Is the Playing Field Really Level? Evidence from Bond-loan Dualholding

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Abstract

Using a novel phenomenon of bondholders on lending syndicates (i.e., bond-loan dualholding), this paper examines whether and how much lenders value their information advantage when borrowers have on-going access to bond markets. We first show that loans issued to borrowers with bond-loan dualholders have spreads that are 6% higher than those without, suggesting that lenders ask for compensation in terms of higher spreads for concerns over losing their information advantage via dualholding. For identification, we use financial institution mergers that result in the formation of bond-loan dualholders and examine its effect on loan spreads. Using data on loan amendments and bondholder trading, we show that dualholding bondholders' informed trading around major corporate events could be one important channel through which lenders' private information is disseminated to bond markets. Additional analysis using the implementation of the Volcker Rule provides corroborative evidence on the channel. Finally, we show that the presence of dualholders results in less information asymmetry and low bondholder concentration in the bond market with implications for corporate financial policy. We conclude that lenders value their information advantage over bondholders even in seemingly transparent borrowers and price in the potential loss of such advantage during the loan contracting process.

Keywords: bond-loan dualholders; information advantage; information spillover; loan spreads; loan amendments; informed trading

JEL classifications: G20, G32

"... the banker must not only know what the transaction is which he is asked to finance and how it is likely to turn out, but he must also know the customer, his business and even his private habits, and get, by frequently 'talking things over with him,' a clear picture of his situation."

– Schumpeter 1939, p. 116

1 Introduction

Banks are special due to their ability to produce valuable private information about borrowers, through repeated interactions and monitoring (Diamond, 1984, 1991; Fama, 1985; Rajan, 1992). In this paper, we ask whether banks still possess any information advantage when their borrowers have on-going access to corporate bond markets. On the one hand, the playing field is seemingly level for private and public lenders in such firms due to disclosure requirements for bond issuance and information dissemination via bond market trading. On the other hand, banks' information is mostly soft information collected over time through frequent and personal contacts between the borrower and the loan officer (Parlour and Plantin, 2008; Liberti and Petersen, 2019; Gustafson, Ivanov and Meisenzahl, 2021). It is unclear how much such information can be replicated and transmitted outside the bank. Taking advantage of a novel phenomenon of bondholders on lending syndicates (i.e., bond-loan dualholding), we come up with a clean estimate of banks' information rents when they compete with bondholders. Moreover, using data on loan amendments and bondholder trading, we delineate one important channel through which banks' private information is transmitted to bond markets. Given that the largest firms in the economy tend to borrow from multiple sources (Rauh and Sufi, 2010; Colla, Ippolito and Li, 2013), our findings will have important implications for corporate financial policy as well as the well-functioning of both loan and bond markets.

When bondholders are lenders, information flows within financial conglomerates give bondholders access to private information about borrowers that is unique to lenders (Massa and Rehman, 2008; Ivashina and Sun, 2011; Massoud et al., 2011; Lowry, Rossi and Zhu, 2019).[1] This may reduce lenders' information advantage hence their bargaining power vis-à-vis bondholders during debt

[1] In this paper, we use banks and lenders interchangeably as banks were dominant in the syndicated loan markets until the end of 1990s; since 2000s, institutional lenders such as insurance companies and mutual funds have become active participants (Ivashina and Sun, 2011).

renegotiation. Relatedly, lenders are also less capable of "holding up" borrowers in future financing when bondholders have access to their private information. Anticipating the potential for information leakage and/or inability to hold-up borrowers, lenders will require a higher spread for borrowers with dualholders, which will be our estimate of lenders' information advantage when borrowers have on-going access to bond markets.

There are two strands of the literature that empirically evaluate the importance of banks' information advantage. The first set of papers rely on event studies or firms' financing choices to shed light on the presence of banks' information advantage (see, for example, James, 1987; Houston and James, 1996; Datta, Iskandar-Datta and Patel, 1999). The second set of papers resort to corporate events such as initial public offerings (IPOs) of bonds that "level the information field" for banks and arm's-length lenders to examine how banks' information advantage vis-à-vis outside lenders changes and their implications for loan pricing (see, for example, Hale and Santos, 2009; Schenone, 2010). Our setting of using bond-loan dualholding differs from prior work relying on major information events in two important ways.

First, when using a borrower's access to bond markets as an information event, the information in question is public disclosures associated with equity/bond IPOs. As a result, the drop in loan spreads documented from prior work is an estimate of the drop in the amount of banks' information advantage vis-à-vis other lenders due to public disclosures and bond market trading, and is not an estimate of the amount of private information possessed by banks through repeated interactions and monitoring. In contrast, our setting of bond-loan dualholding allows us to precisely estimate how much banks value their *private* information advantage over bondholders when they are concerned about the potential of losing such advantage and hence ask for compensation via higher spreads. As far as we are aware, this has not been done prior to our paper.

Second, a borrower's access to bond markets not only represents a drop in the amount of banks' information advantage (as intended) but also introduces new competition to banks. Both could play a role in banks' offering more competitive loan pricing, and it is not easy to disentangle. In contrast, using a sample of firms with both loans and bonds outstanding essentially accounts for on-going private-public lender competition, enabling a clean estimate of the magnitude of banks' anticipated loss of their (private) information advantage vis-à-vis bondholders.

Using a hand-matched sample of 5,760 syndicated loans issued by borrowers with loans and bonds outstanding as well as detailed information on their bondholders over the period 1999–2018, we first show that loans issued by borrowers with bond-loan dualholders have spreads that are 6% higher than those without. In terms of economic significance, this spread difference corresponds to a ten basis point-increase in the cost of loan financing compared to an average loan in the sample. We interpret this value as an estimate of private lenders' information rents lost due to the presence of bond-loan dualholders that makes lenders worry about losing their information advantage and hence ask for compensation in terms of higher spreads. Our main finding remains after controlling for lender-specific lending standards and a host of fixed effects. We further show that the loan spread effect is larger in cases when lenders are at a greater information advantage over bondholders, such as when borrowers are in more complex information environments, or when lenders have stronger incentives to collect information about borrowers, such as when there are fewer lenders on the lending syndicate.

To delineate the channel through which lenders lose their information advantage to bondholders, we utilize an information event - material loan amendments to examine dualholding bondholders' trading. It is well established that there are information flows within a financial conglomerate (see, for example, Massa and Rehman, 2008; Ivashina and Sun, 2011; Massoud et al., 2011; Lowry, Rossi and Zhu, 2019). When lenders have access to private information disclosed during loan amendments, it creates the possibility for bond-loan dualholders to trade on that piece of information in the bond market. We expect that dualholding bondholders will profit from trading on bonds of a borrower involved in loan amendments compared to other bondholders who are not dualholders. To test our conjecture, we start with a sample of material loan amendments recorded by DealScan, and we require borrowers involved have bond-loan dualholders at the time of a loan amendment. We then construct a control sample of (pure) bondholders at the time of the loan amendment matched by investor type and size. Finally, we compare excess returns by the dualholders with those by the control bondholders in the quarter when material loan amendments become effective. We show that dualholding bondholders earn significantly higher excess returns at 4.3% (annualized) around loan amendments compared to their peers who do not have access to such privileged information about their borrowers. We interpret this finding as suggestive evidence that dualholders facilitate information spillover from the loan side to the bond side.

To provide further evidence on the channel, we utilize a regulatory change during our sample period - the introduction and enforcement of the Volcker Rule that prohibits banks in our sample from proprietary trading. In our setting, we have shown that private information gained from the loan side can be used to make profitable trades on the bond side. We hypothesize that after the Volcker Rule, when bank dualholders could no longer directly profit from private information gained on the loan side (via proprietary trading), they are less likely to exploit information flows within their conglomerates. As a result, lenders are less concerned about losing their information advantage to bondholders, and the effect of dualholders on loan spreads will be weakened or even disappear. Consistent with our conjecture, we show that, after banks ceased proprietary trading, there is no significant association between the presence of dualholders in a borrower and its loan spread, suggesting that information spillover and hence lenders' concern about losing their information advantage over bondholders are behind our main findings.

One concern about our main findings is that bond-loan dualholders do not form randomly. It may be the case that bondholders tend to participate in lending syndicates of poorer quality firms that face higher borrowing costs to start with. This may explain why syndicated loans issued by borrowers with bond-loan dualholders are associated with higher spreads. There could also be reverse causality such that higher spreads attract bond-loan dualholding lenders, rather than higher spreads are compensation for lenders' potential loss of information advantage.

To address these endogeneity concerns, we exploit a quasi-natural experiment of mergers between financial institutions that result in the formation of bond-loan dualholders and examine the casual effect of borrowers with dualholders on their loan spreads using a difference-in-differences approach. Mergers between financial institutions are often driven by regulatory and technology shocks (Harford, 2005; He and Huang, 2017). Therefore, such mergers are unlikely to be related to the fundamentals of the portfolio firms of the merging institutions. When two institutions merge, bond-loan dualholders are created if one merging institution is a bondholder and another merging institution is a lender of the same firm. The treatment sample consists of firms with merger-induced bond-loan dualholders. The control sample consists of firms matched to the treated firms by size, leverage, operating performance, and Altman Z-score. We show that controlling for selection, syndicated loans issued by borrowers with bond-loan dualholders have loan spreads that are 29%-39% higher than those without.

We next examine the implications of information spillover from the loan side to the bond side for bond market liquidity. Using different measures of bond market liquidity, we find that the presence of dualholding bondholders results in low information asymmetry and low bondholder concentration in the bond market. In net, trading by dualholders makes the bond market more informationally transparent and more liquid with a more diverse bondholder base.

In additional analysis, we show that conditional on capital raising, the presence of bond-loan dualholders is negatively associated with debt issuance, and positively associated with equity issuance. Taken together, the presence of bond-loan dualholders makes debt financing less likely and is associated with more costly equity financing.

We conclude that banks value their information advantage over bondholders even in seemingly transparent borrowers and price in the potential loss of such advantage during the loan contracting process.

Our paper contributes to the long-standing banking literature on banks being special in terms of their information collection and monitoring roles (Diamond, 1984, 1991; Fama, 1985; Rajan, 1992). We provide evidence on the presence and magnitude of banks' information rents when borrowers have on-going access to bond markets and thus are in relatively transparent information environments, which is new and complements the large empirical literature evaluating the importance of banks' information advantage (see, for example, James, 1987; Houston and James, 1996; Datta, Iskandar-Datta and Patel, 1999; Hale and Santos, 2009; Schenone, 2010).

Our paper also contributes to the literature on informed trading and coordinated decision-making (or cross-subsidy) within financial conglomerates. Prior work shows that information flows within conglomerates, resulting in the superior performance of affiliated funds due to their access to information only available to lenders within the same conglomerate (Massa and Rehman, 2008; Ivashina and Sun, 2011; Massoud et al., 2011; Lowry, Rossi and Zhu, 2019). As far as we are aware, we are the first to document informed trading in the bond market due to bond-loan dualholders' access to privileged information in the loan market and the unintended consequence of higher borrowing costs for those portfolio firms.

Finally, our paper contributes to a growing literature on the dual ownership of a firm's equity and debt by different types of institutional investors. Prior work on dualholdings of equity and loans (bonds) find that borrowing firms tend to benefit in terms of lower costs of borrowing,

greater credit supply, fewer investment restrictions, greater investment efficiency, and executive compensation design that discourage risk-taking (Jiang, Li and Shao, 2010; Ferreira and Matos, 2012; Chava, Wang and Zou, 2017; Chu, 2018; Anton and Lin, 2020; Chen, Zhang and Zhu, 2023). In this paper, we study creditor dualholding, a new and growing phenomenon that has not been examined in the finance literature. Our findings that bond-loan dualholders facilitate information transmission from the loan side to the bond side have important implications for bond market liquidity and corporate financial policy.

2 Literature Review and Our Empirical Strategy

2.1 Literature review on banks' information advantage

Diamond (1984) develops a theory of financial intermediation and delegated monitoring based on an intermediary's (i.e., a bank's) cost advantage in information collection and monitoring. Fama (1985) highlights two institutional features that make banks effective monitors: 1) bank loans are short-term and the renewal process triggers periodic evaluation of a borrower's ability to meet fixed payoff contracts; and 2) bank borrowers are usually also depositors. As a result, banks have an ongoing history of financial information that gives them a comparative cost advantage in making and monitoring repeated short-term loans. Fama (1985) argues that loan renewal is a positive signal of borrower quality to the public market. Diamond (1991) provides a theory of individual and aggregate bank loan demand and concludes that firms borrowing through banks build up a reputation to transition to public debt markets, suggesting a certification role of bank monitoring.

In a seminal paper on banking, Rajan (1992) highlights that banks' private information is a double-edged sword. On the one hand, as a result of banks' screening and monitoring, these private lenders have the capacity to provide cheap "informed" financing as opposed to costly "uninformed" or arm's-length financing. On the other hand, banks' private information gives them bargaining power over borrowers' profits – "hold up" – leading to information rent extraction and more expensive financing if a borrower seeks to switch to a new funding source.

Two strands of the literature empirically evaluate the importance of banks' information advantage. The first set of papers rely on event studies or firms' financing choices to shed light on the presence of banks' information advantage. James (1987) finds significant positive abnormal returns

to firms announcing bank loan agreements, suggesting that banks provide some special service not available from other lenders. Lummer and McConnell (1989) further distinguish between new bank loans and loan renewals and find that for new loans, the excess stock return for borrowers around the loan announcement is not significantly different from zero, whereas for favorable (unfavorable) loan revisions, the excess return is significantly positive (negative). They conclude that banks have an information advantage over other capital-market participants as the result of a continuing working relationship with the borrower. Brown, James and Mooradian (1993) find positive abnormal returns around restructurings that offer equity to private lenders and senior debt to public debtholders, and negative abnormal returns when private lenders are offered senior debt and public lenders are offered equity, suggesting that private lenders are better informed about a firm's prospects than public debtholders. Using data from U.S. large publicly traded firms, Houston and James (1996) find that among firms with a single bank relationship, the reliance on bank debt is negatively related to the importance of growth opportunities. In contrast, among firms with multiple bank lending relationships, that relationship is positive. Moreover, among firms with public debt outstanding, the reliance on bank debt is positively related to the importance of growth opportunities. These authors conclude that banks' information monopoly is less important for firms that borrow from multiple lenders and/or have access to public debt markets. Datta, Iskandar-Datta and Patel (1999) examine whether bank monitoring lowers the cost of public debt financing using a sample of first-time corporate bond issuers. Ma, Stice and Williams (2019) study the effect of bank loan monitoring on public bond contract design. Both studies show that the screening and ongoing monitoring of banks benefit bondholders. The general takeaway from this strand of the literature is that banks possess significant information advantage over other capital-market participants.

