Municipal disclosure and the small trade premium

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May 4, 2016

Abstract

I investigate whether broad access to fundamental information allows retail municipal bond investors to transact at prices similar to those at which institutional investors transact. I capitalize on the introduction of an online financial disclosure repository that simultaneously lowered the cost for retail investors to access fundamental information and lowered the cost for issuers to disseminate it. I find a reduction in the premium small investors pay above large investors for bonds whose issuers were compliant with their disclosure obligations in the online repository. These findings suggest that as investors' information sets align, so does their bargaining power with dealers.

*Stern School of Business, New York University. I am grateful to Peter Schmitt of DPC Data for providing data and information about the structure of the municipal market. A preliminary draft of this paper benefited greatly from comments from Ray Ball, Phil Berger, Hans Christensen, Joseph Gerakos, Christian Leuz, Michael Minnis, Jonathan Rogers, and Douglas Skinner. I gratefully acknowledge financial support from New York University Stern School of Business.

1 Introduction

Despite its size and importance, the municipal bond market remains opaque relative to other financial markets. Municipal bond trading is decentralized, pre-trade price quotations are provided only upon request, and real time post-trade price transparency was not available until 2005. The high cost of gathering price-relevant information confers bargaining power upon institutional investors and disadvantages retail investors (Green et al., 2007b). This informational disadvantage partly explains why small investors pay more than large investors for the same bond.

Prior research documents that public dissemination of post-trade price data lowers the premium small investors pay relative to large investors.[1] Whereas large institutional investors have substantial knowledge of bond values irrespective of public transaction reporting, small retail investors negotiate better terms of trade when they are privy to the prices paid by other investors. However, the municipal bond market is deeply illiquid and information is costly. Therefore, prices do not fully reflect all available information (Grossman and Stiglitz, 1980).

In this paper, I consider the possibility that the cost of gathering fundamental information contributes to institutional investors' disproportionate bargaining power relative to retail investors. Institutional investors continually search for relevant economic and fundamental information about the bonds they hold in inventory because they are required to price their municipal bond positions daily. However, search costs for fundamental information are high because post-issuance financial disclosure is limited in the municipal market. Many issuers do not publicly disseminate financial statements or budgets and, prior to 2009, these documents were filed with designated fee-based information repositories.

I capitalize on the introduction of a free, electronic, centralized repository for municipal disclosures (similar to the SEC's EDGAR system for corporate disclosures). The filing repository had two distinct, but related outcomes. First, it allowed retail investors to access information previously only available to large institutions. Provided that municipal budgets and financial statements are informative to investors, low cost access to these filings allows the information sets of retail and institutional investors to converge. Second, the online repository lowered the cost for issuers to broadly disseminate information, thereby increasing disclosure. In the absence of disclosure, dealers and institutions maintain an advantage over retail investors because they have historical knowledge of the issuer and the expertise to benchmark against similar bonds. When issuer-specific information is made available to all market participants (dealers, institutions, and individuals), the value of this market expertise declines and information sets are again aligned. Because both outcomes of the repository reduce information asymmetry, they may align the bargaining power of

[1] See Edwards et al. (2007) for an analysis of corporate bond price transparency and Schultz (2012) for an analysis of municipal bond price transparency.

retail and institutional investors and enable retail investors to transact with dealers at prices closer to those at which institutional investors transact.

I draw identification from bond-level changes in transaction costs on retail-sized trades relative to transaction costs on institutional-sized trades around the introduction of the online repository. This design uses large traders, who had relatively low-cost access to available financial disclosures and market knowledge in the absence of financial disclosure, as a control group. I draw further identification from variation in ex-ante compliance with continuing disclosure obligations. Of the bonds whose issuers were compliant with their disclosure obligations ex-ante, only those bonds whose issuers remain compliant in the online repository are affected by dissemination. Similarly, of the bonds whose issuers were non-compliant with their disclosure obligations ex-ante, only bonds whose issuers subsequently became compliant in the online repository are affected by improved disclosure.

I provide evidence that both low-cost dissemination and improved disclosure help to reduce the premium small bond buyers pay above large bond buyers. However, I find that neither dissemination nor improved disclosure play a role in small investors' ability to price bonds they sell. The disparity between retail purchases and retail sales suggests bond sellers draw bargaining power with dealers from sources other than fundamental information and are less likely to use this information to perform due diligence than bond buyers.

After controlling for interest rates, credit risk premia, local economic condition, bond age, time to maturity, trade volume, time in dealer inventory, transaction size-specific time trends, and time-invariant bond characteristics, the premium small investors pay for bonds whose issuers were continuously compliant with their disclosure obligations fell 12.8 basis points after their disclosures were broadly disseminated. This reduction represents an economically significant 30 percent convergence of small trade and large trade transaction costs relative to pre-dissemination levels.

While this evidence is consistent with the notion that access to disclosure helps to reduce the small trade premium, the introduction of the repository is coincident with the end of the 2007-2009 financial crisis. Therefore, I explore cross-sectional variation in the reduced small trade premium to gain assurance that these results are attributable to dissemination. I find that the reduction is only evident for bonds whose issuers have few alternate channels through which information can be disseminated and bonds whose issuers' first disclosure in the repository was filed within six months of period end. Moreover, the small trade premium marginally increased for the falsification sample of bonds whose issuers were compliant with their disclosure obligations ex-ante but subsequently became non-compliant in the online repository.

The premium small investors pay to purchase bonds whose issuers became newly compliant with their disclosure obligations in the online repository fell 20.8 basis points, or 44 percent. This reduction is par-

ticularly pronounced for newly compliant issuers of revenue bonds, whose financial statements are useful given the specificity of the repayment source. The reduction is also pronounced for bonds whose issuers' first disclosure in the repository was filed within six months of period end. Providing further support for the notion that these results are attributable to improved disclosure compliance, the small trade premium did not change for the falsification sample of bonds whose issuers were non-compliant ex-ante and remain non-compliant in the online repository.

This paper makes several key contributions. The study is one of the first to document a relationship between post-issuance disclosure compliance and transaction costs in the secondary market for municipal bonds. Tightly regulated corporate disclosures reduce information asymmetry among equity investors (Diamond and Verrecchia, 1991), thereby reducing the expected cost of adverse selection and the bid-ask spread. However, municipal disclosure is notoriously limited, lacks timeliness, and lacks comparability across issuers. Therefore, it is not obvious that post-issuance municipal disclosure is useful to investors. Despite these limitations, I find that timelier access to municipal disclosure is associated with a convergence of retail and institutional prices. These results imply that either the limited information contained in municipal financial filings is useful to investors or bond dealers perceive that it is.

This study is also novel in that the results support the notion that institutional investors draw some of their bargaining power with dealers from access to fundamental information. In conjunction with post-trade transaction reporting (Schultz, 2012), reduced cost access to fundamental information helped to reduce the premium retail investors pay to purchase municipal bonds, suggesting an alignment of retail and institutional bargaining power. Finally, the paper operationalizes the well-documented small trade premium (Harris and Piwowar, 2006) as a proxy for asymmetric bargaining power among municipal bond investors (Green et al., 2007b). In addition to the theoretical appeal of measuring changes in retail transaction costs relative to institutional changes, this approach is a crucial design choice that helps to control for general movements in transaction costs.

The rest of the paper proceeds as follows. Section 2 presents hypotheses and describes municipal disclosure practices. Section 3 describes the data used in the study. Section 4 provides evidence of the relationship between disclosure and small trade premiums, and Section 5 concludes.

2 Transparency in the municipal bond market

2.1 Market structure and post-trade price transparency

In most equity markets, competitive market makers match buy and sell orders that arrive over time from anonymous traders (Easley and O'Hara, 1987). Pre-trade price quotations are continuously available and last-trade prices are easily accessible to all investors. The market maker sells securities at a premium over "true" value and buys securities at a discount. This "bid-ask spread" serves as compensation for (1) order-processing costs (Roll, 1984), (2) inventory risk (Ho and Stoll, 1981), and (3) the cost of adverse selection incurred when transacting with better-informed traders (Glosten and Milgrom, 1985). The probability a trader is informed generally increases in trade size, causing quoted spreads to increase in size. Prior literature supports the role of accounting in reducing information asymmetry (Diamond and Verrecchia, 1991; Leuz and Verrecchia, 2000), thereby reducing the adverse selection component of spreads in equity markets.

By contrast, transparency is far more elusive the secondary market for municipal bonds. Pre-trade price transparency is non-existent and last-trade reporting is a recent innovation. Thus, municipal bond dealers are better informed about order flow than the customers with whom they transact. This knowledge confers an informational advantage upon dealers and reduces the expected cost of adverse selection. The spread (or "markup" over the true value of the security) serves as compensation for the aforementioned costs of intermediation (order processing, inventory risk, and adverse selection) as well as an additional markup due to dealer market power (Duffie et al., 2005; Green et al., 2007b).

The ability of dealers to extract rents is greater in retail transactions because individual investors lack the sophistication and resources of institutional investors to search for and accurately assess the fairness of price quotes.[2] Professional traders are in constant communication with their counterparts at other dealer firms, their own institutional sales people, and the underwriting desk gathering information and soliciting views. By contrast, individual investors have limited incentive to develop such expertise. This lack of sophistication partly explains why transaction costs in the municipal (and, to a lesser extent, corporate) bond markets decrease in trade size (Green et al., 2007a; Harris and Piwowar, 2006).[3] Transaction costs that decrease in trade size are particularly relevant in the municipal bond market because households account for 51 percent of municipal bond holdings.[4] Moreover, retail-sized transactions are more common than institutional-sized

[2]Municipal bond dealers are required to register with the MSRB and are subject to a variety of best practice, due diligence, and disclosure obligations. The National Association of Securities Dealers' Rules of Fair Practice (Article III, section IV) prohibits "excessive" markups (defined as sale price less purchase price) of more than 5 percent.

[3]Other explanations for transaction costs that decrease in trade size are fixed intermediation costs and regulatory capital charges incurred on holding odd lots. However, fixed intermediation costs are unlikely to vary with disclosure and regulatory capital concerns increased (rather than decreased) throughout the sample period, working against my hypotheses.

[4]Followed by mutual funds at 24 percent and insurance companies at 13 percent. Data as of September 2011. The Federal Reserve Flow of Accounts statistical release is available at the following address: http://www.federalreserve.gov/releases/z1/current/z1.pdf.

transactions in the secondary market for municipal bonds.

Public dissemination of executed transaction prices (post-trade transparency) is a means of revealing information about price and leveling the playing field between customers and dealers. Several studies show that post-trade transparency reduces the informational advantage of dealers and lowers transaction costs for corporate bond investors (Edwards et al., 2007; Goldstein et al., 2006; Bessembinder et al., 2006). Similarly, real-time trade reporting in the municipal bond market was mandated in 2005 and played a role in reducing the 42 bp premium small investors pay over large investors on the offer date by 40 percent (Schultz, 2012).

