Passive Ownership and Corporate Bond Lending

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Abstract

Increased corporate bond ownership by passive funds reduces borrowing demand for these bonds, easing short-sale constraints in the corporate bond market. Passive ownership compresses credit spreads, lowering active investors' demand and consequently decreasing dealers' need to borrow bonds for short-selling in market-making activities. When bonds cross maturity thresholds targeted by passive indices, temporary buying pressure from passive funds initially boosts bond borrowing. However, this trend reverses over the medium to long term as borrowing demand from insurers and active investors declines. These findings highlight a positive externality of passive bond ownership: it facilitates dealers' capacity to manage customer-driven buying pressure. Given that bond borrowing primarily supports market-making and liquidity provision, our results caution against imposing short-sale restrictions on corporate bonds.

JEL classification: G12, G14, G23

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1 Introduction

Passive ownership of corporate bonds is on the rise as the popularity of exchange-traded funds (ETFs) has gained traction over the past 20 years. These passive funds differ from traditional corporate bond investors because they follow certain bond indices and aim to minimize tracking errors. Whether the rising ownership of corporate bonds by passive funds enhances or reduces the ease of secondary market transactions is widely debated among academia, policymakers, and market participants but has not reached a consensus yet.

In this paper, we examine a particular type of corporate bond transactions, bond lending and shorting, and ask whether an increase in passive ownership makes it easier or more difficult to borrow bonds and short them. We do so because bond lending and shorting is a grossly understudied area, and we do not have a clear understanding of why investors borrow bonds and short them. Market participants' motivation for shorting bonds, in turn, influences how they react to the increased passive ownership. Therefore, we aim to understand how increased ownership influences both the supply of lendable bonds and the demand.

To measure the impact of passive ownership on lending outcomes, we estimate panel regressions of lending outcome variables, such as lendable supply, quantity of bonds on loan, and borrowing fees. To identify exogenous shocks to passive ownership, we include in the regression high-dimensional fixed effects to soak up any variation in firm-level unobservables driving both the outcome and passive ownership. With issuing firm-by-quarter fixed effects, any time-varying firm-level fundamental information is accounted for. In addition, we include bond fixed effects to control for time-invariant characteristics of bonds, such as the bond's covenants and seniority, as well as other time-varying bond-level controls.

In our main estimates, we find that increased passive ownership increases lending supply. This result is expected because passive funds are natural security lenders, as in any asset market. However, we also find that the increase in ownership reduces the demand to borrow bonds. The demand decrease dominates the supply increase, and thus in the new equilibrium, we observe lower fees and lower quantity of bonds lent. Specifically, we find a one-standard-deviation increase in passive ownership significantly decreases the fee by 0.018 percentage points, or 13.85% of its inter-quartile range, while it slightly reduces the quantity of bonds lent by 0.039 percentage points. While the effect on the fee is economically large, the effect on the quantity is small because the supply and demand move in the opposite direction, canceling with each other.

These findings are in contrast to the increased ownership of insurance firms and active mutual funds. We confirm that these other types of institutional ownership increase lendable supply, just like passive ownership does. However, the reaction in demand is small and dominated by the increased supply. Therefore, an increase in the ownership by insurance firms and active funds leads to an increase in quantity lent and a smaller decrease in borrowing fees. Therefore, passive funds are unique in that its ownership significantly decreases shorting demand.

To understand the decrease in the demand to borrow bonds, we examine how bonds' credit spreads react to the increased ownership. We find that a one-standard-deviation increase in passive ownership reduces credit spreads by 1.9 basis points. Since credit spreads move in the opposite direction with bond prices, the results indicate that the bond becomes more expensive when it is held by passive owners. This finding is consistent with the literature on passive ownership (e.g. Dannhauser 2017; Bretscher, Schmid, and Ye 2024b): since passive funds are forced to hold the security in certain indices, their inelastic demand increases the price of securities held. This reduction in credit spreads is in contrast to the ownership by other types of institutions: we find that an increase in ownership by insurance firms significantly increases credit spreads, while increased ownership by active funds has no effect on credit spreads.

The difference in the reaction of credit spreads explains why the borrowing demand reacts differently for passive ownership and insurance firms' ownership. We argue and show evidence that the main borrowers of bonds are dealers, not end-users such as hedge funds.

When active customers send urgent buy orders to dealers, dealers aim to cater to this buying pressure by first looking at their inventory and potential sellers in their network. When they cannot locate the bond, they resort to borrowing bonds and selling them short to the buying customer. Thus, bond borrowing stems from customers' actions to buy rather than sell the bonds.

When passive ownership rises and credit spread declines, active customers are less likely to buy those expensive bonds, reducing their buying pressure. This reduction in turn decrease dealers' need to borrow bonds, reducing the demand to borrow bonds. In contrast, the insurance firms' and active funds' ownership do not reduce buying pressure because their bonds are not expensive.

The key to the argument above is that the main short sellers of bonds are dealers, not customers. This is the opposite of the practice in the stock market, where the main drivers of short selling are informed hedge funds who identify overvalued stocks and sell them short for speculation. In the corporate bond market, such speculative short sale is prohibitively expensive for customers who pay bid-ask spreads each time they sell short the bond and buy it back to cover. For example, the average half spreads of our bond sample is 29 basis points (bps) per transaction, the average loan tenure is roughly three months, and the average borrowing fee is 44 bps per year. Thus, if a customer borrows a bond and sells it short and buy it back after three months, the round-trip cost is 58 bps, which is very high and more than half of the average three-month corporate bond returns of 1.05%. High bid-ask spreads completely dominate the borrowing fee, which is only 11 bps per three months.

To support this claim, we run a panel regression of the daily customer buy and sell volume on the daily changes in quantity of bonds lent. If customers short selling is the driver of the lending activity, then customer sell volume should be positively correlated with an increase in lending. We find, however, the opposite result. When the amount of bond lent increases, customer sell volume declines and customer buy volume increases. Since customer buy volume is identical to dealer sell volume, this finding suggests that an increase in lending corresponds to dealers selling these bonds. Prior to September 2017, the amount lent increases strongly three business days after dealer sell, reflecting the settlement cycle. After September 2017, the increase occurs two business days after dealer sell because the SEC shortened the standard settlement gap to two business days.

We extend the panel regression of changes in quantity on loan on bond trading volume by including other potential determinants, such as contemporaneous and past bond returns, bid-ask spreads and return volatility. Decomposing the explained variation in bond lending, we find that the contemporaneous dealer trading activity explains by far the largest variation in bond lending. If other variables, such as past returns and half spreads, capture the motives to borrow bonds for non-market-making reasons, the contributions of these factors to bond lending are minimal at best. For example, when we include all explanatory variables in the multivariate panel regression, a one-standard-deviation increase in contemporaneous dealer sell is associated with a 0.05 percentage point increase in daily changes in quantity on loan, corresponding to 23% of its standard deviation. In contrast, a one-standard-deviation increase in the contemporaneous bond return, a measure of speculative short motive, is associated with only a 0.002 percentage point increase.

Therefore, the available evidence indicates that the bond short sellers are mainly dealers and that the demand to borrow corporate bonds is driven by customers' buying pressure, not selling pressure. This finding explains why passive ownership reduces the demand to borrow bonds: the bonds' higher price alleviates speculating customers' incentive to buy them.

Our main results on the impact of passive ownership are obtained by a static comparison of bonds issued by the same firm after controlling for the influence of maturity and bond-specific time-invariant attributes such as covenants. However, the underlying mechanism linking passive ownership and lending outcomes is likely to be more dynamic. When a passive fund invests in a bond, this action itself creates temporary buying pressure, causing dealers to sell short and credit spreads to tighten. Meanwhile, the other speculating customers' aggressive purchase orders gradually diminish over time because the arrival of such an investment opportunity is sporadic. Thus, there are two forces at work: an increase in passive ownership causes short selling to increase in the short run and decrease in the long run.

To test this conjecture, we study the maturity cutoff events as proposed by Bretscher, Schmid, and Ye (2024b). In this study, we regress changes in lending outcome variables on a dummy that equals one when a bond's remaining time to maturity crosses certain cutoff values, such as three, five, and ten years. Their idea is to use this crossing event as a positive shock to passive ownership. This is because there are more bond index funds that track short-term bond indices than those that track long-term bond indices. Thus, as a bond's time to maturity shrinks, it is more likely to be held by more passive funds, and this action is independent of the bond's fundamental value.

We follow Bretscher, Schmid, and Ye (2024b) to estimate the impact of increased passive ownership on quantity on loan. We find evidence supporting our conjecture. One to three months after the bond crosses the maturity cutoff, its quantity lent increases significantly, reflecting the increasing buying pressure of passive funds during this period. Six months after the cutoff event, the passive ownership stabilizes, the quantity on loan starts to decline, and the cumulative changes turn negative 18 months after the cutoff event. This medium-term outcome reflects the decline in borrowing demand, which is exactly what we identify in the main panel regression analysis. Thus, the dynamics of lending activities provide additional support for our main findings that passive ownership alleviates the short sale frictions and helps improve the dealers' market-making capacity.

In summary, we contribute to the literature by examining the impact of increased passive ownership of corporate bonds on bond lending, which is crucial for bond dealers' market-making activities.

Our paper is related to a strand of literature that examines the effect of changing ownership of stocks on stock lending activities. Prado, Saffi, and Sturgess (2016) investigate the effect of institutional ownership on short selling. Coles, Heath, and Ringgenberg (2022) document that increased index investing causes stocks in the index to have a higher short interest. Sikorskaya (2023), Von Beschwitz, Honkanen, and Schmidt (2023), and Palia and Sokolinski (2024) focus on passive ownership on lending outcome and argue that it is crucial to account for the reactions in both lending supply and demand.[1]

The literature on equity lending and short-sales activity is vast. Starting from Miller (1977), a significant amount of work has been done to understand the stock lending activities and their implications on stock prices and returns (e.g. D'Avolio 2002; Cohen, Diether, and Malloy 2007; Boehmer, Jones, and Zhang 2008; Saffi and Sigurdsson 2011; Blocher, Reed, and Van Wesep 2013; Boehmer and Wu 2013; Boehmer, Jones, and Zhang 2013; Kolasinski, Reed, and Ringgenberg 2013; Engelberg, Reed, and Ringgenberg 2018; Chen, Joslin, and Ni 2018; Muravyev, Pearson, and Pollet 2022, 2023a,b). Multiple papers have argued that in the equity space, short-sellers are informed, and short-sale constraints have an economically significant effect on asset prices and stock anomalies.

In contrast, there are a handful of papers on corporate bond lending. Asquith, Au, Covert, and Pathak (2013) provide an initial look at the bond lending activities using proprietary data and report that the cost of borrowing corporate bonds is not much higher than that of borrowing stocks. Anderson, Henderson, and Pearson (2018) and Hendershott, Kozhan, and Raman (2020) study whether bond lending activities are related to subsequent bond returns. They both find evidence that an increase in bond borrowing is associated with lower subsequent returns in the high-yield bond market, but not among the investment grade bonds. Our paper differs from the three papers as we study the impact of the changing ownership landscape in the corporate bond market on bond lending activities.

This paper also contributes to the literature on the behavior of institutional investors in the corporate bond market (e.g., Becker and Ivashina 2015; Choi and Kronlund 2017; Dannhauser and Dathan 2023; Dannhauser and Karmaziene 2023; Bretscher, Schmid, Sen,

[1] All the papers find that passive ownership is associated with an *increase* in short interest and lendable supply in the equity space, but provide mixed evidence on the lending fees.

and Sharma 2024a; Bretscher, Schmid, and Ye 2024b). There is a recent rise in research interest, specifically in corporate bond ETFs and their implications on valuation effect and market liquidity. Dannhauser (2017) documents that an increase in ETF ownership reduces bond yields using a research design based on the changes to Markit iBoxx index inclusion rules. Pan and Zeng (2019) and Koont, Ma, Ľuboš Pástor, and Zeng (2024) examine the influence of ETF ownership on the liquidity of underlying bonds. Dannhauser and Hoseinzade (2022) and Ma, Xiao, and Zeng (2022) show bond ETF creates flow-induced pressure and exposes the bond market to a source of destabilizing demand in times of distress. Our focus, on the other hand, is on the bond lending activity, which has not been studied.

The rest of the paper is organized as follows: In Section 2, we describe our data set; In Section 3, we present our main empirical findings; In Section 4, we investigate the factors influencing bond lending activities; In Section 5, we use alternative instruments for bond ownership; and in Section 7, we provide a concluding remark.

2 Data and Sample Construction

We compile our sample from multiple data sources: (1) IHS Markit for security lending data, (2) Morningstar and the Thomson Reuters eMAXX database for holdings of bond investors, (3) the Mergent Fixed Income Securities Database (FISD) database for bond characteristics, (4) the Enhanced Trade Reporting and Compliance Engine (TRACE) database for bond transaction volume and direction, and (5) the Bank of America Merrill Lynch (BAML) database for daily bond returns. This section outlines the construction of our dataset and variables, as well as presents summary statistics.

2.1 Bond Lending Data

We source our bond lending data from the Markit Securities Finance Buy-Side Analytics Data (now part of S&P) via WRDS. This database covers daily data on securities borrowing and lending activity, including the quantity on loan, the active lendable quantity, utilization ratio, rebates and borrow (loan) fees, average loan tenure, and other lending outcome variables. We select our sample based on two filters. First, we require the variables "*QuantityOnLoan*" and "*IndicativeFee*" are not missing. Next, we require the observation to be non-missing in the corporate bond database, created using Mergent FISD and TRACE.[2] The first requirement implies that all bonds in our sample have non-zero quantity on loan. Thus, our study focuses on the intensive margin. However, the requirement is necessary because we want to study the supply and demand that simultaneously drive the quantity on loan and the borrowing fee, and we do not know the fee for bonds with zero quantity on loan.

We scale the quantity on loan and lendable supply by the amount outstanding of bonds, obtained from FISD. Following recent research in the equity lending market (e.g., Muravyev, Pearson, and Pollet 2022, 2023a), we use the variable "*IndicativeFee*" to proxy for direct short-selling cost, which is a buy-side borrowing fee. Specifically, it is Markit's estimate of the expected borrow cost, in fee terms, for a hedge fund on a given day based on both borrow costs between Agent Lenders and Prime Brokers as well as rates from hedge funds to produce an indication of the current market rate. Since our main analysis is conducted at a quarterly frequency, we take the average of the daily lending variables within each bond-quarter observation.

The Markit sample after the data filters above contains 300,282 bond quarters for 17,363 bonds issued by 1,709 firms over 66 quarters from 2006 Q3 to 2022 Q4. Our sample begins in September 2006 because the bond lending data have been available at a daily frequency since then on WRDS.[3]

[2]We filter corporate bond data following standard approaches in the literature and provide details on the cleaning procedure in the Internet Appendix A.

[3]We have reached out to WRDS and S&P about the missing Markit Securities Finance Analytics bonds and equities data from January 2002 to August 2006. This older data used a different collection methodology compared to data from September 2006 and onward, and is no longer offered by S&P. WRDS acknowledged this issue after our inquiries: `https://wrds-www.wharton.upenn.edu/pages/support/support-articles/markit/msf-analytics-2002-2005-is-legacy-version-1/`. We also spotted sparse and incomplete data for the variable "*IndicativeFee*" in July 2007; however, WRDS and S&P cannot fix this issue.

2.2 Bond Investor Holdings Data

To construct our holdings dataset, we begin with dollar-denominated bonds issued by U.S. firms from the Mergent FISD database. We restrict the sample to corporate bonds that have recorded transactions in the Enhanced TRACE database to ensure data availability and market activity. Mutual fund and exchange-traded fund (ETF) holdings are sourced from Morningstar, which provides comprehensive coverage of fund holdings across asset classes, including bonds, preferred stocks, equities, futures, options, and cash. We identify ETFs using Morningstar's ETF flag and classify index funds following the methodology of Berk and Van Binsbergen (2015) and Dannhauser and Dathan (2023).

In our analysis, passive funds are defined as both index funds and ETFs, while leveraged or inverse index funds and ETFs are excluded.[4] The reporting frequency of fund holdings varies across funds, particularly in the earlier part of the sample period. To address inconsistencies in reporting intervals, we impute missing monthly fund holdings using the nearest available observations. Our sample includes holdings from all passive and active funds, without restrictions on fund type, ensuring that we capture a comprehensive representation of institutional bond ownership, including funds that are not exclusively dedicated to corporate bonds.

