reported as primary market transactions as

[15] Specifically, we exclude the following types of debt: retail notes, foreign government, agency, municipal, pass-through trusts, pay in kind, strips, zeros, Eurobonds/Euronotes, asset and mortgage backed, insured and guaranteed by letters of credit, medium term notes/zeros, convertible, and foreign currency.

well as secondary market transactions that occur immediately after issuance.[16] Finally, following the literature, we exclude trades by one relatively large dealer that, during 2014, began to report an immediately offsetting transaction for the large majority of its principal trades. With these filters imposed, the sample comprises of 138.5 million secondary market transactions in 38,762 distinct CUSIPs.

3.2. Block Market's Activity Through Time

Figure 1 shows the market share of block trades, defined as transactions with par value of $15 million or greater, to total trading volume on TRACE for the bond sample over 2002-2021. During this period, the corporate bond market experienced many significant events, such as the phase-in of trade reporting (2002-2005), the financial crisis (2007-2009), post-crisis regulations (2011-2014), and the growth in electronic trading venues. Throughout these developments, the block market's share of the total trading volume has remained remarkably stable, averaging about 13% over the sample period (Figure 1.A). The block volume share is higher for investment grade bonds than high yield bonds (Figure 1.B) and for large dealers than small dealers (Figure 1.C). Notably, the block volume share has been stable within each category after the financial crisis. We find that the dealer's propensity to "prearrange" block trades has remained stable, averaging about 11% of the block volume, over the sample period (Figure 1.D.).[17]

These patterns on block market's trading activity are similar when we account for changes in issue characteristics and market conditions over the sample period using a regression

[16] Bessembinder et al. (2022) shows that secondary market trading in a new issue in the days following issuance is dominated by the activities of the underwriting syndicate. If the offering day is on or before the 15th of the month we exclude the remainder of the issue month, otherwise we exclude the issue month and the following month.

[17] Following the literature, we define pre-arranged blocks as "riskless principal" trades when the dealer fully offsets the block position with a single opposite direction trade within 15 minutes, effectively acting in an agency capacity (see Harris, 2016; Choi et al., 2023). Bessembinder et al. (2018) report that more than 90% of dealer-to-customer trades each year between 2006 and 2016 were facilitated by dealers as "principal" trades.

framework.[18] Figure 2 shows the regression coefficients of the year indicator variables (circles) and the 95% confidence interval (bars) from the model with 1,023 weekly observations and with Newey-West standard errors. Years 2002 and 2003 serve as the benchmark period. Figure 2.A indicates no significant change in the block market's volume share relative to the benchmark periods. Figure 2.B shows that the percentage of prearranged block trades is higher during the financial crisis, consistent with declines in intermediary capital, but the subsequent years exhibit no significant change relative to the benchmark period. Overall, we do not find support for industry concerns that block trading in corporate bonds has become less relevant over time.

3.3. Identifying Block Trades and Receiving Investor Trades in TRACE data

The goal of this study is to understand outcomes for receiving investors to whom the dealer distributes the block position. We leverage unique features of the corporate bond market to link the initiating block trade with the block dealer's offsetting trades (with receiving investors) that absorb the dealer's large inventory. The enhanced TRACE corporate bond transactions that we utilize includes dealer identification codes, which allows us to track the entire trading activities of a dealer, including indicators for buy and sell trades. Whether a block trade is initiated by a buyer or seller becomes ambiguous when dealers act as brokers (i.e., match one customer with another), or when dealers quickly offset a customer trade with another customer. We therefore require that, in addition to par value of $15 million or greater, block trades must represent a sale or purchase of bonds between customers and dealers, and further, not be reported as "agency" trade on TRACE, or identified as a prearranged trade by our matching algorithm. This approach allows us to identify

[18] Specifically, we regress the weekly block volume share (i.e., aggregate block volume relative to total trading volume) on the (average) characteristics for bonds traded during the week (i.e., log age, log issue size, and the percentage of traded bonds that are high yield, financial sector, and 144A bonds) and several measures of market conditions (i.e., the trailing weekly corporate bond market index return and S&P index return, and the average three-month LIBOR interest rate and the level of the VIX index over the preceding five days).

with high confidence the initiating block trade, reported as a customer buy or sell, that creates a material impact on dealer inventory positions for the relevant holding period.

Having identified the initiating block trade (based on various definitions), we identify the offsetting trades of the block dealer with receiving investors, as follows. We first retain all trades by the block dealer in the bond during the week (i.e., five trading days) after the block trade (e.g., if the block occurs on a Wednesday, the block week is from Wednesday to Friday, and the following Monday to Tuesday). We then, starting with block volume, cumulate the dealer's (signed) trading volume in the bond. If the cumulative imbalance reaches or crosses zero over the block week, we classify the block as being "fully offset". We define the "block end" time as the earlier of the time the block is fully offset or the end of the block week. Receiving investor trades are identified as those that offset the dealer's block position before the block end time.

We categorize the *earliest* large trade as the "trigger" block; thus, additional (opposite sign) block trades in the bond by the same dealer that occur before the block end time are classified as receiving investor trades. After the block end time, additional block trades by the dealer in the bond are available for the initiating block sample. We exclude the following block trades and the associated receiving investor trades from our sample: (a) those identified by the matching algorithm as prearranged, and (b) those with insufficient data to calculate price effects (described in Section 4). In the Appendix, we describe the methodology in detail, along with many examples of the trade classification and the calculations of the block trading cost measures.

Panel B of Table I reports summary statistics for our sample of block initiator trades. We identify 205,104 block trades over our sample period, of which 71% (146,052) are trades in investment grade bonds and 29% (59,052) are trades in high yield bonds. The majority (80%) of block trades are intermediated by large dealers. We present a subsample analysis based on block

size: between $15 and $20 million, between $20 and $30 million, and mega-blocks greater than $30 million. The average block size (par value) is $22.6 million, while for mega-block trades, the average size is $44.3 million. The average block trade size relative to total trading volume for the bond on the block trade day is 51%.

In Table II, we report summary statistics for our sample of receiving investor trades. Panel A reports 690,418 receiving investor trades associated with the block initiator sample, implying that each block trade is associated on average with 3.37 offsetting trades. Of the 205,104 block trades, 72% (148,601) are associated with more than one offsetting trades. The majority of receiving investor trades (71%) are with customers. This is consistent with Hollifield et al. (2020) who find that smaller trades of a dealer are substantially more likely to be offset with other dealers, while larger trades are more likely to be offset with customers.

Table II Panel B reports receiving investor trade size statistics. At the block-level, the average receiving investor trade size is $8.9 million and about 22% of the blocks have average receiving investor's trade size of at least $15 million. In comparison, the average size of TRACE-reported trades during our sample period is $0.5 million. At the level of individual receiving investor trade, 34% are less than $1 million, 54% are between $1 and $15 million and 12% exceed $15 million. This distribution suggests that receiving investors are primarily institutional investors. Both the average size of the offsetting trades and the number of offsetting trades increase with block size. For mega-blocks, the mean offsetting trade size is $15.6 million (Panel B) and the number of offsetting trades average 4.04 (Panel A).

Table II Panel C reports that the percentage of the block position that the dealer offsets during the block-week averages 64%. About 41% of the blocks are fully offset during the block-week and this statistic is slightly higher (44%) for smaller blocks.

4. Block Trading Costs in the Corporate Bond Market

We develop a methodology to measure the price effects surrounding the block transactions. In this section, we decompose price effects into permanent and temporary components, then further decompose temporary effects into dealer and receiving investor spread components.

4.1. Price Effects of Block Trades

Figure 3 Panel A provides a graphical representation of the price effects of a customer-initiated block buy. Following the block trading literature (Kraus and Stoll; 1972), we calculate the block initiator's trading cost for size Q, I(Q), by comparing block trade price P_B at block trade time t_{block} to the bond's value weighted-average price (VWAP) (across all dealers) during the week prior to block trade (P_{-1}). In Equation (1), the variable D equals +1 for a customer-initiated block buy and equals -1 for a block sell.

$$\textit{Block initiator cost, } I(Q) = D * [Ln(P_B) - Ln(P_{-1})] * 100 \qquad (1)$$

In the literature, the price impact due to short term liquidity effects is temporary, since the price is expected to return to equilibrium fairly quickly. For example, in the case of a block sell, the seller may accept a lower block price because of the difficulty of finding willing buyers. The temporary price impact T(Q) reflects the gain to liquidity providers reversing the block position at the equilibrium price. We estimate the reversal in price after a block trade by comparing the block trade price P_B to the bond's weekly VWAP in the following week (P_{+1}).

$$\textit{Temporary price impact, } T(Q) = D * [Ln(P_B) - Ln(P_{+1})] * 100 \qquad (2)$$

The permanent price impact component, P(Q), reflects the change in the market's perception of the bond value following the reporting of the block trade, estimated by comparing the bond's weekly VWAP following the block week (P_{+1}) to the bond's weekly VWAP prior to (P_{-1}) the block week.

$$\textit{Permanent price impact, } P(Q) = D * [Ln(P_{+1}) - Ln(P_{-1})] * 100 \quad (3)$$

We exploit detailed information in the enhanced TRACE database on the entire history of a dealers' trades with counterparties to further delineate temporary price impact into a spread earned by the block dealer and a spread earned by the receiving investors. To calculate dealer spreads, we compare the prices of the dealer's round trip; i.e., the price P_B at which the dealer absorbs the block into inventory, and the VWAP of offsetting trade P_{OFF} at which the dealer reverses the inventory position with receiving investors.

$$\textit{Dealer spread, } D(Q) = D * [Ln(P_B) - Ln(P_{OFF})] * 100 \quad (4)$$

To calculate receiving investor spread, we compare the bond's weekly VWAP following the block week (P_{+1}) with the VWAP P_{OFF} of the receiving investor trades.

$$\textit{Receiver spread, } R(Q) = D * [Ln(P_{OFF}) - Ln(P_{+1})] * 100 \quad (5)$$

In Figure 3, Panel A, the illustration shows a block initiator cost of 20 basis points (bp) that is decomposed into a temporary (15 bp) and permanent (5 bp) price impact. Figure 3 Panel B provides a graphical representation of decomposing temporary price impact (15 bp) into dealer spreads (10 bp) and receiver spreads (5 bp).

To facilitate comparisons across trading cost measures, we retain block trades with non-missing values of initiator costs, dealer spreads and receiver spreads. Thus, the bond must have at least one trade during the prior week, at least one trade during the subsequent week, and at least one (offsetting) trade by the block dealer during the block week. We exclude blocks with initiator costs that exceed $50 (which are highly likely to reflect errors), those identified as "agency" or prearranged trades and those with a block trade price below $5 (see Bai et al., 2019). Trading costs are winsorized at the 1% and 99% levels.

4.2. Estimates of Block Trading Costs

Table III presents the trading costs for our sample of block trades. Panel A reports the block initiator costs. For blocks of at least $15 million, block initiator costs average about 18 bp over our sample period. With about 10,500 block trades each year and the average block size of about $23 million, trading costs for our sample aggregate to about $435 million annually. Trading costs of mega-blocks (21 bp) are about 35% higher than those of smaller blocks (16 bp), consistent with inventory and information models, but notably, this pattern stands in sharp contrast to the literature which finds that trading costs are higher for retail-size trades than those for institutional-size trades (see e.g., Edwards et al., 2007). Panel D reports that block initiator costs are larger for high yield bonds (22 bp) than investment grade bonds (16 bp).

Panels B presents a two-way decomposition of initiator costs into permanent and temporary price impact. For the full sample of block trades, the permanent price impact is economically small, averaging zero bps, and not statistically different from zero for all block size definitions. In contrast to the equity block literature, which finds that information effects increase with block size (e.g., Madhavan and Cheng, 1997), information effects in corporate bonds do not vary systematically with block size. For blocks of at least $15 million, temporary price impact is economically large, averaging 18 bps, and increases with block size, from 16 bp for small blocks to 23 bp for mega-blocks. Liquidity costs are almost twice as large for high yield (32 bp) than investment grade (13 bp) bonds.

Figure 4.A shows the yearly averages of the initiator costs and the decomposition inro temporary and permanent price effects, along with 95% confidence intervals, over our sample period. As expected, block initiator costs are higher during the stress periods of the global financial crisis and COVID-19 pandemic. Temporary price impact closely tracks the initiator costs (with the exception of a larger spike during the COVID-19 pandemic). These patterns suggest that time

series variation in block initiator costs are largely explained by liquidity effects.

4.3. Decomposition of Temporary Component into Dealer and Receiver Spreads

Table III Panel C presents a three-way decomposition of initiator costs into permanent price impact, dealer spreads, and receiver spreads. We find that liquidity costs can be attributed entirely to the compensation received by the block dealer. Dealers spread average 22 bp for trades of at least $15 million and do not vary with block size. Dealer spreads are larger for high yield (31 bp) than investment grade bonds (18 bp).

Dealer spreads of 22 bp in Panel C are larger than temporary price impact of 18 bp in Panel B. Taken together, the results imply that receiving investors earn *negative* spreads for participating in offsetting trades with dealers. For blocks of at least $15 million, receiver spreads average about -3 bp (Panel C). Since inventory positions are costly to a dealer, the finding that receiving investors do not get compensated for providing liquidity services to the dealer, and in fact, are charged a markup by the dealer on offsetting trades is noteworthy.

The markups paid by receiving investors are larger for investment grade bonds (-5 bp) than high yield bonds (1 bp, not statistically significant) and moderate with block size, from -6 bp for smaller blocks to zero markup (not statistically different from zero) for mega blocks.[19] In Appendix Table III, we show that markups are larger when receiving investor is a customer or small dealer, but close to zero when receiving investor is a large dealer.

Figure 4.A shows the yearly averages of the initiator costs and its components, along with 95% confidence intervals, over our sample period. Dealer spreads closely track initiator costs and

[19] In Appendix Table IV, we study the determinants of the price effects of block trades using a panel regression. The dependent variable in the regressions is one of the component measures of block trading costs. The explanatory variables are the important bond attributes, market conditions and block size. Consistent with the literature on corporate bond transactions costs, initiator costs and liquidity effects of the block are positively associated with block size, bond age, and high yield bonds, and negatively associated with issue size. Regression coefficients on bond attributes have a similar sign in the dealer spreads and receiver spreads regressions.

increase during the financial crisis and the COVID-19 period. Consistent with the results reported in Table III, initiator costs are largely explained by compensation earned by the block dealer.[20]

5. The Trades of the Receiving Investors

Given that dealers have limited risk bearing capacity, particularly after post-crisis banking regulations led to a reduction in dealer capital, it seems reasonable that receiving investors earn a premium for providing liquidity services to the dealer (see e.g., Anand et al., 2021; Choi et al., 2023). However, our results suggest that receiving investors, despite being institutional traders, pay a markup to the dealer for participating in offsetting trades. In this section, we examine the economics underlying the receiving investors decision to participate in the block market.

5.1. Why Do Receiving Investors Participate?

Burdett and O'Hara's (1987) model offers a rational explanation for receiver participation in spite of the losses on offsetting trades, namely that investors who desire to either establish or liquidate a block position might incur a larger trade execution cost for initiating a similar-size trade. To test the model's prediction, we build a trading cost model using our sample of block trades and then impute the cost of initiating a hypothetical trade on the block date. Specifically, the dependent variable of the trading cost model is the initiator's cost of the block trade and the explanatory variables are trade attributes, bond characteristics and market conditions at the time of the block trade.[21] The trading cost model is reported in Appendix Table IV Column 1. For each

[20] Appendix Figure I display the coefficients on year dummies for regressions of block trading measures on issue characteristics and market conditions. The results indicate that initiator costs are elevated during and following the financial crisis, with dealer spreads and permanent price impact largely following similar patterns. For all cost measures, after controlling for issue and market controls, there is little variation in block trading costs following the financial crisis.

[21] The dependent variables include the log of block size, age and issue size, and indicators for high yield, financial sector, on-the-run, 144A bonds, and blocks intermediated by small dealers, and the weekly corporate bond market index return, the trailing weekly S&P index return, the average three-month LIBOR interest rate, and the level of the VIX index over the preceding five days. The corporate bond index return is measured around the time of the offsetting trades rather than the time of the triggering block trade.

block trade, we estimate the "*imputed initiator cost*" as the fitted value from the model using the weighted average size of offsetting trades associated with the block trade.[22]

In Table IV Panel A, we report the *receiving investor spread*, the *imputed initiator cost* from the trading cost model (multiplied by -1 for comparison purposes) and the *receiving investor savings*, which is the (pairwise) difference between the two measures. For the full sample, the *receiving investor spread* averages -3 bp and mirror those reported in Table III, while the *imputed initiator cost* averages -14 bp. Thus, *savings* to receiving investors for participating in offsetting trades with the block dealer are both economically (10 bp) and statistically significant. In support of the Burdett and O'Hara (1987) prediction, our results suggest that, although receiving investors incur losses on offsetting trades, participation is still optimal, as it is more expensive to establish or liquidate a similar-size position by initiating a trade.