2.2 Disclosure and issuer transparency

I complement the aforementioned price transparency studies by considering a related form of transparency: the availability of fundamental information. Issuers of municipal securities are exempt from the majority of federal securities laws, including the registration and reporting requirements of the Securities Act of 1933 and the Exchange Act of 1934. Disclosure at the time of issuance (in the form of offering documents called "official statements") is robust because the Municipal Securities Rulemaking Board (MSRB) requires underwriters to obtain such documents to offer the securities to investors. In these offering documents, issuers must agree to provide annual financial disclosures to designated information repositories within a specified period (usually six to nine months). However, breach of a continuing disclosure covenant does not constitute a technical default and issuers are not subject to direct regulatory enforcement of their disclosure obligations. The lack of regulatory consequences for failure to file post-issuance financial statements makes disclosure effectively voluntary for many issuers.

Prior research estimates that 40 percent of issuers in a given year fail to provide post-issuance disclosures (Schmitt, 2011). Because officials have a fiduciary relationship with investors and a political relationship with the electorate, disclosure decisions are the outcome of a trade-off between the capital market benefits and the political costs of disclosure (Cuny, 2016). From a capital market standpoint, disclosure quality is positively related to debt levels and negatively related to alternate mechanisms to reduce the cost of capital, such as bond insurance (Gore et al., 2004). From a political standpoint, disclosure quality is negatively related to electoral incentives (Kido et al., 2012) and positively related to governance mechanisms that constrain these incentives (Evans and Patton, 1983; Austin and Robbins, 1986; Gore, 2004; Baber et al., 2013).

In the absence of financial statements, investors benchmark against fiscal, economic, and demographic information for similar issuers. Benchmarking requires industry expertise and access to relevant data. Thus, dealers and institutional investors are better positioned to value bonds in the absence of disclosure than retail investors. Even when financial statements are publicly available, they may be prohibitively costly to

access. Financial statements and budgets were historically only accessible through fee-based information repositories.[5] Therefore, dealers and large institutional investors had access to available disclosures that were likely not accessible to retail investors. Illustrating the informational disadvantage of retail investors, nearly 700 dealer-to-customer sales in 2008 were executed above par after a distress or default notice was filed (Schmitt, 2009). Trades in principal amounts of less than $100,000 accounted for 65 percent of these transactions.

Recognizing the relative disadvantage retail investors experience in obtaining fundamental information, the MSRB established an online continuing disclosure service via the Electronic Municipal Market Access (EMMA) system in 2009. The stated objective of the web site was to provide information "free of charge... presented in a manner specifically tailored for retail, non-professional investors who may not be experts in financial or investing matters." EMMA now serves as the sole official repository for issuers' continuing disclosure documents, which are available to the public at no charge. Moreover, part of the Dodd Frank Act requires municipal bond dealers to ensure investors are aware of the information filed in EMMA.[6]

In addition to reducing the cost for investors to access fundamental information, the EMMA system reduced the cost for issuers to disseminate information. Prior research demonstrates that issuers, particularly those with few alternate dissemination channels, responded to the reduced dissemination cost with increased disclosure (Cuny, 2016). To the extent financial disclosures are useful to investors, the existence of information (Healy et al., 1999; Lang et al., 2012) and access to it (Bushee et al., 2003) should reduce information asymmetry between institutional and retail investors. As their information sets align, so does their bargaining power with dealers, narrowing the gap between per-bond retail-sized trade prices and institutional-sized trade prices.

3 Data

3.1 Compliance with continuing disclosure requirements

DPC Data was one of four SEC-authorized information repositories before EMMA became the sole repository in July of 2009. From DPC Data, I obtain a list of all long-term, fixed rate bonds in par amounts over $10 million issued between 1997 and 2005 for which issuers are required to provide continuing disclosures. To ensure a single party is responsible for filing financial disclosures, I exclude all bonds with multiple obligors. To ensure sample consistency, I also exclude bonds that mature before 2011, the end of

[5]These repositories include Bloomberg, DPC Data Inc., Interactive Data Pricing and Reference Data Inc., and Standard & Poor's Securities Evaluation Inc. The annual cost of a Bloomberg terminal is approximately $24,000.

[6]http://www.finra.org/sites/default/files/NoticeDocument/p122112.pdf

the sample period. For each bond issue, the data provided by DPC Data indicates the percentage of years in which disclosures were filed relative to the years in which disclosures were required from 1997 to 2007.[7]

The bonds for which disclosure was provided to DPC Data in each year that it was required are termed *CompliantBefore* bonds. By contrast, the remaining bonds are termed *NonCompliantBefore* bonds. DPC Data estimates that 50 percent of bonds are characterized by at least one year of delinquent disclosure (Schmitt, 2008). However, table 1 documents that only 17 percent of the bonds included in this study are characterized by at least one year of delinquent disclosure before 2007. This delinquency rate is relatively low because delinquency decreases in issue size and a minimum level of liquidity is required for market-based tests. Thus, the results presented in this paper may not generalize to inactively traded bonds.

The EMMA web site became the sole repository for continuing disclosures on July 1, 2009. Therefore, I obtain from EMMA the dates of financial filings indexed to each bond in the sample. As described in Table 1, half of the bonds in the sample had at least one financial filing in EMMA within the first six months (by January 2010). Eighty-eight percent of sample bonds had at least one filing by the time the EMMA system had been in place for a full year (July 2010), and 7 percent of sample bonds had no disclosures filed by the end of the sample period in 2011. The average time lag between period end and the filing date of the first filing in EMMA for sample bonds was 222 days.[8] This average is consistent with the typical reporting deadlines for municipalities of 6 to 9 months.

Irrespective of fiscal year-ends or contractual reporting timelines, all sample issuers must file at least one operating filing in EMMA each year to be compliant with their annual disclosure obligations. Therefore, the 85 percent of sample bonds for which a filing was provided in EMMA in each of the first two years of its existence are termed *CompliantAfter* bonds.

When estimating the relationship between dissemination and transaction costs, I focus on bonds whose disclosures were available but costly to access before 2009 and available cheaply after 2009. Seventy-two percent of sample bonds' issuers were compliant with disclosure obligations in DPC Data before 2007 and were also compliant in EMMA after 2009. I label these bonds *AlwaysCompliant*. By contrast, retail investors do not gain access to disclosures filed by issuers that were compliant in DPC Data but do not subsequently disseminate information in EMMA *(NewlyNonCompliant)*.[9] Therefore, changes in the premium small investors pay for these bonds are not attributable to dissemination. *NewlyNonCompliant* bonds account for

[7]Both DPC Data and EMMA aggregate disclosure information at the issue level (rather than the issuer level) because disclosure requirements vary at the issue level.

[8]The sample of time lags is smaller than the full sample of bonds that filed disclosures in EMMA because EMMA does not always clearly define the period-end date in the title of the filing.

[9]Pre-refunding may explain an issuer becoming non-compliant after 2009. There are 199 bonds in the sample that were pre-refunded before the end of the sample period. Despite the fact that disclosure is no longer required after pre-refunding, 53 percent of these bonds are *AlwaysCompliant*, 28 percent are *NewlyNonCompliant*, 10 percent are *NewlyCompliant*, and 9 percent are *NeverCompliant*. The results described in the remainder of the paper are robust to excluding these bonds from the analysis.

11 percent of the sample.

Table 2, Panel A documents the fundamental ways in which *AlwaysCompliant* bonds differ from *NewlyNonCompliant* bonds. Despite the fact that both groups of bonds are similar in terms of their ex-ante disclosure compliance, they differ along several dimensions. On average, *AlwaysCompliant* bonds are half a year younger, have a year less remaining to maturity, are 1.6 notches higher rated, less likely to be callable or pre-refunded, less likely to be revenue bonds, and are more likely to be issued by large general purpose issuers with more total debt outstanding (Zimmerman, 1977) than their *NewlyNonCompliant* counterparts.

When estimating the relationship between improved disclosure compliance and transaction costs, I focus on bonds whose issuers were *NonCompliantBefore* but became *CompliantAfter*, termed *NewlyCompliant* bonds. Because information about these bonds was unavailable (or inconsistent) in the pre-EMMA period, all investors in these bonds receive new information in the post-EMMA period. *NewlyCompliant* bonds account for 13 percent of the sample. By contrast, neither dealers nor investors receive new information about bonds whose issuers are ex-ante non-compliant and remain non-compliant in EMMA *(NeverCompliant)*. *NeverCompliant* bonds account for 4 percent of the sample.

Panel A of Table 2 documents the fundamental ways in which *NewlyCompliant* bonds differ from *NeverCompliant* bonds. Again, despite their similarity in terms of ex-ante disclosure non-compliance, these bonds differ along several dimensions. On average, *NewlyCompliant* bonds are half a year younger, have 5 years less remaining to maturity, are 2 notches higher rated, more likely to be insured, less likely to be callable or pre-refunded, and are issued by issuers with more total debt outstanding than their *NeverCompliant* counterparts.

3.2 Transaction costs

I obtain MSRB trade data from January 2007 through December 2011. This timeframe is chosen for several reasons. First, I measure an issuer's choice of disclosure compliance ex-ante so that I can distinguish between changes in transaction costs after 2009 that are attributable to disclosure and those that are unrelated. Second, the sample periods before and after the repository is implemented are equal to facilitate a difference-in-difference analysis. Third, the sample period avoids the confounding effects of real-time trade price dissemination, which took effect in January 2005, and the addition of credit ratings to EMMA, which took effect in November 2011. Moreover, the time horizon is consistent with the four-year window over which Schultz (2012) measures the effect of real-time transaction reporting.

Transaction-level data provided by the MSRB include a per-bond price (expressed as a percentage of the principal amount of the security), the principal amount of the bond traded, a date and time stamp, and an

indicator of whether the trade was a dealer sale to a customer, a dealer purchase from a customer, or an inter-dealer trade. The MSRB data do not reveal the identity of the dealer reporting the transaction nor do they distinguish retail customers from institutional customers. Therefore, I use market convention to distinguish between these two types of investors. Trades of $100,000 in principal value, known as "blocks," are more likely to be executed by institutional customers (e.g., mutual funds and insurance companies). Smaller trades, known as "odd lots," are more likely to be executed by retail customers (Edwards et al., 2007; Schultz, 2001). The $100,000 retail trade cutoff is further substantiated by the fact that institutional investors in the municipal bond market have few incentives to break up trades into smaller pieces because trading is not anonymous and transaction costs decrease in trade size.