The second set of papers resort to corporate events such as bond IPOs that "level the information field" for banks ("insiders" in the parlance of Rajan (1992)) and arm's-length lenders ("outsiders") to examine how banks' information advantage relative to outside lenders changes and their implications for loan pricing. Santos and Winton (2008) investigate the importance of informational hold-up costs by comparing the interest rates banks charge on their loans to bank-dependent and non-bank-dependent borrowers over the business cycle. They find that loan spreads rise in recessions, but firms with public debt market access pay lower spreads and their spreads rise

less in recessions. They conclude that these findings are consistent with Rajan (1992) that banks earn informational rents. Using bond IPOs are a major information event, Hale and Santos (2009) find that firms are able to borrow at lower interest rates compared to those prior to their bond IPOs. Moreover, firms that get their first credit ratings at the time of their bond IPOs benefit more from larger interest rate savings than those already with credit ratings at the time of their bond IPOs. Using going public as an information-releasing event that levels the playing field for banks (i.e., relationship banks and non-relationship banks), Schenone (2010) finds that after the IPO, the importance of banks' hold-up costs diminishes as the average loan spread goes down, and that loan spreads are decreasing in relationship intensity. She concludes that pre-IPO lenders exploit their information-based monopoly and extract rents from their locked-in borrowers. The general takeaway from this strand of the literature is that public disclosures associated with credit rating or equity/bond IPOs significantly reduce banks' information advantage relative to other creditors. This begs the question that in a world where borrowers have on-going access to public credit, whether and how much banks value their (private) information advantage relative to arm's length lenders, which we aim to address in this paper.

2.2 Our empirical strategy

Taking advantage of a novel phenomenon of bondholders on lending syndicates (i.e., bond-loan dualholding), we develop a clean estimate to quantify how much banks value their (private) information advantage (i.e., earn information rents) when they compete with bondholders.

When bondholders are lenders, information flows within financial conglomerates give bondholders access to private information about borrowers that is unique to lenders (Massa and Rehman, 2008; Ivashina and Sun, 2011; Massoud et al., 2011; Lowry, Rossi and Zhu, 2019). This may reduce lenders' information advantage hence their bargaining power vis-à-vis bondholders during debt renegotiation. Relatedly, lenders are also less capable of "holding up" borrowers in future financing when bondholders have access to their private information. Anticipating potential information leakage and/or inability to hold-up borrowers, lenders will require a higher spread for borrowers with dualholders, which will be our estimate of banks' information rents when borrowers have on-going access to bond markets.

Figure 1 presents the timeline for our loan spread analysis. To obtain an estimate of banks' information rents, we compare loan spreads for borrowers with and without the presence of bond-loan dualholders using the following regression specification:

$$Ln(spread)_{j,i,t} = \beta\ Bond - loan\ dualholder_{i,t-1} + \delta X_{j,i,t} + \theta Z_{i,t-1} + \alpha_t + \alpha_k + \alpha_j + \epsilon_{j,i,t}, \quad (1)$$

where $Ln(spread)_{j,i,t}$ is the natural logarithm of all-in-spread drawn on loan j to firm i in year t. The key variable of interest is $Bond - loan\ dualholder_{i,t-1}$, an indicator variable for whether a borrower has at least one bond-loan dualholder in the year prior to loan j's origination year t. If lenders worry about losing their information advantage in the presence of bond-loan dualholders, we expect lenders will ask for compensation, and β will be positive, suggesting a higher cost of borrowing.[2]

We control for a set of loan characteristics, $X_{j,i,t}$, including loan size, loan maturity, whether a loan contains a revolver, whether a loan is secured, and whether a loan includes a facility with performance pricing provisions. We also control for a set of firm characteristics, $Z_{i,t-1}$, in the fiscal year prior, that can affect loan pricing, including firm size, leverage, Tobin's Q, tangibility, institutional ownership, cash flow volatility, Altman Z score, and S&P credit rating following prior literature (see, for example, Graham, Li and Qiu, 2008; Chava, Livdan and Purnanandam, 2009; Ivashina, 2009; Lin et al., 2011; Valta, 2012; Campello and Gao, 2017). We include a set of fixed effects. Year fixed effects, α_t, based on a loan's origination year t, control for temporal trends in loan pricing. Industry fixed effects, α_k, based on borrower i's two-digit SIC industry k, control for industry differences in loan pricing. Loan purpose fixed effects, α_j, based on loan purposes recorded by DealScan such as takeover, recapitalization, and working capital management, control for heterogeneity in loan pricing due to different loan purposes.

One implication for banks' information advantage is that dualholding bondholders could potentially trade on such information in the bond market. Figure 2 presents the timeline for our informed trading analysis.

[2]Our unit of analysis for loan pricing is at the loan package level because our variable of interest – the presence of bond-loan dualholders at a borrowing firm in the year prior to the focal loan's origination – by construction, does not vary across facilities within the same package. Moreover, multiple facilities within a package are not independent, with general loan terms and pricing typically set at the package level (Hertzel and Officer, 2012). At the loan package level, loan spread is the facility-size weighted average of the spread for each facility if a package comprises multiple facilities following prior literature (see, for example, Chava, Livdan and Purnanandam, 2009, Ashcraft and Santos, 2009).

In the standard Glosten and Milgrom (1985) model, a specialist intermediates trades of buyers and sellers, some of whom may be privately informed about fundamentals. Initially, the specialist knows little about the value and charges a wide spread around the value based on all public information. As time passes (and as trades occur), the specialist's information set becomes better and converges to that of the privately informed trader (see their proposition 4). Therefore, prices become more informationally efficient over time.[3]

In our setting, when better-informed dualholding bondholders trade on private information obtained from the loan side for private gains, initially there will be widening bid-ask spreads as predicted by the market microstructure theory. However, once dualholding bondholders' private information is incorporated into bond prices, we expect bid-ask spreads for bonds with bond-loan dualholders to be smaller than similar bonds without. Moreover, as the bond prices become more efficient in the presence of bond-loan dualholders, it will draw more investors and lead to a more dispersed bondholder base.

We employ the following panel data regression to examine changes in bond market liquidity when there is information spillover from the loan side to the bond side:

$$Liquidity_{i,t} = \beta\ Bond - loan\ dualholder_{i,t-4} + \delta X_{i,t-4} + \alpha_t + \alpha_i + \epsilon_{i,t}, \tag{2}$$

where $Liquidity_{i,t}$ is the bond liquidity measure ($Roll$, $Bondholding\ HHI$, and $Ln(number\ of\ bondholders)$) for firm i in quarter t. The key variable of interest is $Bond - loan\ dualholder_{i,t-4}$, an indicator variable for whether a borrower has at least one bond-loan dualholder in the previous year. We include a set of control variables ($X_{i,t-4}$), time fixed effects (α_t), and firm fixed effects (α_i).

Combined with that there will be higher loan spreads on new loans in the presence of bond-loan dualholders, we expect that when lenders worry about losing information advantage, borrowers are more likely to resort to costly equity financing.

In summary, using a novel setting of bond-loan dualholding, we introduce a clean estimate of lenders' information rents when borrowers have on-going access to bond markets, delineate the

[3] In Kyle (1985), with a few differences from Glosten and Milgrom (1985), essentially the same result emerges. Every time a trade takes place, prices move in the informationally efficient direction. In the limit, as the number of trading opportunities goes to infinity, there is no further gain from being privately informed, as all the information is already incorporated in the price.

channel, and examine bond market liquidity and some unintended consequences when lenders lose their information advantage.

3 Sample Formation, Key Variables, and Sample Overview

3.1 Sample formation

We obtain syndicated loan data from Thomson Reuters' Loan Pricing Corporation (LPC) DealScan database and quarterly bondholding data from Thomson Reuters' Lipper eMAXX database. DealScan contains detailed information on the origination and maturity dates of a loan package along with the names of its lending banks, loan amount, terms and conditions, and other loan-specific costs. eMAXX contains quarter-end security-level par amount holdings of corporate bonds by major institutional investors (such as asset managers, banks, insurance companies, and other). Following prior studies (see, for example, Massa, Yasuda and Zhang, 2013; Cai et al., 2019), we classify a bond issue in eMAXX as a corporate bond if its first six-digit (historic) CUSIP code can be matched to a public firm in Compustat using the six-digit NCUSIP in CRSP monthly file. We focus on US corporate bond holdings by US institutions or US subsidiaries of foreign institutions.[4]

Following prior work (see, for example, Ferreira and Matos, 2012; Schwert, 2018), our definition of a lender (bondholder) is at a financial conglomerate (i.e., fund family) level. To do so, we first aggregate lenders in DealScan to their parents using the link table provided by Schwert (2018). For example, all Bank of America lenders are aggregated under the Bank of America brand. The outstanding loans by Bank One are aggregated under the JP Morgan Chase brand after the former's merger with the latter in 2004. For lenders not covered by Schwert (2018), we use the same aggregation method as his, taking into account of ownership changes due to mergers and divestitures. For institutional bondholders, eMAXX aggregates bond funds at the fund family level using managing firm IDs. However, as in DealScan, there can be multiple eMAXX managing firm IDs for one parent institution. We use a similar method as Schwert (2018) to aggregate subsidiaries or different asset managers to their parents. For example, all managing firm IDs under the BlackRock brand are aggregated under BlackRock, the parent company. After an acquisition,

[4]For example, Dresdner RCM Global Investors based in San Francisco is a subsidiary of Dresdner Bank.

the target's eMAXX ID gets passed on to the acquirer. For example, the eMAXX ID of State Street Research & Management Co. is classified as BlackRock following the completion of its acquisition by BlackRock in 2004Q4. The same rule applies to BlackRock's other acquisitions over the years such as Merrill Lynch Investment Management and Barclays Global Investors. We account for these changes in our aggregation that dynamically links each eMAXX ID to the correct corresponding parent at each point in time during our sample period. Appendix A in the Online Appendix provides detailed description of our aggregation process to create unique parent firm IDs when working with eMAXX.

We start our loan sample in 1999 because the year 1998 is the first year of eMAXX's coverage, and we employ lead-lag specification in our empirical analysis. To match borrower name in Dealscan to GVKEY in Compustat, we extend the DealScan-Compustat link table provided by Chava and Roberts (2008) to the end of 2018.[5] Table 1 Panel A lists the steps taken and filters applied to form our loan sample. Our loan sample comprises 5,760 loan packages issued to 1,224 firms over the period 1999–2018.

To examine informed trading by bond-loan dualholders in the bond market and bond market liquidity, we use bond holding information from eMAXX, bond transaction data from the enhanced historic Trade Reporting and Compliance Engine (TRACE) corporate bond database, and basic bond information such as coupon rate and frequency and first interest and last interest dates from the Mergent Fixed Income Securities Database (FISD). Table 1 Panel B lists the steps taken and filters applied to form our sample for the Roll measure. Our sample starts in July 2002 when TRACE first became available. Our sample for the Roll measure comprises 22,839 firm-quarter observations representing 1,043 firms over the period 7/2002–12/2019. Table 1 Panel C lists the steps taken and filters applied to form our sample for the bondholding concentration measures. Our bondholding sample comprises 37,996 firm-quarter observations representing 1,546 firms over the period 1999–2018.

[5] Blackstone acquired Thomson Reuters in 2018Q4, the data provider that owns DealScan, and renamed it Refinitiv. We note the data structure was significantly different following the acquisition, and we therefore end our loan sample in 2018 to avoid any potential inconsistency.

3.2 Key variables

3.2.1 Bond-loan dualholders

Our definition of bond-loan dualholders is motivated by the following observation. Different from the originate-to-distribute model for a majority of lenders of term loans (Drucker and Puri, 2009), lenders of revolving credit follow the originate-to-hold model. They commit to screening, monitoring, and investing in relationships with borrowers, producing a significant amount of unique private information about their borrowers – a quintessential prototype of banks being special. This observation motivates our definition of bond-bank dualholders limiting to lenders providing revolver loans. This refinement sharpens our estimate of the amount of banks' private information that cannot be replicated by arm's-length lenders.

To identify bond-loan dualholders, we hand-match bondholders from eMAXX with lenders from DealScan. To be a bond-loan dualholder, on the bond side, we require an institution hold at least 0.5% of a firm's bonds outstanding in order for us to capture economically meaningful bond holdings.[6] On the loan side, we require the same institution be on the lending syndicate for an active revolver loan (i.e., credit line). We note that 46% of the borrowers in our loan sample have at least one bond-loan dualholder prior to the focal loan's origination.[7]

3.2.2 Bond returns

Following Jostova et al. (2013), quarterly bond return is the difference between the "dirty" bond price (i.e., price, obtained from the enhanced TRACE, with accrued interest, which is estimated using coupon and payment date information from FISD) at the end of a quarter and the "dirty" bond price at the end of the previous quarter plus the coupon payment divided by the "dirty" bond price at the end of the previous quarter. The quarter-end bond price is the transaction-size weighted average of bond trading prices on and after the 25th of the last month in each quarter.[8]

[6] Prior literature examining equity-loan (bond) dualholding uses either 0.1% to 1% of a borrower's common stock outstanding or at least $2 million of the value of shareholding to capture economically significant holdings (see, for example, Jiang, Li and Shao, 2010; Bodnaruk and Rossi, 2016; Chu, 2018; Chen, Zhang and Zhu, 2023).

[7] Figure OA.1 plots the share of US public bond-issuing firms with bond-loan dualholders over the sample period 1999–2018. We show that there is an overall increasing trend with a significant rise after the Financial Crisis. Before 2009, on average, about a quarter of US public firms with bond-loan dualholders. Towards the end of our sample period, over a third of US public firms have bond-loan dualholders.

[8] If a quarter does not have trading activities on and after the 25th of the last month, that quarter is not included in our analysis.

Quarterly bond excess return is the difference between quarterly bond return and quarterly bond market (i.e., the ICE BofA US Corporate Index) return.

To compute quarterly bond excess return earned by different types of bondholders around loan amendments, following Ivashina and Sun (2011), we incorporate trade directions using quarterly bondholding data from eMAXX.[9] For a bondholder j, the trade direction indicator, $D_{j,i}$, takes the value of -1, 0, or 1, if, compared to the prior quarter, a bondholder reduces, does not change, or increases her position in a given bond, respectively.[10] We take average across excess returns by different types of bondholders (i.e., dualholders and non-dualholders) for each amendment as follows:

$$Bond\ excess\ return_i = \frac{1}{M}\sum_{i=1}^{M}\frac{\sum_{j=1}^{N_i} D_{j,i} ER_i}{N_i} \tag{3}$$

where N_i is the number of bondholders in bond i (N_i has two different values for dualholders and non-dualholders) and M is the number of amendments in a quarter.[11] We report annualized excess returns.

3.2.3 Bond market liquidity measures

Following prior literature (see, for example, Bao, Pan and Wang, 2011; Manconi, Massa and Zhang, 2016), we employ two bond market liquidity measures: the Roll measure and bondholding concentration.

Our first measure, the quarterly implicit bid-ask spread, $Roll$, is estimated as the serial covariance of bond i's returns in quarter t:

$$Roll_{i,t} = 2\sqrt{max(0, -cov(\Delta p_{i,t,d}, \Delta p_{i,t,d-1}))}, \tag{4}$$

[9] Following Ivashina and Sun (2011), we weight the returns by trade direction and not by bond holding size as the underlying assumption is that the direction of the trade captures the nature of inside information disclosed during loan amendments and is exogenous to dualholders, whereas the size of the bondholding could be endogenous to dualholders' portfolios.

[10] Ideally, we would like to be able to determine whether an amendment corresponds to positive (negative) information about a borrower. In reality, details about a loan amendment are highly technical, and often an amendment is triggered by covenant violations. Even when a specific reason is provided, it is hard to infer the direction of an informed trade.