Savings for receiving investors are positive for investment grade (Panel B) and high yield bonds (Panel C), averaging 7 bp and 19 bp, respectively, and larger for mega-blocks (16 bp). Notably, receiving investor spreads are positive (+11 bp) for mega-blocks of high yield bonds (Panel C), with implied *savings* of 32 bp. Further, savings increase monotonically with the number of offsetting trades, from 7 bp when the block is associated with one or two offsetting trades to 22 bp when the block is associated with 10 or more offsetting trades (Panel D).

Overall, these results suggest that receiving investors are better off when block attributes improve their negotiating power with dealers. Specifically, dealers pass through a higher portion of liquidity effects to receiving investors when initiating block is very large (and the dealers may

[22] Admittedly, the trading cost model is based on block trades of at least $15 million and could estimate trading costs with error when average offsetting trade size is less than $15 million. Prior literature reports that trading costs decline with trade size (see, e.g., Edwards et al., 2007). For example, Besseminder et al. (2018) report that transaction costs are 0.25% for trades between $100,000 and $1 million, 0.19% for trades between $1 and $10 million, and 0.16% for trades that exceed $10 million. Given that the average offsetting trade size is around $8 million, the trading cost model based on block trades is likely to underestimate the imputed costs for the offsetting trades.

find it difficult to distribute the bonds) and involves riskier bonds (and the dealers face higher inventory risk). These results offer empirical support for testable predictions *TP1* and *TP2*.

6. Receiving Investor Costs and Post-Trade Reporting Rules

The results thus far suggest that being a counterparty to a block dealer is an optimal strategy for investors interested in building or reducing a large position. One driver of the receiving investor losses is the trading environment that confers information advantages for dealers over receiving investors in bilateral negotiations. In this section, we study changes to regulatory rules concerning the disclosure of trading information that affects asymmetric information in financial markets.

During our sample period, the corporate bond market was subject to numerous regimes of post-trade reporting rules. The regulatory initiatives have generally led to greater transparency but also led to controversy, and in particular, those concerning timely reporting of block transactions, which have been opposed by many industry groups. In light of these specific concerns concerning the block market, we study how greater transparency affects the relative information advantage of different market participants with a focus on the less-studied receiving investors.

First, we study the introduction of mandatory post-trade reporting in corporate bonds, examining the effects for non-public 144A bonds with trade reporting initiated in 2014 and for public bonds with staggered trade reporting initiated in 2003 and 2004. Second, we study block trading during four regulatory regimes pertaining to rules on the maximum stipulated time delay in reporting trades to the TRACE system.

6.1. TRACE Trade Reporting Initiation and Receiving Investor Spreads

The dissemination dates for the 2003 sample, 2004 sample and 144A sample of bonds are March 3, 2003, October 1, 2004 and June 27, 2014, respectively. For each sample, we study a 16-month period before and after the initiation of trade reporting and define the period on or after the

dissemination date as the period after transparency.[23] We require that bonds with TRACE initiation have at least one trade in the period before and after transparency. We retain block trades of at least $15 million that are not offset by the dealer in a single trade within fifteen minutes, blocks trades with non-missing cost measures, and blocks with a price of at least $5.00. These filters yield 622 block trades in 132 issues for the 2003 sample, 863 block trades in 192 issues for the 2004 sample, and 912 block trades in 183 issues for the 2014 sample.

In Table V, we report the results of the impact of mandatory post-trade reporting on block initiator costs, dealer spreads, and receiving investor spreads for our combined sample of block trades. Panel A reports univariate statistics for trading cost measures before and after TRACE initiation. Post- (Pre) Transparency is an indicator variable that equals one for trades in the period after (before) trade reporting, and equals zero otherwise. Panel B reports similar analyses in a multivariate setting. Regressions include issue fixed effects, trade-level controls (the natural log of trade size, whether the intermediary is a small dealer) and market controls (the trailing weekly corporate bond market index return, trailing weekly S&P index return, the change in the average three-month LIBOR interest rate, and the change in the VIX index over the previous week) and standard errors are clustered at the issue level. We report dependent variable averages above the regression results and *p*-Values below the regression coefficients.

Theoretical models (e.g., Pagano and Roell, 1996; Green et al., 2007) predict that opaque markets create opportunities for dealers to exploit their information advantage over customers.

[23] For bonds with TRACE initiation in March 2003, the period before transparency is restricted to 8 months, as the TRACE system was implemented in July 2002. We therefore selected the period after transparency to be 8-months, and to stay consistent, selected a 16-month window for all three sample. Specifically, for bonds with TRACE initiation in March 2003, we study the 16-month period between July 2002 (when TRACE was implemented) and October 2003 and define the period on or after March 2003 as post-TRACE. For bonds with TRACE initiation in October 2004, we study the 16-month period between February 2004 and May 2005, and define the period on or after October 2004 as post-TRACE. For 144A bonds with TRACE initiation in June 2014, we study 16-month period between November 2013 and February 2015, and define the period on or after June 2014 as post-TRACE.

Consistent with theoretical prediction (*TP3*), dealers obtain lower spreads on round-trip trades in the block market with greater transparency. In Table V, the univariate results of dealer spreads in Panel A, column (3) are smaller after trade reporting is initiated, from 22 bp to 18 bp, while regression results in Panel B, column (3) point to reduction in dealer spreads of 7 bp. The reductions are statistically significant in both panels and also economically large, as 7 bp decline is about a third of the dealer spreads (22 bp) in the period before trade reporting.

For block initiators, the univariate results in Panel A, column (1) are not statistically different before and after TRACE initiation, averaging about 19 bp, and in Panel B, column (1), the coefficient on *post-Transparency* in the block initiator regression is not statistically significant. Thus, the reduction in dealer spreads with greater transparency did not significantly affect the trading costs of one type of customers, the block initiators.

Our results suggest that receiving investors are the primary beneficiaries in the block market from greater transparency. Receiver spreads improve, as reported in Panel A, column (5), from a -10 bp before trade reporting to -2 bps after trade reporting. The regression coefficient in Panel B, column (5), points to a similar impact of trade reporting on receiver spreads. The increase of 12 bp is economically large relative to receiver spreads of -10 bps before transparency. The reductions are statistically significant at the 10% level.

Prior studies on the corporate bond market have broadly concluded that greater post-trade transparency has reduced dealer profits and improved trading costs for customers.[24] For example, Edwards et al. (2007) report that customer trade execution costs decline by about 3 to 4 bp for a sample of bonds that experienced TRACE initiation in 2003. Our study differs from prior work on TRACE reporting by focusing on the block market. Our study is related to Gemmill (1996),

[24] See, e.g., Edwards et al. (2007), Bessembinder et al. (2006), Goldstein et al. (2007), and O'Hara et al. (2018).

who examines block trades in the London Stock Exchange equity market after two changes in post-trade transparency, and does not detect any change in liquidity, and with Goldstein et al. (2007), who study a set of BBB-rated bonds, phased into price dissemination in April 2003, and find no reduction in customers' trade execution costs for very large trades.

In the setting of the block market, we test hypotheses concerning specific investor-types and show that transparency effects depend on the relative information disadvantage of the customer. Specifically, transparency benefits the less-informed customers in their negotiations with dealers while leaving outcomes largely unaffected for better-informed customers. These results add nuance to existing evidence that customers benefit from greater transparency.

As shown in Table II, the dealer offsets the block position on average with 3.4 receiving investors. In column (7) we report dispersion (within block) in receiving investor spreads for the subsample of block trades with more than one offsetting trade. The within-block standard deviation in receiver spreads increases from 24 bp before transparency to 27 bp after transparency. In Panel B, the coefficient on *post-Transparency* is positive (but not statistically significant), suggesting that dispersion may increase (or not decline) with greater transparency. We further explore these results below.

6.2. Dispersion in Receiving Investor Spreads

The results thus far suggest that mandatory trade reporting helps receiving investors on average to obtain better terms from dealers, but that within a block, there is greater variation in the terms of the offsetting trades. We next examine whether trade terms vary in any systematic way across offsetting trades associated with a block. Such an analysis could shed light on whether certain strategies lead to better terms and identify the mechanism that drives the dispersion. Focusing on the sample of block trades of at least $15 million, we retain 148,601 block trades that

are associated with two or more receiving investor trades. For each block trade, we then calculate the standard deviation of receiving investor spreads.

Figure 5.A reports a histogram of the dispersion in receiving investor spreads within a block. Across the sample, 19% of blocks exhibit dispersion of 10 to 20 bp, and almost 40% of blocks exhibit dispersion of 20 bp or more. In comparison to average receiver spreads of -3 bp, as reported in Table III, the dispersion in receiver spreads averages 25 bp. These results point to economically large differences (within a block) on terms of offsetting trades. Figure 5.B shows that dispersion in receiver spreads is prevalent across all block sizes and appears smaller for larger blocks. This pattern suggests that there is less variation in terms of offsetting trades when dealers face significant inventory risk (*TP1*).

In Figure 6, we study whether trade terms vary with the trade's position within a sequence of offsets for a block trade. The figure is based on receiving investor spreads for the full sample of 205,104 block trades of at least $15 million. We report mean receiving investor spreads for the first, second, third, and fourth, and "fifth and higher" offsetting trades based on trade execution timestamp on TRACE. Results in Figure 6 show that receiving investor trades earlier in sequence earn negative spreads while those later in sequence earn positive spreads. One explanation for these patterns is based on the theoretical prediction (e.g., Keim and Madhavan, 1996) that the optimal dealer strategy is to first trade with the most interested counterparties who will likely accept a less attractive price. Another explanation for these patterns is disclosure rule for completed transactions, which we explore in detail in the next section.

6.3. Trade Reporting Delay and Receiving Investor Spreads

FINRA's TRACE system disseminates information to the marketplace about corporate bond trades, including trade price and size, immediately upon receipt of a trade report from a

dealer. Dealers are allowed a delay between the time of the trade and the report of the trade to FINRA's TRACE system. The reporting delay allows the block dealer to retain private information generated from the occurrence and terms of the block trade for a period of time. For many block transactions, the dealer will be able to offset a portion of the block position with one or more receiving investors before the public reporting of the block. Back et al. (2020) predicts that counterparties (i.e., receiving investors) obtain better terms on offsetting trades with the dealer after the report versus before the report of a block trade (*TP4*).

In this section, we study the impact of TRACE rules that shortened the maximum stipulated reporting delay in three stages, from 75 minutes, to 45 minutes, to 30 minutes, to the current 15 minutes. We examine the block trades during the four reporting regimes: July 2002-September 2003 when trades were required to be reported within 75 minutes; October 2003-September 2004 when trades were required to be reported within 45 minutes; October 2004-June 2005 when trades were required to be reported within 30 minutes; and July 2005-June 2006 when trades were required to be reported within 15 minutes. In October 2022, FINRA invited comments on a proposal to shorten trade reporting delay in many fixed income markets to no later than one minute after trade execution. We therefore present related evidence for the most recent sample year, 2021, to offer timely guidance for the proposal.

For this analysis, we exclude blocks that are reported more than 24 hours following the execution timestamp of the block trade (these are likely errors) and blocks trades for bonds that were not yet eligible in each regime for TRACE-dissemination. We only retain observations with non-missing block initiator, dealer, and receiving investor spreads and price impact measures. We exclude block trades that are fully offset by the block dealer in a single trade within 15 minutes.

Dollar spreads with absolute values that exceed $50 are deleted and block trades with prices below $5.00 are deleted.

Further, for the analysis in Table VI, we require at least one receiving investor trade both before and after the block trade report timestamp. For each reporting regime, we calculate separately the cost measures for offsetting trades with an execution timestamp prior to the block report timestamp and for offsetting trades with an execution timestamp following the block report timestamp. Dealer and receiving investor spreads are the trade-size weighted average price of the offsetting trades, resulting in two observations for each block trade.[25] This setting allows a control for trade-specific, bond-specific, and market-wide factors on the spread measures.

The results are reported in Table VI Panel A. In the July 2002-September 2003 regime, dealers earn spreads of 30 bp on offsetting trades that occur prior to the block trade report. Once the block trade has been reported, dealer spreads on offsetting trades decline significantly, to 22 bps. The decline in dealer spreads with trade reporting can be observed for all reporting regimes and range from 5 bp to 11 bp.

The patterns in receiver spreads mirror those observed for dealer spreads, yet with an opposite sign. In the July 2002-September 2003 regime, receiving investors lose 16 bp on offsetting trades that occur prior to block trade report, but lose only 7 bp on offsetting trades that occur after block trade report, an improvement in trade terms of about 50%. These improvements can be observed for receiver spreads across all reporting regimes and range from 5 bp to 11 bp.

[25] After removing bonds that are not TRACE eligible, we have 184,498 block trades before the requirement of a pre- and post-report trade over the full sample period 2002-2021. Of this sample, 109,826 (59.4%) do not have a trade before report and 18,034 (10%) do not have a trade post-report. In Appendix Table V, we report the results in Table VI Panel A but do not impose the filter of both a pre-and post-trade report trade. We find the results are qualitatively similar to Table VI. In general, dealer spreads are lower for those offsetting trades that occur after trade report and receiver spreads are higher for those offsetting trades that occur after trade report.

For 2021, dealer spreads decline by 2 bp and receiver spreads increase by 2 bp for offsetting trades that occur after the block trade report than those reported before the block trade report.

In Table VI Panel B, we study the impact of block trade report on dealer and receiver spreads in a multivariate setting. Similar to Table VI Panel A, we focus on within-block-trade differences in spread measures using offsetting trades before and after the block trade, thus we are able to control for trade-specific, bond-specific, and market factors that may also impact spreads. 'Trades after report' is an indicator variable that equals one for offsetting trades after block trade report, and equals zero otherwise. All regressions are estimated using block-level fixed effects and in columns (2) and (4) we also include controls for the average offsetting trade size and the percent of offsetting trades with a customer before and after the block trade report. We report dependent variable averages at the top of the regression and *p*-values below coefficients.

In column (1), the coefficient on 'Trades after Report' is -0.075, and is statistically significant at the 1% level, implying that dealer spreads, on average, are reduced by 7.5 bp on offsetting trades that occur after versus before block trade report. Dealer spreads average 20 bp for this sample of block trades, implying that the reduction is economically large. In column (3), the coefficient on 'Trades after Report' is 0.074, and is statistically significant at the 1% level, implying that receiving investors obtain better prices on offsetting trades after versus before the block trade report. Receiver spreads average -6 bp for our sample of block trades, implying the reduction of 7.4 bp is economically large.

These results provide strong empirical support for the primary mechanism envisioned in theoretical models on how greater transparency levels the playing field in the market. Specifically, timely reporting of block trades allows receiving investors to whom the dealer distributes the block to account for the potential adverse price move of a block trade.

In June 2019, FINRA proposed a pilot program to study changes to rules concerning the reporting of block trades in corporate bonds based on the recommendation of the SEC's Fixed Income Market Structure Advisory Committee (FIMSAC). Specifically, the pilot, which proposed delaying the report of a block trade from 15 minutes to 48 hours, received broad support from large dealers in corporate bonds.[26] Table VI offers empirical evidence on the economics underlying dealers' support for the proposal. Specifically, our results suggest that dealers' spreads will be higher, enabling dealers to offset a greater share of the block position with receiving investors at advantageous prices if block trade reporting is delayed from 15 minutes to 48 hours.

Figure 7 reports the within-block changes in receiving investor spreads from before to after trade reporting (after - before) by year from 2002 to 2021. The shaded portion represents the 95% confidence interval. Similar to the results reported in Table VI, receiver spread changes are positive (and often statistically greater than zero) for the majority of years in the sample period, indicating that on average, receiving investors obtain better prices on offsetting trades after the block trade report. However, during the financial crisis, and in particular during the peak of Covid-19 uncertainty, the relationship reverses, such that offsetting trades that occur before block trade report obtain better price terms. A potential explanation is that, during times of market stress, inventory concerns are substantial, causing dealers to offer better prices on offsetting trades that quickly reverses the block position.

6.4. Dealer Response to Trade Reporting Changes

The results thus far show that dealer spreads on block trades decline with the initiation of trade reporting and that these results are primarily driven by offsetting trades of the dealer after

[26] See SIFMA's comment letter on the proposed pilot: https://www.finra.org/sites/default/files/2019-06/19-12_Sifma_Comment.pdf

the public reporting of a block trade. One potential negative consequence is that, in response to smaller spreads, dealers may withdraw from the block market, or reduce capital for block intermediation. We next examine how dealers respond to the changes in trade reporting rules.