To increase the likelihood that transaction size distinguishes between retail trades and institutional trades, I follow Schultz (2012) and further partition the retail trade category into those less than $25,000 ("small retail") and those greater than or equal to $25,000 ("large retail"). I also partition the institutional trade category into those less than $250,000 ("small institutional") and those greater than or equal to $250,000 ("large institutional"). For the purposes of comparing markups on retail trades and markups on institutional trades, I focus on the difference between markups on trades less than $25,000 and markups on trades greater than or equal to $250,000.

3.2.1 Measuring markups on bond purchases and markdowns on bond sales

Transaction-level data facilitate relatively direct measurement of the difference between a security's "true" value and its selling price. I assume dealers transact with one another at a fair price. For each day in which at least one inter-dealer trade and at least one customer trade occurs, I take the average price at which dealers transact with one another and measure the markup (or markdown) as the basis point difference between this benchmark and the price at which customers purchase (or sell) the same security on the same day. Admittedly, the directness of this measurement method comes at the cost of imposing a liquidity constraint on the data.

Similar to the transaction cost methodology used in Schultz (2012), I measure markup (markdown) on any customer transaction on date t in bond b as:

$$Markup_{b,t}(Markdown_{b,t}) = Trade\,Sign_{b,t} * 10,000 * ln\left[\frac{CustomerPrice_{b,t}}{AvgInterdealerPrice_{b,t}}\right]$$

$Trade\,Sign_{b,t}$ is a buy/sell indicator equal to "1" if the trade is a customer purchase, "-1" if the trade is a customer sale, and "0" if the trade is inter-dealer. Negative markups (and markdowns), which are uncommon and akin to a negative bid-ask spread, are discarded (Chordia et al., 2001). I also Winsorize trade markups (and markdowns) at the 1% (99%) level to reduce the effect of outliers and data entry errors.

I segregate markups on purchases from markdowns on sales for three reasons. First, markups on customer purchases tend to be larger than markdowns on customer sales (Green et al., 2010). Moreover, the negotiating process is different. Potential bond buyers are generally approached by a single dealer, however they can choose among many assets that the dealer holds in inventory. By contrast, customers selling bonds can approach multiple dealers to ensure best execution, however they are constrained by the specificity of the asset they own, are limited to their network of dealers, and are likely facing a liquidity shock that prioritizes speed over price. Second, a dealer holding a bond in inventory is more likely to have an informational advantage that stems from familiarity with fundamentals than when a customer approaches a dealer. Third, because the magnitude of the markup on purchases and the markdown on sales is different, it is important to avoid confounding the results with variation in the proportion of buys and sells rather than variation in information asymmetry.

To ensure sample composition is constant in the difference-in-difference tests, I constrain the data such that markups (markdowns) on trades of varying sizes can be measured in the pre-EMMA period and the post-EMMA period. To be included in the sample of markups on bond purchases, I require that each bond has at least one customer purchase with a contemporaneous inter-dealer trade match in each of the four trade size categories (small retail, large retail, small institutional, and large institutional) in the 2.5 years preceding EMMA's implementation and in the 2.5 years following EMMA's implementation. Thus, each bond in the sample of markups has a minimum of eight dealer-matched customer purchases across the five-year sample period. The markup sample contains 538,444 bond purchases across 3,139 bonds issued by 990 issuers. Customer purchases are more common than customer sales (Green et al., 2010), however I follow the same procedure for markdowns, resulting in a sample of 177,772 bond sales across 1,841 bonds issued by 684 issuers.

Table 2, Panel B documents the trading characteristics of bond purchases across the four disclosure compliance categories. Though *AlwaysCompliant* and *NewlyNonCompliant* bonds are similar in terms of their ex-ante disclosure compliance, they are traded differently. The average *AlwaysCompliant* purchase is nearly half as large as the average *NewlyNonCompliant* purchase, suggesting more institutional trading in the latter. Moreover, investors pay 42 bps more for *AlwaysCompliant* bonds than *NewlyNonCompliant* bonds. This is potentially due to the greater level of dealer intermediation and higher contemporaneous trade volume associated with *AlwaysCompliant* trades. Similar comparisons are evident for bonds whose issuers were non-compliant with their continuing disclosure obligations ex-ante. The average *NeverCompliant* purchase size is three times as large and the markup is 15 bps higher than the average *NewlyCompliant* purchase.

Panel C of Table 2 documents the trade characteristics of customer sales and again illustrates that trading across the four disclosure compliance categories is different. Investors sacrifice 12 bps more for

AlwaysCompliant bonds than *NewlyNonCompliant* bonds and 4 bps more for *NeverCompliant* bonds than *NewlyCompliant* bonds.

4 Relationship between the small trade premium (discount) and disclosure

4.1 Cross-sectional variation in the small trade premium (discount)

Small investors pay more for the *same bond* than large investors. Thus, the remainder of the paper focuses on variation in trade markups and markdowns at the bond level. I term the difference between the average markup on small retail trades and the average markup on large institutional trades in the same bond the "small trade premium." Similarly, the difference between the average markdown on small retail trades and the average markdown on large institutional trades in the same bond is the "small trade discount."

Though several prior papers document relationships between bond characteristics and the average level of trade markups, variation in the small trade premium (discount) has not been documented. Panel A of Table 3 documents patterns in the average small trade premium on customer purchases while Panel B documents patterns in the average small trade discount on customer sales. The small trade discount on sales is larger than the small trade premium on purchases, suggesting retail buyers have more relative bargaining power than retail sellers. Many retail sales are estate settlements in which incentives to perform due diligence and negotiate favorable pricing are lower than when an individual is approached by a dealer to purchase a bond.

I consider five characteristics that are likely to impede retail investors' ability to price bonds. The small trade premium (and discount) exhibits predictable patterns across each of these five characteristics that are consistent with cross-sectional variation in the extent to which small retail investors are disadvantaged in pricing bonds. Moreover, disclosure compliance tends to be present together with lower small trade premiums (discounts). First, small retail investors pay a 16.96 bp larger premium (11.88 bp discount) for bonds that are not rated by both Moody's and Standard & Poor's than they pay for bonds that are rated by both agencies. Investors have fewer sources of information related to these bonds, which is further exacerbated by the statistically lower disclosure compliance of issuers of unrated bonds. Second, the small trade premium is 21.04 (and the discount is 16.64) bps larger for callable bonds than non-callable bonds, consistent with small retail investors having difficulty pricing complex bonds (Harris and Piwowar, 2006). Moreover, issuers of callable bonds provide less disclosure than issuers of non-callable bonds.

Third, the small trade discount is 13.09 bps higher for pre-refunded bonds than those that are not pre-refunded. This is counterintuitive because the funds that will ultimately repay holders of these bonds

are held in escrow. However, perhaps the fact that continuing disclosures are not required after a bond is refunded exacerbates information asymmetry between large investors with the sophistication to benchmark against similar bonds and less knowledgeable small investors. Fourth, the small trade premium is 6.02 (and the discount is 10.16) bps smaller for bonds issued by states, cities, and counties than other issuers. This disparity is perhaps due to low-cost access to the relatively greater quantity of economic and fundamental information about these issuers. Finally, small retail investors pay an additional 3.98 bp premium (7.63 bp discount) relative to large institutional investors for revenue bonds than non-revenue bonds. Disclosure is statistically lower for these bonds despite the fact that the specificity of the revenue source that repays these bonds makes issuer disclosure particularly important.

4.2 Disclosure, dissemination, and changes in the small trade premium (discount)

To identify the relation between disclosure and the small trade premium (discount), I measure changes in markups (markdowns) on small retail trades and large institutional trades around the introduction of EMMA. Because no temporal variation exists in the inception of the public disclosure repository, controlling for unrelated changes in markups (markdowns) to ensure the effects are attributable to disclosure is important. My empirical strategy addresses this issue in several ways. First, I employ a difference-in-difference design, benchmarking small retail trade markups (markdowns) against large institutional trade markups (markdowns) in the periods before and after EMMA. This design uses large institutional traders, who had relatively low-cost access to available financial disclosures before the dissemination mechanism changed, as a control group. Moreover, institutional traders have the expertise and resources to benchmark against similar bonds in the absence of disclosure. Any changes in markups (markdowns) that are unrelated to disclosure would need to affect small and large trades differently to influence my results.

Second, I exploit variation in ex-ante disclosure compliance at the bond level. I estimate the benefit of dissemination by measuring the change in the small trade premium (discount) for *AlwaysCompliant* bonds. To ensure the result is not driven by an unrelated market shift, I perform a falsification test that estimates the change in the small trade premium (discount) for *NewlyNonCompliant* bonds. These issuers' disclosures were not disseminated and therefore retail investors trading these bonds should not benefit from dissemination. Similarly, I estimate the benefit of improved disclosure by measuring the change in the premium (discount) for *NewlyCompliant* bonds. The falsification test measures the change in small trade premium (discount) for *NeverCompliant* bonds. Investors in *NeverCompliant* bonds do not benefit from improved disclosure or dissemination.

Finally, I perform cross-sectional analyses. After estimating the relationship between dissemination and the small trade premium (discount) for the entire sample of *AlwaysCompliant* bonds, I bifurcate the sample into bonds issued by large, general purpose issuers and bonds issued by less well-known issuers. Dissemination of information is not likely an impediment for investors in bonds issued by large general purpose issuers (such as states, cities, and counties) with web sites. Investors in bonds issued by less well-known issuers are more likely to benefit from dissemination. Similarly, after estimating the relationship between improved disclosure and the small trade premium (discount) for the entire sample of *NewlyCompliant* bonds, I partition the sample into revenue bonds and non-revenue bonds. Because of the specificity of the source of repayment for these bonds, disclosures made by revenue bond issuers are more likely to provide new information to market participants than disclosures made by issuers of general obligation bonds.

The final cross-sectional analysis acknowledges that all disclosure is not created equal. Specifically, disclosure is less likely to be informative to investors if it is not timely. Therefore, I bifurcate the sample of *AlwaysCompliant* bonds and *NewlyCompliant* bonds into those whose issuers are timely disclosers and those whose issuers are non-timely disclosers. I define disclosure as timely if the number of days between the period-end date (if available) and the filing date of the first filing in EMMA is less than or equal to 180 days. After six months, information provided in the filing is likely too stale to be useful.

4.2.1 Univariate comparisons of transaction costs on small and large trades

The focus of this study is on changes in the difference between small trade transaction costs and large trade transaction costs, which I attribute to changes in the relative bargaining power of these investors. Changes in transaction costs that are not attributable to bargaining power are controlled through the benchmark sample of large institutional trades. Changes in transaction costs for the benchmark sample of large institutional trades are worthy of discussion because the period I study is characterized by falling interest rates and falling credit risk.[10] In that interest rates (Green et al., 2007b) and credit risk (Harris and Piwowar, 2006) are positively correlated with municipal transaction costs, falling transaction costs are to be expected.