We obtain insurance company holdings data from the Thomson Reuters eMAXX database, which provides fixed-income holdings at a quarterly frequency.[5] To ensure data accuracy, we systematically identify and remove duplicate observations, which may arise for two reasons.

First, eMAXX reports holdings based on the timing of information disclosure. For example, a fund's holdings as of 2002 Q4 may be reported in 2003 Q1, 2003 Q2, or both. As a result, identical bond holdings data can appear in multiple reporting quarters. To address this issue, we retain only the earliest available report for each bond-quarter-fund-managing firm pair. In the example above, we keep the holdings reported in 2003 Q1 and discard the

[4]Inverse and leveraged funds are identified if the lowercase version of fund names contain any of the following strings: plus, enhanced, inverse, ultra, 1.5x, 2.5x, 2x, 3x, 4x, or 5x.

[5]The eMAXX version used in our analysis covers fixed-income holdings data for North America.

duplicate entry from 2003 Q2.

Second, duplicate entries can arise from co-managed funds, where multiple managing firms oversee a single fund's portfolio. In such cases, eMAXX records separate entries for each managing firm, in addition to an aggregated entry for the fund's total holdings.[6] To prevent double counting, we eliminate redundant observations associated with co-managed funds.

We integrate holdings data from Morningstar and eMAXX to construct our bond ownership variables. Specifically, we aggregate bond-level holdings across different investor types on a monthly basis. To address gaps in reporting, we impute missing insurance firm holdings using the nearest available observations. We exclude cases where total reported investor holdings exceed the bond's amount outstanding to ensure data integrity. Finally, we normalize holdings by dividing them by the bond's amount outstanding for active funds, passive funds, and insurance firms. Before merging with IHS Markit bond lending data, our final sample comprises 2,423,423 bond-month observations covering 55,517 bonds from July 2006 to December 2022.

2.3 Summary Statistics

We merge quarterly bond lending data with monthly holdings data to construct our baseline dataset. The final sample comprises 297,693 bond-quarter observations for 17,140 bonds issued by 1,705 firms from 2006 Q3 to 2022 Q4. To mitigate the influence of outliers while avoiding look-ahead bias, we winsorize continuous variables at the 1st and 99th percentiles within each quarter.

Table 1 presents summary statistics for key variables in our quarterly panel, including bond lending outcomes, investor ownership, and other bond characteristics. On average, bonds in our sample have a loan quantity of 1.45%, a lendable supply ratio of 23.74%, a utilization rate of 6.71%, a loan tenure of 74 days, and a borrowing fee of 44 basis points

[6] These observations are identified when the entry for FIRMID is "CO-MANAGED."

(bps). The average credit spread is 213 bps.

Regarding ownership structure, the average passive ownership is 3.43%, with ETFs and index funds accounting for 1.27% and 2.15%, respectively. Active fund ownership averages 9.65%, while insurance firms hold 31.29% of outstanding bonds. The typical bond in our sample has a credit rating of BBB (numerically represented as 8.45), an average age of 4.92 years, a time to maturity of 9.98 years, an amount outstanding of $679 million, and a zero trading day ratio of 35%.

Figure 2 presents the time series of ownership shares, averaged across bonds within each period. In our merged sample, insurance companies hold the largest ownership share among investor types. However, their share has steadily declined over time, decreasing from 42.18% in 2006 to 26.97% in 2022. In contrast, passive mutual fund ownership, though initially negligible, has grown significantly over the sample period. Starting at just 0.44% in 2006, passive ownership increased to 5.21% by 2022, reflecting the broader shift toward passive investment strategies in fixed-income markets.

In Figure 3, we plot the average of the lending outcome variables using all corporate bonds in our sample as well as the subsample of investment-grade and high-yield bonds. Panel A plots the average lendable supply. The supply is more than 30% of the amount outstanding in 2007 and 2008. Thereafter, its size declines steadily and remains around 20% of the bond market.

Figure 3 Panels B and C report the quantity on loan and the short loan quantity, which is the ratio of the bond lending used to short the bonds to the bond's amount outstanding.[7] Consistent with Hendershott, Kozhan, and Raman (2020), we observe a decline in quantity on loan and short loan quantity in 2009. Before the financial crisis, the amount lent represents about 4% of the amount outstanding. After the crisis, it drops to about 1% and remains stable thereafter. Comparing investment-grade bonds with high-yield bonds,

[7] The variable "*Short Loan Quantity*" in Markit represents the number of securities on loan with dividend trading and financing trades removed. Markit uses a proprietary algorithm to strip out these trades.

high-yield bonds have a higher quantity on loan than investment-grade bonds.

Comparing Panels B and C, between 2006 and 2008, the values of the short loan quantity tend to be smaller than the quantity on loan, especially among investment grade bonds, because they are more likely to be used as collateral in financing trades. However, after 2009, the two variables are almost identical. Therefore, these data suggest that the role of financing transactions is limited, and that a large portion of the borrowed bonds are sold short.

Finally, Panel D reports the average borrowing fee. For all bonds, the fee ranges from 0.31% to 0.58% with no discernible pattern. Consistent with Asquith, Au, Covert, and Pathak (2013), the level of the borrowing fee is similar to or even slightly lower than the equity borrowing fee.[8] However, high-yield bonds have higher borrowing fees, ranging from 0.42% to 0.81%. Because the cross-section of fees is skewed to the right, the fee for typical bonds is lower: the median borrowing fee, plotted in Panel E, remains lower than the averages, ranging from 0.24% to 0.43% for all bonds.

In the Internet Appendix B and C, we provide further details on the construction of daily and monthly data used in the paper. Table A1 shows the descriptive statistics of daily and monthly panel data.

3 Passive Ownership and Bond Lending Activities

3.1 Overall Sample

Empirical Method. In this section, we explore the relationship between passive bond ownership and bond lending activities, including lending supply, quantity on loan, and borrowing fees. Specifically, we run a panel regression of lending activity variable Y of bond i

[8] The level of the fee in our sample is higher than some of the previous research that uses the sell-side database. Our database measures the borrowing fee from the perspective of ultimate borrowers. The sell-side data takes the perspective of ultimate lenders and, thus, their fee level is lower because intermediating dealers charge a higher fee to lend than to borrow.

issued by firm k in quarter q on contemporaneous passive ownership shares,

$$Y_{i,k,q} = \beta PassiveFund_{i,k,q} + \gamma X_{i,k,q} + \alpha_{k,q} + \theta_i + \varepsilon_{i,k,q}, \tag{1}$$

where a set of control variables $X_{i,k,q}$ includes the log value of the amount outstanding, numerical rating, time to maturity, and the percentage of zero-trading days. Standard errors are double clustered at the bond and quarter levels.

Our primary variable of interest is $PassiveFund$ defined as the sum of the amount held by all passive funds divided by the bond's amount outstanding and expressed as a percentage. The slope coefficient β allows us to infer the influence of a one-percentage-point increase in passive ownership on lending activities. We also create the scaled ownership by insurance firms, $Insurer$, and that by active mutual funds $ActiveFund$ and compare the effects of passive ownership with them.

We aim to identify an exogenous variation in ownership that is orthogonal to bond issuers' characteristics that might influence lending activities. For example, if a firm has a higher default risk, then this might increase the speculative demand to borrow its bonds, while passive funds investing in high-yield bonds increase their ownership at the same time. To eliminate those unmodelled forces driving both the ownership and the outcome variables, we include the firm-quarter fixed effect in the panel regression. This procedure identifies the coefficients by taking advantage of the variation across bonds with different maturity in the same quarter, issued by the same firm.

It is still possible that variation in maturity may create a mechanical correlation between the dependent variable and $PassiveFund$. For example, passive ownership may increase for short-maturity bonds while shorter maturity may reduce lending fees. In addition, a bond-level variable such as covenants and seniority may simultaneously move ownership and lending outcomes. Thus, we further control for bond fixed effects and bonds' maturity as an additional control variable to eliminate the bond- and maturity-specific shocks driving ownership and lending activities. This rich set of controls rules out potential bias in the estimated relationship between ownership and lending activities.

Main Results. We report β estimates, number of observations, and adjusted R^2 in Panel A of Table 2. We find that a one-percentage-point increase in passive ownership causes the loan quantity to fall 0.009 percentage points (pp), the lendable supply to rise 0.075 pp, and the borrowing fee to fall 0.004 pp. Since the standard deviation of $PassiveFund$ is 4.40%, a one-standard-deviation increase in passive ownership causes the loan quantity to fall by 0.039 percentage points (pp), the lendable supply to rise by 0.333 pp, and the borrowing fee to fall by 0.018 pp. The magnitudes of the reactions of these three outcome variables correspond to 2.9%, 2.5%, and 14.4% of their inter-quartile range, reported in Table 1, respectively. While the effect on the lending fee is substantial compared to its typical variation, the effect on quantity appears to be small. This estimate, however, hides something very interesting, where the shifts in the supply and demand curves almost cancel each other out.

We can infer the underlying shifts in the supply and demand curves by examining the signs of the changes in quantity and price variables. Column (2) of Table 2 shows that lendable supply increases as passive ownership increases. However, columns (1) and (3) show that the equilibrium loan quantity and fees fall. To make sense of these changes, in Panel A of Figure 1, we visualize the effect of increased passive ownership. With increased passive ownership, the increase in lendable supply indicates that the supply curve shifts outward. However, there is a decrease in the demand for bond lending that more than offsets the increased supply, resulting in even lower lending fees and a slightly lower equilibrium loan quantity. The effect on the equilibrium quantity is small because the increase in supply is offset by the decrease in demand.

The response of borrowing demand in the corporate bond market is opposite to that documented in the stock market. Specifically, Sikorskaya (2023) shows that a one-standard-deviation increase in benchmark intensity, another proxy for passive ownership, leads to a

0.348 pp and 0.032 pp *increase* in the quantity on loan and borrowing fees.[9] Thus, in the stock market, the demand for security lending appears to increase in response to increases in passive ownership. We explain below the apparent discrepancy between bonds and stocks.

Panel B of Table 2 reports the multivariate regressions including *PassiveFund*, *ActiveFund*, and *Insurer*. When the left-hand-side variable is lendable supply, the coefficients on *PassiveFund*, *ActiveFund*, and *Insurer* are 0.072 pp, 0.096 pp, and 0.100 pp, respectively. For borrowing fees, the corresponding coefficients are -0.004 pp, -0.0001 pp, and -0.001 pp, respectively. Thus, an increase in institutional ownership generally leads to an increase in bond supply and lower fees.

The difference between passive funds and other institutions arises when the left-hand variable is loan quantity. Here, a one-percentage-point increase in passive ownership reduces the loan quantity by 0.010 pp. In contrast, a one-percentage-point increase in active ownership and insurers increases the loan quantity by 0.030 and 0.019 pp, respectively. Thus, the demand for loan responds differently to ownership by different institutional types. When active fund or insurance ownership increases, borrowing demand may increase or decrease. The magnitude of the demand response, however, is dominated by changes in supply, and thus we observe price and quantity moving in opposite directions. However, in response to an increase in passive ownership, demand falls enough to dominate the increase in supply, so that price and quantity move in the same direction. We visualize these findings in Panel B of Figure 1, explaining the impact of increased ownership by insurance firms on bond lending.

These coefficients can be used to assess the impact of changing landscape of corporate bond ownership on bond lending. From 2006 to 2022, the share of passive funds, active funds, and insurer changes by 6.4 pp, 2.2 pp, and -9.1 pp. By multiplying these changes by the coefficient estimated in Table 2, we estimate that the ownership changes over the past 17

[9]To obtain these values, we multiply the standard deviation of benchmark intensity, 2.56% (her Table 1), by the coefficients in Table 2. Prado, Saffi, and Sturgess (2016) examine the effect of total institutional ownership (rather than passive ownership) and find that a one standard deviation increase in ownership leads to a 0.056 pp decrease in fees.

years have led to a 0.17 pp decline in loan quantity (12.6% of the inter-quartile range) and a 0.016 pp decline in lending fee (13.1% of the inter-quartile). Our estimates suggest that this structural change eases borrowing constraints, allowing dealers to engage in market-making activities more smoothly.

Mechanism. Insurance firms are known to buy and hold and their portfolio turnover rate is generally low. In eMAXX data, the average portfolio turnover rate for passive funds, active funds, and insurance firms are 3.6%, 4.9% and 1.7% per quarter, respectively. Based on this metric, insurers appear to be more inactive than passive funds. What then makes passive funds different from insurers? The key to understanding this dichotomy is that passive funds follow the bond index and must trade to track the index, which includes and excludes bonds based on predetermined criteria. This generates mechanical transactions and inflates the portfolio turnover rate while pushing bond prices up in the index (Dick-Nielsen and Rossi 2018). In contrast, insurance firms are known to reach for yield (Becker and Ivashina 2015), implying that the bonds that they hold tend to be cheaper than those held by their peers.

The relation of bond price to ownership is the key to understanding why the demand to borrow a bond responds to changes in its ownership. A lower bond price motivates opportunistic investors such as hedge funds to send aggressive buy orders and dealers to sell short the bond to cater to this demand. Passive ownership alleviates this pressure by inflating bond prices. To see this, we next examine the response of bond prices.

Column (5) of Panel B, Table 2 reports the relationship between various types of institutional ownership and bonds' credit spreads, which is the difference between the corporate bond yield and the maturity-matched Treasury bond yield. Consistent with the findings of Dannhauser (2017) and Bretscher, Schmid, and Ye (2024b), higher passive ownership is associated with lower credit spreads. In our estimates, a one-percentage-point increase in passive ownership leads to a 0.004 pp decline in credit spreads. This is in contrast to insurance ownership: their ownership leads to a 0.007 pp increase in spreads, confirming their reaching-for-yield behavior. Despite their small ownership share, passive ownership reduces credit spreads, which attenuates the buying pressure of other investors and reduces dealers' demand for short bonds to cater to their trading needs.

The bonds held by passive funds are more expensive, but there may be several mechanisms behind this. For example, Reilly (2022) notes that dealers tend to include overvalued bonds in a creation basket of ETFs, which make up the majority of our passive funds. Thus, while passive ownership may or may not cause the bond price to rise, passive funds end up holding overpriced bonds with lower credit spreads due to the strategic behavior of dealers.

3.2 Subsample of Special Bonds

The effect of passive ownership on bond lending may differ depending on the reason for the lending. If a bond is special, lending is driven by increased demand to borrow it. On the other hand, non-special bonds may be lent to raise cash, which is driven by increased supply.

To understand the potential difference between bonds, we split the sample into special and non-special (GC) bonds. In the equity literature, a cutoff such as 1% of the lending fee is often used to define specialness (e.g., Sikorskaya 2023). Since the lending fee for bonds is somewhat lower than that for stocks, we do not use the same cutoff. Rather, each quarter we define bonds in quarter q to be special if their average lending fee in quarter $q-1$ is in the top ten percentile of the corporate bond cross-section (Palia and Sokolinski 2024 also follow this rule to define special stocks). We use the lagged loan fee to define specialness because the fee in quarter q is the target we want to explain.

Using the subsample of special and GC bonds, we estimate the panel regression in Eq. (1). Table 3 Panel A reports the impact of a one-standard-deviation increase in passive ownership on the same five outcome variables in Table 2, separately for special and GC bonds. An increased passive ownership increases the lending supply and decreases borrowing fee, consistent with our full-sample results in Table 2. As expected, the magnitude of the coefficients is greater for special bonds. A one-standard-deviation increase in passive ownership increases lendable supply by 1.495 pp (9.4% of the sample average) and decreases the fee by 0.187 pp (1.1% of the sample average).

However, the effect of passive ownership on loan quantity is different for special bonds than for GC bonds. A one-standard-deviation increase in passive ownership increases the loan quantity for special bonds by an insignificant 0.086 pp, while it decreases the loan quantity for GC bonds by 0.034 pp ($t = -2.78$). Thus, the reduction in lending activity observed in the main sample is driven by GC bonds, not special bonds. This finding suggests that the impact of passive ownership is spread across a wide range of corporate bonds.