We first study the impact of *initiation* of TRACE reporting in Panel A of Table VII based on the sample of block trades utilized in Table V. Column (1) indicates that dealers do not change their propensity to intermediate block trades; block volume relative to total volume does not decline following TRACE initiation.[27] The results in columns (2)-(4) indicate that, during the block week, dealers offset a larger portion of the block position (from 60% to 63%) and more often fully offset the block position (from 37% in 117 hours to 41% in 110 hours) after transparency.

In Table VII Panel B, we study the impact of mandatory trade reporting on dealers' strategy to offset the block position in a multivariate setting with issue fixed effects and other control variables.[28] The results are similar to those reported in Panel A of Table VII: while we observe no significant change in block volume market share, dealers offset a higher share of the block position within the block week. Further, they are more likely to fully offset the block position within the block week and conduct offsetting activities over a shorter window after transparency. The coefficient on *post-Transparency* is positive and statistically significant for *% Offset* and *% Fully Offset* and negative and statistically significant for *% Hours to Offset*.

Overall, these results suggest that dealers do not withdraw from the block market; however, dealers with recently acquired blocks appear more sensitive to adverse price movements on the

[27] These statistics are based on a cusip-week average.

[28] The regression in Column (1) is estimated using cusip-week block activity, includes the trailing weekly S&P index and the change in the average three-month LIBOR interest rate and VIX index over the previous week, and is estimated using issue level fixed effects and standard errors and standard errors clustered at the issue level. Regressions in Columns (2)-(4) include trade-level and issue-level (the natural log of trade size, bond age, and indicators for on-the-run bonds and block trades intermediated by small dealers) and market controls (the trailing weekly corporate bond market index return, trailing weekly S&P index return, the change in the average three-month LIBOR interest rate, and the change in the VIX index over the previous week) and are estimated using issue level fixed effects and standard errors clustered at the issue level.

block position with greater transparency, leading them to speed up the offsetting activity.

Next, in Table VII Panel C and Panel D we examine reporting and offsetting behavior for the reporting regimes examined in Table VI. The sample is constructed based on screens described for Table VI with one exception - we do not require an offsetting trade in both the period prior to and after the block trade report. Panel C reports statistics on timing of the block trade report by dealers to the TRACE system. *Reporting Delay* in Panel C presents evidence that dealers are strategic about the time delay for reporting block trades, and the delay is sensitive to reporting rules. In the July 2002-September 2003 regime, 92% of trades are reported within the stipulated maximum delay of 75 minutes, but only 70% are reported within 15 minutes. As the stipulated maximum delay drops over time to 15 minutes in the July 2005-June 2006 regime, 90% of trades are reported within the stipulated period. Thus, dealers respond to changes in reporting rules with trade reports that are less delayed, as intended by regulators.

The results thus far indicate that roughly 10% of the trade in each reporting regime are reported to TRACE system by the dealer after the stipulated maximum delay. If non-compliance is strategic, i.e., to withhold private information of the dealer from the market in order to benefit in bilateral negotiations, then non-compliance should be observed more often for large trades. On the other hand, non-compliance due to other (e.g., back-office staff) constraints should have no relation to trade size.

In Table VII Panel C, we report the non-compliance statistics by block size during the four reporting regimes. For blocks of at least $15 million, a material 8-10% of blocks in all four regimes are not in compliance with reporting rules while for the mega blocks of at least $30 million, the non-compliance rate is 10% to 13%. Thus, consistent with strategic behavior, non-compliance with reporting rules is observed more often for the mega blocks where benefits from withholding private

information are greater for the dealer. For comparability, we look at non-compliance for all TRACE trades including the very smallest trades. For this sample, only 4-7% are reported outside of stipulated maximum delay. These results are related to Porter and Weaver (1998), who use out-of-sequence trades to identify late reporting, arguing that NASDAQ dealers strategically delay reporting for equity market that are information motivated.

We show that dealers are strategic not only with the choice of reporting delay, but also with the speed of offset of the block position. In all four reporting regimes, dealer offsets about 20% of the block position before block trade is publicly reported. In other words, as stipulated maximum reporting delay for the block declines from first to fourth reporting regime, dealers offset the block position at a faster rate, potentially to obtain better prices on offsetting trades before block trade is made public. In all four regimes, dealers offset about half the block position within the block week and about 30% of blocks are fully offset within the block week.

Results in column (5) suggest that dealers' behavior in January 2021-December 2021, the most recent year in our sample, are similar to those observed in July 2005-June 2006 regime. Specifically, the average reporting delay is 14.6 minutes vs. 13.7 minutes; the percentage of block trades reported within the maximum stipulated delay of 15 minutes is 93% vs. 90%; the percentage of block volume that is offset within the block week is 64% vs. 54%; the percentage of block trades that are fully offset within the block week is 40% vs. 34%; and the percentage of block volume that is offset before the block trade report is 20% for both periods. The general similarity in dealers' reporting and offsetting behavior over the last 15 years is noteworthy in light of significant developments including global financial crisis, bank regulations, reductions in trading desk personnel, the growth in electronic markets, the Covid-19 pandemic uncertainty, among others.

Panel D reports results of block activity and dealer offsetting behavior in a multivariate

setting. We include indicator variables capturing whether the block occurred during the 45-minute, 30-minute, or 15-minute reporting regime. The 75-minute regime serves as the reference period in the regressions. Regressions are estimated over the July 2002-June 2006 period.[29]

Table VII Panel D Column (1) shows no material reduction in block activity following the shift from 75 to 45-minute and from 45 to 30-minute, and a reduction of 0.4 (or a reduction of about 12%) from 30 to 15-minute reporting regime. In columns (2) and (3), the coefficients on indicator variables are overall not significant for both *% Offset* and *% Fully Offset*, indicating that reductions in maximum stipulated reporting delay do not significantly change dealers offsetting behavior over the window of a block week.

In contrast, in column (4), the coefficient on *% Offset Volume Before Report* is not statistically different across the regimes. As seen in Table VII, Panel C, the average block trade reporting delay declines from 25 minutes in the July 2002-September 2003 regime to 14 minutes in the July 2005-June 2006 regime. Together, these results suggest that dealers strategically speed up the offset activity of the block position as the maximum stipulated reporting delay shortens in three stages. This strategy is reasonable as dealers obtain better terms on offsetting trades that occur before the public report of the block trade.

7. Informed Block Initiators and Receiving Investor: Buys and Sells

We study a new setting where dealers enjoy a relative information advantage over receiving investors. As discussed in Burdett and O'Hara (1987), although the motivation for trade in a block sell could be generated from either information or liquidity, liquidity motives are less likely for a

[29] Regressions include trade-level (except the regression in Column (1)) and issue-level (the natural log of trade size, bond age, issue size, and indicators for bonds issued by financial firms, on-the-run bonds, and block trades intermediated by small dealers) and market controls (the trailing weekly corporate bond market index return, trailing weekly S&P index return, the average three-month LIBOR interest rate, and the VIX index over the previous week) and are estimated using robust standard errors. Regressions in Column (1) are based on cusip-week trading activity and do not include trade-level or small dealer controls.

block buy for which the trader is creating a new position in the bond. Consistent with this prediction, recent studies show evidence of asymmetry in permanent price impact surrounding sustained customer buying versus selling activity in the corporate bond market (see Cai et al., 2019; Anand et al., 2021). In this section, we separately examine block buys and block sells, and first study whether there is asymmetry in the information content of block buys and sells.

Table VIII reports cost measures analogous to those in Tables III for block buys and sells. Consistent with the results reported in Cai et al. (2019) and Anand et al. (2021), block buys appear to be information motivated, while block sells are not. Permanent price impact is positive and substantially higher for block buys (7 bp) than for block sells (-4 bp). This presents the sample of block buys as a setting for which the initiator has private information that introduces adverse selection risk to the dealer and receiving investors.

We study block initiator costs and the dealer and receiver spreads separately for block buys and sells. Of our large sample of block trades of at least $15 million, there are 130,109 sell trades and 74,995 buy trades. In Table VIII Panel A, for block trades of at least $15 million, initiator costs are lower for block buys (15 bp) than block sells (19 bp). For block buys, initiator costs slightly decline with block size, from 14 bp for smaller blocks to 10 bp for mega blocks. Temporary price impact does not decline with block size, implying that initiator cost patterns are largely explained by permanent price impact, which declines with block size (from 9 bp for smaller blocks to 1 bp for mega blocks). For block sells, initiator costs increase monotonically by block size from 17 bp for smaller blocks to 27 bp for mega blocks, largely explained by temporary price impact, which increase with block size (from 23 bp for smaller blocks to 29 bp for mega blocks).

Of interest, dealer spreads are positive and of similar magnitude for both block buys (23 bp) and sells (21 bp) and do not vary with trade size for both block buys and sells. Thus, the higher

adverse selection risk of block buys is absorbed entirely by receiving investors who earn negative spreads (-12 bp). In contrast, for block sells, which do not have information effects, receiving spreads are slightly positive (1 bp).

Following the approach described in Section 5.1 and Table IV, we construct an imputed initiator cost for block buys and sells.[30] Table VIII Panel B reports the results. Imputed initiator costs are large (ranging from 13 bp to 19 bp), and larger for block sells than block buys (e.g., 19 bp versus 13 bp for block trades of at least $15 million).

The main variable of interest, *Savings* for receiving investors, is the difference between receiving investor spread and the imputed initiator cost. For block sells, where information effects are small, *Savings* are large and range from 19 bp to 22 bp. Thus, receiving investors who desire to build a position are better off participating in offsetting trades with a block dealer. For block buys, where adverse selection costs are high, *Savings* is on average slightly positive for the full sample of block trades of at least $15 million (1 bp). Across the three block size definitions, the results are mixed, with *Savings* ranging from -3 bp to + 7 bp. Thus, the results indicate that, receiving investors who desire to liquidate a position are often not worse off by participating in offsetting trades of a large block buy. Stated differently, the losses attributable to adverse selection risk are nearly offset by avoiding paying a premium for participating as an initiator. Our findings provide empirical support for Burdett and O'Hara's (1987) prediction that receiving investors lose money on informed block trades, but despite such losses, participation can be optimal.

[30] Our methodology is similar except we estimate the regression model in Appendix Table VI Column (5) of block initiator costs on bond and market controls for block buys then use the parameter estimates from this model to obtain predicted initiator costs for the offsetting trades of block sells. Similarly, we obtain predicted initiator costs for the offsetting trades of block buys by using parameter estimates generated from the model in Appendix Table VI Column (10) which regresses block initiator costs on bond and market controls for block sells.

To summarize, receiving investor outcomes on informed block trades are similar to those observed for receiving investors in less transparent regimes. Both settings demonstrate the effect of asymmetric information on the block market, showing that receiving investors are worse off in trading environments where dealers have an information advantage in bilateral negotiations.

8. Conclusion and Implications

This study highlights the important role of receiving investors for the vast majority of block trades where dealers participate in a principal capacity. We study 205,104 block trades and 690,418 receiver trades in the corporate bond market over the period 2002 to 2021. We present an approach to decompose price effects of block trades into a permanent price impact, dealer spreads, and receiving investor spreads. The empirical block literature has primarily focused on benefits and costs of the block market to the initiator. The study's main contribution is testing several theoretical predictions about receiving investors that have not received attention in the block market literature. We present new empirical evidence that demonstrates the appeal of the block market for receiving investors who desire to either establish or liquidate a large position.

We show the impact of asymmetric information on block market participants. Receiving investors lose on average 3 bps from participating as a counterparty in the block trade. We exploit the asymmetry in permanent price impact for block buys versus sells and find the adverse price movements following buys are absorbed entirely by receiving investors. Nevertheless, we find that participation is likely an optimal strategy as losses are either substantially lower than or roughly equivalent to costs for initiating a similar-sized trade. These results present direct evidence in support of the Burdett and O'Hara (1987) model.

Most fixed income markets have moved towards a market structure that requires mandatory public reporting of OTC secondary market trades. Back et al. (2018) theoretically show that timely

reporting of trades hurts the dealers by conveying their private information to market participants. Consistent with this model, we show that delayed reporting of block trades improves dealer profits. The specific mechanism is that receiving investors to whom the dealers will distribute the block have less information about the value of the bond. We study two regulatory changes that improved both the availability and timing of public block trade reporting and find these events had little impact on block initiator costs, but led to a substantial transfer in profits from the dealer to receiving investors. Specifically, we report robust evidence that dealer spreads are lower on offsetting trades that occur after a block trade is reported than offsetting trades that occur before the block trade is reported. Receiver spreads mirror those observed for dealer spreads with an opposite sign.

Academic research generally has found that improved post-trade transparency is associated with improved liquidity conditions such as lower transaction costs for customers. Despite these benefits, market participants have expressed concern that greater transparency could impair liquidity in certain market segments, such as the block market. In recent years, regulators have proposed pilots to delay disseminations of block trades in corporate bonds and swaps markets.

Much of the regulatory debate on post-trade transparency has focused on benefits to block initiators and dealers. For example, proponents of delayed block reporting argue that dealers have more time to offset positions and are less vulnerable to adverse price movements from participants who are aware of recent trades. Similarly, block initiators may benefit from delayed trade reporting, as dealers may be willing to facilitate a larger block at a better price. However, dealers and block initiators accrue these benefits from their informational advantage on a recently executed but yet-to-be-reported block trade at the expense of other participants.

In this study, we study one example of a disadvantaged party – receiving investors in the block market – and present evidence on the mechanism underlying the wealth transfer with delayed trade reporting from dealers to receiving investors. We show that timely reporting of block trades helps receiving investors better understand market conditions so that they can negotiate more favorable trade terms with dealers. Our study highlights the crucial role of receiving investors to a well-functioning block market, particularly in recent periods, as dealers are generally unwilling to commit capital for long periods after the post-crisis banking regulations.

References

Admati, A.R., and Pfleiderer, P., 1991. Sunshine trading and financial market equilibrium. *Review of Financial Studies* 4, 443–481.

Amber A., C. Jotikasthira, and K. Venkataraman, 2021, Mutual Fund Trading Style and Bond Market Fragility. *Review of Financial Studies*, Vol. 34 (6), 2993 -3044.

Amihud, Y., and H. Mendelson, 1980. Dealership market: Market-making with inventory. *Journal of Financial Economics* 8(1), 31-53.

Back, K., R. Liu, and A. Teguia, 2020. Signaling in OTC Markets: Benefits and Costs of Transparency. *Journal of Financial and Quantitative Analysis* 55(1):1-59

Bai, J., and T.G. Bali, and Q. Wen, 2019. Common risk factors in the cross-section of corporate bond returns. *Journal of Financial Economics*, Vol. 131 (3), 619-642.

Bao, J., M., O'Hara, and X., Zhou, 2018. The Volcker Rule and corporate bond market making in times of stress. *Journal of Financial Economics*, 130(1), 95-113.

Bessembinder, H., and Venkataraman, K., 2004. Does an electronic stock exchange need an upstairs market? *Journal of Financial Economics, 73*(1), 3-26.

Bessembinder, H., Maxwell, W., and Venkataraman, K., 2006. Market transparency, liquidity externalities, and institutional trading costs in corporate bonds. *Journal of Financial Economics* 82, 251–288.

Bessembinder, H., W. Maxwell, and K. Venkataraman, 2013. Trading Activity and Transactions Costs in Structured Credit Products. *Financial Analysts Journal*, 69, 55–67.

Bessembinder, H., Jacobsen, S., Maxwell, W., and Venkataraman, K., 2018. Capital commitment and illiquidity in corporate bonds. *Journal of Finance* 73, 1615–1661.

Bessembinder, H., Jacobsen, S., Maxwell, W., and Venkataraman, K., 2022. Overallocation and secondary market outcomes in corporate bond offerings. *Journal of Financial Economics* 146, 444–474.

Bloomfield, R., and M. O'Hara, 2000. Can transparent markets survive? *Journal of Financial Economics* 55(3), 425-459.

Brunnermeier, M., Pedersen, L.H., 2005. Predatory trading. *Journal of Finance* 60, 1825–1863.

Booth, G., Lin, J., Martikainen, T., Tse, Y., 2001. Trading and pricing in upstairs and downstairs stock markets. *Review of Financial Studies* 15, 1111–1135.

Burdett, K., and M. O'Hara, 1987. Building blocks: An introduction to block trading, *Journal of Banking & Finance*, Vol. 11(2), 193-212.

Cai, F., S. Han, D. Li, and Y. Li, 2019. Institutional herding and its price impact: Evidence from the corporate bond market. *Journal of Financial Economics* 131, 139-167.

Chalmers, J.; Y. Liu; and Z. J. Wang, 2021. The Difference a Day Makes: Timely Disclosure and Trading Efficiency in the Muni Market. *Journal of Financial Economics* 139, 313-335.