[11] About three percent of the event quarters in the sample involve two amendments.

where $p_{i,t,d}$ is the natural logarithm of bond i's price on day d in quarter t, $\Delta p_{i,t,d} = p_{i,t,d} - p_{i,t,d-1}$ is the price change from trading day $d-1$ to d in quarter t. Bond prices are from the enhanced TRACE database.

Our second measure, $BondholdingHHI$, is the Herfindahl-Hirschman Index (HHI) of bondholding, i.e., the sum of the squares of each bondholder's share (in real number) in quarter t:

$$Bondholding\ HHI_{i,t} = \sum_{j \in S_i} (w_{i,j,t})^2. \tag{5}$$

We also use a simple measure of bondholding dispersion, the number of bondholders.

3.3 Sample overview

Table 2 provides summary statistics for the samples used in our analysis. Definitions of the variables are provided in Appendix Table A.1. Table 2 Panel A provides summary statistics for the loan sample. We show that the average all-in-spread drawn (AISD) relative to LIBOR is 164 basis points (bps) and the median loan spread is 142 bps. About 48% of the borrowers in our sample have at least one bond-loan dualholder. The average dollar value of bonds held by dualholding bondholders is \$11 million, and the average percentage of bonds outstanding held by dualholders is around 8%. Such level of holdings is significant given that the average non-dualholding bondholder in firms with dualholders holds around 6% of bonds outstanding (about \$7 million in value).[12] Similarly, the average dollar value of loans held by dualholding lenders is \$114 million, and their average loan share is about 13%. The level of loan share held by dualholding lenders is significant given that the average dollar value of loans held by lenders is \$51 million, and the average loan share is about 8%.[13]

[12] To obtain the average share (value) of bonds by dualholding bondholders, in the four quarters prior to a sample firm's loan issuance, we first keep the highest share (value) of each bond held by dualholders, and then average across all bonds, weighted by bond par value. The average share (value) of bonds by non-dualholding bondholders are first computed for each bond in the quarter prior to a sample firm's loan issuance, then average across all bonds, weighted by bond par value.

[13] To obtain the average loan share (value) by dualholding lenders, in the year prior to a sample firm's loan issuance, we first calculate the loan share (value) in each outstanding revolver by dualholders, and then average across all revolvers, weighted by revolver size. The average loan share (value) by non-dualholding lenders are first computed for each outstanding revolver, then average across all revolvers, weighted by revolver size. The sample size for calculating these statistics is much smaller because DealScan only has loan share information for about a third of the loans (Ivashina, 2009).

The sample average loan amount is $744 million and the average maturity is 47 months. About 85% of the loan packages contain a revolver loan, and about 39% of the loan packages are secured. Almost half the loan packages have performance pricing provisions.

Table OA.1 in the Online Appendix compares our sample loans to loans issued by US public borrowers in DealScan that are not part of our sample. We show that our sample loans have significantly lower spreads and are significantly and economically larger than other loans in Dealscan. Our sample loans also have some different characteristics from those of other loans: They are less likely to be secured and are more likely to have performance pricing provision. We further show that our sample firms are far larger, and have higher S&P ratings than the average US public borrowers.

Panel B provides summary statistics for the bond sample. The unit of observation is a firm-quarter. We show that the mean/median value of the Roll measure is 0.012/0.009. The mean/median value of *Bondholding HHI* is 0.172/0.074. The mean/median number of bondholders in our sample firms is 65/41. The share of bond-loan dualholders is 36%.

Table OA.2 in the Online Appendix provide the correlation matrices for these two samples. Examination of the correlation matrices more generally suggests little problem of multicollinearity.

4 Estimating Banks' Information Rents

4.1 Baseline results

Table 3 presents the regression results based on the main specification in Equation (1). In column (1), we show that the coefficient on the indicator variable *Bond-loan dualholder* is positive and significant, suggesting that with everything else being equal, syndicated loans issued by borrowers with bond-loan dualholders are associated with higher spreads. In terms of economic significance, this spread difference corresponds to a ten basis point-increase in the cost of loan financing compared to an average loan in the sample. We interpret this value as an estimate of private lenders' information rents that will be lost due to the presence of bond-loan dualholders and hence lenders ask for compensation in terms of higher spreads. Hale and Santos (2009) examine the implications of borrowers' bond IPOs for their cost of borrowing and find that firms that enter the public bond market with an investment (non-investment) grade benefit from a drop of 35 to 50

bps (five to 20 bps) in loan spreads. Schenone (2010) investigates the implications of borrowers' equity IPOs for their cost of borrowing and shows that firms benefit from a drop of 50 bps in loan spreads on the first loan they take out after IPOs. Given that our sample firms are large established companies with on-going access to both loans and bonds, the additional ten bps in loan spreads (relative to the sample average of 164 bps) are economically meaningful.[14]

In columns (2) to (3), we additionally include lead lender fixed effects and lead lender×year fixed effects, respectively. These fixed effects allow us to control for unobservable time-invariant and time-varying lead lender-specific characteristics that may affect loan pricing due to bank-specific lending standards and changing capital levels. Importantly, we note that our main findings remain even after accounting for potential influence on loan pricing from the credit supply side. Financial institutions may specialize in certain industries for their lending portfolios and/or their asset management divisions may also have sector-specific strategies. In column (4), we further include industry×year fixed effects to control for time-varying industry competition for loans, in addition to lead lender×year fixed effects. Our main findings remain.[15]

The economic interpretation for the coefficient on the indicator variable *Bond-loan dualholder* is that when lenders are concerned about losing information advantage to bondholders, their demand for compensation manifest in higher loan spreads. This begs the question of what happens if lenders themselves are dualholders. In the syndicated loan markets, lead lenders are responsible for due diligence and on-going monitoring of borrowers (Sufi, 2007) and thus stand to lose their information rents in the presence of bond-loan dualholders. By extension, if lead lenders themselves are bond-loan dualholders, such concern is internalized and we expect lenders will not ask for compensation. Column (5) presents the results to test this conjecture and our focus is on the standalone term *Bond-loan dualholder* and the interaction term between *Bond-loan dualholder* and *Lead is dualholder*. We show that the coefficient on the standalone dualholder indicator is positive and significant, whereas the coefficient on the interaction term is negative and significant. The

[14]It is possible that the presence of bond-loan dualholders may help align incentives of the two groups of creditors–lenders and bondholders, leading to more efficient renegotiations and workout success. Such a scenario will predict a negative association between the presence of bond-loan dualholders in a borrower and its loan spread. We note that the value of a dualholder's bond stake is usually much smaller compared to that of its loan stake, and that one or two dualholders are unlikely to change the fact that bondholders are too disperse and difficult to coordinate among themselves. In untabulated analysis, when we introduce proxies for potential conflicts between lenders and bondholders, we do not find evidence that incentive alignment is a significant consideration behind our spread result.

[15]In Table OA.3 in the Online Appendix, we further show that our main findings remain if we conduct our analysis at the loan facility level instead of at the loan package level.

F-test indicates that we cannot reject the null that there is no extra spread demanded by lenders when they themselves are dualholders (p-value at 0.027).

In untabulated analysis, we further differentiate between lead lenders and participant lenders being dualholders, between leader lenders being existing lead or not. Out of all cases, only the case that lead lenders are dualholders results in no extra spread (see column (5)), consistent with the notion that monitoring and information production are mainly the responsibilities of lead lenders and are carried out each time when a loan is issued.

4.2 Cross-sectional variations in banks' information rents

So far, we show that lenders ask for compensation for the possibility of losing their information advantage via bond-loan dualholding. We expect lenders' concerns about losing their information advantage to bondholders are greater when they exert more effort to produce information about borrowers or when lenders have strong incentives to collect information about the borrower. In those cases, it is much harder for arm's-length creditors such as bondholders to be informed about a borrower in the same way as lenders, and consequently, lenders demand higher spreads when they worry about the presence of bond-loan dualholders may make them lose their information advantage.

Borrowers in our sample are public firms with bonds outstanding and thus are large firms with a low level of information asymmetry compared to an average public firm in Compustat (see Table OA.1 in the Online Appendix). Despite various disclosure requirements, there still could be cross-sectional variations in the quality of firms' information environments if some firms invest more in intangible assets or engage in poor financial reporting practices. Therefore, information production by private lenders will be valuable. These lenders can generate valuable information about borrowers by conducting monitoring activities such as site visits, in-person meetings, and demanding financial statements on a monthly, sometimes even on a daily basis (Gustafson, Ivanov and Meisenzahl, 2021). To further explore this, we employ a number of measures for the potential value of information production by private lenders. The rationale for our measures is that the more complex information environment a borrower is in, the more valuable is information production by private lenders.

Equity analysts are important information intermediaries in the capital market. Prior work uses the number of analysts folllowing as a proxy for a firm's information environment (see, for example, Kelly and Ljungqvist, 2012; Derrien and Kecskés, 2013). The indicator variable, *High information asymmetry*, takes the value of one if the number of analysts following a firm is in the bottom sample quartile, and zero otherwise. A related measure to analyst coverage is the quality of their research output. *Ceteris paribus*, there is a negative association between a firm's information environment and its following analysts' forecast accuracy (Zhang, 2006). The indicator variable, *High analyst forecast error*, takes the value of one if analyst forecast error for a firm is in the top sample quartile, and zero otherwise. Following prior literature, we calculate analyst forecast error as the absolute difference between a firm's consensus (median) earnings per share (EPS) forecast reported by IBES and its actual EPS divided by stock price (Zhang, 2006).[16] High levels of tangible assets help reduce information asymmetry between corporate insiders and capital providers including creditor and are associated with high recovery rates for creditors (Titman and Wessels, 1988; Shleifer and Vishny, 1992; Almeida and Campello, 2007). The indicator variable, *High asset opacity*, takes the value of one if a firm's net PP&E-to-book asset ratio is in the bottom sample quartile, and zero otherwise. Lee and Mullineaux (2004) argue that small syndicates provide stronger incentives for lenders to produce information and engage in active monitoring. To capture lender monitoring incentives, we use the number of lenders on a lending syndicate, as an inverse proxy for their monitoring incentives. The indicator variable, *High lender monitoring incentive*, takes the value of one if a loan's syndicate size is in the bottom sample quartile, and zero otherwise.

Table 4 presents the results on cross-sectional variations in lenders' information rents. Columns (1)-(3) present the results when we employ different measures of borrowers' information environments. We show that lenders ask for greater compensation for the loss of their information advantage in firms with more complex operations and disclosures that even equity analysts do not get it. Column (4) further shows that lenders ask for greater compensation when they have more incentives to monitor, i.e., private information is more valuable to such lenders. These findings support our conjecture that lenders' concerns about potential information spillover from private

[16]Our main findings remain if we calculate analyst forecast error as the absolute difference between a firm's actual EPS and consensus divided by the absolute value of actual EPS or use the absolute difference directly.

credit to public credit are greater in cases when these lenders' information production is more valuable, resulting in higher loan spreads to compensate such loss.

Another way to explore potential heterogeneity is to sort dualholders by size. We expect that information flows within smaller dualholders are more efficient, lenders' concern about losing information advantage in the presence of dualholders will be more serious and hence ask for greater compensation in terms of higher spreads. Table OA.4 lists the top twenty bond-loan dualholders based on the total number of borrowing firms in which the institution is a bond-loan dualholder, and the total value of bondholdings in which the institution is a bond-loan dualholder (over the sample period). Table OA.5 presents the regression results after removing loans involving the top ten (twenty) dualholders. Consistent with our conjecture, we show that the effect of dualholders on loan spreads becomes stronger after removing loans involving the largest dualholders.

In summary, the cross-sectional variations in the relation between the presence of bond-loan dualholders and loan spreads provide supporting evidence for the existence and magnitude of lenders' information rents.

5 The Channel Analyses

So far, we have established that lenders possess information advantage over bondholders and worry about losing such advantage in the presence of bond-loan dualholders. In this section, we explore two novel settings to help establish the channel.

5.1 Evidence on information spillover

To provide evidence on information spillover from the loan side to the bond side, we need a setting in which bond-loan dualholders' access to private information about borrowers could potentially generate abnormal trading profit for them in the bond market.

Following Ivashina and Sun (2011), we use material loan amendments whereby borrowers request a change in loan amount and/or loan spread, and unanimous approval by all lenders is required. As a result, members of the lending syndicate have access to confidential information about the borrower involved in the loan amendment. If there is information spillover, we would

expect dualholding bondholders trade on such information to earn excess returns compared to bondholders of the same firm without access to such information.[17]

To conduct this analysis, we first retrieve all loan amendments from DealScan. We then manually identify material loan amendments by reading the description of the amendment event provided by DealScan.[18] We require borrowers involved in a material loan amendment to have bond-loan dualholders prior to their amendment event. To address the concern that institutions do not hold a firm's bonds by chance, and excess returns might be generated by investors' bond picking abilities, we take a matching bondholder approach. Specifically, for each dualholding bondholder of a firm involved in a material loan amendment, we use non-dualholding bondholders of the same firm around the time of loan amendment matched by manager type (as classified by eMAXX) and manager asset size (as measured at the beginning of the loan amendment quarter, in the same size quartile) following Ivashina and Sun (2011). We then merge dualholders and non-dualholders with bond transaction data from TRACE. Table OA.6 lists our sample formation steps. Our main sample comprises 211 loan amendments in 204 firm-quarters with available information on bondholders, bond transaction prices, and hence returns.

Table 5 Panel A presents the results on informed trading around material loan amendments. Panel A presents two-sample tests using quarterly excess returns by dualholders and that by non-dualholders. We show that the mean excess quarterly return of dualholders around amendments is 4.3% (annualized), whereas the mean excess quarterly return of non-dualholders around amendments is 0.009% (annualized). The two-sample t-test and Wilcoxon rank-sum test reject the null that the excess quarterly returns for the two groups of bondholders are equal.

To rule out the possibility that lenders' private information may spillover to the bond market through the equity market, we exclude loan-equity dualholders from our sample and repeat the

[17] A typical loan agreement requires a borrower to disclose "material" information in a timely fashion to its lenders. In that sense, private information provided by a borrower to its lenders is not subject to the SEC's Regulation Fair Disclosure (Ivashina and Sun, 2011).

[18] To ensure DealScan contains correct information about a material amendment, we conduct a manual check by randomly selecting observations from our DealScan amendment sample, and cross check them using corporate filings (e.g., 8-K's) on the SEC Edgar website following Ivashina and Sun (2011). Firms are required to file Form 8-K to disclose entry into material contractual agreements and amendments or restatements to such agreements. Some 8-K forms may not have been filed on the date of amendment, but can still be identified by references in Forms 10-K or 10-Q. We show examples of such information from each type of filings in Appendix Figures OA.2, OA.3, and OA.4. Overall, we conclude that amendment information provided by DealScan is mostly accurate.

analysis.[19] This filter only affects bond-loan dualholders that may hold equity at the same time, and reduces the sample to 184 amendments in 177 firm-quarters. The results are presented in Panel B. The findings in Panel B are consistent with those in Panel A, suggesting that the excess returns are not driven by information sources other than from the loan side.