Why does the quantity on loan for special bonds increase albeit insignificantly? This is because the motivation to short special bonds is different from that for GC bonds. Anderson, Henderson, and Pearson (2018) show that informed trading occurs mainly among special bonds with high fees. Specifically, among bonds with high fees, bonds with high quantity on loan earn lower returns than those with low quantity on loan. Therefore, for special bonds, the decrease in credit spreads does not prompt the demand to fall.

3.3 Subsample of High Yield Bonds

Table 4 reports the estimation results of Eq. (1) using the subsample of investment grade and high yield bonds. We define high yield bonds if the numerical rating at the end of quarter $q-1$ is below BBB and investment grade bonds otherwise. We find that an increase in passive fund ownership has qualitatively the same effects on both investment grade and high yield bonds. In both cases, passive ownership increases the supply of bonds available for loan and reduces loan fees, indicating an increase in the supply of bonds available for loan. For the loaned quantity, a one percentage point increase in passive ownership reduces the loaned quantity by 0.035 percentage point for investment grade bonds and by 0.055 percentage point for high-yield bonds. Due to the smaller sample size, the effect on high-yield bonds is statistically indistinguishable from zero. Nevertheless, the key finding is that the demand for credit falls for both investment grade and high yield bonds in response to increased passive ownership.

4 Why Do Market Participants Borrow Corporate Bonds?

4.1 Univariate Analysis

In this section, we analyze the motivation for borrowing corporate bonds. As in Asquith, Au, Covert, and Pathak (2013), there are at least three reasons why market participants borrow bonds: 1) investors speculate on the potential decline in bond prices by borrowing bonds and selling them short, 2) dealers respond to clients' immediate buy orders by borrowing bonds and selling them short, 3) bond owners seek to finance their holdings by lending them out and receiving cash collateral. The first and second motivation generates the demand to borrow bonds, but the borrowers (and thus the short sellers) are different: in the first, customers such as hedge funds are the borrowers and short sellers of the bond; in the second, dealers are the borrowers and sellers. The last motivation generates the lending supply, which reflects the funding needs of bond owners.

To dissect these motivations, we start with a simple "smell" test using univariate regressions and then in the next section check for robustness by adding a number of control variables. As a starter, we run a panel regression of daily customer buy and sell volume scaled by the amount of bonds outstanding on day $d+h$, $Vol_{i,d+h,\xi}$, on daily changes in the amount of credit, also scaled by the amount of bonds outstanding, $dQ_{i,d}$,

$$Vol_{i,d+h,\xi} = a_{h,\xi} + b_{h,\xi} \cdot dQ_{i,d} + \varepsilon_{i,d+h,\xi}, \quad \text{where } \xi \in \{\text{`Buy'}, \text{`Sell'}\}, \tag{2}$$

for $h = -5, ..., 5$. We use daily changes in quantity on loan to capture the flow of activities because trading volume is also a flow variable (as opposed to a stock variable).

The slope coefficient $b_{h,\xi}$ measures the sensitivity of customer trades to changes in loaned quantity. This estimate can be used to distinguish whether customers or dealers are shorting the bonds. Suppose there is an increase in the quantity on loan driven purely by customer selling short, then we expect $b_{h,Sell} = 1$: that is, a one percentage point increase in the quantity on loan corresponds to a one percentage point increase in customer selling. If there is no trading of bonds other than those borrowed, then the R-squared of the regression will be one as well.

It is also possible that the increase in quantity on loan reflects a decrease in the number of customers returning previously borrowed bonds. Then the increase in lending corresponds to a decrease in customer purchases. That is, customer short activity is decreasing. If this is the only driver of dQ, then we expect $b_{h,Buy} = -1$. More realistically, if the increase in borrowing is driven by both an increase in newly established short positions and a decrease in previously established short positions, we expect $0 < b_{h,Sell} < 1$, $-1 < b_{h,Buy} < 0$ and $b_{h,Sell} - b_{h,Buy} > 0$. To the extent that there are bond transactions unrelated to borrowing/lending, the regression R-squared may be lower than one.

If, on the other hand, it is dealers who borrow bonds and short them for market-making activities, then the prediction for the coefficients is the opposite. An increase in borrowing should correspond to an increase in customer *buy*, implying a positive coefficient, $0 < b_{h,Buy} < 1$. It may also correspond to a decrease in customer selling (as dealers' short covering activity decreases), implying a negative coefficient $-1 < b_{h,Sell} < 0$. If dealer short and short covering fully explains lending activities, $b_{h,Sell} - b_{h,Buy} < 0$ holds.

Finally, if bond lending is motivated by financing reasons, then lending is not associated with buying or selling the bond. Therefore, we expect the slope coefficients to be zero for both customer purchases and sales.

We estimate the regression in Eq. (2) using the daily subsample before and after September 4, 2017. We choose the cutoff date as the date when the SEC implemented a new rule for the settlement cycle of securities transactions. Before September 4, transactions are generally settled three business days after the trade date, but on September 4, this gap is reduced to two business days.[10]

Panel A of Figure 4 plots the coefficient estimates $b_{h,\xi}$ of the regression in Eq. (2) using the first subsample before September 4, 2017, along with two standard error bars. We compute standard errors by double-clustering at the bond and date level.

The plot shows a striking pattern for the coefficients on day $d-3$, which reflects the correlation between day $d-3$ volume and day d changes in borrowing quantity. We find that customer buying is strongly positively correlated with quantity on loan, while customer selling is negatively correlated. Using bonds with all credit ratings, a one percentage point increase in changes in quantity on loan corresponds to a 0.19 percentage point increase in customer buys and a 0.11 percentage point decrease in customer sells. Because $b_{h,Sell} - b_{h,Buy} = -0.3 < 0$ holds, dealers' market-making activities are an important driver of bond lending.

Panel B of Figure 4 plots the coefficient estimates $b_{h,\xi}$ for the subperiod after September 5, 2017. The figure looks similar to Panel A, except that the peak of the increase in customer buying now shifts from $d-3$ to $d-2$, reflecting the fact that the settlement period is shortened from three to two days.

The fact that the sum of $|b_{d-3,Sell} - b_{d-3,Buy}|$ is less than one suggests that dealer short selling is an important but not the only driver of bond lending. The insensitivity of bond volume to lending may reflect the existence of financing transactions in which borrowed bonds are not sold. In addition, it is possible that customers speculate and sell borrowed bonds short, but their activity is dominated by dealers' short selling, which attenuates the magnitude of the slope coefficients. At any rate, the evidence we have so far suggests that dealer short selling is not negligible and on average greater than customer short selling.

Informed trading is more prevalent in the HY bond market as these bonds are more sensitive to issuers' default risk. Thus, we may observe more speculative short selling in HY bonds than IG bonds. In Figure A1, we show the univariate regression in Eq. (2) using

[10]In 2024, the settlement period is further reduced to one business day.

the subsample of bonds based on the credit rating on day d. We find that the figures are virtually identical for IG and HY bonds, suggesting that the determinants of bond lending are similar across bonds with various credit ratings.

The effect of changing the settlement period is important for the daily data analysis using the securities lending database. On the settlement day, market participants typically do not make decisions to borrow or lend the securities. These decisions are likely to be made on trade dates that are 2 or 3 business days before settlement. There are exceptions because the settlement of security lending does not follow exactly the rule for settling outright purchase and sales transactions. In an emergency situation of failed delivery, market participants may tend to security lending transactions with very short settlement period, even on the same day. Still, these exceptions are rare. Therefore, typically, if one wants to understand the relationship between securities return and lending, then the "contemporaneous" relationship can be obtained by regressing the quantity lent on day d on the return on day $d-2$ or $d-3$.

4.2 Multivariate Analysis

To quantify the contributions of the three drivers of bond lending, we follow Diether, Lee, and Werner (2009) and regress changes in the quantity on loans on a set of explanatory variables. Specifically, the panel regression model is as follows,

$$\begin{aligned} dQ_{i,d} = {} & b_0 r_{i,d-s} + b_1 \bar{r}_{i,d-s-5,d-s-1} + b_2 Vol_{i,d-s,Buy} + b_3 Vol_{i,d-s,Sell} + b_4 \overline{dQ}_{i,d-5,d-1} \\ & + b_5 \overline{Vol}_{i,d-s-5,d-s-1} + b_6 \overline{Vol}_{i,d-s-5,d-s-1} + b_7 \bar{h}_{i,d-s-5,d-s-1,Buy} + b_8 \bar{h}_{i,d-s-5,d-s-1,Sell} \\ & + b_9 \sigma_{i,d-s-5,d-s-1} + \gamma_d + \alpha_i + \varepsilon_{i,d}, \end{aligned} \tag{3}$$

where the subscript s is 3 if d is on or before September 4, 2017 and 2 thereafter. Thus, day $d-s$ is the date when participants make the decision to borrow and sell a bond. The set of explanatory variables includes $r_{i,d-s}$, the daily return on bond i on day $d-s$; $Vol_{i,d-s,\xi}$, the daily volume with a trading side ξ scaled by amount outstanding; $h_{i,d-s,\xi}$, the half spread with a trade side ξ; $\sigma_{i,d-s-5,d-s-1}$, the bond return volatility computed over the five-day period from day $d-s-5$ to $d-s-1$. Variables with an upper bar refer to the average of the daily values over the period. To compare the economic significance of the slope estimates across variables, in this regression, all explanatory variables are standardized to have a mean of zero and a standard deviation of one. Standard errors are double clustered at the bond and day level.

Column (1) of Table 5 reports the regression estimates using contemporaneous and past bond returns as explanatory variables. Consistent with the existence of opportunistic customer short selling, the slope coefficients are positive. A one-standard-deviation increase in the contemporaneous (i.e. day $d-s$) return is associated with a 0.21 bps increase in lending, while the increase in lagged returns is associated with a 0.03 bps increase. Since the standard deviation of daily changes in the quantity on loan is 19.80 bps, the estimates are economically small, indicating that speculative short selling by customers is likely to play a minor role in explaining bond lending.

Column (2) of Table 5 adds lagged changes in quantity on loan, but the coefficients on the contemporaneous and past returns remain small.

In Columns (3) to (5), we examine the role of customer buying and selling volume. In Column (3), we use the contemporaneous buy and sell volume and the averages of the lagged volume. In Column (3), the point estimates for the coefficient on contemporaneous buys and sells are 4.54 bps and -3.90 bps, respectively. Consistent with the univariate analysis in the previous section, an increase in securities lending is strongly positively associated with a contemporaneous increase in customer buys and negatively associated with customer sells. The point estimates are economically significant when compared to the standard deviation of the right-hand-side variables. The magnitude of the estimates remains unchanged when we add other control variables such as half spreads (buys and sells separately) or the volatility of bond returns.

In Column (6), we add all the variables in the panel regression. The point estimates remain similar for all variables. The magnitude of the coefficient on the contemporaneous customer buying and selling dwarfs that on all other variables. For example, the coefficient on customer buying is about 30 times as large as that of the return, and that on the customer selling is 25 times as large as that on the return. The third and fourth largest coefficients are those on lagged customer sales (-1.64 bps) and lagged average changes in quantity on loans (-1.67 bps). Therefore, dealers' market-making activities, in which they sell short bonds to customers, dominate other variables in explaining the variation in bond lending activity.

5 Identification Based on Maturity Cutoffs

Our main results assess the effect of increased passive ownership using within-firm variation in lending outcomes. While this is a valid approach for identifying ownership shocks, it is not the only one.

Bretscher, Schmid, and Ye (2024b) propose that one can use maturity cutoffs as a valid instrument for changing passive ownership. Specifically, they show that when the remaining maturity of a bond shrinks beyond a certain threshold, such as three or ten years, passive ownership increases. This happens because there are more short-term index funds than long-term index funds. This provides another clean identification of shocks to passive ownership, because the fundamental values of a bond remain very similar when its maturity changes from (say) 10.1 years to 9.9 years. Since Bretscher, Schmid, and Ye (2024b) study the effect of ownership on bond pricing and liquidity, we revisit their results focusing on bond lending outcomes.[11]

To assess the impact of switching ownership, we define a dummy variable that takes on a value of one if a bond's remaining time to maturity crosses the three, five, and ten year cutoffs on any day in month t and zero otherwise, denoted $Switch_{i,t}$. We then regress

[11] Internet Appendix of Bretscher, Schmid, and Ye (2024b) also study several bond lending outcomes. Our results are very similar to theirs, but we extend the horizon for the outcome variables to examine the medium-term effect of increased passive ownership.

changes in lending outcome variables for bond i, including lending supply, quantity on loan, and lending fees. In addition, we use passive ownership as another outcome variable to verify that crossing maturity increases ownership. In this analysis, we use the monthly data constructed as described in the Internet Appendix C.

Specifically, we estimate a panel regression,

$$\Delta Outcome_i^{t-1 \to t+h} = \beta^h Switch_{i,t} + Controls_{i,t-1} + \alpha_i + \lambda_t + e_{i,t}^h, \tag{4}$$

where $\Delta Outcome_i^{t-1 \to t+h}$ is the change of the bond lending and ownership variables for bond i from $t-1$ to $t+h$. We set $h = -4, \ldots, 24$ to study the pre-trends, short- and medium-term impacts. $Controls_{i,t-1}$ includes the log of amount outstanding of the bond, numerical credit rating, and the fraction of zero trading days in a month. Each regression includes bond and year-month fixed effects. For this regression, we restrict to the sample that $\Delta Outcome_i^{t-1 \to t+h}$ are all available across h for comparability. Standard errors are double-clustered at the bond and year-month levels.

Table 6 Panel A reports the coefficient estimates for passive ownership and the corresponding panel in Figure 5 plots the estimated coefficients with two-standard-error bars to visualize them. Consistent with Bretscher, Schmid, and Ye (2024b), we find that when a bond crosses the maturity cutoff, its passive ownership increases significantly. Specifically, the ownership increases 0.021 pp in the month when the bond maturity becomes less than the cutoff ($h = 0$) from a month before. While the initial reaction is statistically insignificant, the ownership gradually increases for the following nine months, with β^9 being estimated at 0.214 pp ($t = 4.54$). This increase is permanent, as the increase in ownership 24 months after crossing the cutoff is still high at 0.239 pp ($t = 3.79$). Thus, we confirm that our instrument is valid and generates non-trivial variation in passive ownership when compared with its sample average (3.63 pp) and inter-quartile range (4.91 pp).

Panels D to F in Table 6 and Figure 5 report the regression estimates in Eq. (4) for changes in quantity on loan, lendable supply, and lending fees. The response of the loan quality three, nine, 18, and 24 months after the bond crosses the cutoff is 0.06 pp, −0.02 pp, −0.11 pp, and −0.12 pp, respectively. That is, in the first three months, the loan quantity increases by a small amount, reflecting the buying pressure created by passive funds who must buy those bonds to track a bond index. However, over the medium term, the initial reaction reverses, and the quantity on loan declines. This happens because the increased passive ownership reduces the bonds' credit spreads and reduces the buying pressure from other speculative investors. As a result, dealers have to sell short bonds less than before, leading to a lower quantity on loan.

The decrease of quantity on loan identified using maturity cutoff as an instrument is qualitatively consistent with our main results based on the quarterly panel regressions with firm-quarter fixed effects. However, quantitatively, the point estimate is economically more significant. In our main result, a one-percentage-point increase in passive ownership reduces the quantity on loan by 0.087 pp. In the maturity cutoff analysis, for $h = 24$. the reaction of quantity on loan to the one-percentage-point increase in passive ownership generates a 0.500 pp (=0.119/0.239) decline in quantity on loan. This reaction is substantial given the average and inter-quartile range of quantity on loan (1.45 pp and 1.35 pp, respectively). In addition, in Panel E, lendable supply declines substantially after a bond crosses the maturity cutoff. The estimated change from $h = -1$ to $h = 24$ is -0.344 pp, which is 3.43 standard errors below zero. This is in contrast to our main results, where an increase in passive ownership raises the lendable supply.

To reconcile the apparent discrepancy in estimated reactions between two types of instruments, one must understand the nature of the maturity cutoff event. That is, when a bond crosses the maturity cutoff, different types of investors react *simultaneously*. To see this, in Panels B and C of Table 6, we report the changes in ownership share of insurance firms and active mutual funds. The corresponding panels in Figure 5 show the regression coefficient estimates.