Panel A of Table 4 demonstrates that markups on large institutional trades of *AlwaysCompliant* bonds (which are, on average, rated A+) fell just 3.07 basis points over the sample period. By contrast, the average markup on large institutional trades of *NeverCompliant* bonds (which are, on average, rated just above BBB+) fell 21.72 basis points over the sample period. *NeverCompliant* bonds are higher risk, and thus have the most dramatic drop in transaction costs. This drop is, however, statistically the same for large and small trades because information asymmetry between these two types of traders is unchanged. These univariate

[10]The average treasury rate in the pre-EMMA period was 3.69 while the average rate in the post-EMMA period was 3.31. The average yield spread between the AAA-rated corporate bond index and the BBB-rated corporate bond index (a commonly used measure of risk) fell from 1.64 percent in the pre-EMMA period to 1.10 percent in the post-EMMA period.

observations demonstrate the importance of using large institutional transaction costs as a benchmark and controlling for trends, economic changes, and the interest rate environment.

Univariate comparisons of average markups (markdowns) on small retail trades to those on large institutional trades in the periods before and after EMMA was implemented illustrate that the *AlwaysCompliant* small trade premium is statistically and economically lower after EMMA than before EMMA. Whereas large institutional trade markups on *AlwaysCompliant* bonds are only 3.07 bps smaller after EMMA than before EMMA, the average markup on small retail trades of *AlwaysCompliant* bonds is 18.05 bp smaller after EMMA than before EMMA. Thus, the *AlwaysCompliant* small trade premium was reduced by 14.98 bps.

By contrast, the difference between the pre-EMMA small trade premium and the post-EMMA small trade premium in the falsification sample of *NewlyNonCompliant* bonds is not statistically different from zero. Because of the disparity in sample size and the lack of covariate balance between *AlwaysCompliant* bonds and *NewlyNonCompliant* bonds, it is not appropriate to perform a difference-in-difference-in-difference between these two samples. Nonetheless, the 9.44 bp greater reduction of the small trade premium for *AlwaysCompliant* bonds is statistically significant and consistent with a convergence in bargaining power that is attributable to dissemination.

Similarly, the *NewlyCompliant* small trade premium is 13.36 bps smaller after EMMA than before EMMA. This statistically significant reduction is consistent with a convergence in bargaining power attributable to improved disclosure that is not evident in the falsification sample of *NeverCompliant* bonds. Though the 8.87 bp greater reduction of the small trade premium for *NewlyCompliant* bonds is consistent with a convergence in bargaining power that is attributable to improved disclosure, the difference is not statistically significant due to the small sample of *NeverCompliant* bonds.

Panel B of Table 4 shows that retail and institutional markdowns on sales did not converge in a statistically powerful way for any group of bonds after EMMA. *AlwaysCompliant* bonds experience a 0.60 bp increase in the small trade discount and *NewlyCompliant* bonds experience a 7.22 bp decrease after EMMA. Neither of these differences is statistically significant.

4.2.2 Multivariable regressions

Unlike the univariate statistics that aggregate trades by bond and broad timeframe, I estimate the following regression at the transaction level:

$$Markup_{b,t}(Markdown_{b,t}) = \alpha_b + \beta_y + \theta_s t + \gamma SizeCategory_{b,t} + \delta Post_{b,t}$$
$$+\eta SizeCategory * Post_{b,t} + \sum \mu_j Controls_{j,b,t} + \varepsilon_{b,t}$$

where α is a bond fixed effect. The *Post* indicator switches to one after July 1, 2009. The difference-in-

difference design relies on the assumptions that disclosure has the same effect in all years and that transaction costs in each size category follow parallel trends before EMMA is implemented. To correct for a possible violation of the first assumption, I include year fixed effects (β) and a linear time trend *(t*). To correct for a possible violation of the second assumption, I include linear time trends specific to each size category (θ_s), which allow for the possibility that small trade transaction costs and large trade transaction costs trend differently across time. Indicators are created for three of the four trade size categories. $SmRet_{b,t}$ denotes a small retail-sized trade in bond b on date t, $LgRet_{b,t}$ denotes a large retail-sized trade, and $SmInst_{b,t}$ denotes a small institutional-sized trade. Thus, markups (markdowns) on large institutional-sized trades serve as the benchmark over which the small trade premium (discount) is measured.

The change in large institutional markups (markdowns) after EMMA was implemented, measured by *Post,* serves as the benchmark that controls for broad market shifts in transaction costs. The coefficient on *SmRet*Post* is the variable of interest, which captures the change in small retail markups (markdowns) relative to the change in large institutional markups (markdowns) after EMMA was implemented. A negative coefficient indicates a convergence of small and large trade markups (markdowns) and a reduction in the informational disadvantage of retail investors with respect to institutional investors.

Time-invariant bond characteristics do not need to be controlled because the bond fixed effect absorbs them. It is, however, important to control for variation in bond and market characteristics. I control for interest rate changes with the daily level of the 10-Year treasury (Green et al., 2007b), changes in municipal market conditions with the daily level of the AAA General Obligation yield curve, and economic changes with contemporaneous gross state product (Harris and Piwowar, 2006). I control for changes in credit risk premia with the yield differential between Moody's seasoned Baa corporate bond yield and Moody's seasoned Aaa corporate bond yield. I control for the log of trade size to account for the possibility that trade sizes within categories changed after EMMA. Costs of intermediation at the transaction level are controlled through the logged par value of all transactions in bond b on date t. I also include an indicator equal to one in the purchase regressions if a preceding customer sale is not observed on date t or *t-1* and equal to one in the sale regressions if a subsequent customer purchase is not observed on date t or *t+1* (Sirri, 2014). Finally, I control for the age of the bond and the time remaining to maturity (Harris and Piwowar, 2006).

Because the dependent variable is the markup (markdown) on an individual transaction, more weight is given to bonds that trade frequently than bonds that trade infrequently (as distinct from the univariate statistics which equal-weighted bonds). To adjust for serial correlation within bonds, robust standard errors are clustered at the bond level.

Dissemination and the small trade premium (discount) Panel A of Table 5 presents results demonstrating a relationship between dissemination and the small trade premium on bond purchases. The coefficient on *SmRet* in Column 1 indicates that before EMMA, 18.67 bps of the small trade premium on *AlwaysCompliant* bonds was not explained by the economic controls. After EMMA was implemented, markups on large institutional trades of *AlwaysCompliant* bonds rose a statistically insignificant 6.52 bps while markups on small retail trades of these bonds fell 6.23 bps.[11] The significant 12.75 bp convergence in small retail markups toward large institutional markups, measured by *SmRet*Post*, is consistent with the notion that access to information aligned the bargaining power of retail investors with that of institutional investors. This convergence represents a 30 percent reduction relative to the pre-EMMA small trade premium of 42.79 bps.

Though I primarily focus on comparing small retail trades to large institutional trades, results are similar when estimating the change in the premium paid by large retail investors and small institutional investors. Specifically, relative to the change in large institutional markups, the premium associated with large retail trades of *AlwaysCompliant* bonds fell 8.94 bps (or 25 percent) and the premium associated with small institutional trades fell 5.32 bps (or 25 percent).

The coefficients on control variables are generally consistent with expectations. Markups increase with municipal and treasury yields and credit risk premia. Larger trade sizes within trade size categories are significantly negatively related to trade markups. Consistent with dealer intermediation increasing transaction costs (Schultz, 2012), markups are larger when trading volume is higher. Markups are also significantly lower for bonds that remain in inventory for more than a day, perhaps because dealers eager to get a bond out of inventory are willing to sell for less (Sirri, 2014).

Column 2 presents results for the falsification sample of *NewlyNonCompliant* bonds. In contrast with the significantly negative coefficient on *SmRet*Post* in column 1, column 2 demonstrates a marginally significant increase in the small trade premium for *NewlyNonCompliant* bonds. Because the *AlwaysCompliant* small trade premium reduction is not evident for *NewlyNonCompliant* bonds, the reduction can likely be attributed to dissemination.

To gain further assurance that the results are attributable to dissemination, I bifurcate the *AlwaysCompliant* sample into bonds that are not issued by large general purpose issuers (in column 3) and bonds that are issued by sates, cities, or counties (in column 4). The small trade premium associated with *AlwaysCompliant* bonds not issued by states, cities, or counties fell 22.22 bps, representing a 49 percent decline relative to the 45.80 bp pre-EMMA small trade premium. Thus, EMMA presented a dramatic change in the information sets of retail investors trading bonds issued by less well-known issuers that are unlikely to maintain web sites.

[11] The summation of the 6.52 coefficient on *Post* and the -12.75 coefficient on *SmRet*Post*.

By contrast, the small trade premium associated with *AlwaysCompliant* bonds issued by states, cities, or counties did not change in a statistically or economically meaningful way. This suggests that dissemination through EMMA did not represent a meaningful change in the information sets of retail investors for large issuers that likely maintain web sites to disseminate information.

Columns 5 and 6 demonstrate that the reduction in the *AlwaysCompliant* small trade premium is only apparent for bonds whose issuers' first disclosure in EMMA was filed within 180 days of period end. The *AlwaysCompliant* small trade premium fell 28.20 bps (or 57 percent) for these bonds. By contrast, the convergence of retail and institutional trade markups is not evident for *AlwaysCompliant* bonds whose issuers' first disclosure in EMMA was not timely. This evidence suggests that disclosure is only informative to retail investors if it is timely. Moreover, these results provide further support for the notion that small trade markups converge toward large trade markups because the information sets of these investors converge.

In contrast with the aforementioned results related to customer purchases, the evidence presented in Panel B does not support the role of access to financial information in reducing small trade discounts on sales. Although small retail trade markdowns on *AlwaysCompliant* bonds converge toward markdowns on large institutional trades after EMMA by 15.96 bps (or 28 percent) in column 1, they also converge in column 2. The *NewlyNonCompliant* small trade discount decreased an economically and statistically significant 25.80 bps (or 37 percent). Because the small trade discount decreased both for bonds whose investors benefited from dissemination and bonds whose investors did not, the convergence cannot be attributed to dissemination, per se. Thus, it does not appear that retail sellers use the information contained in financial disclosures when negotiating with dealers.

Taken together, these results suggest that the cost to access information did not contribute to the relative disadvantage of retail bond sellers but it did contribute to the disadvantage of retail bond buyers.

Improved disclosure compliance and the small trade premium (discount) Table 6 provides evidence supporting the relationship between improved disclosure compliance and the small trade premium for bond purchases, but not the discount on bond sales. Column 1 of panel A demonstrates a significant 20.75 bp convergence in small retail markups toward large institutional markups for *NewlyCompliant* bonds. This 44 percent reduction in the small trade premium is consistent with the notion that disclosure of issuer-specific fundamental information reduces information asymmetry between retail and institutional investors. Because the reduction in the *NewlyCompliant* small trade premium is not evident for *NeverCompliant* bonds, this reduction can likely be attributed to disclosure.