One might argue that an institution's decision to invest in the bonds and loans of a given firm is endogeneous. It could be that institutions hold both the bonds and loans of a firm because they know a lot about the firm. In this case, higher excess returns associated with bond-loan dualholders could be the consequence of their superior knowledge about the firm, and not the consequence of dualholding bondholders profiting from private information about the firm. However, if dualholding institutions have better information about their portfolio firms in general, then their outperformance should not be restricted to the quarter around a material loan amendment. In Panel C, we repeat our analysis using a pseudo-amendment quarter that is one year prior to the actual amendment. We show that there is no difference in performance between dualholders and their non-dualholding peers, suggesting that dualholding bondholders' access to private information about material loan amendments is behind their significant excess returns on the bond side.

In summary, the evidence in this section suggests that bond-loan dualholders facilitate information spillover from private credit to public credit, which makes lenders less special, resulting in them demanding higher spreads.

5.2 The Volcker Rule: Evidence on (lack of) information spillover

A key premise of our empirical analysis in this paper is that there are information flows across divisions (lending and asset management) within a financial conglomerate (Gaspar, Massa and Matos, 2006; Massa and Rehman, 2008; Bodnaruk, Massa and Simonov, 2009; Ivashina and Sun, 2011; Massoud et al., 2011; Lowry, Rossi and Zhu, 2019). If any regulatory change restricts information flows from lending (loans) to asset management (bonds), then lenders will not be concerned about losing their information advantage and hence will not ask for higher spreads.

The Volcker Rule, as part of the Dodd Frank Act following the 2007-2008 Financial Crisis, prohibits banks from using own accounts for short-term proprietary trading of securities, derivatives,

[19] A loan-equity dualholder is a member of the syndicate that provides a revolver loan and simultaneously a shareholder with at least 1% of a focal firm's shares outstanding.

and options on such instruments. After a bank ceases its proprietary trading activity, its incentive to exploit within-conglomerate information flows will be significantly weaker since it loses trading profits using own accounts (Lowry, Rossi and Zhu, 2019). In our setting, lenders' concern about dualholders compromising their information advantage should become less pronounced after dualholders cease proprietary trading activity.

To implement this analysis, we start with a list of 11 banks provided by Lowry, Rossi and Zhu (2019) that ceased proprietary trading between June 2010 to July 2015 - thereafter we refer those 11 banks as the Volcker banks. To form our sample of loan-bank-year observations, we require that a borrower has an outstanding revolver with any of the Volcker banks in the year prior to the issuance of the focal loan. For this analysis, the sample period is from 2010 to 2018. The indicator variable, *Bank dualholder*, takes the value of one if any of the 11 Volcker banks in a loan-bank pair is also a dualholder in the year prior to the focal loan's origination year, and zero otherwise. The indicator variable, *Cease proprietary trading*, takes the value of one if a loan's origination year is after the year in which a bank in an loan-bank pair ceases proprietary trading activity, and zero otherwise. The indicator variable, *Post*2015, takes the value of one if a loan's origination year is after 2015, which is the deadline for banks to cease proprietary trading, and zero otherwise.

Table 6 presents the results of this analysis. Columns (1) and (2) split the sample into subsamples of loans before and after bank dualholders cease proprietary trading activity, respectively. We find that, indeed, the effect of bank dualholders on loan spread is no longer significant after these dualholders cease proprietary trading activity. In column (3), we use the full sample and include an interaction term *Bank dualholder* $\times$ *Cease proprietary trading* capturing bank dualholders ceasing proprietary trading. The F-test indicates that we cannot reject the null that there is no extra spread demanded by lenders in the presence of bank dualholders after the Volcker Rule (p-value at 0.024). In other words, lenders do not ask for compensation when there is no information spillover via bank dualholding due to the Volcker Rule. Column (4) further shows that after 2015, the deadline for bank compliance with the Volcker Rule, the effect of bank dualholders on loan spreads completely disappears. Overall, our findings provides further support for the channel analysis - when lenders are not concerned about potential information spillover to bond markets due to the Volcker Rule, they do not demand compensation for retaining their information advantage.

6 Identification Using Mergers of Financial Institutions

One concern about our estimate of lenders' information rents is that bond-loan dualholders do not form randomly. It may be the case that bondholders tend to participate in lending syndicates of poorer quality firms that face higher borrowing costs to start with. This may explain why syndicated loans issued to borrowers with bond-loan dualholders are associated with higher spreads. There could also be reverse causality such that higher spreads attract bond-loan dualholding lenders, rather than higher spreads are compensation for lenders' potential loss of information advantage.

To deal with these endogeneity concerns, we exploit an exogenous shock to the formation of bond-loan dualholders induced by mergers between financial institutions. Mergers between financial institutions are mostly driven by regulatory and technology shocks (Harford, 2005; He and Huang, 2017). Therefore, it is highly unlikely that two financial institutions make merger decisions based on the fundamentals of firms in their bond portfolios.[20] An additional benefit of our identification strategy is that there are multiple shocks (i.e., multiple mergers of financial institutions) that affect different firms at different points in time in terms of the formation of bond-loan dualholders. Identification using multiple shocks helps address the concern that there could be potential omitted variables coinciding with one single shock that directly affects the outcome variable.

To identify mergers between financial institutions, we start with major mergers of lenders recorded in the link table provided by Schwert (2018), and complement this list with mergers between 13F-filing institutions prior to 2010 provided by He and Huang (2017) and Lewellen and Lowry (2021). We further search online for major mergers between financial institutions (with US operations) since 2010 that can be matched to deals in the SDC database. The sample period for this analysis is from 2002 to 2016 given that we require a six-year event window from three-year prior to deal announcement to three-year after deal completion. We then manually match bondholders from eMAXX and lenders from DealScan to acquirers and targets involved in these deals. A firm is classified as a treated firm if one of the merging institutions holds greater than 0.5% of its bonds

[20] For example, when Bank of New York (BNY) and Mellon merged in 2007, BNY was on the lending syndicate for a five-year revolver loan to Nordstrom Inc. originated in November 2005 maturing in November 2010, while Mellon was holding 4% of Nordstrom's outstanding bonds prior to the merger. The newly merged entity BNY Mellon thus became a bond-loan dualholder of Nordstrom for reasons unrelated to Nordstrom's fundamentals that can affect its credit risk and loan spread going forward.

prior to merger completion year, while the other merging institution is on the lending syndicate for its revolver loan originated prior to and remaining active beyond merger completion year. We also require a treated firm not to have any existing bond-loan dualholders in the year prior to merger completion year.

To form our pool of potential control firms, we exclude firms experience an increase in the number of bond-loan dualholders induced by a financial institution merger, as well as those with existing bond-loan dualholders prior to a merger. Control firms are matched to a treated firm using quartiles sorted based on firm size, leverage, ROA, and Altman Z score in the year prior to merger completion among all Compustat firms with bonds outstanding. The matching criteria are chosen as these are firm characteristics most often associated with a firm's credit risk. Table OA.7 lists the sample formation steps. The final difference-in-differences (DID) sample comprises 76 loans from 24 treated firms and 311 loans from 89 control firms in association with eight merger events over the period 2002–2009.

We employ the following DID specification:

$$Ln(spread)_{m,j,i,t} = \beta Treat_{m,i,t} \times Post_{m,t} + \delta X_{j,i,t} + \theta Z_{i,t-1} + \alpha_j + \alpha_{m,t} + \alpha_{m,i} + \epsilon_{m,j,i,t}, \tag{6}$$

where $Treat_{m,i,t}$ is an indicator that takes the value of one for loan j obtained by treated firm i due to merger event m. $Post_{m,t}$ is an indicator variable that takes the value of one if a loan is obtained during the three years after deal completion, and zero if obtained during the three years before deal announcement.[21] Given that a firm may be treated by different mergers over the sample period, we include merger $\times$ firm fixed effect $\alpha_{m,i}$ to force identification through variations over time in the cost of borrowing for the same firm in a given merger event (He and Huang, 2017; Chu, 2018). This set of fixed effects also help address the potential concern that unobserved firm characteristics may affect the likelihood of a firm being affected by financial institution mergers. Alternatively, we include the less stringent merger $\times$ industry fixed effects to examine variations over time in the cost of borrowing within the same industry in a given merger event. Given that the event windows for different merger events may overlap, we also include merger $\times$ year fixed effect $\alpha_{m,t}$ to absorb common time trends across mergers. Due to high dimensional merger $\times$ firm and merger $\times$ year

[21] To ensure clean identification, we discard the year during which the merger becomes effective for each merger event (Chu, 2018).

fixed effects, the two standalone terms *Treat* and *Post* are absorbed. Equation (6) includes the same firm and loan characteristics as in Equation (1). Standard errors are clustered at the merger $\times$ firm level.

Table 7 presents the results. Panel A presents the two-sample comparison between the treated and control firms over the pre-treatment period. We show that the treatment and control firms are similar in almost all observable dimensions (with one exception regarding institutional ownership).

Panel B presents the results based on the DID specification in Equation (6). In column (1), we include merger$\times$ industry fixed effects and find that treated firms obtain loans with an average of 39% higher spread during the three years after the merger. In column (2), we include the more stringent merger$\times$ firm fixed effects, focusing on within-merger event within-firm variation in loan spread. Our main findings remain. On average, the spread on loans to the treated firms is 29% higher than that on loans to the control firms during the three years after the merger.

When conducting the DID analysis, we need to control for investment styles of merging institutions, which could be related to firm characteristics and hence these firms' loan spreads. In a refinement of our main identification scheme, we further require the control firms to have either bond- or loan-link with either of the merging institutions. This more stringent requirement results in a new DID sample comprising 74 loans from 23 treated firms and 202 loans from 58 control firms in association with the seven merger events.[22] Column (3) reports the DID results. We show that our main findings remain despite a drop in sample size.[23]

We note that the DID analysis of the causal effect of dualholders on loan spread is larger than the OLS estimate. One possible explanation is that the OLS estimate is downward biased because bond-loan dualholders by construction only exist in firms with loans and bonds outstanding, which tend to be large and transparent firms for which lenders' information advantage might be smaller. Another possible explanation is that we employ a sharp treatment whereby treated firms do not have existing bond-loan dualholders prior to the treatment, while in the baseline loan sample,

[22]The JP Morgan Chase and Bank One merger did not survive this filter because we could not find a control firm that meets the additional requirement

[23]Lewellen and Lowry (2021) raise some concerns about using merger events during the 2008 Financial Crisis for identification due to its potentially confounding effects. To ensure that our identification scheme is not subject to their critique, we remove the two mergers in 2009 and repeat the DID analysis using a reduced sample of 276 observations. It is worth noting that our main findings remain.

borrowers have existing bond-loan dualholders and the presence of dualholders is sticky. As a result, the sharp treatment effect will be larger than the on-going continuous effect of dualholding.

Figure 3 plots the dynamic treatment effect, using the deal completion year as the benchmark year (thus omitted). We show that there is no pre-existing trend in the difference between spreads on loans issued by the treated firms and those by the control firms before the merger, and the difference between loan spreads for the treated firms and those for the control firms widens over time subsequent to the merger (and induced formation of bond-loan dualholders). We conclude that the effect of information spillover via bond-loan dualholders on lenders asking for compensation for their potential loss of information advantage via loan spreads is likely to be causal.

7 Additional Investigation

7.1 Information spillover and bond market liquidity

Under our conceptual framework, we expect dualholding bondholders will trade on private information that they obtain from the loan side. As a result, bond prices will become more informationally efficient over time as predicted by Glosten and Milgrom (1985) and Kyle (1985). In this section, we employ bond transaction data from TRACE and bondholding data from eMAXX to examine bond market liquidity after informed trading takes place.

Table 8 column (1) presents the regression results relating the presence of bond-loan dualholders to the Roll measure, a widely used bond market liquidity measure. We show that there is a negative and significant association between the presence of bond-loan dualholders and the Roll measure, suggesting that information spillover from private credit to public credit helps reduce information asymmetry among bond market participants.

Table 8 columns (2) and (3) present the regression results relating the presence of bond-loan dualholders to different measures of bondholding concentration. We show that there is a negative (positive) and significant association between the presence of bond-loan dualholders and bond-holding concentration (the number of bondholders), suggesting that information spillover from private credit to public credit helps attract more bondholders with dispersed holdings.

In summary, we show that the presence of bond-loan dualholders results in less information asymmetry and more liquidity in the bond market.

7.2 Information spillover and financial policy

To explore the effect of information spillover due to bond-loan dualholders on firms' financing choices, we start with Compustat firms with bonds outstanding and construct a sample of firm-year observations with external financing activities over the period 1999–2019 from Capital IQ Transactions/Offerings. We classify a firm-year observation as having debt financing if there is an offering of "fixed income issuance," or as having equity financing if there is an offering of "follow-on equity offering."[24] The indicator variables, *Debt issuance* and *Equity issuance*, are defined accordingly. In addition to examining the propensity of debt or equity issuance, we also relate the presence of bond-loan dualholders to the volume of issuance. *Equity/Debt issuance volume* is the natural logarithm of one plus the issuance amount. Table 9 presents the regression results in which we additionally control for firm characteristics and firm and year fixed effects.

We show that there is a negative (positive) and significant association between the presence of bond-loan dualholders and both the propensity and amount of debt (equity) issuance, suggesting that lenders' concern of losing their information advantage has implications for corporate financial policy.

8 Conclusions

This paper takes advantage of a new phenomenon of bondholders on lending syndicates to assess the existence and magnitude of banks' information advantage when borrowers have on-going access to bond markets. Anticipating potential information leakage and/or inability to hold-up borrowers, lenders will require a higher spread for borrowers with dualholders, which will be our estimate of banks' information advantage.

Using a hand-matched sample of 5,760 syndicated loans issued to borrowers with loans and bonds outstanding as well as detailed information on their bondholders over the period 1999–2018, we first show that loans issued by borrowers with bond-loan dualholders have spreads that are 6% higher than those without. This spread difference is larger when lenders are at a greater information advantage over bondholders. We interpret the above findings as consistent with banks possessing

[24] Only in two percent of the cases, a firm issues both equity and debt in the same year. Removing those observations does not change our main findings.

information advantage over bondholders even in large transparent borrowers. We further show that dualholding bondholders earn significantly higher returns around loan amendments compared to their peers who are not on the lending syndicates, suggesting that one channel through which banks lose their information advantage is via dualholding bondholders' trading in bond markets. Additional analysis using the Volcker Rule whereby bank dualholders could not engage in informed trading in bond markets provides corroborative evidence on this channel. For identification, we use mergers between financial institutions that result in the formation of bond-loan dualholders and examine their presence on loan spreads. We show that loans by borrowers with merger-induced bond-loan dualholders have loan spreads that are significantly higher than those without. We next examine the implications of information spillover for bond market liquidity, and find that the presence of dualholders results in low information asymmetry and low bondholder concentration in the bond market. We further show that conditional on firms seeking external financing, those with bond-loan dualholders are less likely to raise debt capital. We conclude that banks value their information advantage over bondholders even in seemingly transparent borrowers and price in the potential loss of such advantage during the loan contracting process.

Overall, we paint a nuanced picture of information spillover from the loan side to the bond side. On the one hand, it hurts borrowing firms due to high spreads, and shapes these firms' financial policy (less loan but more equity issuance). On the other hand, it makes the bond market more liquid with less information asymmetry. Future work is called for to examine the real implications of levelling the playing field for private and public lenders.

Appendix

Table A.1. Variable definitions

This table provides detailed variable definitions. All continuous variables are winsorized at the 1st and 99th percentiles. All dollar amount is in 1998 dollars.