Choi, J., Y. Huh, S. Shin (2023) Customer Liquidity Provision: Implications for Corporate Bond Transaction Costs. *Management Science*, forthcoming.

Gao, P., P. Schultz, and Z. Song. 2017. Liquidity in a Market for Unique Assets: Specified Pool and To-Be-Announced Trading in the Mortgage-Backed Securities Market. *Journal of Finance*, 72, 1119–1170.

Dick-Nielsen, J., and M. Rossi, 2019. The Cost of Immediacy for Corporate Bonds, *Review of Financial Studies*, 32(1), 1–41.

Duffie, D., Dworczak, P., and Zhu, H., 2017. Benchmarks in Search Markets. *Journal of Finance 72*(5), 1983–2044.

Easley, D., and O'Hara, M., 1987. Price, trade size, and information in securities markets. *Journal of Financial Economics* 21, 123–142.

Edwards, A., Harris, L., and M. Piwowar, 2007. Corporate bond market transactions costs and transparency. *Journal of Finance* 62, 1421–1451.

Gemmill, G., 1996. Transparency and Liquidity: A Study of Block Trades on the London Stock Exchange under Different Publication Rules, *Journal of Finance*, 51 (5), 1765-1790.

Goldstein, M., Hotchkiss, E., and E. Sirri, 2007. Transparency and liquidity: a controlled experiment on corporate bonds. *Review of Financial Studies* 20, 235–273.

Goldstein, M., Hotchkiss, E., and Stanislava Nikolova, 2021. Dealer Behavior and the Trading of Newly Issued Corporate Bonds. Working paper, University of Southern California.

Goldstein, M., and E. Hotchkiss, 2020. Providing liquidity in an illiquid market: Dealer behavior in U.S. corporate bonds. *Journal of Financial Economics* 135(1), 16-40.

Green, R., B. Hollifield, and N. Schürhoff, 2007. Financial intermediation and the costs of trading in an opaque market, *Review of Financial Studies*, Vol. 20, 275-314.

Grossman, S., 1992. The informational role of upstairs and downstairs markets. *Journal of Business* 65, 509–529.

Harris, L., 1992. Consolidation, Fragmentation, Segmentation and Regulation. Working paper, University of Southern California.

Harris, Larry, 2016. Transaction costs, trade throughs, and riskless principal trading in corporate bond markets. Working Paper, University of Southern California.

Hendershott, T.; D. Li; D. Livdan; and N. Schurhoff, 2020. Relationship Trading in OTC Markets. *Journal of Finance* 75, 683-734.

Hendershott, T.; D. Li; D. Livdan; and N. Schurhoff, 2022. True Cost of Immediacy. Working paper, UC Berkeley.

Hollifield, B., A. Neklyudov, and C. Spatt, 2022. Volume and Intermediation in Corporate Bond Markets, Working paper, Carnegie Mellon University.

Kargar, M., B. Lester, S. Plante, and P. Weill, 2022. Sequential Search in Corporate Bonds. Working paper, University of Illinois.

Keim, D. B., and A. Madhavan, 1995, Anatomy of the Trading Process Empirical Evidence on the Behavior of Institutional Traders. *Journal of Financial Economics, 37* (3), 371-398.

Kraus, A., and H. Stoll, 1972. Price Impact of Block Trading on the New York Stock Exchange. *Journal of Finance*, 27 (3), 569-88.

Madhavan, A., 1995, Consolidation, Fragmentation, and the Disclosure of Trading Information. *Review of Financial Studies* 10 (4), 1035-1064.

Madhavan, A. 2000. Market Microstructure: A survey. *Journal of Financial Markets* 3, 205-258.

Madhavan, A., and Cheng, M., 1997. In search of liquidity: block trades in the upstairs and downstairs market. *Review of Financial Studies* 10, 175–203.

Naik, Y., A. Neuberger, and S. Viswanathan, 1999. Trade Disclosure Regulation in Markets with Negotiated Trades. *Review of Financial Studies* 12 (4), 873–900.

O'Hara, M., Wang, Y., and Zhou, X., 2018. The Execution Quality of Corporate Bonds. *Journal of Financial Economics* 130, 308–326.

O'Hara, M., and X. Zhou, 2021. The Electronic Evolution of Corporate Bond Dealers. *Journal of Financial Economics*, 140(2), 368-390.

Pagano, M., and A. Roell, 1996. Transparency and Liquidity: A Comparison of Auction and Dealer Markets with Informed Trading. *Journal of Finance*, 51(2), 579-611

Seppi, D., 1990. Equilibrium block trading and asymmetric information. *Journal of Finance* 45, 73–94.

Smith, B.F., Turnbull, A.S., and R.W. White, 2001. Upstairs markets for principal and agency trades: analysis of adverse information and price effects. *Journal of Finance* 56, 1723–1746.

Schultz, P., 2001, Corporate Bond Trading: A Peek Behind the Curtain. *Journal of Finance* 56, 677-698.

Schultz, P, 2012. The Market for New Issues of Municipal Bonds: The Roles of Transparency and Limited Access to Retail Investors. *Journal of Financial Economics*, 106, 492–512.

Schultz, P, 2017. Inventory Management by Corporate Bond Dealers. Working Paper, University of Notre Dame.

Schultz, P., and Z. Song, 2019. Transparency and Dealer Networks: Evidence from the Initiation of Post-Trade Reporting in Mortgage-Backed Security Market. *Journal of Financial Economics*, 133, 113–133.

Stoll, H., 1978. The Supply of Dealer Services in Securities Markets. *Journal of Finance* 33(4), 1133-51.

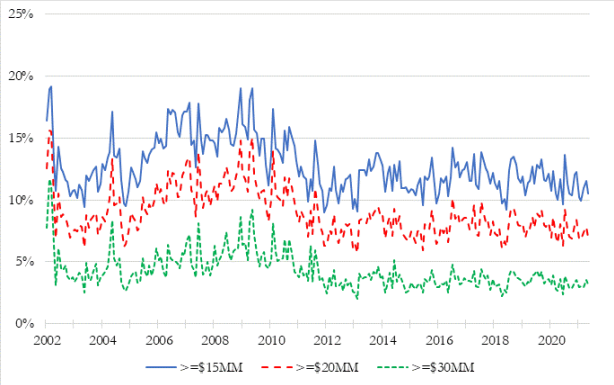
Trebbi, F., and K. Xiao. 2019. Regulation and market liquidity. *Management Science*. 65, 1949–1968.

Figure 1

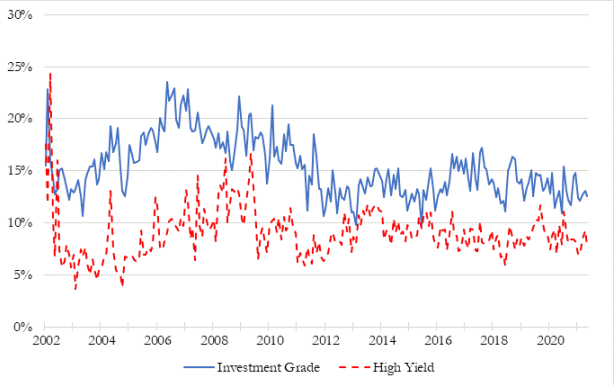
Block Trading Activity 2002-2021

These figures show block trading statistics over the July 2002 to November 2021 sample period. Figure A shows block trading volume relative to total volume for blocks that exceed $15 million (blue solid), $20 million (red long dash), and $30 million (green short dash). Figures B and C show block trading volume (>=$15 million) relative to total volume for investment grade (blue solid) and high yield (red long dash) bonds and for blocks intermediated by large (blue solid) and small (red long dash) dealers, respectively. Figure D shows the percent of block trades that are prearranged, defined as blocks that are offset in a single trade within 15 minutes.

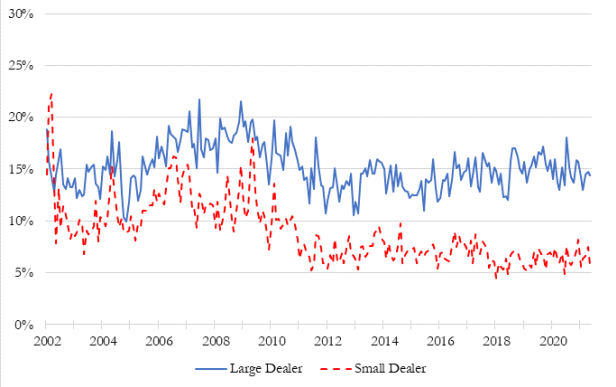
A. Block Size



B. Investment Grade vs. High Yield



C. Large vs. Small Dealer



D. % of Block Trades Prearranged

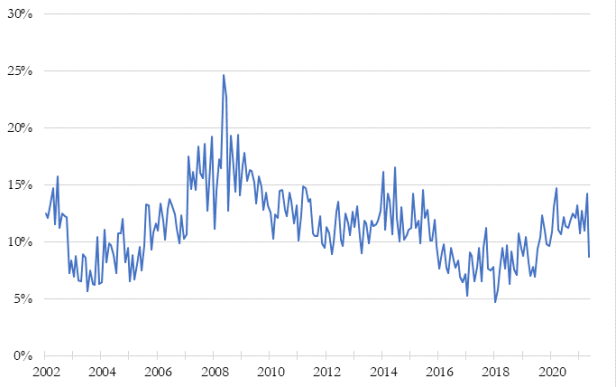
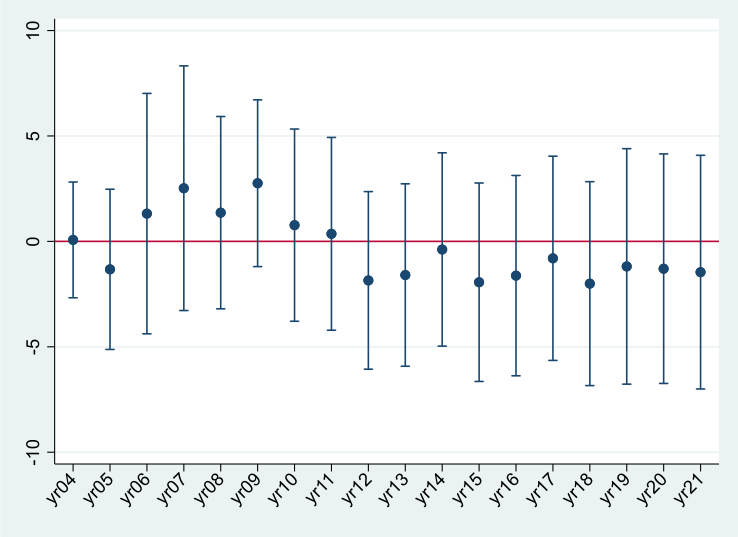


Figure 2

Block Trading: Year Effects

These figures show the coefficients on year dummies for regressions of block activity on issue characteristics and market conditions. Regressions report Newey-West standard errors. Circles represent the regressions coefficients and bars represent the 95% confidence interval. Years 2002 and 2003 are omitted in the regressions. Figure A shows the results when block trading relative to total volume is the dependent variable (reported as a percent). Figure B shows the percent of block trades that are prearranged, defined as blocks that are offset in a single trade within 15 minutes. For both figures, blocks are defined as trade sizes of at least $15 million. Data are organized on a weekly basis and regressions include 1,023 observations. Regression controls include log age, log issue size, and the percentage of traded bonds that are high yield, financial sector, and 144A bonds, and the trailing weekly corporate bond market index return, the trailing weekly S&P index return, the average three-month LIBOR interest rate, and the level of the VIX index over the preceding five days.

A. Block Volume / Total Volume



B. % Block Prearranged

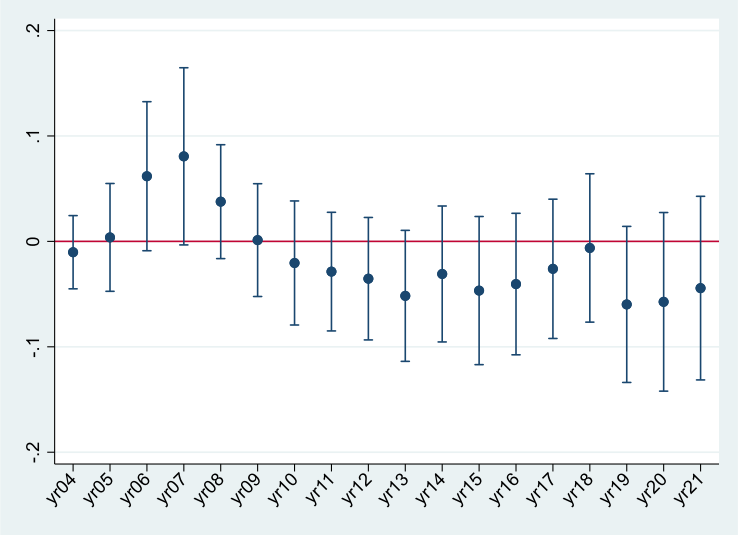


Figure 3

Decomposition of Block Initiator Costs

This figure shows the decomposition of block initiator costs for a hypothetical block buy by a customer at price P_B at time t_{block}. The bond trades at P_{-7} the week prior to the block trade at t_{-7} and at P_{+7} the week subsequent to the block trade at t_{+7}. The intermediating dealer offsets the block trade at a weighted-average buy price P_{Offset} at time t_{offset}. In Panel A, block initiator costs of 20bp are decomposed into a temporary price impact component (15bp) and a permanent price impact component (5bp). In Panel B, block initiator costs of 20bp are decomposed into two temporary price impact components, dealer spread (5bp) and receiver spread (5bp), and a permanent price impact component (5bp). The decomposition of a hypothetical block sell by a customer is analogous except reversed.

A. Temporary & Permanent Component B. Dealer, Receiver & Permanent Component

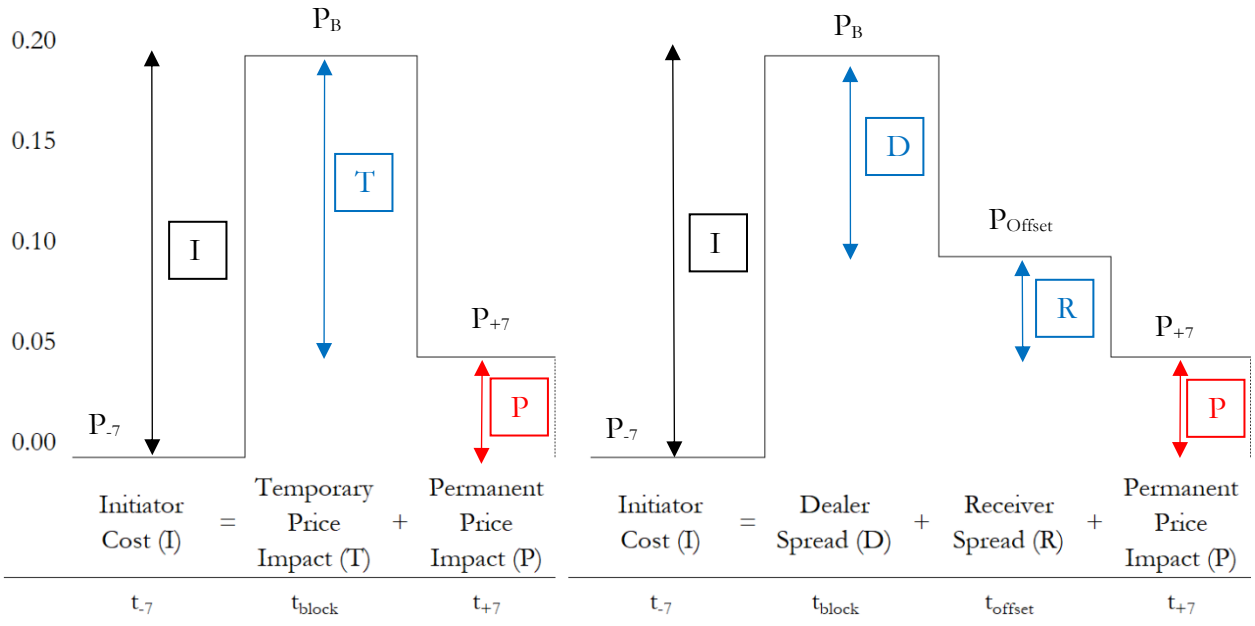


Figure 4

Initiator Cost and Decomposition by Year

This figure reports the block initiator costs and components by year (2002-2021). Figure A reports the two-way decomposition by permanent and temporary price impact. Gray solid indicates initiator costs, blue dash-dash-dot indicates temporary price impact, and green thin dash indicates permanent price impact. Blue dash-dash-dot indicates dealer spreads. Figure B reports the three-way decomposition by dealer spread, receiving investor spread, and permanent price impact. Gray solid indicates initiator costs, blue dash-dash-dot indicates dealer spreads, red dash indicates receiving investor spreads, and green thin dash indicates permanent price impact. The shaded portion represents the 95% confidence interval.