Columns 3 and 4 provide further assurance that the results are attributable to disclosure. Specifically, the reduction in the *NewlyCompliant* small trade premium is limited to revenue bonds, for which financial

disclosure is more useful and more likely to change the information sets of investors. *NewlyCompliant* revenue bonds experience a 24.82 bp, or 49 percent, reduction in the small trade premium. Moreover, the reduced small trade premium for *NewlyCompliant* bonds is only significant for bonds whose issuers' first disclosure in EMMA was filed within 180 days of period end. Column 5 documents a significant 29.26 bp, or 42 percent, reduction in the *NewlyCompliant* small trade premium for bonds whose issuers were timely.

The evidence presented in Panel B does not support the role of improved disclosure compliance in reducing small trade discounts on sales. Column 1 demonstrates a statistically and economically significant 26.40 bp reduction in the small trade discount on *NewlyCompliant* bonds that is not evident for *NeverCompliant* bonds in Column 6. While this evidence is consistent with improved disclosure compliance reducing the small trade discount, the cross-sectional evidence casts some doubt that the reduction is attributable to disclosure, per se. The *NewlyCompliant* small trade discount fell for both revenue bonds as well as non-revenue bonds even though disclosure should be more important for revenue bonds. In addition, the reduction in the *NewlyCompliant* discount is not statistically significant for timely or non-timely disclosers.

Together, these results suggest that the existence of fundamental information helps to level the informational playing field between retail and institutional bond buyers but not bond sellers.

5 Conclusion

Small investors pay more than large investors for municipal bonds in part because opacity and costly information endow institutional investors with bargaining power. In this paper, I estimate the extent to which fundamental information and access thereto can influence the premium small investors pay relative to large investors.

Over the sample period studied, disclosure presents a more dramatic change to the information set of retail investors than institutional investors. Therefore, I focus on the relative cost savings from disclosure rather than aggregate cost savings. Specifically, I examine changes in per-bond transaction costs on small trades relative to large trades around the introduction of a free, centralized repository for municipal disclosure (EMMA). Despite the lack of timeliness and standardization of municipal disclosure, the results suggest that the EMMA repository fulfilled its desired role of informing retail bond buyers.

I find that when financial statements become cheaper to access, per-bond transaction costs paid by small investors converge toward those of large investors. The cumulative dollar impact of this convergence is consequential. Holding all else equal, if every ex-ante compliant issuer remained compliant in the EMMA repository, the aggregate savings across retail-sized bond purchases in 2009 stemming simply from improved

dissemination would have been $104 million.[12] Considering the incremental cost to issuers of maintaining their ex-ante disclosure compliance is likely negligible, this cost savings is large.

The premium paid by small investors also falls after an ex-ante non-compliant issuer becomes compliant with their continuing disclosure obligations. If all non-compliant issuers improved disclosure compliance, retail investors could save approximately $174 million annually.[13] Though the benefits must be weighed against the costs of disclosure, this estimate suggests that in addition to the cost of capital and risk management benefits of disclosure, issuers can save individual investors money by publicly disseminating financial statements and budgets.

[12] An estimated 60 percent of issuers were compliant with their continuing disclosure requirements in 2009 (Schmitt, 2011). The average daily par amount purchased in retail-sized transactions in 2009 was $571.8 million (MSRB, 2011). Assuming bond trading is even across issuers, the 12.5 bp convergence of small retail markups toward large institutional markups equates to $286k per day.

[13] An estimated 40 percent of issuers were non-compliant with their continuing disclosure requirements in 2009. The 20.8 bp convergence of small retail markups toward large institutional markups equates to $476k per day.

Appendix: Definitions of variables

Variable	Definition
>1 day in inventory	An indicator equal to one if a customer purchase (sale) does not succeed (precede) a customer sale (purchase) within one day of trade date t.
AAA GO yield	The daily yield on the Bond Buyer General Obligation 20-bond municipal bond index.
Age	Years between the issue date of the bond and the date of the observation, rounded.
AlwaysCompliant	A bond for which all required disclosures from the year after issuance were provided to DPC Data through 2007 and to EMMA through 2011.
Callable	An indicator equal to one if the issuer has the option to redeem the bond before its scheduled maturity date.
CompliantAfter	A bond for which at least one financial filing was submitted to EMMA in each of its first two years of existence.
CompliantBefore	A bond for which all required disclosures from the year after issuance through 2007 were provided to DPC Data.
Credit rating	The average credit rating across rating agencies at issuance. A credit rating of "Aaa" is coded as "24," decreasing to a rating of "D," coded as "1." Non-rated issues are coded as "0" in the regressions.
Debt outstanding	The par value of all bonds outstanding from the issuer as of December 31, 2015.
EMMA	The Electronic Municipal Market Access system, operated by the Municipal Securities Rulemaking Board. This web-based system makes offering documents, issuer financial statements, secondary trade data, event notices, and credit ratings available to the public free of charge. References to "EMMA" in this paper relate to the continuing disclosure service enacted on July 1, 2009.
Gross State Product (GSP)	Annual level of GSP from the Bureau of Economic Analysis.
Insured	An indicator equal to one if the principal and interest payments are guaranteed by a municipal bond insurer.
Issue size	The aggregate par value of all bonds in bond b's issuance.
Large general purpose (LgGP)	An indicator equal to one if the bond is issued by a state, city, or county. Information about these issuers is relatively easy to access online.
Large institutional (LgInst)	Trades with par values equal to or greater than $250,000.
Large retail (LgRet)	Trades with par values greater than or equal to $25,000 but less than $100,000.
Markdown	The basis point difference between the average price at which dealers transact with one another and the price at which customers sell the same bond on the same day.
Markup	The basis point difference between the average price at which dealers transact with one another and the price at which customers purchase the same bond on the same day.
Municipal bond	A certificate of debt issued by a state or local government or its agencies.
NewlyCompliant	A bond for which at least one required post-issuance disclosure was not provided to DPC Data before 2007, however at least one financial filing was submitted to EMMA in each of its first two years of existence.
NewlyNonCompliant	A bond for which all required post-issuance disclosure was provided to DPC Data before 2007, however disclosure was not provided in at least one of the first two years of EMMA's existence.
Number of dealers	The number of inter-dealer transactions reported in bond b on date t.
Pre-refunded	A bond issue that is redeemed before the first call date (usually to obtain a lower interest rate). The funds to repay bondholders are held in escrow until the refunded bonds become callable. Refunding status is measured as of December 31, 2011.

Appendix, continued

Variable	Definition
Revenue bond	An indicator equal to one if bond b is classified as a revenue bond, supported by a specific source of revenue rather than the taxing authority of the issuer.
Risk Premium	The yield difference between Moody's seasoned Baa corporate bond yield and Moody's seasoned Aaa corporate bond yield. Obtained on a monthly basis from the Federal Reserve Bank of St. Louis.
Small institutional (SmInst)	Trades with par values greater than or equal to \$100,000 and less than \$250,000.
Small retail (SmRet)	Trades with par values less than \$25,000.
Small trade discount	The difference between the markdown charged on small retail sales and the markdown charged on large institutional sales in the same bond. Small retail transactions are those less than \$25,000 in par value and large institutional transactions are those greater than or equal to \$250,000 in par value.
Small trade premium	The difference between the markup charged on small retail purchases and the markup charged on large institutional purchases in the same bond. Small retail transactions are those less than \$25,000 in par value and large institutional transactions are those greater than or equal to \$250,000 in par value.
Time to maturity	Years between the date of the observation and the maturity date of the bond, rounded.
Timely	An indicator equal to one if the number of days between the period-end date (if available) and the filing date of the first filing in EMMA is less than or equal to 180.
Trade size	The par value traded, as reported by the MSRB.
Treasury	The daily yield on the 10-year treasury bond.
Unrated	A bond that is not rated by both Moody's and Standard & Poors at issuance.
Volume	The aggregate par value of all transactions (inter-dealer, customer sales, and customer purchases) in bond b on date t.

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Table 1: Compliance with continuing disclosure requirements

The sample includes 3,741 unique bonds, of which 3,139 are included in the bond purchase analysis and 1,841 are included in the bond sale analysis. Issuers of *CompliantBefore* bonds were compliant with their continuing disclosure obligations to DPC Data from the year after issuance through 2007. The date of the first filing in EMMA represents the date of the first financial filing posted in EMMA after it became the continuing disclosure repository in 2009, conditional upon filing by December 31, 2011. The timeliness of the first filing in EMMA is the number of days between the period-end date (if available) and the filing date. *CompliantAfter* bonds' issuers were compliant with their continuing disclosure obligations in EMMA in each of its first two years of existence. Issuers of *AlwaysCompliant* bonds were compliant with their continuing disclosure obligations with DPC Data through 2007 and with EMMA through 2011.

	Obs	Mean	StdDev	P25	P50	P75
CompliantBefore	3,741	0.83	0.37	1.00	1.00	1.00
Date of first filing in EMMA	3,472	12/21/09		8/19/09	12/29/09	3/9/10
Timeliness of first filing in EMMA (if available)	2,001	222.15	141.57	148	204	272
CompliantAfter	3,741	0.85	0.36	1.00	1.00	1.00
AlwaysCompliant	3,741	0.72	0.45	0.00	1.00	1.00

Table 2: Statistics describing bonds, bond purchases, and bond sales

Panel A summarizes the characteristics of the 3,741 bonds in the sample. Panel B summarizes transaction characteristics of 538,444 purchases of 3,139 bonds. Panel C summarizes transaction characteristics of 177,772 sales of 1,841 bonds. Column (a) presents sample means for *AlwaysCompliant* bonds and column (b) presents means for *NewlyNonCompliant* bonds. Issuers of *AlwaysCompliant* bonds were compliant with their continuing disclosure obligations to DPC Data from the year after issuance through 2007 and were also compliant in EMMA in each of its first two years of existence. *NewlyNonCompliant* bonds were compliant with DPC Data but non-compliant in EMMA. Column (c) presents sample means for *NewlyCompliant* bonds and column (d) presents means for *NeverCompliant* bonds. Issuers of *NewlyCompliant* bonds were non-compliant with their continuing disclosure obligations to DPC Data in at least one year between the year after issuance and 2007, but were compliant in EMMA in each of its first two years of existence. *NeverCompliant* bonds were non-compliant with DPC Data and non-compliant in EMMA. All variables are defined in the Appendix. Significance levels from two-sided t-tests of mean differences are presented. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Bond Characteristics