Variable	Definition
The loan sample	
Loan-level variables:	
Loan spread	A loan package's all-in-drawn spread (in bps) over LIBOR, computed as the facility-size weighted average of the spread for each facility if a package contains multiple facilities.
Deal size	The natural logarithm of a loan package's dollar amount.
Deal maturity	The natural logarithm of a loan package's maturity computed as the facility-size weighted average of the maturity for each facility if a package contains multiple facilities.
Revolver	An indicator that takes the value of one if a loan package contains a revolver facility, and zero otherwise.
Secured	An indicator that takes the value of one if a loan package contains a facility that is secured by collateral, and zero otherwise.
Performance pricing	An indicator that takes the value of one if a loan package contains a facility with a performance pricing provision, and zero otherwise.
Firm-level variables:	
Bond-loan dualholder	An indicator that takes the value of one if a firm has at least one bond-loan dualholder during a fiscal year, and zero otherwise. A bond-loan dualholder is a bondholder with at least 0.5% of a focal firm's bonds outstanding and simultaneously a member of the syndicate that provides a revolver loan.
Firm size	The natural logarithm of total assets.
Leverage	Book value of debt divided by the sum of market value of equity and book value of debt.
Tangibility	Net property, plant, and equipment divided by total assets.
ROA	Income before extraordinary items divided by total assets.
Tobin's Q	Sum of market value of equity and book value of debt divided by total assets.
Altman Z score	Z score is computed as $1.2\times$(working capital/total assets)$+1.4\times$(retained earnings/total assets) $+3.3\times$(EBIT/total assets)$+0.6\times$(shareholder equity/debt)$+1.0\times$(sales/total assets).
Cash flow volatility	The standard deviation of four quarterly EBITDA to total assets ratios during a fiscal year.
Institutional ownership	Fraction of shares outstanding held by institutional investors.
S&P rating	S&P credit rating score for which "AAA" level has a value of 1, 2 if "AA", 3 if "A", 4 if "BBB", 5 if "BB", 6 if "CCC" or worse, 7 if no rating.

Variable	**Definition**
High information asymmetry	An indicator that takes the value of one if a firm's analyst coverage is in the bottom sample quartile, and zero otherwise. Data is from IBES.
High analyst forecast error	An indicator that takes the value of one if a firm's analyst forecast error is in the top sample quartile and zero otherwise. Forecast error is calculated as the absolute difference between a firm's consensus (median) EPS forecast reported by IBES and actual EPS, normalized by stock price at the prior fiscal year end.
High asset opacity	An indicator that takes the value of one if a firm's tangibility is in the bottom sample quartile, and zero otherwise.
High lender monitoring incentive	An indicator that takes the value of one if a loan's syndicate size is in the bottom sample quartile, and zero otherwise.
The bond sample	
Bond excess return	Quarterly bond return minus quarterly market return on bonds, proxied by the ICE BofA Corporate Index return (from the Federal Reserve Bank at St. Louis). Following Jostova et al. (2013), bond quarterly return is the difference between the "dirty" bond price (i.e., price with accrued interest) at the end of a quarter and the "dirty" bond price at the end of the previous quarter plus the coupon payment scaled by the "dirty" bond price at the end of the previous quarter. The quarter-end price is the transaction-size weighted average of bond trading prices on and after the 25th of the last month in each quarter. Data is from the enhanced TRACE database and FISD.
Roll	Following Roll (1984), the quarterly implicit bid-ask spread is estimated as the squared root of the negative value of the serial covariance of price changes of bond j from trading day $d-1$ to d in quarter t. If the covariance value is greater than zero, we replace it with zero. Data is from the enhanced TRACE database.
Bondholding HHI	The sum of the squared value of each bondholder's holding in a firm-quarter. Data is from eMAXX.
Number of bondholders	The number of bondholders in a firm-quarter. Data is from eMAXX.
Cash holdings	Cash and short-term securities divided by total assets.
Bond share	Bonds and notes outstanding divided by a firm's total debt. Data is from Capital IQ.

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Figure 1. Timeline of firms with bond-loan dualholders and their subsequent loan issuance

This figure plots the timeline for our loan spread analysis in Table 3. We first obtain loans issued in Year t by firms with both loans and bonds outstanding. We then determine whether those issuers have bond-loan dualholders in Year $t-1$, through revolver loans and bonds.

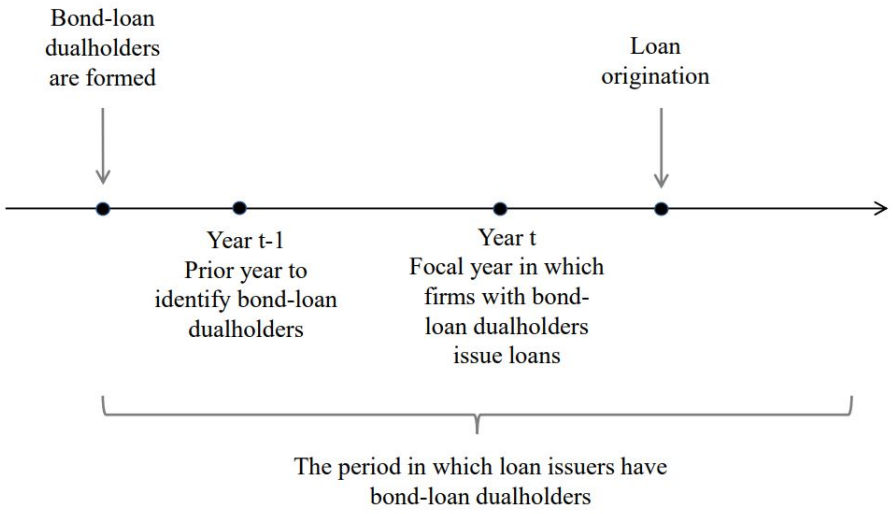


Figure 2. Timeline of bondholders' trading around loan amendments

This figure plots the timeline for our bond return analysis around loan amendments in Table 5. We first determine the event quarter in which a material loan amendment becomes effective. We then determine whether there are bond-loan dualholders who are participants of the amended revolver loan.

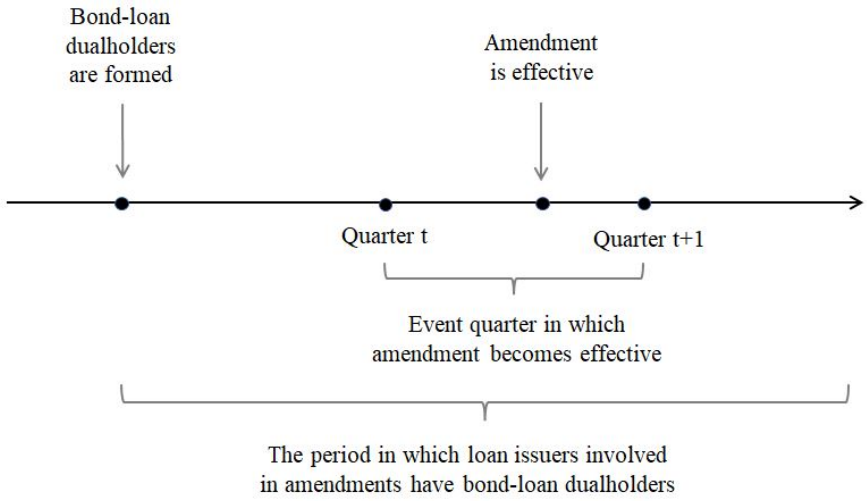


Figure 3. Dynamic treatment effect of financial institution mergers on loan spread

This figure plots the dynamic effect on treated firms' loan spreads of mergers between financial institutions that create bond-loan dualholders in those treated firms. Year T is deal completion year and hence benchmark year.

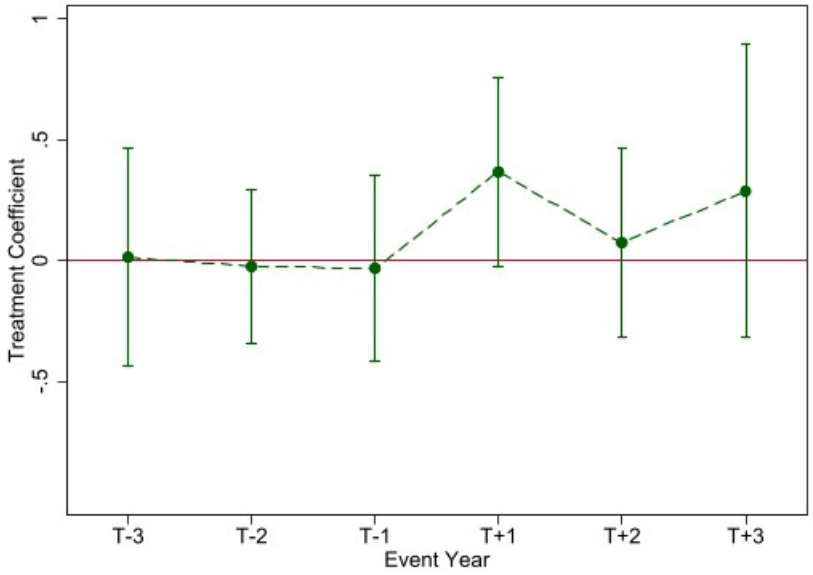


Table 1. Sample formation

This table lists steps taken and filters applied to form the loan and bond samples. In Panel A, we describe how we form the sample for loan spread analysis in Table 3. In Panel B, we describe how we form the sample for the Roll measure used in Table 8. In Panel C, we describe how we form the sample for the bondholding concentration measure used in Table 8.

Panel A: Loan sample formation

Step		# of loans
1	Loan packages originated in the US over the period 1999–2018 from DealScan	101,095
2	Exclude loans that cannot be matched to GVKEY in Compustat	60,638
3	Exclude loans with missing loan spread (or base rate not LIBOR), loan maturity, or loan amount	46,154
4	Exclude loans to borrowers in finance or utilities	26,406
5	Exclude loans to borrowers without both loans and bonds outstanding at the time of loan origination	6,846
6	Exclude loans to borrowers with missing firm financial information from Compustat	5,764
7	Exclude loans due to including loan purpose and industry fixed effects	5,760

Panel B: Bond sample formation (the Roll measure)

Step		# of transactions	# of trading days	# of bond-quarter obs.	# of firm-quarter obs.
1	Transactions over the period 7/2002 –12/2019 from TRACE after removing duplicates, withdrawn entries, and entries with correction following Dick-Nielsen (2009, 2014)	175,141,170			
2	Exclude transactions if the transaction's price change is more than 50% from a previous trade following Rossi (2014) (the price outlier filter)	175,073,707			
3	Exclude transactions if the absolute difference between the transaction's price and the median price of prior 20 transactions is more than five times of the median absolute deviation using the same 20 prices following Rossi (2014) (the median price filter)	172,344,544			
4	Exclude transactions of bonds with less than one year to maturity	149,893,131	22,109,773		
5	Exclude trading days if the gap between two trading days (to compute price change) is greater than a week or if a bond-quarter has fewer than ten observations of price change following Bao, Pan and Wang (2011)		19,245,283	511,957	103,527
6	Keep firm-quarter observations that can be matched to Compustat quarterly with full set of control variables, and are not in finance or utilities				22,839

Panel C: Bond sample formation (Bondholding HHI)

Step		# of firm-quarter obs.
1	Firm-bond-asset manager-quarter observations over the period 1999–2018 from eMAXX	42,003,450
2	Firm-asset manager-quarter observations after aggregation across bonds	24,986,915
3	Exclude eMAXX bond issuers that cannot be matched to GVKEY in Compustat	5,834,435
4	Exclude eMAXX managers flagged as "CO-MANAGED" and consolidate eMAXX managing firm IDs to unique parent ID as described in Appendix A	5,008,032
5	Compute firm-quarter bondholding HHI	89,679
6	Keep firm-quarter observations that can be matched to Compustat quarterly with full set of control variables, and are not in finance or utilities	37,996

Table 2. Summary statistics

This table presents the summary statistics for samples used in our analyses. Panel A presents the summary statistics for the baseline loan sample. Panel B presents the summary statistics for the bond sample. Definitions of the variables are provided in Appendix Table A.1.

Panel A: Loan sample summary statistics

Variable	N	Mean	SD	25th	Median	75th
Loan spread (bps)	5,760	163.70	115.60	75	142.08	225
Ln(loan spread)	5,760	4.810	0.837	4.317	4.959	5.416
Bond-loan dualholder	5,760	0.477	0.500	0	0	1
Number of dualholders(conditioned on bond-loan dualholder=1)	2,755	1.905	1.127	1	2	2
% of bonds in dualholding	2,755	0.082	0.113	0.024	0.048	0.090
Bond value in dualholding ($millions)	2,755	11.08	11.66	3.415	7.107	14.41
% of bonds held by an average non-dualholding bondholder	2,755	0.062	0.065	0.026	0.040	0.071
Bond value held by an average non-dualholding bondholder ($millions)	2,755	6.604	4.066	3.868	6.001	8.417
% of loan value in dualholding	1,532	0.129	0.082	0.070	0.113	0.167
Loan value in dualholding ($millions)	1,532	114.17	163.51	31.33	59.44	121.71
% of loan value held by an average non-dualholding lender	1,532	0.078	0.052	0.046	0.061	0.090
Loan value held by an average non-dualholding lender ($millions)	1,532	51.04	43.73	25.33	39.02	58.43
Deal amount ($millions)	5,760	744	1,087	170	373	858
Deal maturity (months)	5,760	47.02	20.41	36	60	60
Revolver	5,760	0.847	0.360	0	1	1
Secured	5,760	0.389	0.488	0	0	1
Performance pricing	5,760	0.480	0.500	0	0	1
Total assets ($millions)	5,760	7,990	14,798	1,025	2,535	7,609
Leverage	5,760	0.284	0.192	0.138	0.238	0.385
ROA	5,760	0.042	0.063	0.017	0.046	0.076
Cash flow volatility	5,760	0.009	0.010	0.003	0.006	0.011
Tobin's Q	5,760	1.723	0.812	1.185	1.494	1.988
Tangibility	5,760	0.323	0.240	0.130	0.253	0.470
Institutional ownership	5,760	0.744	0.225	0.649	0.801	0.905
Altman Z score	5,760	3.094	1.785	1.876	2.832	3.935
S&P rating	5,760	5.051	1.722	4	5	7

Panel C: Bond sample summary statistics

Variable	N	Mean	SD	25th	Median	75th
Roll	22,839	0.012	0.011	0.005	0.009	0.015
Bondholding HHI	37,966	0.172	0.233	0.038	0.074	0.184
Number of bondholders	37,966	65.388	69.243	14	41	93
Ln(number of bondholders)	37,966	3.552	1.283	2.708	3.738	4.543
Bond-loan dualholder	37,966	0.360	0.480	0	0	1
Total assets ($millions)	37,966	7,455	14,680	919	2,304	6,514
Leverage	37,966	0.275	0.189	0.135	0.226	0.373
ROA	37,966	0.007	0.030	0.002	0.011	0.020
Cash holdings	37,966	0.124	0.148	0.028	0.071	0.159
Tobin's Q	37,966	1.788	0.965	1.179	1.509	2.048
Insitutional ownership	37,966	0.748	0.261	0.647	0.810	0.921
Bond share	37,966	0.768	0.267	0.598	0.864	1

Table 3. Bond-loan dualholders and loan spread

This table presents the baseline loan-level regressions examining the relation between a borrower with the presence of bond-loan dualholders and its loan spread. *Lead is dualholder* is an indicator that takes the value of one if the lead lender of the focal loan is an existing bond-loan dualholder prior to loan issuance. The last row presents the F-test (p-value) of the null that there is no extra spread demanded by lenders when they themselves are dualholders. Definitions of the variables are provided in Appendix A.1. Industry fixed effects are at the two-digit SIC level. When including lead lender fixed effects we drop loans in which there are more than one lead lender. Standard errors (in parentheses) are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10%, respectively.