A. Temporary and Permanent Price Impact

B. Dealer and Receiving Investor Spread and Permanent Price Impact

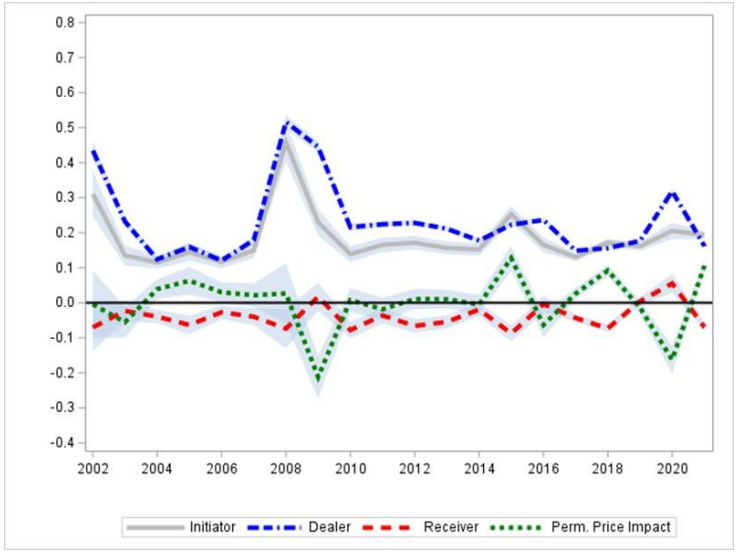
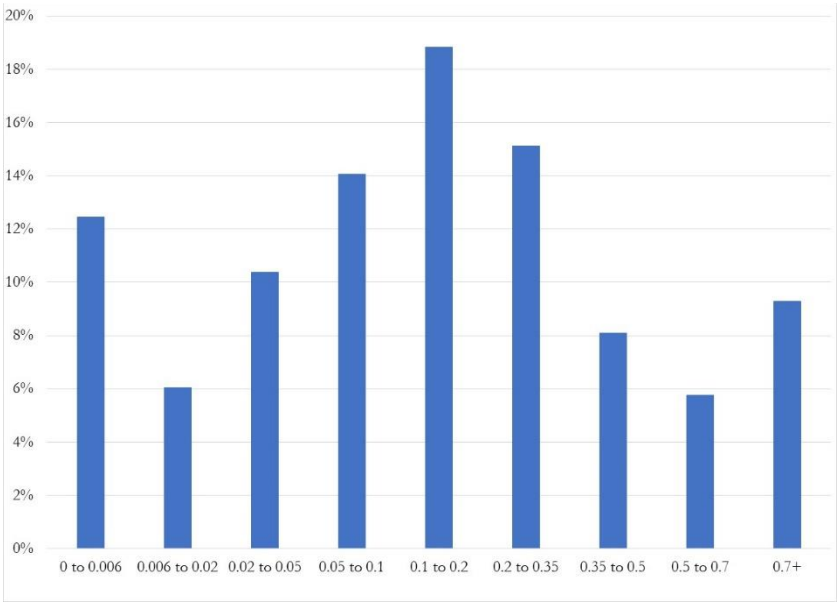


Figure 5

Dispersion in Receiving Investor Costs

These figures report the dispersion in receiving investor spreads for block trades (of at least $15 million) with at least two offsetting trades. Of the 205,104 blocks, 148,601 blocks have more than one offsetting trade. Of the 205,104 blocks, there are 690,418 receiving investor trades. Panel A reports a histogram of within-block standard deviation for the sample of 148,601 blocks. Panel B reports within block standard deviation for five block size definitions.

A. Histogram of Within-Block Dispersion



B. Dispersion by Block Size

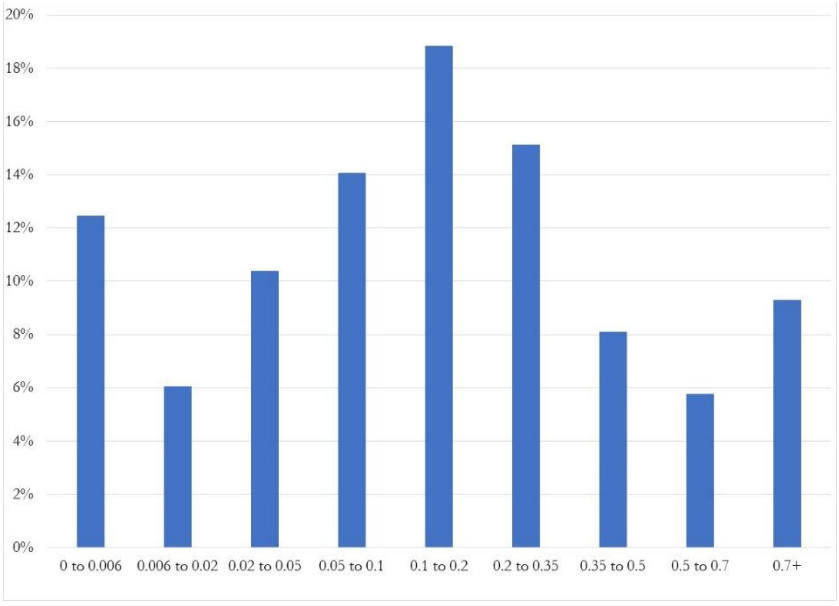


Figure 6

Receiving Investor Spread by Trade Sequence

These figures report the receiving investor spread by trade sequence for the full sample of 205,104 block trades of at least $15 million. We report mean receiving investor spreads for the first, second, third, and fourth offsetting trades and for the fifth and higher offsetting trades.

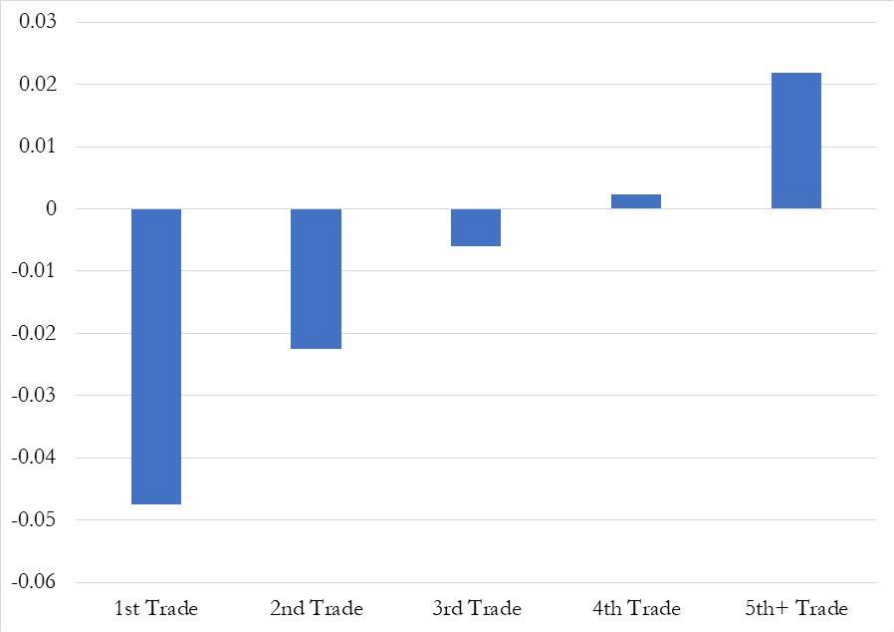


Figure 7

Change in Receiving Investor Spread After vs. Before Trade Report

This figure reports the changes in receiving investor spreads from before to after trade report (after - before) by year (2002-2021). This analysis is run within-block for the sample of block trades (of at least $15 million). To construct the sample, we exclude statistics for blocks that are reported more than 24 hours following the trade execution time and block trades for bonds that are not yet disseminated. We only retain observations with non-missing block initiator, block dealer, and receiving investor spread and price impact measures. We exclude block trades that are fully offset by the block dealer in a single trade within 15 minutes. Dollar spreads with absolute values that exceed $50 are deleted and block trades with prices below $5.00 are deleted. We require an offsetting trade by a receiving investor both before and after the trade is reported and we compute the weighted-average spread for both periods, resulting in two observations for each block trade. The shaded portion represents the 95% confidence interval.

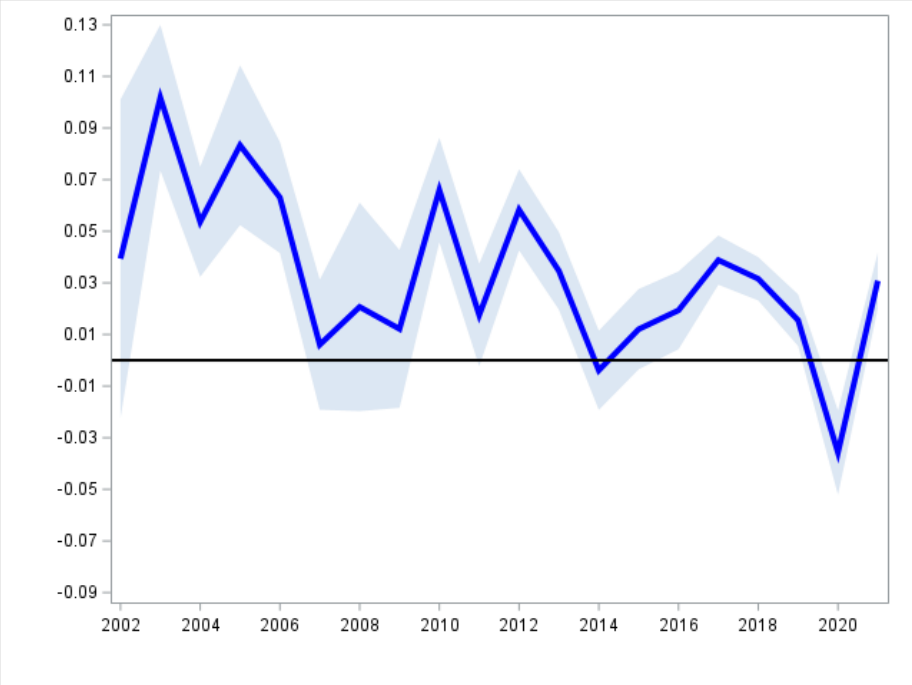


Table I
Block Trade Sample Description

Panel A summarizes the sample construction. Corporate bond trade data are from TRACE (Trade Reporting and Compliance Engine) and bond descriptive data are from the Mergent Fixed Income Securities Database (FISD). The sample period is July 2002 to November 2021. Our final sample consists of 38,762 cusips and 138,526,671 trades. Panel B describes the sample of block trades for four definitions of blocks. We only retain block trades with non-missing block cost measures. We exclude block trades that are fully offset by the block dealer in a single trade within 15 minutes, with cost measures that exceed $50, and with prices below $5.00.

Panel A: Sample Construction

	# Cusips	# Trades
Corporate bonds in FISD After FISD cleaning	55,842	
Corporate bonds in TRACE and FISD	39,801	147,886,718
Exclude bonds having less than 5 trades over the sample period	39,147	147,885,137
Exclude trades with a trade size > issue size	39,143	147,882,961
Exclude primary market transactions	39,106	146,212,835
Exclude trades reported after amount outstanding falls to zero	38,863	145,987,174
Exclude trades reported by dealer w/ offshore trades	38,861	143,677,740
Exclude trades immediately following offering date	38,767	138,528,434
Exclude 2002 trades with pre-July execution dates	38,762	138,526,671

Panel B: Sample Description

	Block >= $15M	Block $15M - $20M	Block $20M - $30M	Block >= $30M
# Observations	205,104	106,157	92,990	35,341
Investment Grade	146,052	73,286	67,015	26,160
High Yield	59,052	32,871	25,975	9,181
Large Dealer Counterparty	163,940	85,086	74,292	27,983
Small Dealer Counterparty	41,164	21,071	18,698	7,358
Average Block Size ($)	22,631,802	16,162,489	22,595,263	44,400,226
Single Block Size/Total Bond-Level Volume for Day	51%	48%	50%	53%

Table II

Receiving Investor Trade Sample Description

This table reports receiving investor trade sample statistics. Panel A reports the sample size of receiving investor trades and the number of block trades with more than one offsetting receiving investor. Panel B reports receiving investor trade size statistics. Panel C reports statistics on the total amount and timing of block offsets by receiving investors. Panel C statistics are computed at the block-level then averaged across all blocks. We report statistics for block trades that exceed $15 million.

	Block >= $15M	Block $15M - $20M	Block $20M - $30M	Block >= $30M
Panel A: Sample Statistics				
# Block Observations	205,104	106,157	92,990	35,341
# Receiving Investors	690,418	326,626	318,584	142,617
# Offsetting Trades by Receiving Investors Days [1,5]	3.37	3.08	3.43	4.04
# Block Observations w/ Multiple Receiving Investors	148,601	73,712	67,757	27,299
% Block Observations w/ Multiple Receiving Investors	72%	69%	73%	77%
% Offsetting Trades w/ Customer Receiving Investors	71%	72%	71%	74%
Panel B: Receiving Investor Trade Size Statistics				
Receiving Investor Trade Size	8,913,353	7,730,210	9,798,451	15,572,302
% Receiving Investor Trades >= $15M	22%	21%	26%	35%
Distribution by Trade Size				
=<$100K	17%	18%	17%	15%
>$100K - <$1M	17%	17%	16%	15%
>=$1M - <$5M	26%	27%	26%	23%
>=$5M - <$10M	17%	18%	17%	16%
>=$10M - <$15M	11%	11%	11%	10%
>=$15M	12%	10%	14%	20%
Panel C: Amount and Timing of Offsets				
% Offset in Days [1,5]	64%	64%	64%	67%
% Fully Offset in Days [1,5]	41%	44%	42%	42%
Hours to Offset (if not fully offset, set to 7*24= 168)	110	106	108	109

Table III
Block Trading Cost Decomposition

This table reports mean summary statistics of block trading costs. We examine block trades that exceed $15 million, greater than or equal to $15 and less than $20 million, greater than or equal to $20 million and less than $30 million, and greater than or equal to $30 million. Panel A reports block initiator costs. In Panel B, we decompose block initiator costs into a permanent price impact and temporary price impact component. In Panel C, we decompose block initiator costs into three components: 1) the permanent price impact and the two components of temporary price impact, 2) dealer spread, and 3) receiving investor spread. In Panel D, we report trading cost estimates for investment grade and high yield bonds for the sample of block trades of at least $15 million. Initiator cost is defined as the log difference between the price of the bond one week prior to the block trade and the block price. Permanent price impact is defined as the log difference between the price of the bond one week following and one week prior to the block trade. Temporary price impact is defined as the log difference between the price of the bond one week following the block trade and the block price. Dealer spread is the log difference between the weighted average price that the dealer offsets the block trade and the block price. Receiving investor spread is the log difference between the price of the bond one week following the block trade and the weighted average price that the dealer offsets the block trade. The unit of analysis is at the individual block-level. Variables are winsored at the 1% and 99% levels.

Panel A: Block Initiator Costs					
	Block >= $15M		Block $15M - $20M	Block $20M - $30M	Block >= $30M
	Mean	Median		Mean	
Block Initiator Trading Cost	0.18	0.08	0.16	0.17	0.21
Panel B: Two-Way Decomposition					
Permanent Price Impact	0.00	0.01	0.00	0.01	-0.01
Temporary Price Impact	0.18	0.06	0.16	0.17	0.23
Panel C: Three-Way Decomposition					
Permanent Price Impact	0.00	0.01	0.00	0.01	-0.01
Dealer Spread	0.22	0.13	0.22	0.22	0.22
Receiving Investor Spread	-0.03	-0.03	-0.06	-0.05	0.00

Panel D: By Credit Rating				
	Investment Grade		High Yield	
	Mean	Median	Mean	Median
Block Initiator Cost	0.16	0.07	0.22	0.10
Permanent Price Impact	0.03	0.02	-0.08	0.00
Temporary Price Impact	0.13	0.05	0.32	0.11
Dealer Spread	0.18	0.11	0.31	0.23
Receiving Investor Spread	-0.05	-0.02	0.01	-0.04

Table IV
Receiving Investor and Imputed Block Cost

This table reports hypothetical block trading costs for the receiving investor. We examine block trades that exceed $15 million, greater than or equal to $15 and less than $20 million, greater than or equal to $20 million and less than $30 million, and greater than or equal to $30 million. The unit of analysis is at the individual block-level. Panels A-D report mean summary statistics of hypothetical block trading costs for the receiving investor for the full sample, investment grade and high yield bonds, and by the number of receiving investor counterparties offsetting the block. To calculate imputed initiator cost, we use the regression coefficients reported in Appendix Table IV Column 1 and replace block size with the weighted average size of the offsetting trades by the receiving investors and the corporate bond index return is measured around the time of the offsetting trades rather than the time of the triggering block trade. We then use the predicted values from this regression to calculate imputed initiator cost. We report imputed costs * (-1) so that receiver spreads are comparable to imputed costs. Receiving investor spread is computed as in previous tables and is the log difference between the price of the bond one following the block trade and the weighted average price that the dealer offsets the block trade. Receiving investor savings is the (pairwise) difference between the imputed initiator cost and the realized receiving investor spread. *** on Receiving Investor Savings indicates the receiving investor spread is statistically different from the imputed cost as a trade initiator.