	(a) Always Compliant (N=2,685)	(b) Newly NonCompliant (N=428)	(a)-(b)	(c) Newly Compliant (N=488)	(d) Never Compliant (N=140)	(c)-(d)
Issue year	2003	2003	0.61***	2003	2002	0.63***
Maturity year	2021	2022	-1.13***	2023	2027	-4.63***
Credit rating (if rated)	20.39	18.76	1.62***	19.92	17.62	2.30***
Insured	0.64	0.65	-0.01	0.74	0.62	0.12***
Callable	0.66	0.72	-0.06**	0.71	0.85	-0.14***
Pre-refunded	0.04	0.13	-0.09***	0.04	0.12	-0.08***
Revenue bond	0.56	0.62	-0.06**	0.84	0.82	0.02
Large general purpose (*LgGP*)	0.37	0.29	0.08***	0.15	0.11	0.04
Issue size ($Millions)	580	839	-259***	323	322	1
Debt outstanding ($Millions)	19,665	13,357	6,308***	5,709	3,838	1,870*

Panel B: Trade Characteristics - Bond Purchases

	(a) Always Compliant (N=387,576)	(b) Newly NonCompliant (N=54,438)	(a)-(b)	(c) Newly Compliant (N=80,421)	(d) Never Compliant (N=16,009)	(c)-(d)
Trade size	109,413	194,943	-85,530***	88,859	278,812	-189,953***
Markup	140.29	98.06	42.22***	157.32	141.79	15.52***
Ln(Volume)	13.64	13.41	0.23***	13.65	13.57	0.08***
Number of dealers	6.95	5.51	1.44***	6.72	6.45	0.27***
$>$ 1 day in inventory	0.20	0.19	0.02***	0.17	0.17	-0.01

Panel C: Trade Characteristics - Bond Sales

	(a) Always Compliant (N=112,120)	(b) Newly NonCompliant (N=27,098)	(a)-(b)	(c) Newly Compliant (N=26,503)	(d) Never Compliant (N=12,051)	(c)-(d)
Trade size	235,940	224,418	11,522	194,893	152,857	42,036***
Markdown	94.85	82.55	12.31***	98.50	102.79	-4.29***
Number of dealers	2.97	2.83	0.14***	3.87	3.37	0.50***
Ln(Volume)	12.46	12.73	-0.28***	12.71	12.94	-0.23***
$>$ 1 day in inventory	0.35	0.35	0.00	0.30	0.40	-0.10***

Table 3: Cross-sectional variation in the small trade premium (discount) and compliance with continuing disclosure obligations

Panel A summarizes the small trade premium and compliance with continuing disclosure obligations for the 3,139 bonds included in the sample of bond purchases. Panel B summarizes the small trade discount and compliance with continuing disclosure obligations for the 1,841 bonds included in the sample of bond sales. The small trade premium (discount) is calculated as the average markup (markdown) on small retail trades minus the average markup (markdown) on large institutional trades in the same bond. Markup (markdown) is the basis point difference between the price paid (received) by a customer and the average price at which dealers transact with one another in bond b on date t, Winsorized at the 1% level. Small retail trades are those with par values less than $25,000 and large institutional trades are those with par values greater than or equal to $250,000. Column (a) presents the mean small trade premium (discount) for sample bonds that possess the characteristic listed in rows 1-5. Column (b) presents the mean small trade premium (discount) for sample bonds that do not possess the listed characteristic. Column (c) presents the proportion of sample bonds possessing the characteristic listed in rows 1-5 that were *AlwaysCompliant*. Column (d) presents the proportion of bonds that do not possess the characteristic that were *AlwaysCompliant*. Issuers of *AlwaysCompliant* bonds were compliant with their continuing disclosure obligations with DPC Data from the year after issuance through 2007 and were also compliant in EMMA in each of its first two years of existence. *Unrated* bonds are not rated by both Moody's and Standard & Poors. Issuers have the option to redeem *Callable* bonds before their scheduled maturity date. *Pre-refunded* bonds are redeemed before the first call date and the funds to repay bondholders are held in escrow until the bonds become callable. Refunding status is measured as of the end of the sample period, December 31, 2011. *Large general purpose* bonds are issued by states, cities, or counties. *Revenue bonds* are supported by revenue from a specific source rather than ad valorem taxes. Significance levels from two-sided t-tests of mean differences are presented. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Small trade premium on bond purchases

		Small trade premium					AlwaysCompliant				
		(a)		(b)		(a)-(b)	(c)		(d)		(c)-(d)
		Variable=1		Variable=0		Diff	Variable=1		Variable=0		Diff
		N	Mean	N	Mean	Mean	N	Mean	N	Mean	Mean
1	Unrated	353	46.11	2,786	29.15	16.96***	353	0.54	2,786	0.75	-0.21***
2	Callable	2,111	37.94	1,028	16.90	21.04***	2,111	0.70	1,028	0.77	-0.06***
3	Pre-refunded	182	29.61	2,957	31.14	-1.53	182	0.54	2,957	0.74	-0.19***
4	Large general purpose (*LgGP*)	1,045	27.04	2,094	33.06	-6.02***	1,045	0.82	2,094	0.68	0.15***
5	Revenue bond	1,425	33.23	1,714	29.25	3.98***	1,425	0.66	1,714	0.78	-0.12***

Panel B: Small trade discount on bond sales

		Small trade discount					AlwaysCompliant				
		(a)		(b)		(a)-(b)	(c)		(d)		(c)-(d)
		Variable=1		Variable=0		Diff	Variable=1		Variable=0		Diff
		N	Mean	N	Mean	Mean	N	Mean	N	Mean	Mean
1	Unrated	218	55.74	1,623	43.87	11.88***	218	0.50	1,623	0.71	-0.21***
2	Callable	1,320	49.98	521	33.35	16.64***	1,320	0.66	521	0.75	-0.08***
3	Pre-refunded	113	57.56	1,728	44.47	13.09***	113	0.43	1,728	0.70	-0.27***
4	Large general purpose (*LgGP*)	516	37.96	1,325	48.12	-10.16***	516	0.79	1,325	0.65	0.14***
5	Revenue bond	988	48.81	853	41.18	7.63***	988	0.62	853	0.76	-0.14***

Table 4: Univariate comparison of average markups (markdowns) before and after EMMA

EMMA was established as the sole continuing disclosure on July 1, 2009. Panel A compares the change in markups on small retail purchases with the change in markups on large institutional purchases of 3,139 bonds before and after EMMA. Panel B presents changes in the average markdown on small retail and large institutional sales of 1,841 bonds. Issuers of *AlwaysCompliant* bonds were compliant with their continuing disclosure obligations to DPC Data from the year after issuance through 2007 and were also compliant in EMMA in each of its first two years of existence. *NewlyNonCompliant* bonds were compliant with DPC Data but non-compliant in EMMA. Issuers of *NewlyCompliant* bonds were non-compliant with their continuing disclosure obligations to DPC Data in at least one year between the year after issuance and 2007, but were compliant in EMMA in each of its first two years of existence. *NeverCompliant* bonds were non-compliant with DPC Data and non-compliant in EMMA. The "Pre-EMMA" period in columns (a) and (c) spans January 1, 2007 through June 30, 2009. The "Post-EMMA" period in columns (b) and (d) spans July 1, 2009 through December 31, 2011. The small trade premium (discount) is calculated as the difference between the average markup (markdown) on small retail trades and the average markup (markdown) on large institutional trades in the same bond. Markup is the implied dealer markup (in basis points) charged on a customer purchase relative to the average price at which dealers transact with one another in bond b on date t, Winsorized at the 1% level. Markdown is the implied dealer markdown charged on a customer sale. Small retail trades (*SmRet*) are those with par values less than $25,000 and large institutional trades (*LgInst*) are those with par values greater than or equal to $250,000. Significance levels from two-sided t-tests of mean differences are presented. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Small trade premiums on purchases of bonds based on their disclosure compliance before and after EMMA

		AlwaysCompliant (N=2,276)			NewlyCompliant (N=393)		
		(a)	(b)	(b)-(a)	(c)	(d)	(d)-(c)
		Pre-EMMA	Post-EMMA		Pre-EMMA	Post-EMMA	
(i)	SmRet	109.14	91.09	-18.05***	118.17	100.14	-18.03***
(ii)	LgInst	71.87	68.81	-3.07**	78.35	73.67	-4.67
(i)-(ii)		37.27***	22.29***	-14.98***	39.82	26.47***	-13.36***

		NewlyNonCompliant (N=370)			NeverCompliant (N=100)		
		(a)	(b)	(b)-(a)	(c)	(d)	(d)-(c)
		Pre-EMMA	Post-EMMA		Pre-EMMA	Post-EMMA	
(iii)	SmRet	85.57	70.25	-15.32***	124.20	98.00	-26.20***
(iv)	LgInst	54.29	44.51	-9.78***	89.06	67.35	-21.72**
(iii)-(iv)		31.28***	25.74***	-5.54	35.13***	30.65***	-4.48
(i-ii)-(iii-iv)				-9.44**			-8.87

Panel B: Small trade discounts on sales of bonds based on their disclosure compliance before and after EMMA

		AlwaysCompliant (N=1,263)			NewlyCompliant (N=246)		
		(a)	(b)	(b)-(a)	(c)	(d)	(d)-(c)
		Pre-EMMA	Post-EMMA		Pre-EMMA	Post-EMMA	
(i)	SmRet	91.34	91.46	0.12	100.58	93.93	-6.64
(ii)	LgInst	48.19	47.71	-0.48	50.86	51.44	0.58
(i)-(ii)		43.16***	43.76***	0.60	49.72***	42.49***	-7.22

		NewlyNonCompliant (N=245)			NeverCompliant (N=87)		
		(c)	(d)	(d)-(c)	(a)	(b)	(b)-(a)
		Pre-EMMA	Post-EMMA		Pre-EMMA	Post-EMMA	
(iii)	SmRet	84.65	78.67	-5.99	107.37	98.71	-8.66
(iv)	LgInst	39.30	28.24	-11.06	58.93	47.64	-11.29
(iii)-(iv)		45.35***	50.43***	5.07	48.44***	51.06***	2.63
(i-ii)-(iii-iv)				-4.54			-10.04

Table 5: Relationship between transaction costs, trade size, and dissemination

$$Markup_{b,t}(Markdown_{b,t}) = \alpha_b + \beta_y + \theta_s t + \gamma SizeCategory_{b,t} + \delta Post_{b,t} + \eta SizeCategory * Post_{b,t} + \sum \mu_j Controls_{j,b,t} + \varepsilon_{b,t}$$