When the bond crosses the cutoff, insurance firms gradually reduce their ownership share. While the changes in ownership in the month of crossing the maturity cutoff are close to zero, the cumulative changes become more negative as the horizon h increases. For $h = 24$, insurance firms' ownership declines 0.488 pp ($t = -5.22$). In contrast, active mutual funds initially reduce their share, but the effect eventually disappears over the medium term. For example, the estimated change from $h = -1$ to $h = 3$ is -0.287 pp ($t = -2.93$), but the cumulative change from $h = -1$ to $h = 24$ is insignificant 0.054 pp.

In summary, over the medium term, crossing the maturity cutoff significantly increases passive ownership and decreases insurance ownership. The decrease in insurance ownership reduces the lendable supply and dominates the increase in passive funds. Changes in insurance ownership dominate because the magnitude of the change is larger (-0.488 pp) than that of passive ownership (0.243 pp), and a one percentage point increase in insurance ownership has a larger impact on lendable supply (0.100 pp, see the unscaled coefficient in Table 2) than the same change in passive ownership (0.072 pp). As a result, the maturity cutoff event significantly reduces lendable supply, as shown in Panel E, Figure 5. This reduction in supply leads to a more pronounced decline in quantity on loan (Panel B) than that in our main results.

In contrast, the borrowing fee (Panel F) reacts little when a bond crosses the maturity cutoff. This is because the increase in passive ownership decreases the fee, while the decreased insurance ownership increases it. Since the two forces cancel each other out, the resulting reactions in the lending fee are insignificant for all horizons.

In this section, we use the event study approach to understand the impact of changing bond ownership on bond lending. The findings support our main results in Section 3, where all else equal, an increase in passive ownership reduces the quantity on loan and borrowing fees.

6 Fungible Issues

In this section, we examine an alternative shock based on bond issuance. Borrowing firms can choose to increase the size of an existing bond issue by issuing fungible bonds with the same terms as the original bonds, akin to seasoned equity offerings. These issues are interesting because an increase in dealer inventory in the primary market issue is likely to motivate dealers to supply the bond to ETFs through creation baskets. Thus, we view it as another type of shock to ETF bond holdings.

For this exercise, we use the Mergent FISD data and identify 626 instances where the amount outstanding increased during our sample period. The average and standard deviation of the increase, relative to the pre-issuance amount, are 44.56% and 40.36%, respectively. We then employ the local projection method used in the prior section to examine the response of ETF ownership, loan quantity, and credit spreads. Specifically, we estimate the panel regression,

$$\Delta Outcome_i^{t-1\to t+h} = \beta^h Increase_{i,t} + Control_{i,t-1} + \alpha_t + \gamma_i + \varepsilon_{i,t}^h, \quad \text{for } h \in [-4, 6]. \qquad (5)$$

where $\Delta Outcome_i^{t-1\to t+h}$ represents the change in ETF ownership and lending variables for bond i from $t-1$ to $t+h$. We require that the changes in the outcome variable be available for all h. $Increase_{i,t}$ is an indicator that equals one if the outstanding amount of bond i increases in month t, and zero otherwise. Control variables include the logarithm of the outstanding amount, credit rating, time to maturity, and the percentage of zero trading days. Each regression includes bond and year-month fixed effects. We double cluster standard errors by firm and year-month. We restrict the sample to six months after the event due to the limited number of events.

Table 7 reports the estimated regression coefficients. On impact ($h = 0$), ETF ownership increases by 0.01 pp, which is insignificant. However, ownership increases gradually from one to six months after the bond issuance. In six months, the cumulative increase in ETF ownership is 0.337 pp ($t = 3.63$), which is notably larger than the corresponding value of the maturity cutoff exercise (Table 6, 0.180 pp). This result is not a mechanical artifact of ETFs tracking value-weighted indices, as our ownership measure is the ratio of ownership to outstanding amount, adjusted for new issues. Thus, the evidence suggests that fungible issuance increases the share of bonds held by ETFs.

The middle panel of table 7 reports the regression estimates for changes in loan quantity. We find that loan quantity declines significantly in the month of issuance and continues to decrease for the next two months, and then rebounds in the sixth month. The decline in loan quantity is as large as -0.798% in the first month, which is significant compared to the interquartile range of 1.35%. The fact that short sales decrease rather than increase supports the contention that short sellers are primarily dealers rather than speculators betting on a decline in bond prices post-issuance.

Figure 6 plots these regression coefficients, which visualize the cumulative changes in the outcome variables. We also find that credit spreads do not respond to issuance, suggesting that there is another link between ETF ownership and short selling activity: an increase in dealer inventory leads to greater bond supply to ETFs while reducing the dealers' need to borrow bonds to meet customer demand. Taken together, the evidence underscores a strong relationship between passive ETF ownership and dealer short activity.

7 Conclusion

In this paper, we investigate the mechanism through which increased passive ownership impacts the lending activity of corporate bonds. To understand the mechanism, it is essential to clarify why market participants borrow or lend corporate bonds, which have order-of-magnitude higher bid-ask spreads than stocks and thus their trading is costly for investors. We show that bond lending occurs mainly for dealers' market making activities and the role of speculative short sales by investors is limited. Therefore, short sale is positively related with an increase in buying pressure of investors, which propels dealers to sell short to cater to the customer demands. Thus, when a bond is more expensive, its price reduces buying pressure from speculative investors, reducing the demand to borrow corporate bonds. This is interesting because it is exactly the opposite of what would happen in the equity market, where it is less costly to sell short the security. In a low-cost environment, speculators will try to take advantage of overvalued securities by selling them short, thereby increasing the demand to borrow the security.

Because the motivation to sell short is to provide liquidity in bond trading, an increase in passive ownership reduces the demand to borrow bonds. At the same time, since passive funds are the natural lenders of the security, it increases the lendable supply, resulting in a reduction in borrowing fees. Our analysis based on the large panel data reveals that the decline in demand dominates the increase in supply, resulting in a small reduction in the equilibrium quantity of bonds borrowed.

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Von Beschwitz, Bastian, Pekka Honkanen, and Daniel Schmidt, 2023, Passive ownership and short selling, *Available at SSRN 4438781* .

Figure 1: Security Lending Supply and Demand

This figure illustrates the supply and demand curves for security lending markets. In Panel A, we consider an increase in passive ownership, which leads to a decreased quantity on loan and lower fees. In Panel B, we consider an increase in insurance ownership, which leads to an increase in quantity on loan and lower fees.

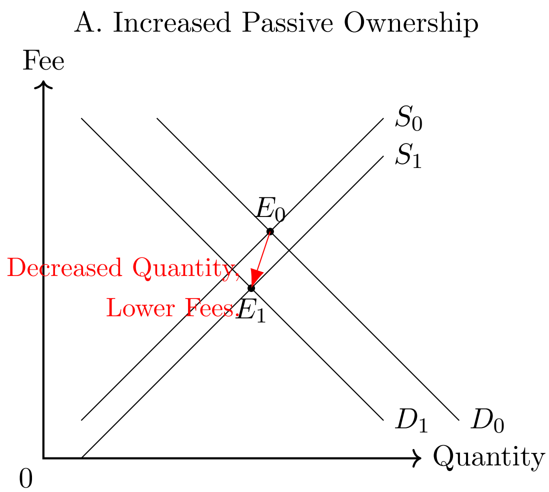


Figure 2: Time Series Plots of Bond Ownership

This figure plots the six-month moving average of percentage ownership in corporate bonds included in our baseline quarterly panel dataset, disaggregated by investor type, from July 2006 to December 2022. The dotted green line represents holdings by insurance companies, the dashed blue line represents the share of bonds held by active mutual funds, and the solid red line represents the share of bonds held by passive mutual funds, including index funds and exchange-traded funds (ETFs). Holdings data are sourced from eMAXX and Morningstar, while bond amount outstanding data are obtained from Mergent FISD. Details on sample construction are provided in Section 2.

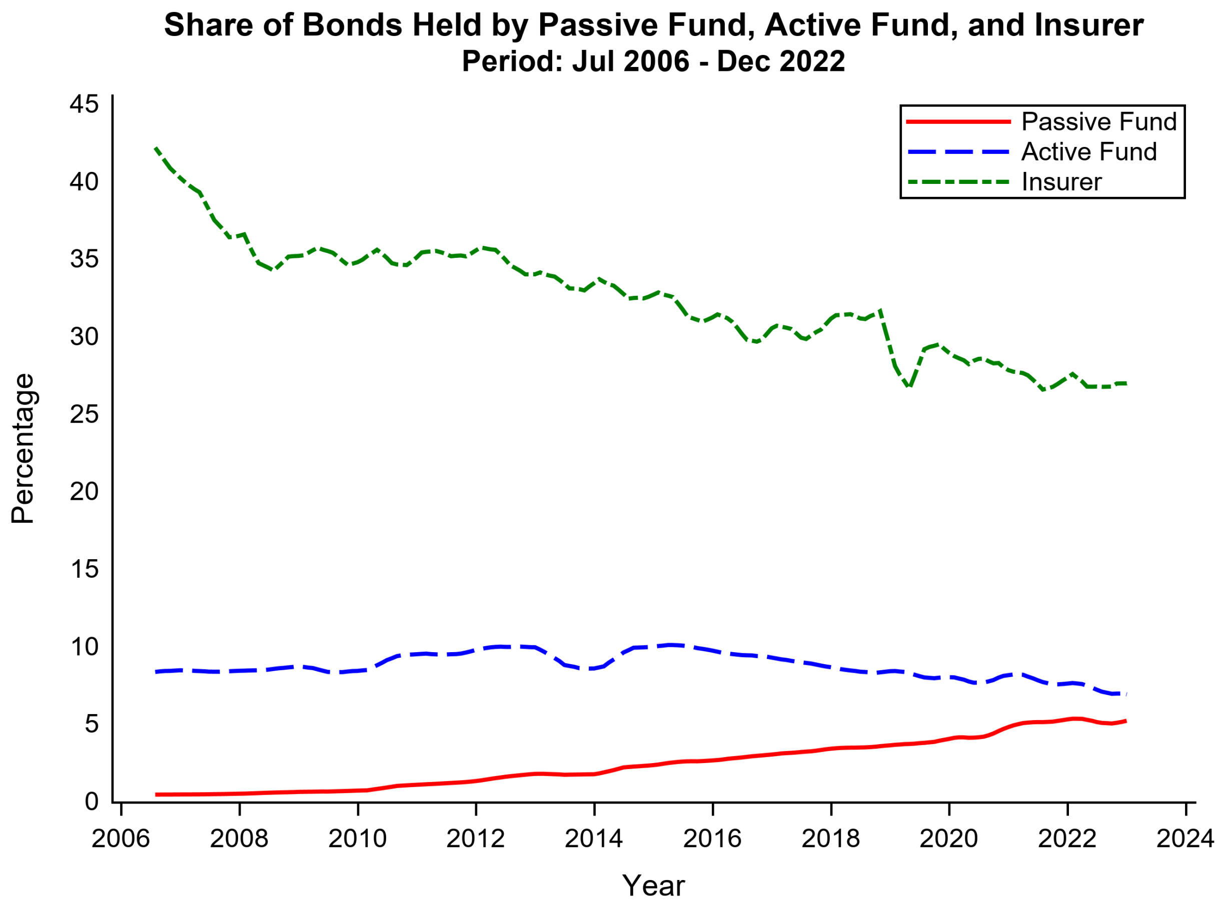
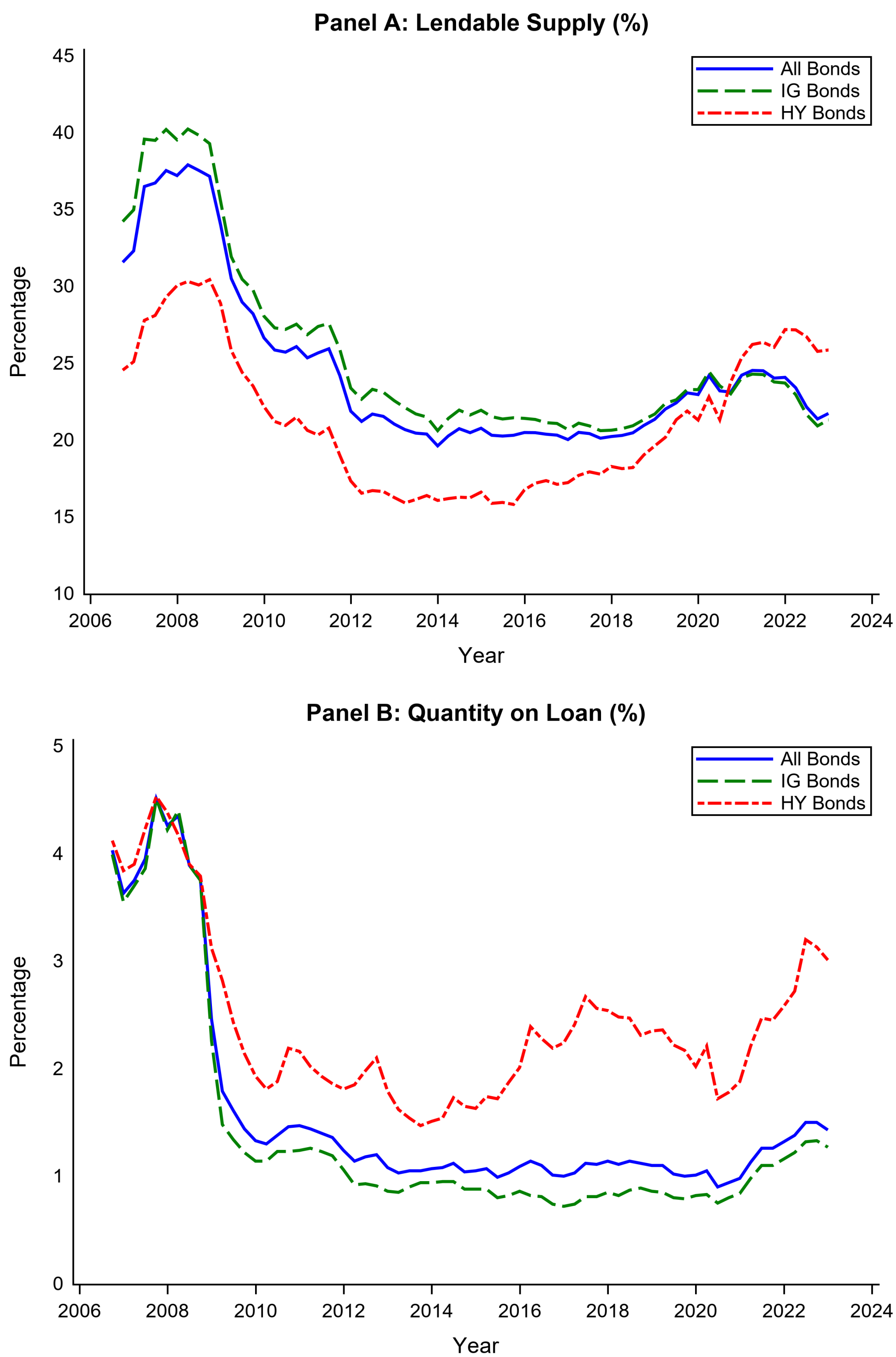
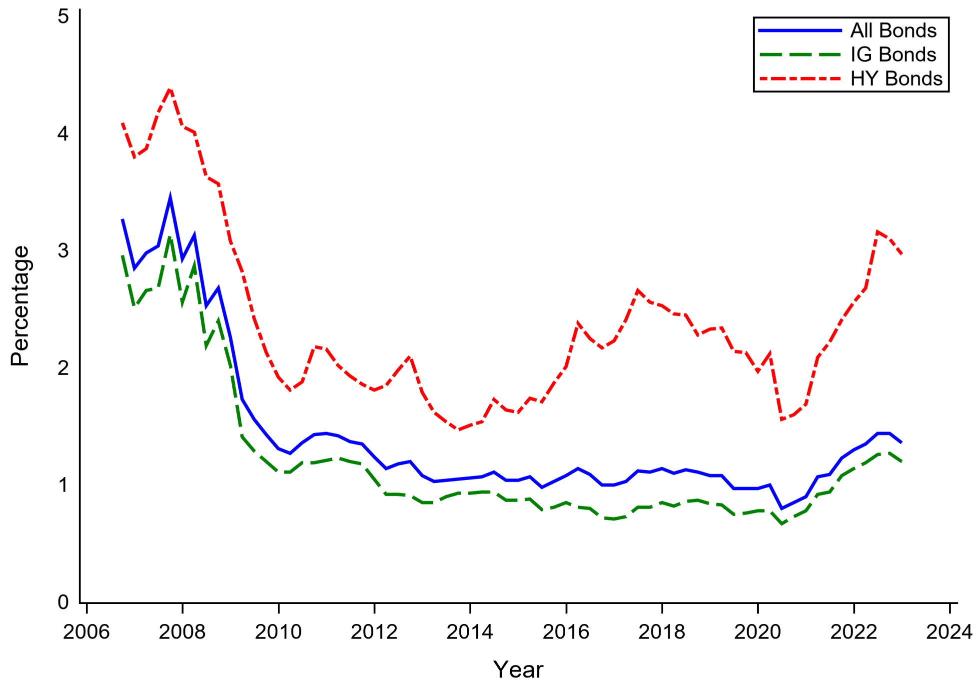