	Ln(loan spread)				
	(1)	(2)	(3)	(4)	(5)
	Baseline	Lead lender FE	Lead lender ×Year FE	Industry ×Year FE	Lead lender is bond-loan dualholder
Bond-loan dualholder	0.056***	0.066***	0.063***	0.066***	0.067***
	(0.017)	(0.016)	(0.017)	(0.018)	(0.017)
Bond-loan dualholder×Lead is dualholder					-0.049*
					(0.027)
Loan size	-0.116***	-0.096***	-0.095***	-0.100***	-0.116***
	(0.013)	(0.014)	(0.015)	(0.016)	(0.013)
Loan maturity	0.183***	0.103***	0.091***	0.096***	0.182***
	(0.016)	(0.016)	(0.017)	(0.017)	(0.015)
Revolver	-0.180***	-0.150***	-0.161***	-0.146***	-0.179***
	(0.024)	(0.024)	(0.025)	(0.026)	(0.024)
Secured	0.314***	0.307***	0.287***	0.300***	0.315***
	(0.020)	(0.020)	(0.021)	(0.022)	(0.020)
Performance pricing	-0.027	-0.021	-0.006	-0.020	-0.027
	(0.017)	(0.017)	(0.017)	(0.018)	(0.017)
Firm size	-0.047***	-0.045***	-0.050***	-0.051***	-0.046***
	(0.012)	(0.012)	(0.013)	(0.014)	(0.012)
Leverage	0.704***	0.696***	0.741***	0.746***	0.705***
	(0.073)	(0.074)	(0.078)	(0.083)	(0.073)
ROA	-0.456***	-0.356**	-0.494***	-0.814***	-0.454***
	(0.159)	(0.155)	(0.162)	(0.175)	(0.159)
Cash flow volatility	1.151	0.593	0.326	0.922	1.203*
	(0.721)	(0.696)	(0.779)	(0.831)	(0.726)
Tobin's Q	-0.017	-0.019	-0.019	-0.036*	-0.018
	(0.019)	(0.019)	(0.019)	(0.018)	(0.019)
Tangibility	-0.153**	-0.143**	-0.147**	-0.135**	-0.152**
	(0.060)	(0.060)	(0.064)	(0.064)	(0.060)
Institutional ownership	0.055	0.072*	0.070	0.110**	0.052
	(0.042)	(0.042)	(0.044)	(0.043)	(0.042)
Altman Z score	-0.044***	-0.047***	-0.044***	-0.037***	-0.044***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
S&P rating	0.075***	0.085***	0.086***	0.083***	0.076***
	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)
Year FE	Yes	Yes	No	Yes	Yes
Industry FE	Yes	Yes	Yes	No	Yes
Deal purpose FE	Yes	Yes	Yes	Yes	Yes
Lead lender FE	No	Yes	No	No	No
Lead lender×Year FE	No	No	Yes	Yes	No
Industry×Year FE	No	No	No	Yes	No
Obs.	5,760	5,470	5,284	5,084	5,760
Adj. R-squared	0.715	0.735	0.746	0.759	0.715
Null: Net dualholder effect when lead is dual = 0					0.018
					(0.027)

Table 4. Bond-loan dualholders and loan spread: Information advantage

This table presents an extension to the baseline loan-level regression, adding interaction terms between the presence of bond-loan dualholders and a number of cross-sectional variables proxying for lenders' information advantage. The last row presents the F-test (p-value) of the null that there is no extra spread demanded by dualholders in borrowers situating in more complex information environments (when lenders have greater monitoring incentives). Definitions of the variables are provided in Appendix A.1. Industry fixed effects are at the two-digit SIC level. Standard errors (in parentheses) are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10%, respectively.

	Ln(loan spread)			
	(1)	(2)	(3)	(4)
Partition variable X:	High information asymmetry	High analyst forecast error	High asset opacity	High lender monitoring incentive
Bond-loan dualholder	0.037**	0.029	0.038**	0.031*
	(0.018)	(0.019)	(0.019)	(0.017)
Bond-loan dualholder×X	0.080**	0.072**	0.063*	0.089***
	(0.036)	(0.033)	(0.035)	(0.033)
X	-0.015	0.025	0.018	0.024
	(0.025)	(0.023)	(0.031)	(0.023)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Loan purpose FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	5,760	5,187	5,760	5,760
Adj. R-squared	0.715	0.722	0.716	0.716
Null: Bond-loan dualholder + Bond-loan dualholder×X = 0	0.117***	0.101***	0.101***	0.121***
	(0.033)	(0.029)	(0.031)	(0.032)

Table 5. Bond excess returns of dualholders and non-dualholders around loan amendments

This table examines excess returns on trades in bonds of companies with loan amendments by bondholders with and without access to private information about those loan amendments. The column "Dualholders" presents excess returns to bond-loan dualholders who have access to private information about loan amendments due to their presence on the focal firm's revolver loan syndicate. The column "Non-dualholders" presents excess returns to bondholders of the same focal firm (as dualholders) who do not have access to private information about loan amendments due to their absence on the loan side. We compute bond excess return as the difference between quarterly bond return and bond market return in the quarter of a loan amendment, incorporating bondholders' trade directions (annualized). We conduct a *t*-test on the difference in means and a Wilcoxon test on the difference in medians. Panel A presents the result of this analysis. In Panel B, we exclude loan-equity dualholders from both the dualholders and non-dualholders groups. In Panel C, we present the placebo test based on the main sample in Panel A. The sample size is smaller due to data availability. Definitions of the variables are provided in Appendix A.1.

Panel A: Dualholders' quarterly excess returns around loan amendment

	Dualholders		Non-dualholders		Dualholders - non-dualholders	
	Mean	Median	Mean	Median	Mean difference (t-test)	Median difference (Wilcoxon)
Bond excess return	0.043**	0.006	-0.006	-0.003	0.049**	0.009**
Obs.	204		204			

Panel B: Excluding loan-equity dualholders

	Dualholders		Non-dualholders		Dualholders - non-dualholders	
	Mean	Median	Mean	Median	Mean difference (t-test)	Median difference (Wilcoxon)
Bond excess return	0.051*	0.008	-0.004	-0.002	0.055**	0.010*
Obs.	177		177			

Panel C: Placebo test

	Dualholders		Non-dualholders		Dualholders - non-dualholders	
	Mean	Median	Mean	Median	Mean difference (t-test)	Median difference (Wilcoxon)
Bond excess return	-0.008	0.000	-0.001	0.000	-0.007	0
Obs.	151		151			

Table 6. Information spillover and loan spread: The Volcker Rule

This table compares the effect of dualholders on loan spread before with that after bank dualholders had to cease proprietary trading activity due to the Volcker Rule. We start with a list of 11 banks provided by Lowry, Rossi and Zhu (2019) that ceased proprietary trading between June 2010 to July 2015. To form our sample, we require that a borrower has an outstanding revolver with any of the Volcker banks in the year prior to the issuance of the focal loan, resulting in 1,857 loan-bank-year observations over the period 2010–2018. The indicator variable, *Bank dualholder*, takes the value of one if any of the 11 Volcker banks in a loan-bank pair is also a dualholder in the year prior to the focal loan's origination year, and zero otherwise. The indicator variable, *Cease proprietary trading*, takes the value of one if a loan's origination year is after the year in which a bank in an loan-bank pair ceases proprietary trading activity, and zero otherwise. The indicator variable, *Post*2015, takes the value of one if a loan's origination year is after 2015, which is the deadline for banks to cease proprietary trading, and zero otherwise. The last row presents the F-test (p-value) of the null that there is no extra spread demanded by lenders in the presence of bank dualholders after the Volcker Rule. Definitions of the variables are provided in Appendix A.1. Industry fixed effects are at the two-digit SIC level. Standard errors (in parentheses) are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10%, respectively.

	Ln(loan spread)			
	(1)	(2)	(3)	(4)
	Before bank ceases prop. trading	After bank ceases prop. trading		
Bank dualholder	0.118***	0.026	0.112***	0.056**
	(0.037)	(0.025)	(0.033)	(0.024)
Bank dualholder×Cease proprietary trading			-0.087**	
			(0.037)	
Cease proprietary trading			0.012	
			(0.042)	
Bank dualholder×Post2015				-0.052*
				(0.031)
Controls	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Loan purpose FE	Yes	Yes	Yes	Yes
Obs.	499	1,352	1,857	1,857
Adj. R-squared	0.599	0.621	0.626	0.626
Null: Net effect of bank dualholder after Volcker Rule = 0			0.025	0.004
			(0.024)	(0.029)

Table 7. Identification using mergers of financial institutions and DID analysis

This table presents the difference-in-differences (DID) regression analysis. For identification, we employ a sample of mergers between financial institutions that results in the formation of dualholders for reasons exogenous to loan spread of these merging institutions' (loan or bond) portfolio firms. A firm is classified as treated if one merging institution holds greater than 0.5% of its bonds outstanding, and the other merging institution is on the syndicate of its revolver loan, all prior to the merger event. We further require a treated firm not to have any existing bond-loan dualholders prior to the merger event. Control firms are matched to treated firms using quartiles sorted by firm size, leverage, ROA, and Altman Z score in the year prior to the merger event. Panel A presents the two-sample comparison between the treated and control firms in terms of firm characteristics over the three-year pre-treatment period. We conduct a t-test on the difference in means and a Wilcoxon test on the difference in medians. Panel B presents the result of the DID regression. *Treat* is an indicator variable that takes the value of one for treated firms, and zero otherwise. *Post* is an indicator variable that takes the value of one for the three-year post-treatment period, and zero for the three-year pre-treatment period. Column (3) imposes more stringent requirements on the control firms whereby we require them have either a bond- or loan-link with either of the merging institutions to control for investment styles of those institutions in the DID analysis. The set of control variables are the same as those in Table 3 and are omitted for brevity. Definitions of the variables are provided in Appendix A.1. Industry fixed effects are at the two-digit SIC level. Standard errors (in parentheses) are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Pre-treatment comparison

	Treat		Control		Difference	
	Mean	Median	Mean	Median	Mean	Median
Loan spread	111.61	87.50	124.60	87.50	-12.99	0.00
Firm size	7.859	7.738	7.990	7.765	-0.131	-0.027
Leverage	0.246	0.211	0.235	0.190	0.011	0.021
ROA	0.056	0.059	0.055	0.051	0.001	0.008
Cash flow volatility	0.008	0.007	0.009	0.006	-0.001	0.001
Tobin's Q	1.729	1.707	1.888	1.733	-0.159	-0.026
Tangibility	0.320	0.224	0.327	0.259	-0.007	-0.035
Institutional ownership	0.776	0.792	0.713	0.752	0.064*	0.040
Altman Z score	3.559	3.215	3.413	3.079	0.146	0.136
S&P rating	5.044	5.000	4.812	4.000	0.233	1.000

Panel B: Difference-in-differences analysis

	Ln(loan spread)		
	(1)	(2)	(3)
Treat×Post	0.330**	0.251**	0.237*
	(0.147)	(0.119)	(0.120)
Treat	-0.191	-	-
	(0.123)	-	-
Controls	Yes	Yes	Yes
Loan purpose FE	Yes	Yes	Yes
Merger×Year FE	Yes	Yes	Yes
Merger×Industry FE	Yes	No	No
Merger×Firm FE	No	Yes	Yes
Obs.	387	387	276
Adj. R-squared	0.802	0.818	0.820

Table 8. Information spillover and bond market liquidity

This table presents firm-quarter regressions examining the relation between the presence of bond-loan dualholders and bond market liquidity. In column (1), the dependent variable, *Roll*, is the quarterly implicit bid-ask spread, estimated as the squared root of the negative value of serial covariance of price changes of bond j from trading day $d-1$ to d in quarter t. In column (2), the dependent variable, *Bondholding HHI*, is the sum of the squared value of each bondholder's holding (in real number) in a firm-quarter. In column (3), the dependent variable is $Ln(number\ of\ bondholders)$. Definitions of the variables are provided in Appendix A.1. Standard errors (in parentheses) are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10%, respectively.

	Roll (1)	Bondholding HHI (2)	Ln(number of bondholders) (3)
Bond-loan dualholder	-0.001***	-0.020***	0.162***
	(0.000)	(0.004)	(0.019)
Firm size	-0.002***	-0.070***	0.568***
	(0.000)	(0.008)	(0.032)
Leverage	0.008***	-0.045*	0.490***
	(0.002)	(0.023)	(0.098)
ROA	-0.001	-0.085	0.408**
	(0.004)	(0.059)	(0.184)
Cash holdings	0.001	0.071**	-0.179
	(0.001)	(0.029)	(0.114)
Tobin's Q	-0.000	-0.010**	0.072***
	(0.000)	(0.004)	(0.017)
Institutional ownership	-0.001	-0.041**	0.099
	(0.001)	(0.019)	(0.072)
Bond share	-0.002***	-0.055***	0.312***
	(0.001)	(0.012)	(0.044)
Firm FE	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Obs.	22,790	37,904	37,904
Adj. R-squared	0.372	0.686	0.882

Table 9. Information spillover and external financing choices

This table presents firm-year regressions examining the relation between the presence of bond-loan dualholders and firms' financing choices, conditional on them raising any external capital. The sample period is 1999–2019. The indicator variable, *Debt (equity) issuance*, takes the value of one if a firm chooses debt (equity) for external financing in a given year, and zero otherwise. *Debt (equity) issuance volume* is the natural logarithm of one plus the dollar value of debt (equity) issuance by a firm for its external financing in a given year. Definitions of the variables are provided in Appendix A.1. Standard errors (in parentheses) are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10%, respectively.