The sample consists of actively-traded bonds issued before December 31, 2005. The sample period begins in January 2007 and ends in December 2011. The dependent variable in Panel A is the implied dealer markup charged on a customer purchase relative to the average price at which dealers transact with one another in bond b on date t, Winsorized at the 1% level. The dependent variable in Panel B is the implied dealer markdown charged on a customer sale of bond b on date t, Winsorized at the 1% level. Each observation is a customer purchase (sale) matched to a corresponding inter-dealer trade. Indicators are included for each size category other than large institutional trades, which serve as the benchmark group in all regressions. Small retail trades (*SmRet*) are those with par values less than $25,000 and large retail trades (*LgRet*) are those with par values greater than or equal to $25,000 but less than $100,000. Small institutional trades (*SmInst*) are those with par values greater than or equal to $100,000 but less than $250,000 and large institutional trades (*LgInst*) are those with par values greater than or equal to $250,000. EMMA was established as the sole continuing disclosure on July 1, 2009, lowering the cost for retail investors to access financial disclosures. Issuers of *AlwaysCompliant* bonds were compliant with their continuing disclosure obligations to DPC Data from the year after issuance through 2007 and were also compliant in EMMA in each of its first two years of existence. *NewlyNonCompliant* bonds were compliant with DPC Data but non-compliant in EMMA. The variable of interest is *SmRet*Post,* which measures the change in the additional markup (markdown) small retail investors pay above large institutional investors after EMMA is implemented. All columns include bond fixed effects, year fixed effects, a linear time trend variable, and group-specific linear time trends for small retail, large retail, and small institutional trades. Column 1 includes *AlwaysCompliant* bonds. Column 2 presents the results of a falsification test of bonds for whom transaction costs are unaffected by dissemination, *NewlyNonCompliant* bonds. Columns 4 and 6 present results for bonds that are less affected by disclosure than the bonds in columns 3 and 5. Column 3 includes *AlwaysCompliant* bonds not issued by large, general purpose issuers (*Non-LgGP*) and column 4 includes *AlwaysCompliant* bonds issued by states, cities, or counties (*LgGP*). Column 5 includes *AlwaysCompliant* bonds whose issuers' first disclosure in EMMA was filed within 180 days of period-end (*Timely*) and column 6 includes *AlwaysCompliant* bonds whose issuers' first disclosure was filed more than 180 days after period-end (*NotTimely*). The average pre-EMMA premium (discount) before adding controls is provided for each size category for comparison purposes. Control variables are defined in the Appendix. If applicable, the predicted sign of the coefficient (*Pred.*) is provided. Robust standard errors (in parentheses) are clustered at the bond level. The ***, **, and * denote statistical significance at 1%, 5%, and 10% levels (two-tailed), respectively. The adjusted R-squared (within) describes the extent to which the regression explains variation in markups and markdowns within bonds. The adjusted R-squared (overall) describes the extent to which cross-sectional variation in the dependent variable (markup / markdown) is explained.

Table 5, Continued

Panel A: Relationship between dissemination and markups							
	Pred.	(1)	(2)	(3)	(4)	(5)	(6)
SmRet	+	18.67***	26.59***	19.44***	21.49***	13.46*	26.69***
		(3.17)	(5.17)	(4.18)	(4.33)	(7.98)	(4.50)
SmRet*Post	-	-12.75***	10.03*	-22.22***	10.49	-28.20***	3.60
		(4.51)	(5.44)	(4.75)	(8.57)	(8.56)	(8.53)
LgRet	+	20.42***	22.32***	20.54***	21.86***	11.72*	27.25***
		(2.38)	(3.93)	(3.27)	(3.14)	(6.00)	(3.31)
LgRet*Post	-	-8.94***	2.85	-16.31***	4.52	-27.52***	2.04
		(3.29)	(5.59)	(4.01)	(5.39)	(7.41)	(5.35)
SmInst	+	13.79***	15.34***	14.24***	13.16***	4.46	19.42***
		(2.11)	(3.37)	(2.98)	(2.75)	(5.35)	(2.94)
SmInst*Post	-	-5.32*	5.19	-10.63***	3.06	-18.66***	2.36
		(2.74)	(4.95)	(3.57)	(4.22)	(6.59)	(4.27)
Post	+/-	6.52	1.01	10.79*	0.57	22.78**	-1.13
		(4.56)	(6.80)	(5.85)	(6.24)	(11.08)	(6.29)
Treasury	+	8.81***	5.83	7.32***	13.38***	12.11**	11.04***
		(1.97)	(3.61)	(2.48)	(2.86)	(5.58)	(2.79)
AAA GO yield	+	21.47***	16.33***	27.42***	7.16	23.33***	13.24***
		(3.80)	(4.64)	(4.93)	(4.37)	(8.90)	(4.23)
Risk premium	+	9.85***	16.98***	9.00**	14.64***	14.46	16.81***
		(3.29)	(5.12)	(4.08)	(4.48)	(8.90)	(4.24)
GSP		-51.79	44.36	-37.57	-116.13*	-142.58	-19.23
		(35.07)	(76.20)	(39.70)	(61.83)	(87.46)	(60.67)
Age	+	0.86	-0.54	1.31	-0.58	-2.46	1.75
		(1.73)	(2.44)	(2.09)	(2.64)	(3.79)	(3.10)
Time to maturity	+	2.96*	-0.18	3.73**	-1.00	3.90	1.01
		(1.60)	(4.61)	(1.84)	(2.68)	(3.89)	(2.81)
Ln(Trade size)	-	-7.08***	-1.97	-6.08***	-9.00***	-7.48***	-7.30***
		(0.73)	(1.40)	(0.62)	(1.53)	(1.13)	(1.60)
Ln(Volume)	+	4.49***	0.60	4.32***	4.97***	4.80***	4.97***
		(0.46)	(1.39)	(0.58)	(0.71)	(1.15)	(0.69)
>1 day in inventory	-	-10.00***	-15.52***	-11.86***	-6.50***	-11.41***	-7.38***
		(0.78)	(1.42)	(0.94)	(1.38)	(1.74)	(1.25)
Sample		Always Compliant	Newly NonCompliant	Always Compliant	Always Compliant	Always Compliant	Always Compliant
Sub-Sample				Non-LgGP	LgGP	Timely	NotTimely
Pre-EMMA SmRet		42.79	26.97	45.80	37.00	49.70	39.57
Pre-EMMA LgRet		35.70	23.16	38.01	32.26	40.89	34.56
Pre-EMMA SmInst		21.19	11.53	22.54	19.41	22.19	21.36
Observations		387,576	54,438	267,162	120,414	93,514	140,023
Number of bonds		2,276	370	1,415	861	429	882
R-squared (within)		0.05	0.04	0.05	0.04	0.06	0.04
R-squared (overall)		0.38	0.39	0.36	0.40	0.35	0.36

Table 5, Continued

Panel B: Relationship between dissemination and markdowns							
	Pred.	(1)	(2)	(3)	(4)	(5)	(6)
SmRet	+	6.31	-3.76	6.49	7.76	7.11	10.90
		(4.27)	(6.97)	(4.79)	(6.97)	(8.04)	(6.81)
SmRet*Post	-	-15.96***	-25.80***	-22.52***	0.03	-25.91**	-13.73*
		(5.11)	(7.86)	(5.37)	(9.45)	(10.03)	(8.29)
LgRet		-3.99	-9.82*	-3.53	-3.92	-2.21	-4.29
		(3.43)	(5.71)	(4.10)	(5.38)	(6.78)	(5.35)
LgRet*Post	-	-7.91*	-13.70**	-13.31***	3.87	-19.35**	-2.47
		(4.24)	(5.54)	(4.32)	(8.52)	(8.47)	(7.62)
SmInst		-2.71	-8.37*	-0.36	-7.90*	-7.35	-7.05
		(3.19)	(4.95)	(4.01)	(4.72)	(6.94)	(4.71)
SmInst*Post	-	-0.08	-5.83	-3.31	5.51	-8.59	4.20
		(4.51)	(4.66)	(4.66)	(9.16)	(8.87)	(8.39)
Post		6.00	15.29**	10.58**	-3.53	20.71**	2.64
		(4.43)	(6.31)	(4.58)	(8.62)	(8.19)	(7.98)
Treasury	+	-3.27*	-4.09*	-4.13**	-1.15	-4.24	-3.30
		(1.69)	(2.26)	(1.97)	(3.10)	(3.54)	(3.05)
AAA GO yield	+	14.74***	16.33***	16.01***	11.01*	16.39***	11.92**
		(2.59)	(3.37)	(2.82)	(5.73)	(5.15)	(4.96)
Risk premium	+	0.70	2.58	-0.32	3.08	4.25	1.62
		(2.71)	(3.74)	(3.38)	(4.06)	(5.33)	(3.90)
GSP		-40.94	59.87	-54.93	52.69	14.34	-27.96
		(36.44)	(65.31)	(39.33)	(48.72)	(60.33)	(54.84)
Age	+	-0.25	1.31	-0.64	0.83	-0.88	-0.15
		(1.12)	(2.24)	(1.25)	(2.35)	(2.59)	(1.83)
Time to maturity	+	1.27	0.54	1.04	2.80	3.23	1.22
		(1.09)	(2.32)	(1.20)	(2.38)	(2.60)	(2.01)
Ln(Trade size)	-	-18.24***	-20.14***	-18.49***	-17.86***	-20.14***	-17.16***
		(0.84)	(1.05)	(0.84)	(1.65)	(1.38)	(1.48)
Ln(Volume)	+	8.58***	9.63***	9.01***	7.82***	8.88***	7.91***
		(0.86)	(1.05)	(0.79)	(2.03)	(1.42)	(1.67)
>1 day in inventory	-	-28.14***	-19.30***	-28.42***	-27.45***	-27.96***	-29.55***
		(0.99)	(1.71)	(1.12)	(1.88)	(1.71)	(1.80)
Sample		Always Compliant	Newly NonCompliant	Always Compliant	Always Compliant	Always Compliant	Always Compliant
Sub-Sample				Non-LgGP	LgGP	Timely	NotTimely
Pre-EMMA SmRet		56.39	69.95	59.76	49.20	70.02	53.67
Pre-EMMA LgRet		29.34	37.90	31.96	24.47	41.00	25.31
Pre-EMMA SmInst		15.50	16.65	18.28	10.02	21.55	10.76
Observations		112,120	27,098	82,857	29,263	29,422	38,781
Number of bonds		1,263	245	856	407	280	479
R-squared (within)		0.10	0.15	0.10	0.11	0.10	0.11
R-squared (overall)		0.24	0.27	0.24	0.26	0.22	0.25

Table 6: Relationship between transaction costs, trade size, and improved disclosure compliance

$$Markup_{b,t}(Markdown_{b,t}) = \alpha_b + \beta_y + \theta_s t + \gamma SizeCategory_{b,t} + \delta Post_{b,t} + \eta SizeCategory * Post_{b,t} + \sum \mu_j Controls_{j,b,t} + \varepsilon_{b,t}$$