Figure 3: Time Series Plots of Bond Lending Activities

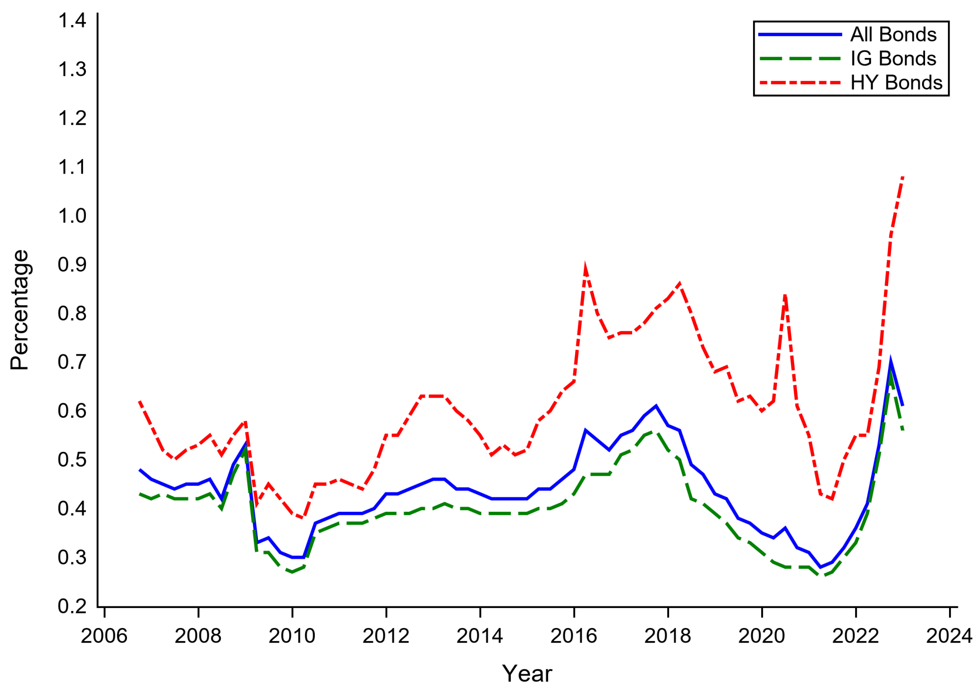
This figure plots the average lending market outcomes of corporate bonds included in our baseline quarterly panel data from 2006 Q3 to 2022 Q4. The solid blue line represents the whole sample, while the dashed green and dot red lines display investment grade and high yield bonds, respectively.



Panel C: Short Loan Quantity (%)



Panel D: Borrowing Fee (%)



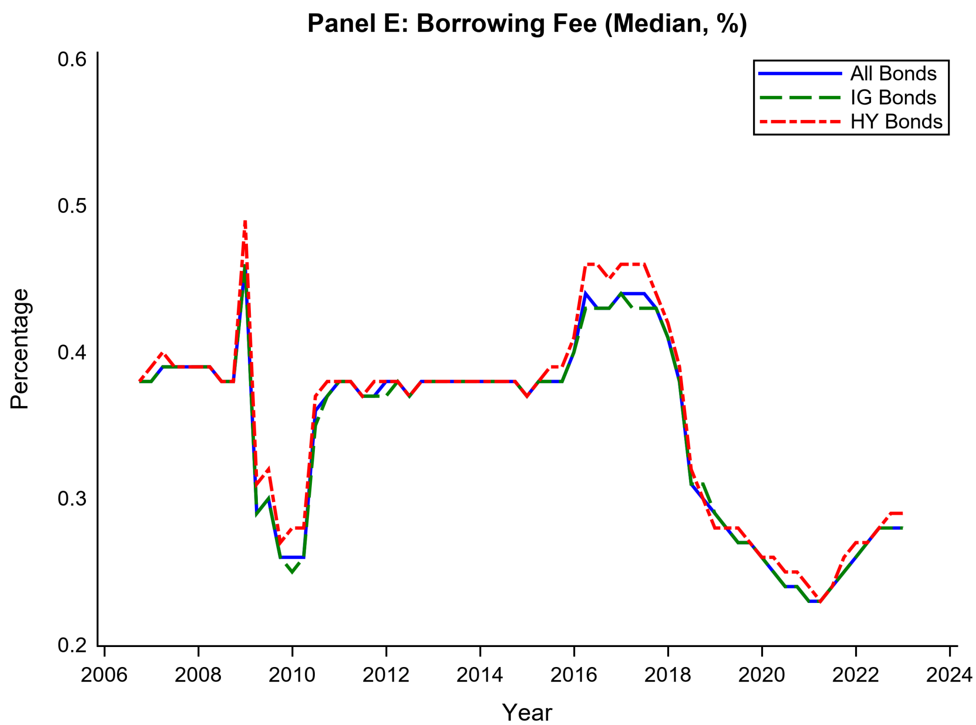

Panel E: Borrowing Fee (Median, %)
All Bonds
IG Bonds
HY Bonds
Percentage
0.6
0.5
0.4
0.3
0.2
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year

Figure 4: Panel Regression of Dollar Trading Volume on Changes in Quantity on Loan

This figure plots the slope coefficients of the panel regression of dealer-customer trading volume on the day $d + h$ on the day d changes in quantity on loan. Trading volume and quantity on loan are scaled by the amount outstanding. The y-axis represents a change in the percentage of the scaled dollar trading volume as a result of a one percentage change in the scaled quantity on loan. Panel A is for all bonds up to Sep 4, 2017, and Panel B is for all bonds after Sep 5, 2017.

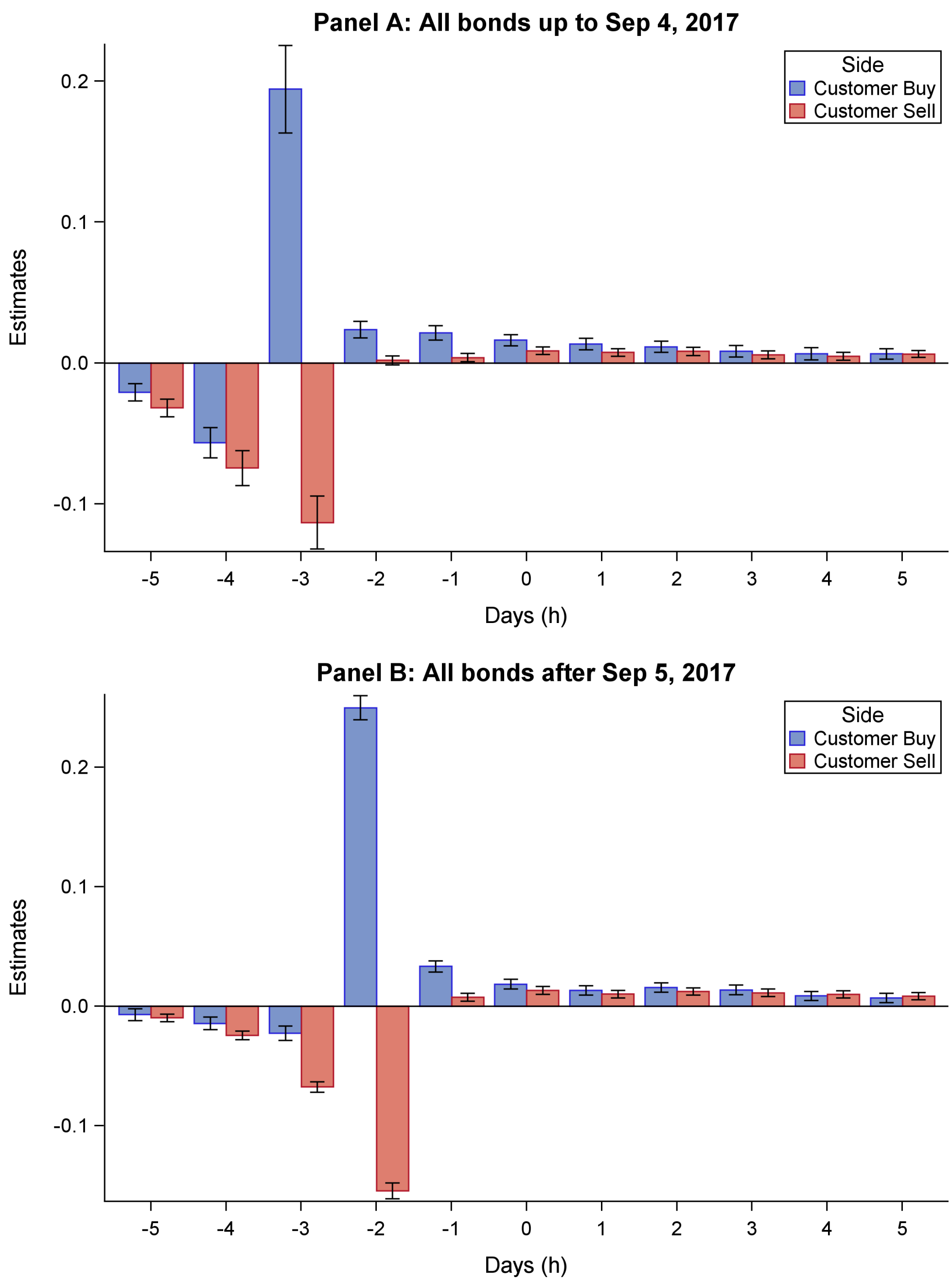


Figure 5: Investor Ownership and Bond Lending around Maturity Cutoffs

The figure plots the slope coefficients β^h from the following regression for $h \in [-4, 24]$

$$\Delta Outcome_i^{t-1\rightarrow t+h} = \beta^h Switch_{i,t} + Controls_{i,t-1} + \alpha_t + \gamma_i + \varepsilon_{i,t}^h,$$

where $\Delta Outcome_i^{t-1\rightarrow t+h}$ is the change of investor ownership and lending variables for bond i from $t-1$ to $t+h$. $Switch_{i,t}$ is an indicator variable equal to one if bond i crosses any one of the maturity cutoffs (i.e., 10 years, 5 years, and 3 years) in month t, and 0 otherwise. Thus, the y-axis represents the change of outcome variables relative to the pre-crossing level after a bond crosses the maturity cutoffs. Control variables include the log of the amount outstanding, credit rating, time to maturity, and the percentage of zero trading days. Each regression includes bond and year-month fixed effects. Error bars represent the two-standard-error confidence intervals, where standard errors are clustered at both the bond and year-month levels.

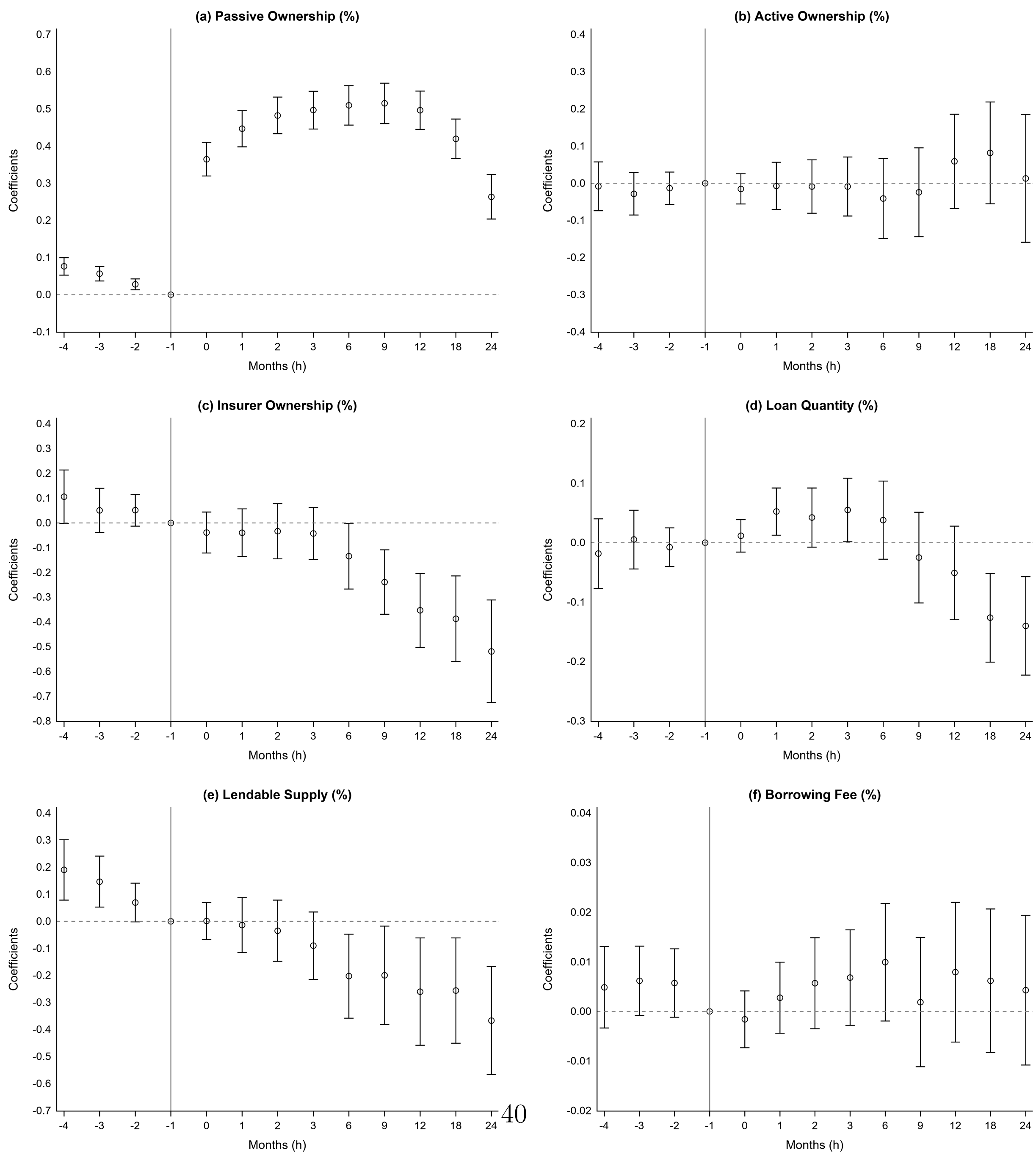


Figure 6: Passive Ownership and Bond Lending around Outstanding Amount Increases

The figure plots the slope coefficients β^h from the following regression for $h \in [-4, 6]$

$$\Delta Outcome_i^{t-1 \to t+h} = \beta^h Increase_{i,t} + Controls_{i,t-1} + \alpha_t + \gamma_i + \varepsilon_{i,t}^h,$$

where $\Delta Outcome_i^{t-1 \to t+h}$ is the change of passive fund ownership and lending variables for bond i from $t-1$ to $t+h$. $Increase_{i,t}$ is an indicator that equals one if the outstanding amount of bond i increases in month t, and zero otherwise. Control variables include the log of the amount outstanding, credit rating, time to maturity, and the percentage of zero trading days. Each regression includes bond and year-month fixed effects. Error bars represent the two-standard-error confidence intervals, where standard errors are clustered at both the bond and year-month levels.