	Block >= $15M	Block $15M - $20M	Block $20M - $30M	Block >= $30M
Panel A: Full Sample				
Receiving Investor Spread	-0.03	-0.06	-0.05	0.00
Imputed Initiator Cost * (-1)	-0.14	-0.13	-0.14	-0.15
Receiving Investor Savings	0.10***	0.07***	0.09***	0.16***
Panel B: Investment Grade				
Receiving Investor Spread	-0.05	-0.06	-0.06	-0.04
Imputed Initiator Cost * (-1)	-0.12	-0.11	-0.12	-0.13
Receiving Investor Savings	0.07***	0.05***	0.07***	0.10***
Panel C: High Yield				
Receiving Investor Spread	0.01	-0.05	-0.04	0.11
Imputed Initiator Cost * (-1)	-0.18	-0.18	-0.19	-0.21
Receiving Investor Savings	0.19***	0.13***	0.15***	0.32***
Panel D: By # Counterparties				
	1-2 Offsetting Trades	3-5 Offsetting Trades	6-9 Offsetting Trades	10+ Offsetting Trades
Receiving Investor Spread	-0.08	0.00	0.04	0.12
Imputed Initiator Cost * (-1)	-0.15	-0.13	-0.12	-0.11
Receiving Investor Savings	0.07***	0.13***	0.16***	0.22***

Table V
Block Trading Costs and Transparency Events

This table reports changes in block costs for bonds that experienced a transparency event. We include three events: 144A bonds that experienced a transparency event in June 2014 and public bonds that experienced a transparency event in March 2003 or October 2004. We focus on the 16-month period surrounding the event and 'Post' refers to trades that occur on or after the transparency event. To be included in the sample, bonds must have at least one block trade in the pre- and post-TRACE period. For both samples, we only retain observations with non-missing block initiator, block dealer, and receiving investor spread and price impact measures. Blocks are trades of $15 million or more. These filters yield 912 block trades for the June 2014 event, 622 block trades for the March 2003 event, and 863 block trades for the October 2004 event. Panel A reports univariate statistics. Column (7) reports the standard deviation (within block) of receiving investor spread for the subsample of block trades that have offsets by multiple receiving investors. Panel B reports multivariate tests. Regressions include trade-level and issue-level (the natural log of trade size and bond age, and indicators for on-the-run bonds and block trades intermediated by small dealers) and market controls (the trailing weekly corporate bond market index return, trailing weekly S&P index return, the change in the average three-month LIBOR interest rate, and the change in the VIX index over the previous week) and are estimated using issue-level fixed effects and standard errors clustered at the issue level. Dependent variable averages for the full sample are reported at the top of the regression and *p*-Values are reported below coefficients. Variables are winsored at the 1% and 99% levels. ***, **, and * indicate statistical signicance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Initiator Cost		Dealer Spread		Receiving Investor Spread		
Panel A: Univariate Statistics							
	Mean	Median	Mean	Median	Mean	Median	Std. Dev
Pre-Transparency	0.18	0.12	0.22	0.19	-0.10	-0.05	0.24
Post-Transparency	0.19	0.08	0.18	0.14	-0.02	-0.03	0.27
Chg.	0.02	-0.05	-0.04	-0.05	0.08	0.02	0.03
Panel B: Multivariate Tests							
Dependent Variable Average	0.18		0.20		-0.06		0.25
Post-Transparency	-0.069		-0.070**		0.116*		0.044
	(0.239)		(0.012)		(0.070)		(0.171)
Issue-level fixed effect	YES		YES		YES		YES
Trade-level controls	YES		YES		YES		YES
Issue-level controls	YES		YES		YES		YES
Market conditions controls	YES		YES		YES		YES
Observations	2,389		2,389		2,393		1,549
Adjusted R^2	0.061		0.180		0.111		0.214

Table VI
Block Trading Costs and Trade Reporting Changes

This analysis considers block trading costs over four regulatory periods that reduced the time dealers were required to report trades and in 2021 (the most recent year in the sample). To construct the sample, we exclude statistics for blocks that are reported more than 24 hours following the trade execution time and blocks trades for bonds that are not yet disseminated. We only retain observations with non-missing block initiator, block dealer, and receiving investor spread and price impact measures. We exclude block trades that are fully offset by the block dealer in a single trade within 15 minutes. Dollar spreads with absolute values that exceed $50 are deleted and block trades with prices below $5.00 are deleted. We require an offsetting trade by a receiving investor both before and after the trade is reported and we compute the weighted-average spread for both periods, resulting in two observations for each block trade. In Panel A Column 1 reports statistics when trades were required to be reported within 75 minutes. Columns 2 and 3 report statistics when trades were required to be reported within 45 and 30 minutes, respectively. Column 4 reports statistics in the early one-year period when trades were required to be reported within 15 minutes. Column 5 reports statistics in 2021 (the last year in our sample). Panel B reports regressions with a 'Trades after Report' indicator for dealer and receiver spreads after the trade has been reported. All regressions include block-level fixed effects and in columns (2) and (4) we also include controls for the average offsetting trade size and the percent of offsetting trades with a customer in the pre- and post-report periods. Standard errors are estimated using the Huber-White sandwich estimator. All variables are winsorized at the 1% and 99% levels. ***, **, and * indicate statistical signicance at the 1%, 5%, and 10% level, respectively.

Panel A: Summary Statistics, By Period

	(1)	(2)	(3)	(4)	(5)
	July 2002-Sep. 2003	October 2003-Sep.	October 2004-June	July 2005-June 2006	2021
	75 Minutes	45 Minutes	30 Minutes	15 Minutes	15 Minutes
Dealer Spread					
- Before Report	0.30	0.16	0.26	0.23	0.22
- After Report	0.22	0.11	0.15	0.18	0.19
Chg. Dealer Spread	-0.08	-0.06	-0.11	-0.05	-0.03
Receiving Investor Spread					
- Before Report	-0.16	-0.08	-0.12	-0.02	-0.08
- After Report	-0.07	-0.02	0.01	0.00	-0.05
Chg. Receiver Spread	0.08	0.06	0.11	0.05	0.03

Panel B: Multivariate Tests

	(1)	(2)	(3)	(4)	(5)	(6)
	July 2002-June 2006				2021	
	Dealer Spread		Receiving Investor Spread		Dealer Spread	Receiver Spread
Dependent Variable Average	0.20	0.20	-0.06	-0.06	0.21	-0.06
Trades after Report	-0.075***	-0.054***	0.074***	0.049***	-0.029***	0.027***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.001)	(0.010)
Block-Level Fixed Effect	YES	YES	YES	YES	YES	YES
Offset Trade Controls	NO	YES	NO	YES	NO	NO
Observations	10,670	10,670	10,670	10,670	8,510	8,510
Adjusted R-squared	0.216	0.224	0.780	0.782	0.166	0.809

Table VII
Strategic Dealer Trade Reporting and Offsetting Behavior

This analysis considers dealers' strategic block reporting and offsetting behavior. Panel A and Panel B report dealer offsetting behavior for block trades before and after transparency using the sample utilized in Table V. Panel A shows univariate results and Panel B shows the impact of transparency on block activity and dealer offsetting behavior in a multivariate setting. The regression in Column (1) is estimated using cusip-week block activity, includes the trailing weekly S&P index and the change in the average three-month LIBOR interest rate and VIX index over the previous week, and is estimated using issue-level fixed effects and standard errors clustered at the issue level. Regressions in Columns (2)-(4) include trade-level and issue-level (the natural log of trade size, bond age, and indicators for on-the-run bonds and block trades intermediated by small dealers) and market controls (the trailing weekly corporate bond market index return, trailing weekly S&P index return, the change in the average three-month LIBOR interest rate, and the change in the VIX index over the previous week) and are estimated using issue-level fixed effects and standard errors clustered at the issue level. Panel C and Panel D examine reporting and offsetting behavior over various trade reporting regimes. To construct the sample, we exclude statistics for blocks that are reported more than 24 hours following the trade execution time and blocks trades for bonds that are not yet disseminated. We only retain observations with non-missing block initiator, block dealer, and receiving investor spread and price impact measures. We exclude block trades that are fully offset by the block dealer in a single trade within 15 minutes. Block trades with dollar spreads with absolute values that exceed $50 or with prices below $5.00 are deleted. Panel C reports statistics on the timing of dealer trade reporting for the four reporting regimes used in Table VI and for 2021 (the most recent year in our sample). Panel D reports regressions of block activity and dealer offsetting behavior with indicators for whether the block occurred during the 45-minute, 30-minute, or 15-minute reporting regime and the 75-minute regime is the reference period. Regressions are estimated over the July 2002-June 2006 period. Regressions include trade-level (except the regression in Column (1)) and issue-level (the natural log of trade size, bond age, issue size, and indicators for bonds issued by financial firms, on-the-run bonds, and block trades intermediated by small dealers) and market controls (the trailing weekly corporate bond market index return, trailing weekly S&P index return, the average three-month LIBOR interest rate, and the VIX index over the previous week) and are estimated using robust standard errors. Regressions in Column (1) are based on cusip-week trading activity and do not include trade-level or small dealer controls. All variables are winsorized at the 1% and 99% levels. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Panel A: Transparency - Univariate				
	% Block Vol / Tot Volume	% Offset Days[1,5]	% Fully Offset	Hours to Offset
Pre-Transparency	4.84	60%	37%	117.2
Post-Transparency	4.77	63%	41%	110.0
Chg.	-0.06	3%	4%	-7.3
Panel B: Transparency - Multivariate				
	% Block Vol / Tot Volume	% Offset Days[1,5]	% Fully Offset	Hours to Offset
Post-Transparency	-0.156	0.057**	0.061**	-8.437**
	(0.419)	(0.018)	(0.035)	(0.043)
Issue-level fixed effect	YES	YES	YES	YES
Trade-level controls	NO	YES	YES	YES
Issue-level controls	YES	YES	YES	YES
Market conditions controls	YES	YES	YES	YES
Observations	31,150	2,389	2,389	2,389
Adjusted R^2	0.018	0.114	0.103	0.126

Panel C: Reporting Changes - Univariate					
	July 2002-Sep. 2003	October 2003-Sep. 2004	October 2004-June 2005	July 2005-June 2006	2021
	75 Minutes	45 Minutes	30 Minutes	15 Minutes	15 Minutes
Reporting Delay (in minutes)	25.08	17.76	15.14	13.72	14.58
% Reported w/ in 75 minutes	92%	93%	94%	96%	95%
% Reported w/ in 45 minutes	81%	90%	92%	94%	94%
% Reported w/ in 30 minutes	75%	88%	90%	93%	94%
% Reported w/ in 15 minutes	70%	82%	86%	90%	93%
% Reported Outside Regulation: >= $15M	8%	10%	10%	10%	7%
% Reported Outside Regulation: $15M - $20M	8%	8%	9%	9%	4%
% Reported Outside Regulation: $20M - $30M	7%	10%	11%	11%	12%
% Reported Outside Regulation: >= $30M	10%	13%	13%	13%	7%
% Reported Outside Regulation: all trades	7%	7%	4%	5%	
% Block Volume / Total Volume	3.43	3.21	3.29	3.43	2.50
% Offset Days[1,5]	54%	53%	54%	54%	64%
% Fully Offset	34%	33%	35%	34%	40%
% Offset Volume Before Block Trade Report	20%	17%	20%	20%	20%

Panel D: Reporting Changes - Multivariate				
Dependent Variable	% Block Volume / Total Volume	% Offset Days[1,5]	% Fully Offset	% Offset Volume Before
45 Minute Regime	-0.107	-0.007	0.015	0.001
	(0.201)	(0.524)	(0.247)	(0.947)
30 Minute Regime	-0.226	0.015	0.037*	0.006
	(0.107)	(0.400)	(0.072)	(0.703)
15 Minute Regime	-0.404*	0.020	0.027	-0.024
	(0.058)	(0.486)	(0.398)	(0.334)
Trade-level controls	NO	YES	YES	YES
Issue-level controls	YES	YES	YES	YES
Market conditions controls	YES	YES	YES	YES
Observations	453,544	22,695	22,695	22,695
Adjusted R^2	0.040	0.013	0.006	0.018

Table VIII
Block Trading Cost Decomposition - Buys vs. Sells

This table reports summary statistics of block trading costs for block buys and block sells by trade size subsamples. We examine block trades that exceed $15 million, greater than or equal to $15 and less than $20 million, greater than or equal to $20 million and less than $30 million, and greater than or equal to $30 million. We decompose block initiator costs into two components: permanent price impact and temporary price impact; we then further decompose temporary price impact into two components: dealer spread and receiving investor spread. The unit of analysis is at the individual block-level. Panel A reports costs reported by trade size subsamples. Variables are winsored at the 1% and 99% levels. Panel B reports summary statistics of hypothetical block trading costs for the receiving investor separately for block buys and block sells. To compute imputed initiator cost, we use the regression coefficients reported in Appendix Table VI Columns 1 and 6 and replace block size with the weighted average size of the offsetting trades by the receiving investors and corporate bond index return is measured around the time of the offsetting trades rather than the time of the triggering block trade. We then use the predicted values from this regression to compute imputed initiator cost. Receiving investor savings is the difference between the imputed initiator cost and the realized receiving investor cost. The unit of analysis is at the individual block-level. *** on Receiving Investor Savings indicates the receiving investor spread is statistically different from the imputed cost as a trade initiator.

Panel A: Cost Decomposition					
	Block >= $15M		Block $15M - $20M	Block $20M - $30M	Block >= $30M
	Mean	Median	Mean		
	Block Sells by Customer				
Block Initiator Cost	0.19	0.08	0.17	0.19	0.27
Permanent Price Impact	-0.04	0.01	-0.06	-0.03	-0.03
Temporary Price Impact	0.24	0.08	0.23	0.22	0.29
Dealer Spread	0.23	0.13	0.23	0.22	0.23
Receiving Investor Spread	0.01	-0.01	0.00	0.00	0.05
	Block Buys by Customer				
Block Initiator Cost	0.15	0.07	0.14	0.15	0.10
Permanent Price Impact	0.07	0.03	0.09	0.07	0.01
Temporary Price Impact	0.09	0.03	0.06	0.08	0.10
Dealer Spread	0.21	0.13	0.21	0.21	0.21
Receiving Investor Spread	-0.12	-0.06	-0.15	-0.13	-0.10
Panel B: Imputed Receiving Investor Block Cost					
	Block Sells by Customer				
Receiving Investor Spread	0.01	-0.01	0.00	0.00	0.05
Imputed Initiator Cost * (-1)	-0.19	-0.18	-0.19	-0.18	-0.17
Receiving Investor Savings	0.20***	0.16***	0.19***	0.19***	0.22***
	Block Buys by Customer				
Receiving Investor Spread	-0.12	-0.06	-0.15	-0.13	-0.10
Imputed Initiator Cost * (-1)	-0.13	-0.13	-0.13	-0.15	-0.17
Receiving Investor Savings	0.01**	0.03***	-0.03***	0.01	0.07***

Appendix for

Asymmetric Information and Receiving Investor Outcomes in the Block Market for Corporate Bonds

Appendix A
Identifying Receiving Investor Trades

Having identified the initiating block trade (based on various definitions), we retain all trades by the block dealer in the bond during the week (i.e., five trading days) after the block trade (e.g., if the block occurs on Wednesday, the block week is from Wednesday to Friday, and the following Monday to Tuesday). We then, starting with block volume, cumulate the dealer's (signed) trading volume in the bond. If the cumulative imbalance reaches or crosses zero over the block week, we classify the block as being "fully offset".[31] For a block trade that is not fully offset, the percent that is offset equals [(block quantity-ending cumulative inventory)/block quantity)].

We define the "block end" time as the earlier of the time the block is fully offset or the end of the block week. We focus on one week for the following reasons. First, Bessembinder et al. (2018) show that the proportion of weekly trading volume that is carried into dealers' weekend inventory is generally less than 10%. Goldstein and Hotchkiss (2020) report median (mean) dealer holding periods of one (ten days). Hollifield et al. (2022) show more than 70% of large trades are matched within a week. Second, as the time from block trade increases, the link between a triggering block trade and the dealers' offsetting trades of opposite sign becomes less clear.