	Debt issuance		Equity issuance	
	Propensity	Volume	Propensity	Volume
	(1)	(2)	(3)	(4)
Bond-loan dualholder	-0.045***	-0.898***	0.044**	0.835**
	(0.014)	(0.279)	(0.018)	(0.344)
Firm size	0.076***	1.872***	-0.134***	-2.426***
	(0.020)	(0.392)	(0.023)	(0.443)
Leverage	-0.208***	-4.654***	0.361***	6.823***
	(0.080)	(1.589)	(0.091)	(1.753)
ROA	0.168	3.983	-0.279*	-5.284*
	(0.133)	(2.665)	(0.144)	(2.810)
Cash holdings	0.075	1.644	-0.332**	-6.492**
	(0.111)	(2.151)	(0.133)	(2.554)
Tobin's Q	-0.044***	-0.809***	0.053***	1.100***
	(0.016)	(0.311)	(0.018)	(0.355)
Tangibility	0.177	3.287	-0.279**	-5.192*
	(0.109)	(2.115)	(0.139)	(2.691)
Institutional ownership	0.165**	3.035**	-0.161**	-2.895*
	(0.064)	(1.267)	(0.075)	(1.500)
Altman Z score	0.025***	0.470***	-0.012	-0.223
	(0.009)	(0.170)	(0.009)	(0.172)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs.	3,391	3,391	3,391	3,391
Adj. R-squared	0.299	0.351	0.336	0.320

Online Appendix

Online Appendix to

"Is the Playing Field Really Level? Evidence from Bond-loan Dualholding"

A Cleaning up eMAXX institution IDs

Since our definition of bond-loan dualholders is at the parent firm level, we need to consolidate wholly-owned subsidiaries (with separate reporting) into their parent and to account for the impact of corporate events (such as M&As and divestitures) on subsidiary-parent link at different points in time over our sample period 1998-2018. To complicate the matter, we note that eMAXX inadvertently assign different "Managing firm ID" (the parent firm identifier used by eMAXX) to the same parent firm. We decide to create our own unique parent firm ID by taking the following steps.

Step 1

The goal of this step is to create a managing firm ID list based on the number of reporting frequency (i.e., at the bond issue ID-year-quarter level) in eMAXX over the sample period 1998-2018 in descending order, so that our clean-up process starts with the most important bondholders. These bondholders are also more likely to be conglomerates with multiple subsidiaries or corporate events, resulting in different managing firm IDs in eMAXX.

Sort managing firm ID by frequency of bond issue ID-year-quarter observations in descending order (requiring that issuers can be matched to GVKEYs from Compustat). Below are the top ten IDs based on frequency of reporting in eMAXX:

Reporting frequency rank	Managing firm ID
1	11979
2	12668
3	11854
4	11614
5	12527
6	12488
7	14659
8	12352
9	12538
10	10782

We next search each managing firm ID from the above sort in eMAXX to identify corresponding firm names because it is often in eMAXX, that there are multiple managing firm IDs associated with the same parent company. In other words, there is no one-to-one correspondence between

managing firm ID and managing firm name. Using managing firm ID 12668 as an example, it shows there are seven firm names linked to the same ID.[25]

Managing firm name	Managing firm ID
BlackRock Advisors, Inc.	12668
BlackRock Financial Management Inc	12668
BlackRock Financial Management Inc FixedIncome	12668
BlackRock Financial Management, Inc	12668
BlackRock Financial Management, Inc.	12668
BlackRock International	12668
BlackRock, Inc.	12668

Step 2

The goal of this step is to manually check the nature of the relationship between each managing firm ID – managing firm name link shown in eMAXX.

For each managing firm ID, we manually search all firms linked to that managing firm ID, via their websites to determine the relationship among them. Using the example above, we come to the conclusion that BlackRock Advisors, Inc., BlackRock Financial Management Inc, and BlackRock International are subsidiaries of BlackRock, Inc. BlackRock Financial Management Inc FixedIncome, BlackRock Financial Management, Inc, and BlackRock Financial Management, Inc. are duplicate entries of BlackRock Financial Management Inc by eMAXX. As a result of the above search, we create a unique ID BlackRock as the parent of the managing firms corresponding to this managing firm ID.

Step 3

The goal of this step is to manually check the nature of the relationship between multiple managing firm names to one managing firm ID links to uncover whether the link is the result of duplicate entries, subsidiary-parent relation, corporate event such as M&As, or simply incorrect due to similar names (but no actual relation).

To make sure we include all potential subsidiaries of BlackRock (by name association, or duplicate entries by eMAXX), we search BlackRock within managing firm names, and come up with the following list: 34 managing firm name – managing firm ID pairs:

[25]We use the managing firm ID 12668 as an example because it covers all possible scenarios involved in our matching scheme as compared to the managing firm ID 11979, which belongs to Prudential Financial.

Managing firm name	Managing firm ID
BlackRock Investment Management LLC	11590
BlackRock Investment Management LLC Plainsboro	11590
BlackRock Investment Management LLC Princeton	11590
BlackRock New Jersey	11590
BlackRock Advisors Inc	11954
BlackRock Advisors LLC	11954
BlackRock Advisors, Inc.	11954
BlackRock Advisors, Inc. Liquidity Management	11954
BlackRock	12289
BlackRock	12530
BlackRock Fund Advisors	12530
BlackRock Advisors, Inc.	12668
BlackRock Financial Management Inc	12668
BlackRock Financial Management Inc FixedIncome	12668
BlackRock Financial Management, Inc	12668
BlackRock Financial Management, Inc.	12668
BlackRock International	12668
BlackRock, Inc.	12668
DSP BlackRock Investment Managers Private Ltd	15298
DSP BlackRock Investment Managers Pvt Ltd	15298
BlackRock Asset Management Canada Ltd	21571
BlackRock Japan Co Ltd	27727
Blackrock Japan Co Ltd	27727
BlackRock Investments Canada Inc	35237
BlackRock Singapore Limited	35480
BlackRock Investment Management Australia Limited	35493
BlackRock Investment Management Australia Ltd	35493
BlackRock Asset Management Canada Limited	55039
BlackRock Asset Management North Asia Limited	55235
Blackrock Alternative Advisors	55402
BlackRock Institutional Trust Company, N.A.	55436
BlackRock Financial Management, Inc	55459
BlackRock Investment Management, LLC	55513
BlackRock Investment Management Australia Ltd	55661

We then manually search all these firms via their websites using firm names only, combining address information with firm name, read related filings, search SDC if M&As are involved, to determine whether they do belong to BlackRock, or they are different institutions that happen to have BlackRock in their names. Among the 34 pairs, we find that DSP BlackRock Investment Managers Private Ltd (15298) is a joint venture in India between DSP Group and BlackRock in which BlackRock holds a 40% stake.[26] We therefore do not assign this managing firm ID (15298) to the BlackRock parent. We end up with a set of managing firm IDs linked to the same parent BlackRock.

There are two possible reasons for multiple managing firm IDs to be associated with a parent. One is a long-standing parent-subsidiary relation such as Blackrock Advisors (11954) since 2003 in eMAXX. The other is a corporate event such as M&As (BlackRock acquisitions of BGI) or divestitures (Barclay's divestiture of BGI). This second case will result in the managing firm ID-parent link to be time varying.

Step 4

The goal of this step is to establish a time window in which a specific managing firm ID – our unique firm ID (at the parent firm level) link is applicable (for example, due to M&As or divestitures).

Given that our empirical analysis is at the parent level, we require the exact window in which a specific managing firm ID-parent link is applicable (within our sample period), i.e., link effective date and link end date. In the eMAXX database, when a merger takes place involving two filing institutions, eMAXX retains the managing firm ID of the target institution but changes the managing firm name to the acquirer. Continue with the example above, we search the unique managing firm ID in eMAXX to see whether it is associated with a different managing firm name due to past M&As. In one example, our search ends up with the following pairs

It shows that two of the BlackRock IDs 12530 and 21571 are also linked to Barclays Global Investors because eMAXX updates the corresponding managing firm name to BlackRock after BlackRock's acquisition of BGI in 2009Q4. As a result, the link of 12530 to BlackRock is only active starting 2010Q1, and the same applies to the link of 21571 to BlackRock. Therefore, we create a link effective date as of deal completion date (2010Q1) between these two managing firm IDs

[26] See, the Economic Times (https://economictimes.indiatimes.com/markets/stocks/news/dsp-group-to-buy-out-blackrocks-40-stake-in-dsp-blackrock-mf/articleshow/64066183.cms) and Crunchbase (https://www.crunchbase.com/organization/dsp-blackrock).

Managing firm name	Managing firm ID
Barclays Global Investors San Francisco	12530
BlackRock	12530
BlackRock Fund Advisors	12530
Barclays Global Investors Toronto	21571
BlackRock Asset Management Canada Ltd	21571

and our unique ID for BlackRock. At the same time, we also create a link end date (2009Q4) between these two managing firm IDs and our unique ID for Barclays. The above steps allow us to dynamically track conglomerate affiliation of each managing firm ID in eMAXX to our unique parent ID (BlackRock and Barclays).

Continue with the above example, we also identify similar situations with three other managing firm IDs from the BlackRock-related list: 1) 12289, originally belongs to State Street Research & Management but then is assigned to BlackRock following BlackRock's acquisition of State Street Research & Management in 2004Q4 (deal effective quarter 2004Q3);[27] 2) 11590 and 27727, originally belong to Merrill Lynch (the parent) but then are assigned to BlackRock (the new parent) following the latter's acquisition of Merrill Lynch Investment Managers in 2006Q3 (link effective quarter is set to 2006Q4, which is one quarter after deal completion).

Managing firm name	Managing firm ID
BlackRock	12289
State Street Research & Management Co.	12289
BlackRock Investment Management LLC	11590
BlackRock Investment Management LLC Plainsboro	11590
BlackRock Investment Management LLC Princeton	11590
BlackRock New Jersey	11590
Merrill Lynch Asset Management Inc.	11590
Merrill Lynch Investment Managers	11590
Merrill Lynch Investment Managers MLIM	11590
BlackRock Japan Co Ltd	27727
Blackrock Japan Co Ltd	27727
Merrill Lynch Investment Managers Co Ltd	27727

[27] It is worth noting that State Street Research & Management is unaffiliated with State Street Asset Management, one of the big three asset managers.

B Figures

Figure OA.1. The presence of bond-loan dualholders in US public firms over time

This figure plots the share of Compustat firms with bonds outstanding that have at least one bond-loan dualholder in a given year over the period 1999–2018. A bond-loan dualholder is a member of the syndicate that provides a revolver loan and simultaneously a bondholder with at least 0.5% of a focal firm's bonds outstanding.

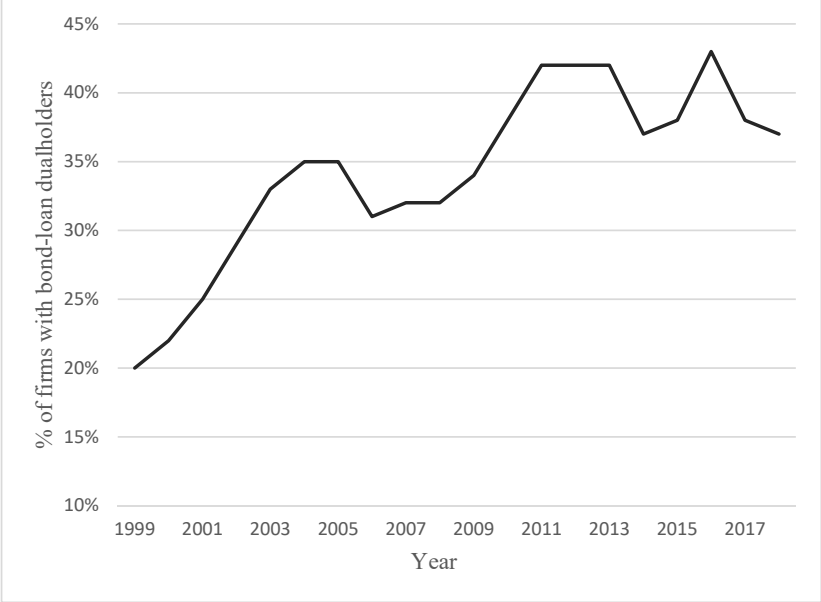
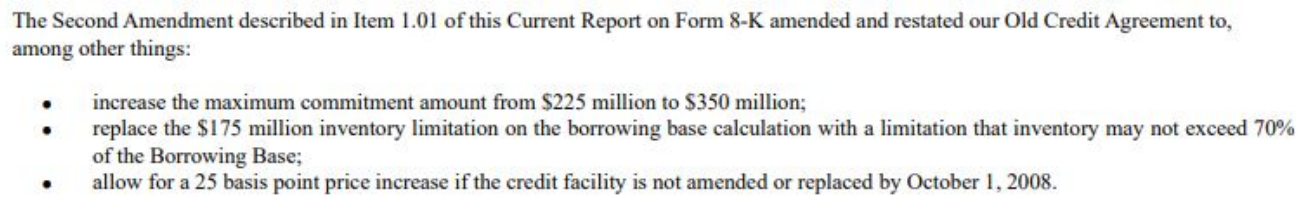


Figure OA.2. Credit amendment for Frontier Oil on June 23, 2008

This figure presents a screenshot of the 8-K filing by Frontier Oil Corporation on June 23, 2008. This is an example of our random manual check of the material credit amendments reported by DealScan that we use in our analysis. We follow Ivashina and Sun (2011) and first check the Form 8-K corresponding to the amendment date reported by DealScan. Form 8-K requires disclosure of entry into material contractual agreements and amendments (waivers) or restatements to such agreements. Some of the amendments can also be identified by references in Forms 10-K or 10-Q. (SEC filing link: https://www.sec.gov/Archives/edgar/data/110430/000011043008000027/form8k.htm)

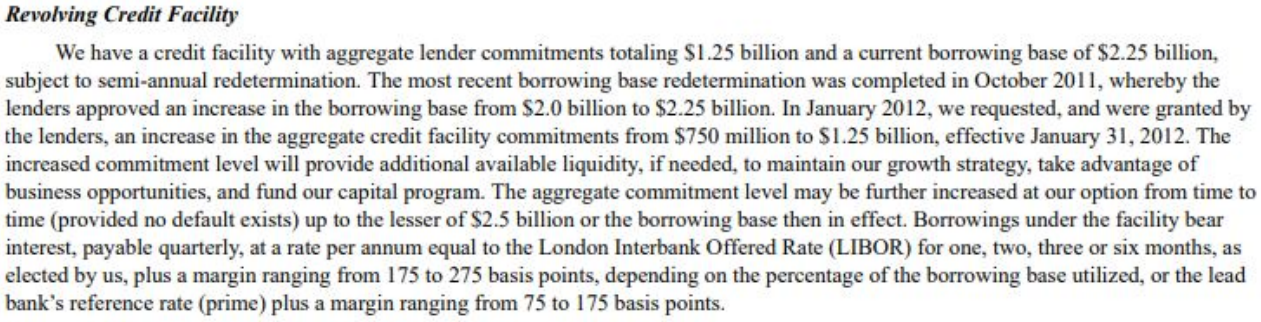


The Second Amendment described in Item 1.01 of this Current Report on Form 8-K amended and restated our Old Credit Agreement to, among other things:

- increase the maximum commitment amount from $225 million to $350 million;
- replace the $175 million inventory limitation on the borrowing base calculation with a limitation that inventory may not exceed 70% of the Borrowing Base;
- allow for a 25 basis point price increase if the credit facility is not amended or replaced by October 1, 2008.