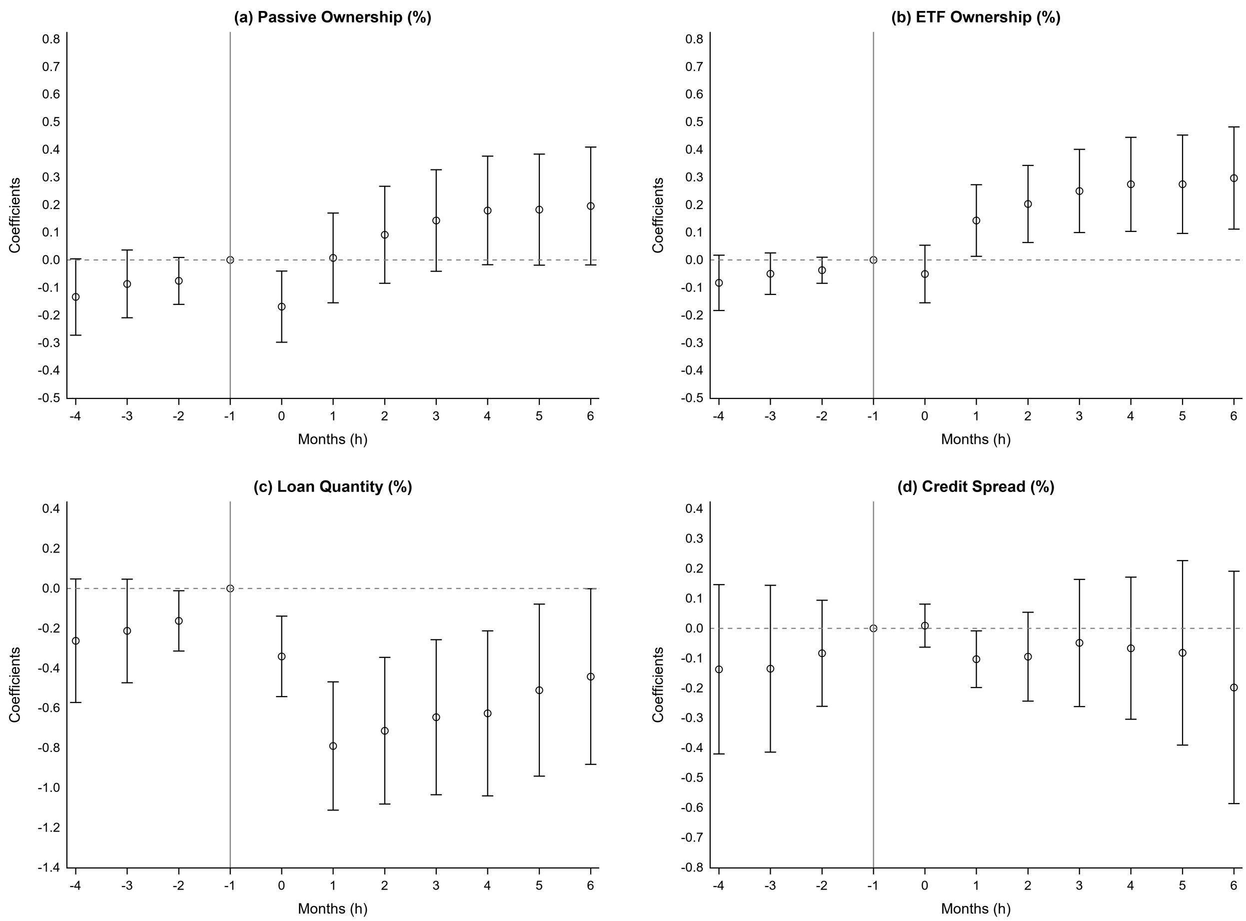


Table 1: Descriptive Statistics

This table reports summary statistics for the main variables at the bond-quarter level. We compute quarterly averages of daily bond lending variables for each bond unless mentioned otherwise. *Loan Quantity* is defined as the quantity on loan from Markit divided by the amount outstanding from Mergent FISD. *Lendable Supply* is the active lendable quantity from Markit divided by the amount outstanding. *Utilization Rate* is defined as the ratio of the quantity on loan to the lendable quantity. *Loan Tenure* is the average number of days that bond loans have been open. *Borrowing Fee* is the buy-side fee paid by the ultimate borrower ("*IndicativeFee*" in Markit). *Rebate Rate* is the "*IndicativeRebate*" in Markit. *DCBS* is the cost of borrow score provided by Markit, ranging from 1 (low cost) to 10 (high cost). *Fee Risk* is the natural logarithm of the standard deviation of borrowing fees within a calendar quarter. *Recall Risk* is the natural logarithm of the standard deviation of utilization rate in a given quarter. *Lender Concentration* is a Herfindahl-Index-like measure at the bond level provided by Markit that describes the concentration of lenders. *Special* is a dummy variable equal to one if the borrowing fee in a given quarter falls in the top decile of the fee distribution across bonds and zero otherwise. *Credit Spread* is calculated as the average difference between the corporate bond yield and the yield of a matching Treasury bond within a quarter. h^{Buy} (h^{Sell}) is half spread from the customer buy (sell) side, defined as the quarterly average of the log price differences between customer buy (sell) trades and inter-dealer trades following O'Hara and Zhou (2021). We match customer buy (sell) trades with the closest in-time inter-dealer trade over the past five trading days with replacement. We decompose the share of bonds held by mutual funds into *Passive Fund* (i.e., index funds and ETFs) and *Active Fund* based on Morningstar data. *Insurer* represents the share of bonds held by insurance firms, sourced from eMAXX. *Amount* is the amount of bonds outstanding in millions of dollars. *Rating* is the numerical rating score, where 1 refers to a AAA rating by S&P and Aaa by Moody's, 21 refers to a C rating for both S&P and Moody's. *Age* is the age of a bond in years. *Maturity* is the time to maturity in years. *ZTD* is the percentage of zero trading days in a given quarter. To mitigate the influence of outliers, all continuous variables are winsorized at the 1st and 99th percentiles within each quarter. The dataset is compiled from Mergent FISD, TRACE, Markit, Morningstar, and eMAXX. The final sample comprises 17,140 bonds issued by 1,705 firms, covering the period from Q3 2006 to Q4 2022.

Variable	Mean	SD	P1	P25	P50	P75	P99	IQR	Obs
Loan Quantity (%)	1.45	2.58	0.01	0.16	0.51	1.51	12.06	1.35	297,693
Lendable Supply (%)	23.74	10.95	1.78	16.38	22.70	29.72	56.79	13.34	297,693
Utilization Rate (%)	6.71	11.98	0.03	0.78	2.46	6.98	65.01	6.20	297,693
Loan Tenure (days)	74.27	86.56	1.00	23.27	44.08	88.92	455.55	65.66	297,693
Borrowing Fee (%)	0.44	0.47	0.17	0.28	0.37	0.40	2.94	0.13	297,693
Rebate Rate (%)	0.56	1.44	−2.12	−0.25	−0.12	1.08	4.90	1.33	297,693
DCBS	1.06	0.29	1.00	1.00	1.00	1.00	2.75	0.00	297,693
Fee Risk	−2.85	1.01	−5.25	−3.45	−2.90	-2.48	0.14	0.97	253,298
Recall Risk	−0.28	1.74	−6.64	−1.07	0.02	0.86	2.69	1.93	291,480
Lender Concentration	0.49	0.32	0.00	0.29	0.49	0.73	1.00	0.44	297,693
Special	0.10	0.30	0.00	0.00	0.00	0.00	1.00	0.00	297,693
Credit Spread (%)	2.13	2.67	0.23	0.88	1.41	2.40	11.51	1.52	293,193
h^{Buy} *(%)*	0.28	0.87	−1.59	0.01	0.14	0.43	3.15	0.43	286,041
h^{Sell} *(%)*	0.26	0.97	−2.10	0.00	0.16	0.45	3.09	0.45	284,634
Passive Fund (%)	3.43	3.06	0.00	0.70	2.93	5.29	12.24	4.59	297,693
ETF Fund (%)	1.27	1.46	0.00	0.03	0.78	2.03	6.21	2.01	297,693
Index Fund (%)	2.15	2.28	0.00	0.03	1.56	3.48	9.04	3.45	297,693
Active Fund (%)	9.65	10.07	0.00	2.05	6.28	13.92	43.27	11.87	297,693
Insurer (%)	31.29	20.70	0.21	13.96	28.29	45.89	82.06	31.93	297,693
Amount ($ mil)	679	569	105	300	500	799	3,000	499	297,660
Rating	8.45	3.10	1.50	6.50	8.00	10.00	17.00	3.50	297,693
Age (years)	4.92	4.45	0.32	1.80	3.63	6.59	21.22	4.79	297,693
Maturity (years)	9.98	8.70	1.13	3.71	6.55	14.39	29.69	10.68	297,693
ZTD (%)	34.77	29.78	0.00	6.35	28.57	59.38	96.72	53.03	297,693

Table 2: Passive Ownership and Bond Lending Activities

This table presents the results from regressing bond lending outcomes and credit spreads on ownership of institutional investors. The dependent variables are quarterly averages of loan quantity, lendable supply, borrowing fee, DCBS, and credit spread. *Passive Fund*, *Active Fund*, and *Insurer* represent factions of bond par amount held by passive mutual funds, actively managed mutual funds, and insurance firms, respectively. Bond control variables include the log value of amount outstanding, rating, time to maturity, and the fraction of zero-trading days. The variable definitions can be found in Table 1. We include bond and firm × quarter effects in each regression. We double cluster standard errors by firm and year-quarter, and t-statistics are in parentheses. *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively. The sample period is from 2006 Q3 to 2022 Q4.

	Loan Quatity (1)	Lendable Supply (2)	Borrowing Fee (3)	DCBS (4)	Credit Spread (5)
Panel A: Passive Funds Only					
Passive Fund	−0.0103	0.3082***	−0.0229***	−0.0133***	−0.0443***
	(−1.13)	(8.05)	(−4.95)	(−5.32)	(−10.15)
Bond Controls	Yes	Yes	Yes	Yes	Yes
Firm×Qtr FE	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes
Observations	281,886	281,886	281,886	281,886	277,403
Adjusted R^2	0.597	0.811	0.472	0.489	0.953
Panel B: Passive Funds Plus Other Investors					
Passive Fund	−0.0050	0.3355***	−0.0232***	−0.0134***	−0.0429***
	(−0.52)	(9.10)	(−4.94)	(−5.32)	(−10.02)
Active Fund	0.0442***	0.1316***	0.0006	0.0004	−0.0017
	(10.78)	(7.67)	(0.95)	(0.99)	(−1.09)
Insurer	0.0194***	0.1056***	−0.0012***	−0.0006**	0.0062***
	(5.17)	(9.58)	(−2.74)	(−2.42)	(7.89)
Bond Controls	Yes	Yes	Yes	Yes	Yes
Firm×Qtr FE	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes
Observations	281,886	281,886	281,886	281,886	277,403
Adjusted R^2	0.602	0.815	0.472	0.490	0.953

Table 3: Passive Ownership and Bond Lending Activities, Subsample Results by Specialness

This table presents the results from regressing bond lending outcomes and credit spreads on ownership of institutional investors. The results are separately reported for special bonds and general collateral (GC) bonds. A bond is defined as special in a given quarter if its lagged borrowing fee is in the top decile of the fee distribution across bonds, and as GC, otherwise. Bond control variables include the log value of amount outstanding, rating, time to maturity, and the fraction of zero-trading days. We include bond and firm × quarter effects in each regression. We double cluster standard errors by firm and year-quarter, and t-statistics are in parentheses. *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively. The sample period is from 2006 Q3 to 2022 Q4.

	Special					GC				
	Loan Quantity (1)	Lendable Supply (2)	Borrowing Fee (3)	DCBS (4)	Credit Spread (5)	Loan Quantity (6)	Lendable Supply (7)	Borrowing Fee (8)	DCBS (9)	Credit Spread (10)
Panel A: Passive Funds Only										
Passive Fund	0.0559	0.5750***	−0.0611***	−0.0390***	−0.0292	−0.0126	0.2151***	−0.0051***	−0.0031***	−0.0431***
	(1.05)	(3.59)	(−3.07)	(−3.08)	(−1.05)	(−1.38)	(5.91)	(−4.13)	(−4.50)	(−10.39)
Bond Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,465	12,465	12,465	12,465	12,019	245,177	245,177	245,177	245,177	241,713
Adjusted R^2	0.771	0.751	0.611	0.615	0.960	0.571	0.831	0.246	0.162	0.952
Panel B: Passive Funds Plus Other Investors										
Passive Fund	0.0412	0.5668***	−0.0612***	−0.0389***	−0.0260	−0.0069	0.2468***	−0.0052***	−0.0032***	−0.0412***
	(0.78)	(3.75)	(−3.09)	(−3.05)	(−0.95)	(−0.71)	(7.12)	(−4.16)	(−4.51)	(−10.31)
Active Fund	0.0657***	0.0948***	-0.0011	0.0000	-0.0061	0.0384***	0.1375***	0.0000	0.0001	0.0002
	(4.50)	(3.38)	(−0.30)	(0.00)	(−0.69)	(9.47)	(7.77)	(0.21)	(0.80)	(0.19)
Insurer	0.0156	0.0873***	−0.0021	0.0001	0.0080	0.0179***	0.1051***	−0.0003*	−0.0001	0.0068***
	(1.59)	(4.00)	(−0.54)	(0.03)	(1.17)	(4.56)	(9.78)	(−1.86)	(−1.09)	(9.03)
Bond Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,465	12,465	12,465	12,465	12,019	245,177	245,177	245,177	245,177	241,713
Adjusted R^2	0.777	0.753	0.611	0.615	0.960	0.575	0.835	0.246	0.162	0.952

Table 4: Passive Ownership and Bond Lending Activities, Subsample Results by Credit Rating

This table presents the results from regressing bond lending outcomes and credit spreads on ownership of institutional investors. The results are separately reported for investment grade (IG) and high yield (HY) bonds. A bond is classified as high yield if its credit rating at the end of the previous quarter is below BBB; otherwise, it is categorized as investment grade. Bond control variables include the log value of the amount outstanding, rating, time to maturity, and the fraction of zero-trading days. We include bond and firm × quarter effects in each regression. We double cluster standard errors by firm and year-quarter, and t-statistics are in parentheses. *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively. The sample period is from 2006 Q3 to 2022 Q4.

	IG					HY				
	Loan Quantity	Lendable Supply	Borrowing Fee	DCBS	Credit Spread	Loan Quantity	Lendable Supply	Borrowing Fee	DCBS	Credit Spread
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Passive Funds Only										
Passive Fund	−0.0166	0.2666***	−0.0217***	−0.0124***	−0.0380***	0.0453**	0.5391***	−0.0216***	−0.0134***	−0.0517***
	(−1.67)	(6.53)	(−4.78)	(−4.99)	(−9.84)	(2.11)	(7.80)	(−4.21)	(−4.32)	(−3.50)
Bond Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	234,539	234,539	234,539	234,539	230,565	46,535	46,535	46,535	46,535	46,027
Adjusted R^2	0.567	0.818	0.316	0.322	0.931	0.665	0.804	0.706	0.692	0.950
Panel B: Passive Funds Plus Other Investors										
Passive Fund	−0.0101	0.3006***	−0.0219***	−0.0125***	−0.0363***	0.0299	0.5191***	−0.0217***	−0.0135***	−0.0513***
	(−0.96)	(7.65)	(−4.78)	(−4.98)	(−9.70)	(1.36)	(7.58)	(−4.26)	(−4.39)	(−3.45)
Active Fund	0.0348***	0.1596***	0.0013*	0.0009**	-0.0002	0.0565***	0.1042***	0.0001	0.0002	0.0008
	(7.95)	(7.06)	(1.83)	(2.07)	(−0.15)	(8.81)	(4.03)	(0.07)	(0.23)	(0.28)
Insurer	0.0179***	0.0976***	−0.0010**	−0.0004*	0.0065***	0.0174**	0.1349***	−0.0009	−0.0007	0.0068**
	(4.45)	(9.08)	(−2.20)	(−1.73)	(10.35)	(2.61)	(6.07)	(−0.71)	(−0.82)	(2.05)
Bond Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	234,539	234,539	234,539	234,539	230,565	46,535	46,535	46,535	46,535	46,027
Adjusted R^2	0.570	0.821	0.316	0.322	0.932	0.672	0.808	0.706	0.692	0.950

Table 5: Panel Regression of Daily Changes in Quantity on Loan

This table reports the estimates from the panel regression of changes in the quantity on loan for all bonds:

$$dQ_{i,t} = \beta X_{i,t} + \rho dQ_{i,t-5,t-1} + \alpha_t + \gamma_i + \varepsilon_{i,t},$$

where a set of explanatory variables includes the daily return r_t, the average of the past 5 days' returns $r_{t-5,t-1}$, the turnover rate of customer buy ($Turn^{Buy}$) and sell ($Turn^{Buy}$) on day t and averages from $t-5, t-1$, half spreads for buy trades (h^{buy}) and sell trades (h^{sell}) averaged from day $t-5$ to $t-1$, and standard deviation of returns over the last five days $\sigma(r)_{t-5,t-1}$. Daily changes in the amount outstanding are scaled by the amount outstanding of the bond on day t and expressed as a percentage. Bond controls include the natural logarithm of the amount outstanding, credit ratings, and time to maturity. The variables on the right-hand side are standardized so that they have a mean of zero and a standard deviation of one. We include bond and date fixed effects in each regression specification. We double cluster standard errors by bond and date, and t-statistic are given in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. We require each bond to have at least 252 daily observations in the regression. The sample includes 11,411 bonds across 1,259 firms from September 13, 2006 to December 30, 2022.