The sample consists of actively-traded bonds issued before December 31, 2005. The sample period begins in January 2007 and ends in December 2011. The dependent variable in Panel A is the implied dealer markup charged on a customer purchase relative to the average price at which dealers transact with one another in bond b on date t, Winsorized at the 1% level. The dependent variable in Panel B is the implied dealer markdown charged on a customer sale of bond b on date t, Winsorized at the 1% level. Each observation is a customer purchase (sale) matched to a corresponding inter-dealer trade. Indicators are included for each size category other than large institutional trades, which serve as the benchmark group in all regressions. Small retail trades (*SmRet*) are those with par values less than $25,000 and large retail trades (*LgRet*) are those with par values greater than or equal to $25,000 but less than $100,000. Small institutional trades (*SmInst*) are those with par values greater than or equal to $100,000 but less than $250,000 and large institutional trades (*LgInst*) are those with par values greater than or equal to $250,000. EMMA was established as the sole continuing disclosure on July 1, 2009, lowering the cost for retail investors to access financial disclosures. Issuers of *NewlyCompliant* bonds were non-compliant with their continuing disclosure obligations to DPC Data in at least one year between the year after issuance and 2007, but were compliant in EMMA in each of its first two years of existence. *NeverCompliant* bonds were non-compliant with DPC Data and non-compliant in EMMA. The variable of interest is *SmRet*Post,* which measures the change in the additional markup (markdown) small retail investors pay above large institutional investors after EMMA is implemented. All columns include bond fixed effects, year fixed effects, a linear time trend variable, and group-specific linear time trends for small retail, large retail, and small institutional trades. Column 1 includes bonds that are *NewlyCompliant*. Column 2 presents the results of a falsification test of bonds for whom transaction costs are unaffected by disclosure, *NeverCompliant* bonds. Columns 4 and 6 present results for bonds that are less affected by disclosure than the bonds in columns 3 and 5. Column 3 includes *NewlyCompliant* bonds that are revenue bonds (*Rev*) and column 4 includes bonds that are *NewlyCompliant* but are not revenue bonds (*Non-Rev*). Column 5 includes *NewlyCompliant* bonds whose issuers' first disclosure in EMMA was filed within 180 days of period-end (*Timely*) and column 6 includes *NewlyCompliant* bonds whose issuers' first disclosure was filed more than 180 days after period-end (*NotTimely*). The average pre-EMMA premium (discount) before adding controls is provided for each size category for comparison purposes. Control variables are defined in the Appendix. If applicable, the predicted sign of the coefficient (*Pred.*) is provided. Robust standard errors (in parentheses) are clustered at the bond level. The ***, **, and * denote statistical significance at 1%, 5%, and 10% levels (two-tailed), respectively. The adjusted R-squared (within) describes the extent to which the regression explains variation in markups and markdowns within bonds. The adjusted R-squared (overall) describes the extent to which cross-sectional variation in the dependent variable (markup / markdown) is explained.

Table 6, Continued

Panel A: Relationship between improved disclosure compliance and markups							
	Pred.	(1)	(2)	(3)	(4)	(5)	(6)
SmRet	+	4.17	23.87	5.14	24.10*	5.36	11.75
		(7.94)	(15.15)	(8.65)	(12.29)	(9.99)	(12.19)
SmRet*Post	-	-20.75***	-1.04	-24.82***	12.28	-29.26***	-21.39
		(6.99)	(13.66)	(7.22)	(17.52)	(9.43)	(13.05)
LgRet	+	13.34**	24.19**	13.95**	27.35**	23.95***	14.97
		(5.96)	(11.32)	(6.66)	(11.22)	(8.54)	(10.55)
LgRet*Post	-	-14.19**	6.10	-17.59***	11.18	-20.73**	-15.02
		(6.02)	(14.16)	(6.21)	(16.67)	(7.99)	(11.51)
SmInst	+	10.04*	6.46	12.06*	11.70	25.70**	2.58
		(5.24)	(9.25)	(6.14)	(9.64)	(11.01)	(9.22)
SmInst*Post	-	-9.42*	0.68	-12.77**	15.10	-19.28*	-8.96
		(5.65)	(13.27)	(6.08)	(15.55)	(9.80)	(10.73)
Post	+/-	9.57	1.68	11.62	-10.33	4.22	16.91
		(7.92)	(13.18)	(8.60)	(22.22)	(13.38)	(13.19)
Treasury	+	15.69***	2.77	15.41***	13.90**	22.85***	20.15***
		(4.11)	(10.01)	(4.61)	(6.32)	(7.77)	(6.20)
AAA GO yield	+	22.79***	24.41**	26.84***	5.95	28.63***	18.76*
		(5.85)	(11.31)	(6.51)	(7.74)	(10.64)	(9.50)
Risk premium	+	14.00**	15.90	12.44**	18.63	11.11	19.22**
		(5.62)	(13.62)	(5.78)	(15.16)	(9.08)	(8.67)
GSP		-100.71	-48.34	-147.74	68.30	-146.60	-81.51
		(102.13)	(134.01)	(116.20)	(92.37)	(181.89)	(79.47)
Age	+	-3.95	6.63	-4.70	3.98	7.12	-8.24**
		(3.77)	(7.87)	(4.14)	(6.03)	(8.05)	(3.62)
Time to maturity	+	-0.19	-2.93	-1.88	10.85***	0.27	4.12
		(2.86)	(3.64)	(3.15)	(3.82)	(5.59)	(5.44)
Ln(Trade size)	-	-6.72***	-3.55	-6.76***	-6.95***	-9.09***	-5.14***
		(0.95)	(3.10)	(1.05)	(1.92)	(1.31)	(1.34)
Ln(Volume)	+	3.70***	4.27	3.67***	3.86***	5.63**	2.77**
		(0.88)	(2.72)	(0.97)	(1.29)	(2.14)	(1.21)
>1 day in inventory	-	-11.48***	-11.17*	-11.80***	-9.76***	-13.00***	-10.06***
		(1.77)	(5.69)	(2.05)	(3.35)	(3.53)	(2.53)
Sample		Newly Compliant	Never Compliant	Newly Compliant	Newly Compliant	Newly Compliant	Newly Compliant
Sub-Sample				Rev	Non-Rev	Timely	NotTimely
Pre-EMMA SmRet		47.69	32.98	50.65	38.09	69.47	43.25
Pre-EMMA LgRet		40.72	24.43	43.28	32.87	61.81	35.98
Pre-EMMA SmInst		24.83	8.64	27.50	15.55	46.26	17.60
Observations		80,421	16,009	69,666	10,755	26,766	34,772
Number of bonds		393	100	262	131	80	149
R-squared (within)		0.06	0.05	0.07	0.06	0.09	0.06
R-squared (overall)		0.39	0.39	0.37	0.35	0.28	0.43

Table 6, Continued

Panel B: Relationship between improved disclosure compliance and markdowns							
	Pred.	(1)	(2)	(3)	(4)	(5)	(6)
SmRet	+	8.59	-9.46	12.98	-8.70	42.33***	12.43
		(9.57)	(12.24)	(10.28)	(20.36)	(12.09)	(12.68)
SmRet*Post	-	-26.40***	3.90	-21.87**	-51.18**	-20.36	-20.31
		(10.15)	(17.11)	(10.76)	(22.77)	(17.68)	(12.23)
LgRet		-3.02	-15.42	-0.26	-16.91	30.65**	-5.99
		(8.91)	(9.88)	(9.80)	(15.38)	(12.34)	(11.01)
LgRet*Post	-	-17.18**	3.49	-14.32	-33.41**	0.95	-15.19
		(8.42)	(15.15)	(9.12)	(15.89)	(12.53)	(11.77)
SmInst		-4.26	-18.49**	-2.51	-20.39*	15.06	2.10
		(6.85)	(8.66)	(7.64)	(11.67)	(12.06)	(11.32)
SmInst*Post	-	-7.42	6.90	-4.08	-26.86*	10.34	-7.74
		(6.92)	(16.56)	(7.52)	(14.19)	(11.51)	(11.78)
Post		18.03	-31.88	16.14	25.96	1.75	4.68
		(11.97)	(19.40)	(13.07)	(20.61)	(14.95)	(12.42)
Treasury	+	-4.13	-8.36	-3.96	-4.59	-3.39	3.21
		(3.01)	(5.83)	(3.17)	(8.83)	(5.57)	(4.42)
AAA GO yield	+	17.27***	28.50***	19.18***	5.95	19.33**	14.83*
		(4.80)	(6.22)	(4.96)	(13.69)	(7.62)	(7.48)
Risk Premium	+	8.58	-12.95	8.76	9.33	6.72	3.91
		(6.45)	(7.98)	(7.01)	(12.78)	(7.55)	(7.36)
GSP		-45.31	65.98	-83.24	140.17	-285.11*	105.30*
		(95.46)	(103.69)	(101.82)	(93.52)	(158.50)	(53.60)
Age	+	-0.88	-2.19	-0.53	-3.86	-3.73	6.42***
		(2.63)	(4.70)	(2.78)	(5.80)	(3.73)	(2.33)
Time to maturity	+	6.18***	-7.44	6.39**	1.26	5.39	-0.59
		(2.24)	(4.91)	(2.49)	(4.22)	(3.87)	(3.45)
Ln(Trade size)	-	-17.65***	-23.81***	-17.37***	-19.54***	-11.36***	-19.82***
		(1.97)	(2.13)	(2.13)	(4.22)	(2.83)	(2.27)
Ln(Volume)	+	8.11***	4.56***	7.90***	10.48***	3.31	9.48***
		(1.41)	(1.54)	(1.52)	(2.58)	(2.09)	(1.48)
>1 day in inventory	-	-26.25***	-18.66***	-26.29***	-24.45***	-27.03***	-27.75***
		(2.17)	(2.80)	(2.39)	(4.82)	(4.30)	(2.80)
Sample		Newly Compliant	Never Compliant	Newly Compliant	Newly Compliant	Newly Compliant	Newly Compliant
Sub-Sample				Rev	Non-Rev	Timely	NotTimely
Pre-EMMA SmRet		64.43	63.32	66.58	54.72	73.62	59.84
Pre-EMMA LgRet		37.70	31.41	39.90	25.82	49.72	28.83
Pre-EMMA SmInst		19.30	7.77	21.49	6.70	29.58	15.02
Observations		26,503	12,051	23,213	3,290	8,821	9,893
Number of bonds		246	87	187	59	61	93
R-squared (within)		0.12	0.10	0.12	0.13	0.12	0.13
R-squared (overall)		0.22	0.19	0.22	0.18	0.19	0.24