Figure OA.3. Credit amendment for Continental Resources on January 31, 2012

This figure presents a screenshot of the 10-Q filing by Continental Resources, Inc. for the fiscal quarter ended March 31, 2012. This is an example of our random manual check of the material credit amendments reported by DealScan that we use in our analysis. We follow Ivashina and Sun (2011) and first check the Form 8-K corresponding to the amendment date reported by DealScan. Form 8-K requires disclosure of entry into material contractual agreements and amendments (waivers) or restatements to such agreements. Some of the amendments can also be identified by references in Forms 10-K or 10-Q. (SEC filing link: https://www.sec.gov/Archives/edgar/data/732834/000119312512208800/d328579d10q.htm)



Revolving Credit Facility

We have a credit facility with aggregate lender commitments totaling $1.25 billion and a current borrowing base of $2.25 billion, subject to semi-annual redetermination. The most recent borrowing base redetermination was completed in October 2011, whereby the lenders approved an increase in the borrowing base from $2.0 billion to $2.25 billion. In January 2012, we requested, and were granted by the lenders, an increase in the aggregate credit facility commitments from $750 million to $1.25 billion, effective January 31, 2012. The increased commitment level will provide additional available liquidity, if needed, to maintain our growth strategy, take advantage of business opportunities, and fund our capital program. The aggregate commitment level may be further increased at our option from time to time (provided no default exists) up to the lesser of $2.5 billion or the borrowing base then in effect. Borrowings under the facility bear interest, payable quarterly, at a rate per annum equal to the London Interbank Offered Rate (LIBOR) for one, two, three or six months, as elected by us, plus a margin ranging from 175 to 275 basis points, depending on the percentage of the borrowing base utilized, or the lead bank's reference rate (prime) plus a margin ranging from 75 to 175 basis points.

Figure OA.4. Credit amendment for Autozone on August 9, 2002

This figure presents a screenshot of the 10-K filing by Autozone, Inc. for the fiscal year ended August 31, 2002. This is an example of our random manual check of the material credit amendments reported by DealScan that we use in our analysis. We follow Ivashina and Sun (2011) and first check the Form 8-K corresponding to the amendment date reported by DealScan. Form 8-K requires disclosure of entry into material contractual agreements and amendments (waivers) or restatements to such agreements. Some of the amendments can also be identified by references in Forms 10-K or 10-Q. We can then identify the 8-K filing for the amendment that was filed not on, but after the amendment date. (10-K SEC filing link: https://www.sec.gov/Archives/edgar/data/866787/000095014402010940/g78922e10vk.htm; 8-K SEC filing link: https://www.sec.gov/Archives/edgar/data/866787/000086678702000045/agramend.htm)

10.17	Amendment No. 2 dated August 9, 2002, to Five-Year Credit Agreement dated as of may 23, 2000, (as amended by the certain Amendment No. 1 to Five-Year Credit Agreement dated May 23, 2001) among AutoZone, Inc., as borrower, the several lenders from time to time party thereto, and Bank of America, as Administrative Agent and The Chase Manhattan Bank, as Syndication Agent. Incorporated by reference to Exhibit 10.3 to the Form 8-K dated October 1, 2001.

C Tables

Table OA.1. Comparison of sample loans to other loans in DealScan

This table compares key loan and firm characteristics between the loan sample and other loans issued by US public firms in DealScan that are not part of our sample. We conduct a *t*-test on the difference in means and a Wilcoxon test on the difference in medians. Definitions of the variables are provided in Appendix A.1.

	Baseline sample		Other loans in DealScan		Difference	
	Mean	Median	Mean	Median	Mean	Median
Loan spread	163.70	142.08	176.65	150	-11.87***	-12.95***
Deal amount ($millions)	744	373	344	115	400***	258***
Deal maturity	47.02	60	46.36	48	0.66**	12***
Revolver	0.847	1	0.883	1	-0.036***	0
Secured	0.389	0	0.526	1	-0.137***	-1***
Performance pricing	0.480	0	0.426	0	0.054***	0
Total assets ($millions)	7,990	2,535	3,180	647	4,810***	1,888***
Leverage	0.284	0.238	0.252	0.190	0.032***	0.048***
ROA	0.042	0.046	0.028	0.041	0.014***	0.005***
Cash flow volatility	0.009	0.006	0.012	0.007	-0.003***	-0.001***
Tobin's Q	1.723	1.494	1.823	1.527	-0.100***	-0.033
Tangibility	0.323	0.253	0.320	0.254	0.003	-0.001
Institutional ownership	0.744	0.801	0.345	0.369	0.399***	0.432***
Altman Z score	3.094	2.832	3.460	3.117	-0.366***	-0.285***
S&P rating	5.051	5	6.731	7	-1.680***	-2***

Table OA.2. Correlation matrices

This table presents the correlation matrices for samples used in our analyses. Panel A presents pairwise correlations for the baseline loan sample. Panel B presents pairwise correlations for the bond sample. Definitions of the variables are provided in Appendix A.1.

Panel A: Loan sample correlation matrix

	Ln(loan spread)	Bond-loan dual-holder	Deal size	Deal maturity	Revolver	Secured	Perform-mance pricing	Firm size	Market leverage	ROA	Cash flow volatility	Tobin's Q	Tangibility	Institutio-nal own-ership	Altman Z score	S&P rating
Ln(loan spread)	1.000															
Bond-loan dualholder	-0.119***	1.000														
Deal size	-0.301***	0.355***	1.000													
Deal maturity	0.349***	-0.038***	0.020	1.000												
Revolver	-0.195***	-0.029**	0.007	0.054***	1.000											
Secured	0.531***	-0.074***	-0.194***	0.249***	-0.073***	1.000										
Performance pricing	-0.043***	-0.033**	0.061***	0.070***	0.137***	0.068***	1.000									
Firm size	-0.384***	0.475***	0.679***	-0.163***	-0.085***	-0.366***	-0.109***	1.000								
Market leverage	0.451***	0.023*	-0.162***	0.060***	-0.105***	0.381***	-0.014	-0.164***	1.000							
ROA	-0.371***	0.032**	0.186***	-0.042***	0.049***	-0.301***	0.001	0.164***	-0.501***	1.000						
Cash flow volatility	0.054***	-0.065***	-0.108***	-0.029**	0.028**	0.090***	0.020	-0.162***	-0.035***	-0.094***	1.000					
Tobin's Q	-0.363***	-0.002	0.141***	-0.090***	0.032**	-0.233***	-0.034***	0.107***	-0.603***	0.450***	0.085***	1.000				
Tangibility	0.012	0.035***	-0.001	-0.017	0.021	0.052***	0.003	0.014	0.204***	-0.095***	0.108***	-0.138***	1.000			
Institutional ownership	0.019	0.063***	0.129***	0.125***	-0.016	-0.028**	0.027**	0.082***	-0.187***	0.078***	-0.084***	0.026**	-0.103***	1.000		
Altman Z score	-0.380***	-0.095***	0.022*	-0.081***	0.092***	-0.282***	0.012	0.002	-0.648***	0.557***	0.062***	0.700***	-0.237***	0.047***	1.000	
S&P Rating	0.555***	-0.359***	-0.416***	0.281***	-0.056***	0.456***	0.035***	-0.667***	0.285***	-0.264***	0.094***	-0.217***	0.005	-0.017	-0.178***	1.000

Panel B Bond sample correlation matrix

	Roll	Bondholding HHI	Ln(number of bond-holders)	Bond-loan dual-holder	Firm size	Leverage	ROA	Cash hold-ings	Tobin's Q	Insitutional owner-ship	Bond share
Roll	1.000										
Bondholding HHI	0.186***	1.000									
Ln(number of bondholders)	-0.251***	-0.754***	1.000								
Bond-loan dualholder	-0.125***	-0.295***	0.416***	1.000							
Firm size	-0.157***	-0.232***	0.511***	0.217***	1.000						
Leverage	0.152***	0.069***	-0.095***	0.063***	-0.122***	1.000					
ROA	-0.116***	-0.199***	0.221***	0.083***	0.119***	-0.336***	1.000				
Cash holdings	0.023***	0.289***	-0.293***	-0.232***	-0.037***	-0.292***	-0.113***	1.000			
Tobin's Q	-0.116***	0.015**	0.005	-0.115***	0.001	-0.579***	0.185***	0.415***	1.000		
Institutional ownership	0.017**	0.027***	-0.107***	0.008	-0.237***	-0.141***	0.011*	0.083***	0.077***	1.000	
Bond share	0.023***	0.080***	-0.034***	-0.065***	0.008	0.048***	-0.082***	0.206***	0.040***	-0.048***	1.000

Table OA.3. Bond-loan dualholders and loan spread using the facility-level loan spread

This table presents a robustness check on our main analysis in Table 3 using facility-level loan spreads. Definitions of the variables are provided in Appendix A.1. Industry fixed effects are at the two-digit SIC level. Standard errors (in parentheses) are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10%, respectively.

	Ln(loan spread)				
	(1)	(2)	(3)	(4)	(5)
	Baseline	Lead lender FE	Lead lender ×Year FE	Industry ×Year FE	Lead lender is bond-loan dualholder
Bond-loan dualholder	0.049***	0.049***	0.047***	0.042***	0.063***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)
Bond-loan dualholder×Lead is dualholder					-0.062**
					(0.026)
Facility size	-0.125***	-0.113***	-0.105***	-0.106***	-0.124***
	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
Facility maturity	0.015	0.005	-0.019	-0.011	0.0147
	(0.019)	(0.020)	(0.021)	(0.021)	(0.019)
Secured	0.316***	0.297***	0.279***	0.284***	0.317***
	(0.019)	(0.019)	(0.020)	(0.020)	(0.0188)
Performance pricing	-0.031*	-0.026	-0.014	-0.021	-0.031*
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Firm size	-0.030***	-0.032***	-0.042***	-0.044***	-0.029***
	(0.011)	(0.011)	(0.012)	(0.012)	(0.011)
Leverage	0.562***	0.565***	0.615***	0.618***	0.565***
	(0.068)	(0.071)	(0.074)	(0.077)	(0.068)
ROA	-0.526***	-0.438***	-0.596***	-0.893***	-0.523***
	(0.160)	(0.156)	(0.162)	(0.170)	(0.160)
Cash flow volatility	1.022	0.591	0.165	0.795	1.086
	(0.746)	(0.727)	(0.801)	(0.823)	(0.751)
Tobin's Q	-0.020	-0.013	-0.023	-0.043**	-0.021
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Tangibility	-0.083	-0.086	-0.084	-0.048	-0.083
	(0.056)	(0.058)	(0.061)	(0.062)	(0.056)
Institutional ownership	0.047	0.049	0.052	0.076*	0.044
	(0.041)	(0.042)	(0.043)	(0.041)	(0.040)
Altman Z score	-0.039***	-0.044***	-0.037***	-0.033***	-0.039***
	(0.009)	(0.010)	(0.010)	(0.010)	(0.009)
S&P Rating	0.071***	0.073***	0.073***	0.073***	0.0719***
	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)
Year FE	Yes	Yes	No	Yes	Yes
Industry FE	Yes	Yes	Yes	No	Yes
Facility purpose FE	Yes	Yes	Yes	Yes	Yes
Facility type FE	Yes	Yes	Yes	Yes	Yes
Lead lender FE	No	Yes	No	No	No
Lead lender×Year FE	No	No	Yes	Yes	No
Industry×Year FE	No	No	No	Yes	No
Obs.	8,048	7,761	7,636	7,501	8,048
Adj. R-squared	0.740	0.755	0.783	0.821	0.740
Null: Net dualholder effect when lead is dual = 0					0.000
					(0.025)

Table OA.4. Top 20 bond-loan dualholders

This table list the top 20 bond-loan dualholders over the period 1999–2018 based on the number of firms in which they are dualholders or the combined dollar value of their bond holdings as dualholders. A number of financial institutions such as Wachovia (acquired by Wells Fargo) and Merrill Lynch (acquired by Bank of America) were acquired and merged into new institutions during the sample period, and we use their pre-merger activities in this table.

Rank	Based on number of firms as dualholders	Based on value of bond holdings as dualholders
1	JP Morgan Chase	JP Morgan Chase
2	Deutsche Bank	Deutsche Bank
3	Citigroup	ING Group
4	Wells Fargo	Citigroup
5	Goldman Sachs	Goldman Sachs
6	Bank of America	Barclays
7	ING Group	Wachovia
8	Wachovia	Morgan Stanley
9	Morgan Stanley	Wells Fargo
10	PNC	GE Capital
11	UBS	PNC
12	US Bancorp	RBC
13	Northern Trust	Bank of America
14	Credit Suisse	State Street
15	Barclays	TD Bank
16	GE Capital	New York Life Insurance
17	Merrill Lynch	UBS
18	Societe Generale	Allianz
19	BNP Paribas	HSBC
20	RBC	Northern Trust

Table OA.5. Excluding the largest dualholders

This table presents the baseline loan-level regressions after removing loans with the top ten (twenty) largest dualholders (based on number of firms involved as dualholders) listed in Table OA.4. Definitions of the variables are provided in Appendix A.1. Industry fixed effects are at the two-digit SIC level. Standard errors (in parentheses) are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10%, respectively.

	Ln(loan spread)	
	(1)	(2)
	Exclude loans with top 10 dualholders	Exclude loans with top 20 dualholders
Bond-loan dualholder	0.085***	0.088***
	(0.024)	(0.032)
Controls	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Loan purpose FE	Yes	Yes
Obs.	4,211	3,716
Adj. R-squared	0.697	0.687

Table OA.6. Sample formation for our bond return analysis around loan amendments

This table lists steps taken and filters applied to form the sample for bond return analysis in Table 5.

Step		# of amendments	# of quarterly bond return observations
1	Facility amendments of loans issued to US public borrowers over the period 2002–2018 from DealScan	24,241	
2	Exclude amendments of loans issued to borrowers without having bonds outstanding	5,238	
3	Exclude non-material amendments (i.e., no change in pricing or amount)	721	
4	Exclude amendments of loans issued to borrowers without bond-loan dualholders	350	
5	Exclude amendments of loans issued to borrowers for which we cannot compute their dualholders' quarterly bond returns	211	204
6	Exclude amendments of loans issued to borrowers who have both bond-loan dualholders and loan-equity dualholders	184	177

Table OA.7. Mergers between financial institutions used in our identification test

This table describes sample formation and list merger deals used in our identification test in Table 7. Panel A lists steps taken and filters applied to form the sample of mergers between financial institution that result in the formation of bond-loan dualholders (for reasons exogenous to a focal firm's loan spread). We start with a list of bank mergers in Michael Schwert's link table, supplemented with deals in He and Huang (2017), Lewellen and Lowry (2021), and online search of financial institutions (with operations in the US) over the period 1999–2017. Panel B lists those merger deals. Effective year is the year of deal completion according to SDC. Wells Fargo completed its acquisition of Wachovia on December 31, 2008 so we code the effective year as 2009.

Panel A: Merger sample formation

Step		# of deals
1	Merger deals between financial institutions that can be matched to either DealScan lenders or eMAXX institutions or both	88
2	Keep deals that result in a treatment, i.e., between a bondholder and a lender of firms in our loan sample	28
3	Exclude deals in which the treated firms have bond-loan dualholders before deal completion	16
4	Exclude deals in which the treated firms cannot be matched to a control firm based on size, leverage, profitability, and Altman Z score	15
5	Exclude deals in which the treated and control firms do not originate at least one loan before and one loan after merger completion	8

Panel B: List of mergers used in the DID analysis

Deal	Acquirer	Target	Effective year
1	Allianz	Dresdner Bank	2002
2	JP Morgan Chase	Bank One Corporation	2004
3	Bank of America	FleetBoston Financial	2004
4	Wells Fargo	Strong Capital	2005
5	Bank of New York	Mellon Financial	2007
6	Bank of America	LaSalle Bank Corporation	2007
7	Wells Fargo	Wachovia	2009
8	BNP Paribas	Fortis	2009