	(1)	(2)	(3)	(4)	(5)	(6)
r_t	0.0021^{***}	0.0022^{***}				0.0016^{***}
	(9.86)	(10.18)				(8.07)
$r_{t-5,t-1}$	0.0003^{*}	0.0007^{***}				0.0013^{***}
	(1.81)	(3.79)				(7.23)
$dQ_{t-5,t-1}$		-0.0139^{***}		-0.0167^{***}	-0.0143^{***}	-0.0167^{***}
		(-22.92)		(-25.93)	(-23.75)	(-25.97)
$Turn_t^{Buy}$			0.0454^{***}	0.0458^{***}	0.0441^{***}	0.0458^{***}
			(111.84)	(112.22)	(109.61)	(112.07)
$Turn_t^{Sell}$			-0.0390^{***}	-0.0389^{***}	-0.0394^{***}	-0.0389^{***}
			(-121.86)	(-121.68)	(-122.44)	(-121.69)
$Turn_{t-5,t-1}^{Buy}$			0.0003	0.0060^{***}		0.0060^{***}
			(1.48)	(20.20)		(20.18)
$Turn_{t-5,t-1}^{Sell}$			-0.0107^{***}	-0.0165^{***}		-0.0164^{***}
			(-61.98)	(-55.52)		(-55.28)
$h_{t-5,t-1}^{Buy}$			-0.0001	-0.0001		-0.0002^{**}
			(-0.85)	(-1.09)		(-1.89)
$h_{t-5,t-1}^{Sell}$			-0.0000	-0.0001		0.0003^{***}
			(-0.03)	(-0.60)		(3.21)
$\sigma(r)_{t-5,t-1}$					-0.0021^{***}	-0.0011^{***}
					(-9.09)	(-5.54)
Bond Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,693,324	10,693,324	10,693,324	10,693,324	10,693,324	10,693,324
Adjusted R^2	0.010	0.015	0.052	0.059	0.055	0.059

Table 6: Investor Ownership and Bond Lending Activities around Maturity Cutoffs

The figure plots the slope coefficients β^h from the following regression for $h \in [-4, 24]$

$$\Delta Outcome_i^{t-1 \to t+h} = \beta^h Switch_{i,t} + Controls_{i,t-1} + \alpha_t + \gamma_i + \varepsilon_{i,t}^h,$$

where $\Delta Outcome_i^{t-1 \to t+h}$ is the change of investor ownership and lending variables for bond i from $t-1$ to $t+h$. We require the outcome variable changes to be available for all h. $Switch_{i,t}$ is an indicator variable equal to one if bond i crosses any one of the maturity cutoffs (i.e., 10 years, 5 years, and 3 years) in month t, and 0 otherwise. Control variables include the log of the amount outstanding, credit rating, time to maturity, and the percentage of zero trading days. Each regression includes bond and year-month fixed effects. We double cluster standard errors by firm and year-month, and t-statistics are in parentheses. *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively. The sample comprises 318,279 bond-month observations for 9,754 corporate bonds issued by 1,184 firms, covering the period from February 2007 to December 2022.

h	-4	-3	-2	0	1	2	3	6	9	12	18	24
					Panel A: LHV = $\Delta Passive\ Fund^{t-1 \to t+h}$							
Switch	0.076***	0.056***	0.028***	0.365***	0.447***	0.482***	0.497***	0.509***	0.515***	0.496***	0.420***	0.264***
	(6.48)	(5.84)	(3.81)	(16.07)	(18.36)	(19.57)	(19.57)	(19.21)	(19.01)	(19.31)	(15.80)	(8.81)
					Panel B: LHV = $\Delta Active\ Fund^{t-1 \to t+h}$							
Switch	−0.008	−0.029	−0.013	−0.015	−0.007	−0.009	−0.009	−0.041	−0.024	0.059	0.082	0.013
	(−0.25)	(−1.01)	(−0.62)	(−0.75)	(−0.23)	(−0.25)	(−0.22)	(−0.77)	(−0.41)	(0.93)	(1.19)	(0.15)
					Panel C: LHV = $\Delta Insurer^{t-1 \to t+h}$							
Switch	0.106*	0.051	0.051	−0.039	−0.039	−0.034	−0.043	−0.135**	−0.239***	−0.353***	−0.386***	−0.518***
	(1.96)	(1.13)	(1.60)	(−0.95)	(−0.82)	(−0.61)	(−0.81)	(−2.03)	(−3.68)	(−4.74)	(−4.48)	(−5.00)
					Panel D: LHV = $\Delta Loan\ Quantity^{t-1 \to t+h}$							
Switch	−0.018	0.005	−0.007	0.012	0.052***	0.042*	0.055**	0.038	−0.025	−0.051	−0.126***	−0.140***
	(−0.63)	(0.22)	(−0.45)	(0.86)	(2.64)	(1.70)	(2.07)	(1.16)	(−0.66)	(−1.29)	(−3.38)	(−3.38)
					Panel E: LHV = $\Delta Lendable\ Supply^{t-1 \to t+h}$							
Switch	0.190***	0.147***	0.069*	0.001	−0.014	−0.035	−0.090	−0.203***	−0.200**	−0.260***	−0.256***	−0.367***
	(3.39)	(3.11)	(1.94)	(0.03)	(−0.28)	(−0.62)	(−1.44)	(−2.61)	(−2.20)	(−2.62)	(−2.63)	(−3.67)
					Panel F: LHV = $\Delta Borrowing\ Fee^{t-1 \to t+h}$							
Switch	0.005	0.006*	0.006*	−0.002	0.003	0.006	0.007	0.010*	0.002	0.008	0.006	0.004
	(1.19)	(1.78)	(1.67)	(−0.55)	(0.78)	(1.24)	(1.42)	(1.68)	(0.29)	(1.13)	(0.86)	(0.57)

Table 7: Passive Ownership and Bond Lending Activities around Outstanding Amount Increases

The table reports the slope coefficients β^h from the following regression for $h \in [-4, 6]$

$$\Delta Outcome_i^{t-1\to t+h} = \beta^h Increase_{i,t} + Controls_{i,t-1} + \alpha_t + \gamma_i + \varepsilon_{i,t}^h,$$

where $\Delta Outcome_i^{t-1\to t+h}$ is the change of passive or ETF ownership and lending variables for bond i from $t-1$ to $t+h$. We require the outcome variable changes to be available for all h. $Increase_{i,t}$ is an indicator that equals one if the outstanding amount of bond i increases in month t, and zero otherwise. Control variables include the log of the amount outstanding, credit rating, time to maturity, and the percentage of zero trading days. Each regression includes bond and year-month fixed effects. We double cluster standard errors by firm and year-month, and t-statistics are in parentheses. *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively. The sample comprises 32,447 bond-month observations for 761 corporate bonds issued by 422 firms, covering the period from February 2007 to June 2022.

h	−4	−3	−2	0	1	2	3	4	5	6
				Panel A: LHV = $\Delta Passive\ Ownership^{t-1\to t+h}$						
Increase	−0.134*	−0.087	−0.076*	−0.169***	0.008	0.091	0.143	0.179*	0.183*	0.196*
	(−1.94)	(−1.41)	(−1.78)	(−2.62)	(0.09)	(1.04)	(1.55)	(1.82)	(1.82)	(1.83)
				Panel B: LHV = $\Delta ETF\ Ownership^{t-1\to t+h}$						
Increase	−0.083*	−0.050	−0.037	−0.051	0.143**	0.203***	0.250***	0.274***	0.275***	0.297***
	(−1.66)	(−1.32)	(−1.57)	(−0.98)	(2.20)	(2.91)	(3.32)	(3.22)	(3.08)	(3.21)
				Panel C: LHV = $\Delta Loan\ Quantity^{t-1\to t+h}$						
Increase	−0.263*	−0.213	−0.163**	−0.341***	−0.790***	−0.714***	−0.646***	−0.627***	−0.510**	−0.442**
	(−1.70)	(−1.64)	(−2.16)	(−3.38)	(−4.91)	(−3.88)	(−3.32)	(−3.03)	(−2.36)	(−2.01)
				Panel D: LHV = $\Delta Credit\ Spread^{t-1\to t+h}$						
Increase	−0.137	−0.135	−0.083	0.009	−0.103**	−0.095	−0.049	−0.067	−0.082	−0.198
	(−0.97)	(−0.97)	(−0.94)	(0.25)	(−2.19)	(−1.28)	(−0.46)	(−0.56)	(−0.53)	(−1.02)

Internet Appendix
"Passive Ownership and Corporate Bond Lending"

A Corporate Bond Filters

In this section, we describe our procedure to filter corporate bonds based on the Mergent Fixed Income Securities Database (FISD) database and the Enhanced Trade Reporting and Compliance Engine (TRACE) database from WRDS.

TRACE data contains transaction prices and volume, trade direction, and the exact date and time of each trade. Following Dick-Nielsen (2014), we clean the TRACE data, remove canceled transaction records, and adjust records that are subsequently corrected or reversed. We also follow Bessembinder, Kahle, Maxwell, and Xu (2008) to correct potential data errors and remove observations in enhanced TRACE data with large return reversals, defined as a 20% or greater return followed by a 20% or greater return of the opposite sign. We merge the TRACE database with Mergent FISD to collect information on bond characteristics such as amount outstanding, credit rating, and time to maturity.

Following the recent literature (e.g., Dickerson, Mueller, and Robotti 2023; Dick-Nielsen, Feldhütter, Pedersen, and Stolborg 2023), we apply additional filters to eliminate (1) bonds that are not listed or traded in the U.S. public market; (2) bonds that are U.S. Government, private placements, mortgage-backed, asset-backed, agency-backed, or equity-linked;[12] (3) convertible bonds or bonds with a floating coupon rate or an odd frequency of coupon

[12] Following Dick-Nielsen, Feldhütter, Pedersen, and Stolborg (2023), we define equity-linked bonds, as bonds whose field "issue name" contains any of the strings "EQUITYLINKED", "EQUITY LINKED", and "INDEX-LINKED".

payments; (4) bonds that have less than one year to maturity; (5) bond transactions that are labeled as when-issued, locked-in, have special sales conditions, or have more than a two-day settlement period; (6) transaction records with trade size larger than issue size or trade size is not a integer; (7) bonds that do not have a principal value of $1,000; (8) bonds with incomplete issuance information (offering date, amount, and maturity) or non-positive historical amount outstanding (e.g., bonds are called); and (9) bonds that are not issued by public firms (i.e., with a valid PERMNO from CRSP).

B Daily Bond Sample Construction

In this section, we provide further details on the construction of the daily bond panel data used in Table 5.

After matching the daily Markit security lending data to the merged Mergent FISD-TRACE bond sample as specified in Section A, we obtain 18,458,551 observations for 18,085 corporate bonds issued by 1,755 firms from September 11, 2006 to December 30, 2022.

Next, we move to construct customer buy/sell volume. Enhanced TRACE records the direction of trades from the reporting dealers' perspective. Thus, for each customer-dealer trade, we treat dealer-buy trades as customer sales and dealer-sell trades as customer buys. We treat missing trading volume and customer buy/sell trade observations in TRACE as zero volume when computing bonds' transaction volume. To distinguish zero volume from missing observations, we first create empty panel data by setting the beginning and ending dates for an initial list of bonds in the sample, which is determined by the intersection of the three databases (TRACE, Mergent FISD, and Markit) we use. For the list of trading days, we use those in CRSP and exclude bond trades recorded on the days when stock markets are closed.[13] The beginning and ending dates for each bond are set by its issuance date and maturity date or the last call date. We then merge TRACE volume to the empty panel to determine which days have zero volume.

To obtain an estimate of transaction cost, we follow O'Hara and Zhou (2021) and match each customer buy/sell trade with the closest in time inter-dealer trade in that bond over the past five trading days. We construct half spreads for both the customer buy side and sell side as the volume-weighted average of the log price differences between customer buy/sell trades and inter-dealer trades. Moreover, to mitigate the microstructure noise, we compute daily bond returns and volatility using quote prices from the Bank of America Merrill Lynch (BAML) database provided by the Intercontinental Exchange (ICE).

The SEC announced on March 22, 2017, that the settlement cycle (i.e., the time between the transaction date and the settlement date) for most broker-dealer securities transactions will change from three business days (i.e., T+3) to two business days (i.e., T+2) on September 5, 2017. Thus, to account for these settlement gaps, we adjust trading volume, bond returns, and half spreads on day d by day $d-3$ values for the sample up to September 4, 2017 and by day $d-2$ values after September 5, 2017. Then, we compute return volatility and five-day moving averages based on the "adjusted" variables.

We require each bond to have at least 252 daily observations after merging daily bond lending data, trading volume, half spreads, and bond returns data. The final sample includes 10,693,324 bond-day observations for 11,411 corporate bonds across 1,259 firms from

[13]This choice excludes some sparse trades on weekends but includes more trading days than Treasury market data.

September 13, 2006 to December 30, 2022. We winsorize continuous variables at 1% and 99% by month to mitigate the effects of outliers while avoiding look-ahead bias. Table A1, Panel A reports the descriptive statistics for the daily bond panel data.