Receiving investor trades are identified as those that offset dealer's block position before the block end time. Specifically, we categorize the *earliest* large trade as the "trigger" block and opposite sign trades – both block and non-block - in the bond by the same dealer that occur before the block end time as receiving investor trades. After the block end time, the next block trade by the dealer in the bond is included in the initiating block sample. For each block trade, we calculate the price effects described in Section 4.1, and the percent of the block that is offset, defined as: Max [0, (block quantity-ending cumulative inventory)/block quantity)].

[31] This follows the spirit of Goldstein and Hotchkiss (2020) who construct a measure of dealer roundtrip costs.

Below, we describe several examples, beginning with the easiest scenario. Suppose for Dealer A, we observe a $25 million customer buy at 10:00am, a $15 million sell at 11:00am, and a $10 million sell at 11:05am. Our approach identifies the trigger trade as the $25 million block buy and the receiving investor trades as the two subsequent customer sells. Notably, while the $25 million trade is classified as initiating block trade, the $15 million and $10 million trade are classified as receiving investor trades. In this example, the block is fully offset, as cumulative imbalance equals zero, and the block period is defined as one day (i.e., the block start and end date are the same).

Alternatively, suppose we observe a $25 million customer buy at 10:00am and then observe several sell trades but the cumulative imbalance of Dealer A in the bond does not equal or cross zero during the block week. In this example, we classify the initiating block trade as not being fully offset and define the block period as the full week (i.e., block end date equals the block start date plus four trading days).

A.1. Classification Issues

One scenario is when the size of the triggering block trade is smaller than size of the receiving investor trade. For example, suppose we observe a block sell trade of $15 million at 10:15am and a block buy trade of $20 million at 11:30am. Our approach identifies the trigger block trade as the $15 million even though the receiving investor trade has a larger size. One concern is that our approach may incorrectly identify the $15 million as the trigger trade.

We address this concern as follows. First, FINRA's reporting rules stipulate 15 minutes as the maximum reporting delay during the majority of our sample period. Thus, when the difference in trade timestamp between the trigger block and receiver trades exceeds the stipulated reporting delay, it is unlikely that our approach leads to misclassification. To minimize

classification errors, we remove prearranged trades from the analyses; scenarios where a trigger block trade is fully offset by the Dealer A with a single trade within 15 minutes.

Second, we define block trades using three thresholds, $15 million, $20 million and $30 million. For mega (e.g., $30 million) blocks, it is less likely that initiating block trade is incorrectly classified. Third, in Appendix Table I below, we show that the percent of fully offset blocks where the receiving investor trade occurs on the same day as the trigger block and exceeds the block trade size is only 6%. Further, the percent of fully offset blocks where the receiving investor trade occurs within 15 minutes and exceeds the block trade size is only 0.8%. These results suggest that the misclassification rate in the overall sample is likely to be low. Fourth, in Appendix Table II, we show that the main results of Table III analyses are unchanged when we exclude the 6% of block trades that are fully offset by a larger trade, described above.

A.2. Examples of Classification

Example 1, $15 million block trade threshold:

Trade Execution Date	Initiator (I) or Receiver (R)	Signed Trade Size	Trade Hour	Trade Minute	Trade Second	Dealer ID	Cumulative Inventory	Percent Offset	Block End Date
3/4/2021	I	27,000,000	11	33	1	3341	27,000,000		
3/4/2021	R	-27,000,000	16	43	34	3341	0	100%	4-Mar-21
3/9/2021		15,000,000	11	53	41	3341	15,000,000		
3/9/2021		3,310,000	14	30	51	3341	18,310,000		
3/9/2021		1,000,000	15	3	53	3341	19,310,000		
3/9/2021		-20,000,000	17	1	55	3341	-690,000		

Dealer ID 3341 buys a block from customer of $27 million at 11:33 on 3/4/2021. We retain *all* trades for this dealer over the next five trading days (3/4-3/10). Although we observe many block trades during the five-day period, the block buy of $27 million at 11:33 is identified as the initiating "trigger" block (identified by I in column 2) as it is the earliest trade. Sorting the data by trigger trade, then by execution time, we calculate the cumulative imbalance in the bond for the dealer.

The dealer has an opposite sign sell trade of $27 million at 16:43. Since the cumulative imbalance equals zero at this time, we classify the block as being "fully offset" after this trade. The $27 million sell at 16:43, although it is a block, is classified as "receiving investor" trade (identified by R in column 2). Because the imbalance equals zero on 3/4/21, the $15 million block buy on 3/9/21 at 11:53 is allowed to enter the initiating block sample.

Example 2, $15 million block trade threshold:

Trade Execution Date	Initiator (I) or Receiver (R)	Signed Trade Size	Trade Hour	Trade Minute	Trade Second	Dealer ID	Cumulative Inventory	Percent Offset	Block End Date
8/30/2021	I	-15,724,000	12	51	55	204	-15,724,000		
8/31/2021		-10,000	16	0	26	204	-15,734,000	0%	5-Sep-21

Dealer 204 sells a $15.7 million block to a customer on 8/30/21. We only observe one other trade for dealer over the block-week, and this trade is not offsetting the inventory position. This block program ends on 9/5/21 (Trading Day 5), and the percent offset is set to 0%. This block is not included in our sample because the decomposition of trading costs requires at least one receiving investor trade.

Example 3, $15 million block trade threshold:

Trade Execution Date	Initiator (I) or Receiver (R)	Signed Trade Size	Trade Hour	Trade Minute	Trade Second	Dealer ID	Cumulative Inventory	Percent Offset	Block End Date
3/9/2021	I	15,000,000	11	53	41	3341	15,000,000		
3/9/2021		3,310,000	14	30	51	3341	18,310,000		
3/9/2021		1,000,000	15	3	53	3341	19,310,000		
3/9/2021	R	-20,000,000	17	1	55	3341	-690,000	100%	3/9/2021

Dealer 3341 buys $15 million from a customer at 11:53 (the initiating block trade, identified as I). We retain all trades for the dealer over the next five days. The dealer has two additional buys that brings the cumulative inventory to $19.3 million, and then has a large $20 million sell. The sell trade brings the dealer's cumulative imbalance below zero over the block week. Thus, the block is considered fully offset and the $20 million sell at 17:01 is classified as receiving investor trade,

identified as R. The $3.3 and $1 million trades are used for calculating the cumulative imbalance but are not included in the initiating block sample or receiving investor trade sample.

Example 4, $15 million block trade threshold:

Trade Number	Initiator (I) or Receiver (R)	Trade Execution Date	Signed Trade Size	Trade Hour	Trade Minute	Trade Second	Dealer ID	Cumulative Inventory	Percent Offset	Block End Date
1	I	6/8/2021	(15,000,000)	15	34	23	28	(15,000,000)		
2		6/8/2021	(165,000)	16	1	5	28	(15,165,000)		
3		6/8/2021	(1,000,000)	16	16	52	28	(16,165,000)		
4		6/8/2021	(1,050,000)	16	23	29	28	(17,215,000)		
5		6/9/2021	(2,000,000)	10	3	58	28	(19,215,000)		
6	R	6/9/2021	5,000,000	15	57	9	28	(14,215,000)		
7		6/9/2021	(500,000)	16	2	52	28	(14,715,000)		
8	R	6/9/2021	65,000	16	30	22	28	(14,650,000)		
9	R	6/10/2021	3,000,000	9	21	54	28	(11,650,000)		
10	R	6/10/2021	10,000,000	9	49	4	28	(1,650,000)		
11	R	6/10/2021	32,000	16	0	37	28	(1,618,000)		
12		6/11/2021	(5,000,000)	13	13	55	28	(6,618,000)		
13		6/11/2021	(300,000)	13	18	56	28	(6,918,000)		
14		6/11/2021	(30,000)	13	33	13	28	(6,948,000)		
15		6/11/2021	(100,000)	16	1	7	28	(7,048,000)		
16	R	6/14/2021	500,000	15	0	4	28	(6,548,000)	56%	14-Jun-21

Dealer 28 sells $15 million to a customer at 15:34 (the initiating block trade, identified as I) on 6/8/21. The dealer has 15 additional trades over the block week, of which nine are sell trades that increase the imbalance and six are buys trades that offset the imbalance. By the end of the block week on 6/14/21, the receiving investor buy trades (i.e., trades 6, 8, 9, 10, 11 and 16 identified as R) total $18.6 million and the additional sell trades total $10.1 million, bringing the cumulative inventory to $6.55 million. Thus, the block is not considered fully offset, and the percent offset of the block position is set to ($15M-$6.55M)/ $15M = 56%.

Example 5, $15 million block trade threshold:

Trade Execution Date	Initiator (I) or Receiver (R)	Signed Trade Size	Trade Hour	Trade Minute	Trade Second	Dealer ID	Cumulative Inventory	Percent Offset	Block End Date
10/22/2021	I	20,000,000	11	17	35	204	20,000,000		
10/22/2021	R	(10,000,000)	10	57	25	204	10,000,000		
10/22/2021	R	(10,000,000)	11	2	11	204	0	100%	10/22/2021
10/26/2021		5,000,000	16	12	25	204	5,000,000		
10/26/2021		(5,000,000)	16	13	23	204	0		
10/28/2021		2,000,000	13	45	5	204	2,000,000		

Dealer 3341 buys $20 million from a customer at 11:17 on 10/22/21. Note that $10 million sell to customer at 10:57 on 10/22/21 occurs prior to the $20 million trade; however, it is not a block trade under the $15 million block trade threshold. Thus, the $20 million trade at 11:17 is identified as initiating block trade, identified as I. Trades are sorted first by the trigger trade, and then execution time on the block day. The two $10 million sell trades are classified as receiving investor trades identified as R. These two trades fully offset the block, so the additional trades by the block dealer on 10/26 and 10/28 are not classified as I or R.

Example 6, $15 million block trade threshold:

Trade Number	Initiator (I) or Receiver (R)	Trade Execution Date	Signed Trade Size	Trade Hour	Trade Minute	Trade Second	Dealer ID	Cumulative Inventory	Percent Offset	Block End Date
1	I	10/21/2021	15,000,000	8	2	41	28	15,000,000		
2		10/21/2021	1,000,000	7	37	23	28	16,000,000		
3	R	10/21/2021	(10,000,000)	8	35	28	28	6,000,000		
4	R	10/21/2021	(5,000,000)	9	34	52	28	1,000,000		
5	R	10/21/2021	(5,000,000)	9	35	7	28	(4,000,000)	100%	10/21/2021
6		10/21/2021	35,000,000	9	36	41	28	31,000,000		
7		10/21/2021	(10,000,000)	9	39	55	28	21,000,000		
8		10/21/2021	(10,000,000)	9	55	48	28	11,000,000		
9		10/21/2021	(5,000,000)	10	13	58	28	6,000,000		
10		10/21/2021	(5,000,000)	10	57	10	28	1,000,000		
11		10/21/2021	35,000,000	11	35	4	28	36,000,000		
12		10/21/2021	(10,000,000)	11	44	17	28	26,000,000		
13		10/22/2021	(500,000)	10	52	17	28	25,500,000		
14		10/25/2021	(12,600,000)	9	51	54	28	12,900,000		
15		10/25/2021	(5,000,000)	13	18	14	28	7,900,000		
16		10/25/2021	20,000,000	13	39	40	28	27,900,000		
17		10/25/2021	(2,000,000)	14	59	18	28	25,900,000		
18		10/26/2021	(2,000,000)	7	51	38	28	23,900,000		
19		10/26/2021	30,000,000	8	51	21	28	53,900,000		
20		10/26/2021	(10,000,000)	8	55	7	28	43,900,000		
21		10/26/2021	(5,000,000)	9	3	34	28	38,900,000		
22		10/26/2021	(10,000,000)	9	20	6	28	28,900,000		
23		10/26/2021	(5,000,000)	10	21	40	28	23,900,000		
24		10/26/2021	(5,000,000)	10	52	45	28	18,900,000		
25		10/26/2021	(195,000)	16	4	25	28	18,705,000		
26		10/27/2021	(2,090,000)	8	25	14	28	16,615,000		
27		10/27/2021	20,000,000	10	15	42	28	36,615,000		
28		10/27/2021	3,000,000	12	46	2	28	39,615,000		
29		10/27/2021	340,000	12	59	27	28	39,955,000		
30		10/27/2021	1,500,000	13	58	31	28	41,455,000		

Dealer 3341 buys $15 million from a customer (the initiating block trade, identified as I) on 10/21/21 at 8:02. There are 30 additional trades during the block week. The second trade increase

cumulative balance to $16 million. The third and fourth trade are opposite sign trades that reduce the cumulative balance to $1 million. The fifth trade further reduces the cumulative balance to -$4 million, resulting in cumulative imbalance switching signs (i.e., zero crossing). We consider the block to be fully offset and Trades 3, 4, and 5 are classified as receiving investor trades, denoted as R. Because the block trade 1 is fully offset, we allow the $35 million block buy on 10/21/21 at 9:36 to enter the sample as an initiating block trade.

Example 7, $20 million block trade threshold sample:

Trade Execution Date	Initiator (I) or Receiver (R)	Signed Trade Size	Trade Hour	Dealer ID	Cumulative Inventory	% Offset	Block End Date
3/9/2021	I	-20,000,000	17:01	3341	-20,000,000		
3/9/2021	R	15,000,000	11:53	3341	-5,000,000		
3/9/2021	R	3,310,000	14:30	3341	-1,690,000		
3/9/2021	R	1,000,000	15:03	3341	-690,000	96.6%	3/15/2021

Note that example 7 is identical to Example 3. Dealer 3341 buys $15 million from a customer at 11:53 on 3/9/21. However, the trade size of $15 million is below the block trade threshold for the $20 million analysis. Thus, the $20 million sell trade by the customer is identified as the trigger block trade, identified by I. We retain all trades for the dealer over the next five days, including the block trade day. The dealer has three buy trades that are classified as R and they add up to $19.3 million, and the cumulative imbalance on Day 5 is -$690,000. Thus, the percent offset for the block is 96.6% (i.e., (20,000,000-690,000)/20,000,000). In the study, we present results based on three block trade samples using thresholds $15 million, $20 million and $30 million.

A.3. Example of Trading Cost Measures Computation

Trade Execution Date	Signed Trade Size	Trade Price	Trade Time	Weight	Weight*Price
8/10/2021	-15,000,000	122.855	10:05		
8/10/2021	10,000,000	122.599	11:15	67%	81.733
8/10/2021	4,000,000	122.600	3:15	27%	32.693
8/11/2021	1,000,000	122.679	10:00	7%	8.179
			WA Offset Price		122.605
WA $Price_{t-7}$	122.650				
WA $Price_{t+7}$	122.680				

In this example, a dealer sold $15 million to a customer for $122.855 (the block price). The bond was trading at $122.650 the week prior (the weighted average trade price at t-7). Therefore,

Initiator cost = 0.17 = ((ln(122.855)-ln(122.650)*100).

The dealer offsets the block with three R trades at a weighted average buy price of $122.605.

Dealer spread = 0.20 = ((ln(122.855)-ln(122.605)*100).

The bond was trading at $122.680 the week after (the weighted average trade price at t+7).

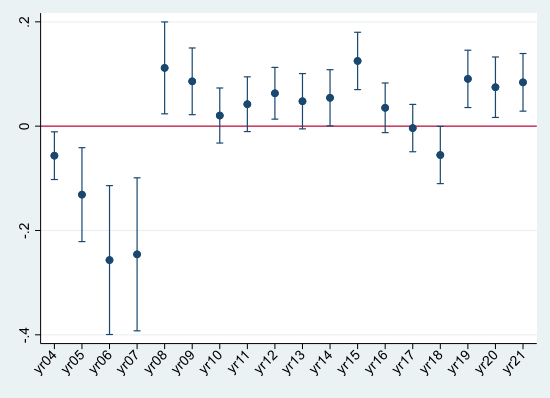
Receiving investor spread = -0.06 = ((ln(122.605)-ln(122.680)*100).

Permanent Price Impact = -0.02 = ((ln(122.680)-ln(122.650)*100).

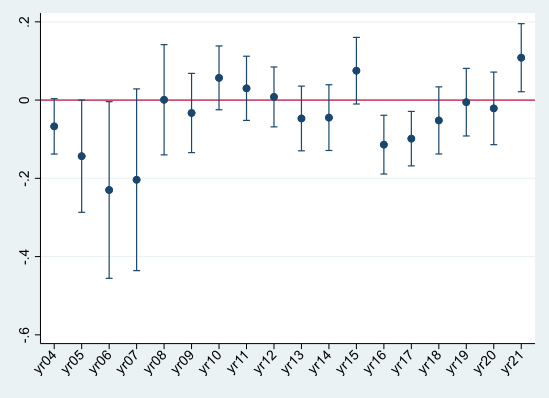
Appendix Figure 1
Block Trading Costs: Year Effects

This figure shows the coefficients on year dummies for regressions of block trading measures on issue and intermediating dealer characteristics and market conditions. Regressions report Newey-West standard errors. Circles represent the regressions coefficients and bars represent the 95% confidence interval. Years 2002 and 2003 are omitted in the regressions. Figure A shows regression coefficient on year dummies when initiator cost is the dependent variable. Figure B shows permanent price impact, Figure C temporary price impact, Figure D dealer spread, and Figure E receiver spread. The regressions include all independent variables described in Figure 2.

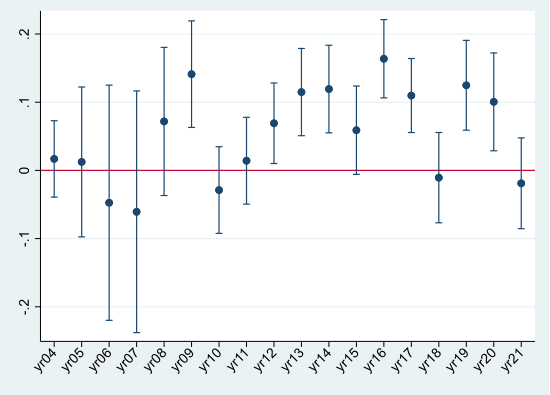
A. Initiator Cost



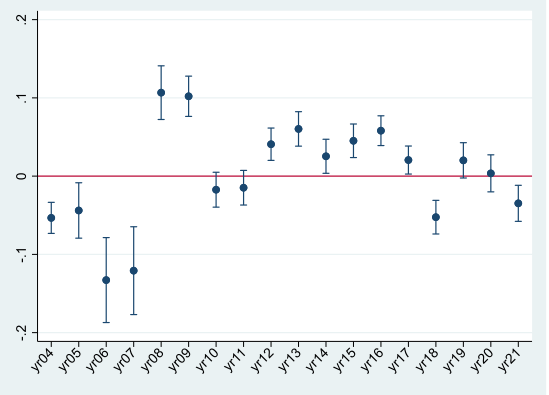
B. Permanent Price Impact



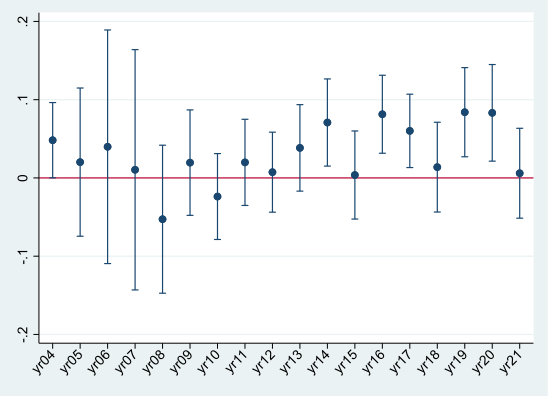
C. Temporary Price Impact



D. Dealer Spread



E. Receiver Spread



Appendix Table I
Initiator Trade Classification Analysis

This table reports statistics on cases for which the initiating block trade is difficult to classify. In the first row, we report the percent of blocks with at least one offsetting receiving investor trade that exceeds the trade classified as the initiating block trade. In the second row, we report the percent of fully offset blocks with at least one offsetting receiving investor trade on the day of the initiating block trade that exceeds the size of the initiating block trade. In the third row, we report the percent of fully offset blocks with at least one offsetting receiving investor trade within 15 minutes of the initiating block trade that exceeds the size of the initiating block trade.

	Block >= $15M	Block $15M - $20M	Block $20M - $30M	Block >= $30M
% Receiving Investor Trade Size > Block Size	10%	16%	12%	9%
% Receiving Investor Trade Size > Block Size and Offset in 1 Day	6%	10%	8%	5%
% Receiving Investor Trade Size > Block Size and Offset in 15 Minutes	0.8%	1.3%	1.0%	0.7%

Appendix Table II
Block Trading Cost Decomposition-Robustness

This table reports mean summary statistics of block trading costs for block trades that exceed $15 million. In Columns (1)-(2), we further refine the sample utilized in Table II by excluding fully offset blocks with an offset trade size that exceeds the triggering initiator trade size on the same day as the block. In Columns (3)-(4), we further refine the sample utilized in Table II by excluding "reversal" block trades, cases for which the block trade price exceeds both the weighted average price in the week prior and the weighted average price in the week following the block trade by at least 15%, or the block price is less than both prices by the same magnitude. Panel A reports block initiator costs. In Panel B, we decompose block initiator costs into a permanent price impact and temporary price impact component. In Panel C, we decompose block initiator costs into three components: 1) the permanent price impact and the two components of temporary price impact, 2) dealer profit, and 3) receiving investor profit. In Panels D and E, we report trading cost estimates for investment grade and high yield bonds, respectively. Initiator cost is defined as the log difference between the price of the bond one week prior to the block trade and the block price. Permanent price impact is defined as the log difference between the price of the bond one week following and one week prior to the block trade. Temporary price impact is defined as the log difference between the price of the bond one week following the block trade and the block price. Dealer spread is the log difference between the weighted average price that the dealer offsets the block trade and the block price. Receiving investor spread is the log difference between the price of the bond one week following the block trade and the weighted average price that the dealer offsets the block trade. The unit of analysis is at the individual block-level. Variables are winsored at the 1% and 99% levels.

	Mean	Median	Mean	Median
	Exclude blocks with offset trade > initiator trade		Exclude "reversal" block trades >=15%	
Panel A: Block Initiator Costs				
Block Initiator Trading Cost	0.19	0.08	0.17	0.08
Panel B: Two-Way Decomposition				
Permanent Price Impact	0.00	0.02	0.00	0.01
Temporary Price Impact	0.19	0.06	0.18	0.06
Panel C: Three-Way Decomposition				
Permanent Price Impact	0.00	0.02	0.00	0.01
Dealer Spread	0.22	0.13	0.22	0.13
Receiving Investor Spread	-0.03	-0.02	-0.04	-0.03
Panel D: Investment Grade				
Block Initiator Cost	0.17	0.07	0.16	0.07
Permanent Price Impact	0.04	0.02	0.03	0.02
Temporary Price Impact	0.13	0.05	0.13	0.05
Dealer Spread	0.18	0.11	0.18	0.11
Receiving Investor Spread	-0.05	-0.02	-0.05	-0.02
Panel E: High Yield				
Block Initiator Cost	0.23	0.11	0.21	0.10
Permanent Price Impact	-0.08	0.00	-0.08	0.00
Temporary Price Impact	0.33	0.11	0.30	0.11
Dealer Spread	0.31	0.23	0.31	0.23
Receiving Investor Spread	0.02	-0.04	0.00	-0.04

Appendix Table III
Receiving Investor Spread: by Counterparty Type

This table reports receiving investor srpeads by counterparty type. We examine block trades that exceed $15 million. The unit of analysis is at the individual block-level. 'Majority customer counterparty' are block trades for which 50% or greater of the offsetting trades with receiving investors are customers. 'Majority small dealer counterparty' are block trades for which 50% or greater of the offsetting trades with receiving investors are with small dealers. 'Majority large dealer counterparty' are block trades for which 50% or greater of the offsetting trades with receiving investors are with large dealers. 'Mix of counterparties' are block trades that do not fit any of the above definitions. Large dealers are defined as the thirty-four most active dealers studied by Bessembinder, Jacobsen, Maxwell, and Venkataraman (2018). All other dealers are coded as 'small dealers'.

	Obs	Receiving Investor Spread
Majority Customer Counterparty	160,366	-0.04
Majority Small Dealer Counterparty	36,335	-0.03
Majority Large Dealer Counterparty	6,246	0.00
Mix of Counterparties	2,154	-0.04

Appendix Table IV
Determinants of Block Trading Costs

This table shows regressions of measures of block trading costs on bond characteristics, intermediating dealer size, and market conditions. All regressions are estimated using year fixed effects and robust standard errors. The unit of analysis is at the individual block-level. Dependent variables are winsored at the 1% and 99% levels. Dependent variable averages are reported at the top of the regression.

	(1)	(2)	(3)	(4)	(5)
	Block Initiator	Permanent Price Impact	Temporary Price Impact	Dealer Spread	Receiving Investor Spread
Dependent Variable Average	0.179	0.000	0.185	0.220	-0.034
Log(Block Size)	0.039***	-0.007	0.064***	-0.003	0.067***
	(0.002)	(0.620)	(0.000)	(0.345)	(0.000)
Log (Bond Age)	0.008*	-0.016***	0.026***	0.020***	0.005*
	(0.069)	(0.000)	(0.000)	(0.000)	(0.084)
Log (Issue Size)	-0.041***	0.030***	-0.074***	-0.047***	-0.024***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
High Yield Indicator	0.043**	-0.101***	0.157***	0.105***	0.054***
	(0.030)	(0.000)	(0.000)	(0.000)	(0.000)
Financial Indicator	-0.039***	-0.006	-0.035***	-0.036***	-0.000
	(0.001)	(0.526)	(0.000)	(0.000)	(0.943)
On-the-run Indicator	0.007	0.006	-0.002	0.004	-0.007
	(0.495)	(0.624)	(0.819)	(0.169)	(0.428)
144A Indicator	-0.017	-0.030*	0.015	0.007*	0.006
	(0.140)	(0.066)	(0.232)	(0.067)	(0.600)
Small Dealer Indicator	0.014*	0.024**	-0.008	0.007**	-0.011
	(0.058)	(0.048)	(0.409)	(0.025)	(0.179)
Corp Bond Index Return over Relevant Period	-0.140***	-0.101***	0.151***	0.072***	0.053***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ave. Stock Market Index Return (t-1 to t-5)	-4.204***	-9.617***	3.691***	-0.334	4.215***
	(0.001)	(0.000)	(0.007)	(0.361)	(0.000)
Ave. 3-Month Libor (t-1 to t-5)	0.046**	0.024	0.030	0.019***	0.015
	(0.038)	(0.376)	(0.138)	(0.003)	(0.389)
Ave. VIX (t-1 to t-5)	0.003*	-0.012***	0.016***	0.011***	0.004***
	(0.095)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.043	0.046	-0.393**	0.556***	-0.974***
	(0.805)	(0.853)	(0.044)	(0.000)	(0.000)
Observations	205,021	205,072	205,021	205,021	205,058
Adjusted R-squared	0.008	0.007	0.013	0.063	0.003

Appendix Table V
Block Trading Costs and Trade Reporting Changes - Full Sample Results

This analysis considers block trading costs over four regulatory periods that reduced the time dealers were required to report trades and in 2021 (the most recent year in the sample). To construct the sample, we exclude statistics for blocks that are reported more than 24 hours following the trade execution time and blocks trades for bonds that are not yet disseminated. We only retain observations with non-missing block initiator, block dealer, and receiving investor spread and price impact measures. We exclude block trades that are fully offset by the block dealer in a single trade within 15 minutes. Dollar spreads with absolute values that exceed $50 are deleted and block trades with prices below $5.00 are deleted. We compute the weighted-average spread for both the before and after trade report periods. Column (1) reports statistics when trades were required to be reported within 75 minutes. Columns (2) and (3) report statistics when trades were required to be reported within 45 and 30 minutes, respectively. Column (4) reports statistics in the early one-year period when trades were required to be reported within 15 minutes. Column (5) reports statistics in 2021 (the last year in our sample). All variables are winsorized at the 1% and 99% levels.

	(1)	(2)	(3)	(4)	(5)
	July 2002-September 2003	October 2003-September 2004	October 2004-June 2005	July 2005-June 2006	2021
	75 Minutes	45 Minutes	30 Minutes	15 Minutes	15 Minutes
Dealer Spread					
- Before Report	0.28	0.15	0.23	0.20	0.21
- After Report	0.19	0.09	0.12	0.13	0.16
Diff. Dealer Spread	-0.09	-0.06	-0.11	-0.07	-0.05
Receiving Investor Spread					
- Before Report	-0.10	-0.07	-0.11	0.01	-0.07
- After Report	-0.06	-0.03	-0.07	-0.05	-0.07
Diff. Receiver Spread	0.05	0.04	0.04	-0.06	0.00

Appendix Table VI
Determinants of Block Trading Cost Regressions: Buys vs. Sells

This table shows regressions of measures of block trading costs on bond characteristics, intermediating dealer size, and market conditions. All regressions are estimated using year fixed effects and robust standard errors. Columns (1)-(5) show results for block sells and columns (6)-(10) show results for block buys. To be included in the sample, we retain observations with non-missing block initiator, block dealer, and receiving investor spread and price impact measures. Blocks are trades of $15 million or more. We exclude block trades that are fully offset by the block dealer in a single trade within 15 minutes. Dollar spreads with absolute values that exceed $50 are deleted. We exclude block trades with prices below $5.00. The unit of analysis is at the individual block-level. Dependent variables are winsored at the 1% and 99% levels.

	Block Sells					Block Buys				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Initiator	Perm. Price Impact	Temp. Price Impact	Dealer	Receiving	Initiator	Price Impact	Temp. Price Impact	Dealer	Receiving
Dependent Variable Average	0.19	-0.04	0.24	0.23	0.01	0.15	0.07	0.09	0.21	-0.12
Log(Block Size)	0.074***	0.053***	0.051***	-0.008**	0.054***	-0.026*	-0.077***	0.042**	-0.000	0.056***
	(0.000)	(0.001)	(0.000)	(0.046)	(0.000)	(0.094)	(0.001)	(0.032)	(0.976)	(0.001)
Log (Bond Age)	-0.010***	-0.033***	0.025***	0.021***	0.003	0.032***	0.009	0.026***	0.020***	0.005
	(0.002)	(0.000)	(0.000)	(0.000)	(0.431)	(0.000)	(0.151)	(0.000)	(0.000)	(0.278)
Log (Issue Size)	-0.043***	0.053***	-0.105***	-0.046***	-0.051***	-0.035***	-0.021*	-0.009	-0.049***	0.037***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.067)	(0.332)	(0.000)	(0.000)
High Yield Indicator	0.018	-0.189***	0.213***	0.124***	0.088***	0.076***	0.016	0.078***	0.076***	0.011
	(0.108)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.450)	(0.000)	(0.000)	(0.467)
Financial Indicator	-0.039***	-0.022**	-0.021**	-0.033***	0.005	-0.042***	0.003	-0.039***	-0.035***	-0.007
	(0.000)	(0.040)	(0.012)	(0.000)	(0.461)	(0.000)	(0.867)	(0.002)	(0.000)	(0.482)
On-the-run Indicator	0.013	0.030**	-0.022*	0.003	-0.025**	0.001	-0.020	0.030*	0.006	0.014
	(0.180)	(0.035)	(0.056)	(0.409)	(0.010)	(0.945)	(0.298)	(0.069)	(0.230)	(0.308)
144A Indicator	0.003	0.007	-0.009	0.012***	-0.016	-0.065***	-0.128***	0.073***	0.002	0.058***
	(0.828)	(0.709)	(0.557)	(0.006)	(0.208)	(0.000)	(0.000)	(0.000)	(0.777)	(0.001)
Small Dealer Indicator	0.001	0.007	-0.011	0.007*	-0.009	0.034***	0.029	0.013	0.009*	0.007
	(0.885)	(0.622)	(0.305)	(0.060)	(0.346)	(0.004)	(0.112)	(0.396)	(0.093)	(0.589)
Corp Bond Index Return over Period	-0.677***	-0.773***	1.266***	0.438***	0.776***	0.722***	0.862***	-1.527***	-0.469***	-0.922***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ave. Stock Market Index Return (t-1 to t-5)	-23.634***	-16.250***	8.923***	-1.704***	-2.331*	28.117***	13.112***	-8.480***	1.399**	7.033***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.062)	(0.000)	(0.000)	(0.000)	(0.018)	(0.000)
Ave. 3-Month Libor (t-1 to t-5)	0.065***	-0.026	0.075***	0.044***	0.046**	0.017	0.141***	-0.058*	-0.023**	-0.061**
	(0.001)	(0.390)	(0.002)	(0.000)	(0.024)	(0.530)	(0.001)	(0.084)	(0.034)	(0.031)
Ave. VIX (t-1 to t-5)	0.006***	-0.016***	0.027***	0.011***	0.009***	0.006***	0.011***	-0.008***	0.009***	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.517***	-0.932***	0.005	0.579***	-0.518***	0.704***	1.116***	-0.410	0.627***	-1.321***
	(0.009)	(0.001)	(0.984)	(0.000)	(0.007)	(0.008)	(0.007)	(0.233)	(0.000)	(0.000)
Observations	130,056	130,087	130,056	130,056	130,079	74,965	74,985	74,965	74,965	74,979
Adjusted R-squared	0.111	0.170	0.090	0.134	0.136	0.126	0.203	0.089	0.111	0.188