C Monthly Bond Sample Construction

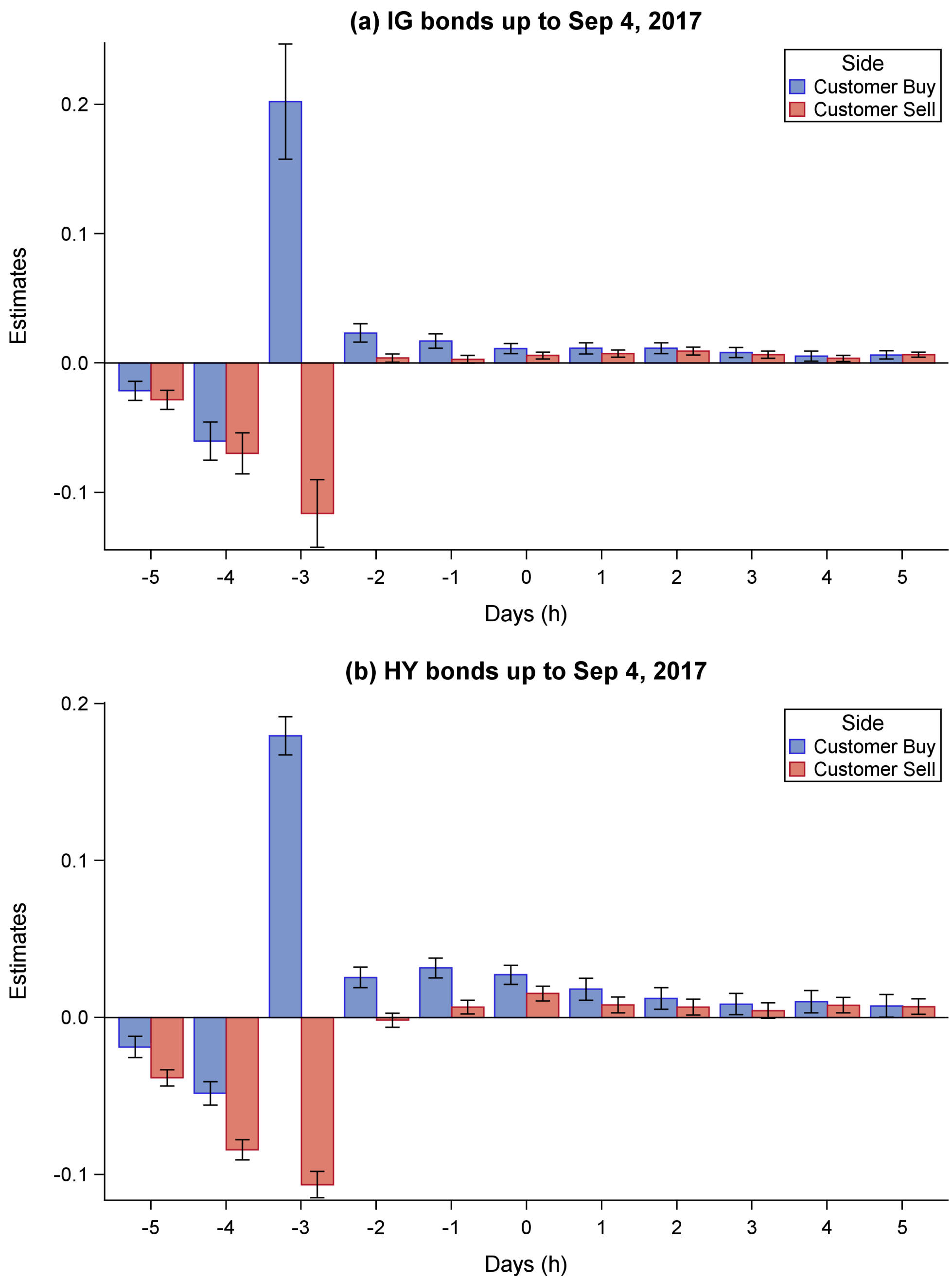
This section provides additional details on the construction of the monthly bond panel data used in Figure 5.

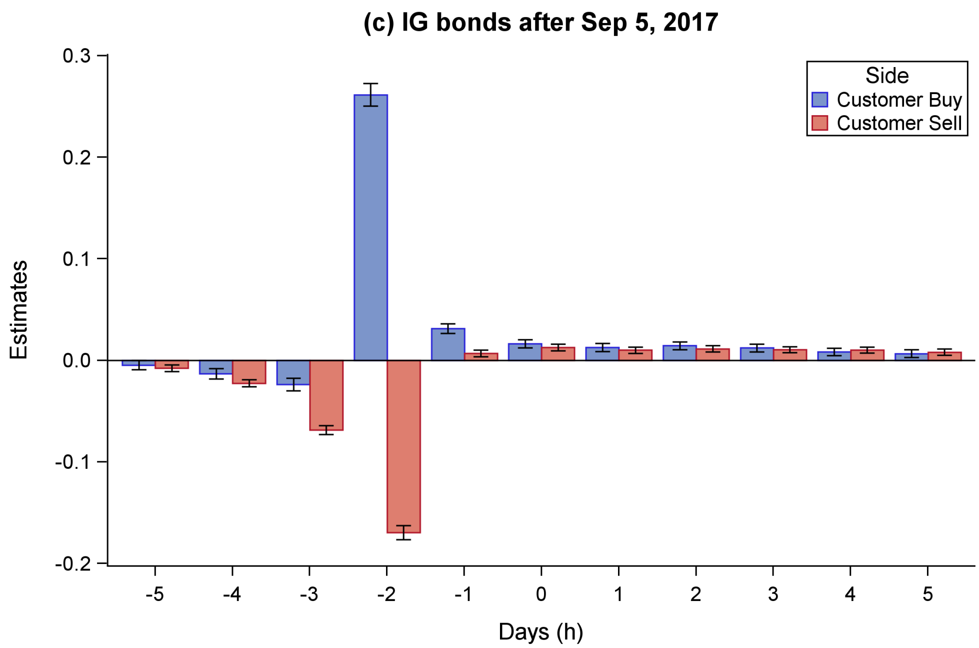
We begin with daily bond lending data from IHS Markit, which we match to the merged Mergent FISD-TRACE bond sample. We then compute the monthly averages of lending outcome variables by aggregating the daily Markit data within each bond-month observation. Following Bretscher, Schmid, and Ye (2024b), we exclude bonds issued within the past six months to ensure a more stable sample. This process yields 815,719 observations for 17,214 corporate bonds issued by 1,718 firms over 196 months from September 2006 to December 2022.

Next, we merge the monthly bond lending data with bond holdings data from Morningstar and eMAXX, aligning them based on bond CUSIPs and calendar months. We define a *Switch* indicator that equals one if a bond crosses one of the there cutoffs: 10-, 5-, and 3-year time to maturity. We compute the change of passive ownership and lending outcome variables from month $t-1$ to month $t-h$ and require all the outcome variable changes to be available for $h \in [-4, 24]$. These filtering criteria yield a final sample of 318,279 bond-month observations for 9,754 corporate bonds issued by 1,184 firms from February 2007 to December 2022. To mitigate the influence of outliers, we winsorize continuous variables at the 1st and 99th percentiles within each month. Table A1, Panel B presents descriptive statistics for the final monthly bond panel dataset.

Figure A1: Panel Regression of Dollar Trading Volume on Changes in Quantity on Loan, IG vs HY

The figure plots the slope coefficients of the panel regression of dealer-customer trading volume on day $d + h$ on day d changes in quantity on loan. Trading volume and quantity on loan are scaled by the amount outstanding. The y-axis represents a change in the percentage of the scaled dollar trading volume as a result of a one percentage change in the scaled quantity on loan. Subfigures (a) to (b) are for investment grade and high yield bonds up to Sep 4, 2017. Subfigures (c) to (d) are for investment grade and high yield bonds after Sep 5, 2017.




(c) IG bonds after Sep 5, 2017
Side
Customer Buy
Customer Sell
Estimates
0.3
0.2
0.1
0.0
-0.1
-0.2
-5
-4
-3
-2
-1
0
1
2
3
4
5
Days (h)

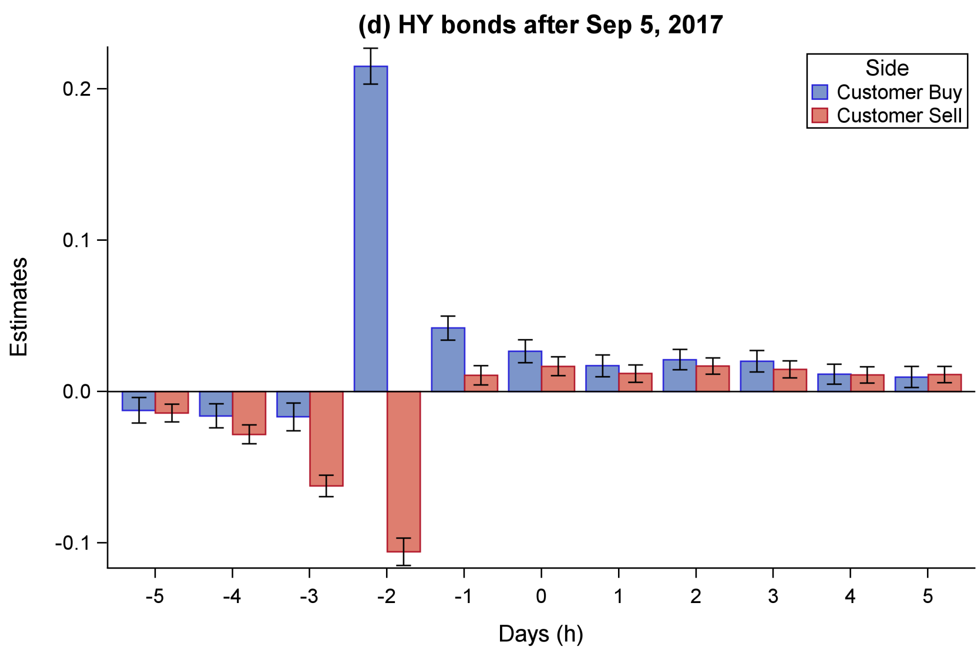

(d) HY bonds after Sep 5, 2017
Side
Customer Buy
Customer Sell
Estimates
0.2
0.1
0.0
-0.1
-5
-4
-3
-2
-1
0
1
2
3
4
5
Days (h)

Table A1: Descriptive Statistics of Daily and Monthly Panels

This table reports the summary statistics of the main variables at the bond-day and bond-month levels. The combined bond data are from Mergent FISD, TRACE, Markit, and eMAXX. The definitions of common bond characteristics are the same: *Amount* is the amount of bonds outstanding in millions of dollars; *Rating* is the numerical rating score, where 1 refers to a AAA rating by S&P and Aaa by Moody's, 21 refers to a C rating for both S&P and Moody's; *Age* is the age of a bond in years; *Maturity* is the time to maturity in years. Panel A shows the descriptive statistics of the sample used in Table 5, which includes 11,411 bonds across 1,259 firms from September 13, 2006 to December 30, 2022. dQ is the changes in quantity on loan scaled by the amount outstanding. The explanatory variables includes the daily return r_t, the average of the past 5 days' returns $r_{t-5,t-1}$, the turnover rate of customer buy ($Turn^{Buy}$) and sell ($Turn^{Buy}$) on day t and averages from $t-5, t-1$, half spreads for buy trades (h^{buy}) and sell trades (h^{sell}) averaged from day $t-5$ to $t-1$, and standard deviation of returns over the last five days $\sigma(r)_{t-5,t-1}$. Panel B shows the summary statistics of the sample used in Figure 5, which includes 9,668 bonds across 1,181 firms from February 2007 to December 2022. We compute monthly averages of daily bond lending variables for each bond unless mentioned otherwise. *Loan Quantity* is defined as the quantity on loan from Markit divided by amount outstanding. *Lendable Supply* is the active lendable quantity from Markit divided by amount outstanding. *Utilization Rate* is defined as the ratio of the quantity on loan to the lendable quantity. *Loan Tenure* is the average number of days that bond loans have been open. *Borrowing Fee* is the buy-side fee paid by the ultimate borrower ("*IndicativeFee*" in Markit). *Rebate Rate* is the "*IndicativeRebate*" in Markit. *DCBS* is the cost of borrow score provided by Markit, ranging from 1 (low cost) to 10 (high cost). *Fee Risk* is the natural logarithm of the standard deviation of borrowing fees within a month. *Recall Risk* is the natural logarithm of the standard deviation of utilization rate in a given month. *Lender Concentration* is a Herfindahl-Index-like measure at the bond level provided by Markit that describes the concentration of lenders. *Special1* is a dummy variable that equals one if at least one day with borrowing fee exceeds or equal to 1% in a month, and zero otherwise. *Special2* is a dummy variable that equals one in a given month if its borrowing fee is in the top decile of the fee distribution across bonds, and zero otherwise. *Credit Spread* is calculated as the average difference between the corporate bond yield and the yield of a matching Treasury bond within a month. h^{Buy} (h^{Sell}) is the monthly average of the log price differences between customer buy (sell) trades and inter-dealer trades following O'Hara and Zhou (2021). We match customer buy (sell) trades with the closest in time inter-dealer trade over the past five trading days with replacement. *Total Ownership* is the share of bonds held by all the investors in eMAXX. *Passive Fund*, *Active Fund*, and *Insurer* represent factions of bond par amount held by passive mutual funds, actively managed mutual funds, and insurance firms, respectively. We use the investor type classification code provided by eMAXX to group investors into insurance firms and mutual funds. We manually link eMAXX to the CRSP Mutual Fund database by matching funds based on their names and use index fund and ETF flags (as well as search keywords in fund names) to further decompose mutual fund ownership into *Passive Fund* (i.e., index funds and ETFs) and *Active Fund*. To mitigate the influence of outliers, we winsorize variables at 1% and 99% for each period.

Variable	Mean	SD	P1	P25	P50	P75	P99	Obs
				Panel A: Daily Bond Panel				
dQ	−0.002	0.198	−0.719	−0.011	0.000	0.007	0.732	10,693,324
$dQ_{t-5,t-1}$	−0.001	0.093	−0.313	−0.016	0.000	0.013	0.322	10,693,324
r_t	0.016	0.765	−1.732	−0.143	0.017	0.181	1.759	10,693,324
$r_{t-5,t-1}$	0.017	0.351	−0.847	−0.056	0.016	0.099	0.838	10,693,324
$\sigma(r)$	0.421	0.645	0.018	0.138	0.274	0.513	2.399	10,693,324
Amount ($ mil)	875	640	250	500	700	1,000	3,250	10,693,324
Rating	8.464	3.205	1.000	6.000	8.000	10.000	17.000	10,693,324
Age (years)	4.003	3.476	0.173	1.521	3.115	5.540	17.674	10,693,324
Maturity (years)	8.667	7.824	1.151	3.515	5.926	9.219	29.425	10,693,324
$Turn^{Buy}$	0.189	0.442	0.000	0.001	0.026	0.145	2.320	10,693,324
$Turn^{Sell}$	0.117	0.330	0.000	0.000	0.004	0.049	1.818	10,693,324
$Turn^{Buy}_{t-5,t-1}$	0.208	0.297	0.002	0.033	0.099	0.255	1.468	10,693,324
$Turn^{Sell}_{t-5,t-1}$	0.133	0.215	0.000	0.011	0.046	0.161	1.068	10,693,324
$h^{Buy}_{t-5,t-1}$	0.390	0.770	−1.088	0.058	0.226	0.570	2.925	10,693,324
$h^{Sell}_{t-5,t-1}$	0.357	0.804	−1.190	0.048	0.211	0.520	3.013	10,693,324
				Panel B: Monthly Bond Panel				
Loan Quantity (%)	1.555	2.599	0.008	0.192	0.593	1.691	12.376	311,378
Lendable Supply (%)	24.767	9.904	4.738	18.134	23.834	30.180	54.620	311,378
Utilization Rate (%)	6.879	11.950	0.035	0.850	2.624	7.281	66.203	311,378
Loan Tenure (days)	81.966	91.301	4.238	25.427	51.259	101.851	485.169	311,378
Borrowing Fee (%)	0.402	0.323	0.162	0.287	0.375	0.392	2.085	311,378
Rebate Rate (%)	0.495	1.214	−1.412	−0.249	−0.105	1.203	4.901	311,378
DCBS	1.035	0.207	1.000	1.000	1.000	1.000	2.000	311,378
Fee Risk	−3.016	0.959	−6.220	−3.552	−2.985	−2.645	−0.363	221,285
Recall Risk	−0.971	1.879	−8.357	−1.800	−0.682	0.233	2.106	307,892
Lender Concentration	0.451	0.301	0.000	0.264	0.444	0.659	1.000	311,378
$Turn^{Buy}$ (%)	0.144	0.170	0.000	0.034	0.090	0.189	0.846	311,378
$Turn^{Sell}$ (%)	0.095	0.119	0.000	0.018	0.055	0.126	0.586	311,378
h^{Buy}(%)	0.334	0.917	−1.631	0.013	0.201	0.540	3.258	287,492
h^{Sell}(%)	0.283	0.989	−2.069	−0.026	0.188	0.510	3.353	287,540
Total Ownership (%)	46.599	15.784	13.432	35.302	46.250	57.326	84.883	311,378
Insurer (%)	32.629	18.584	1.588	17.356	31.005	45.673	78.953	311,378
Passive Fund (%)	3.727	4.648	0.000	1.099	2.837	5.044	23.387	311,378
Active Fund (%)	9.938	11.040	0.000	2.197	5.914	13.479	48.597	311,378
Amount ($ mil)	788	608	150	400	563	1,000	3,000	311,378
Rating	8.195	2.946	2.000	6.000	8.000	9.500	16.500	311,378
Age (years)	4.476	3.656	0.962	1.956	3.488	5.633	19.115	311,378
Maturity (years)	11.313	8.537	3.082	5.110	7.384	18.345	29.099	311,378

Table A2: Sample List of Passive Funds in eMAXX

This table lists the top 25 passive funds in eMAXX as of 2022 in terms of the number of distinct corporate bonds held. We select passive funds based on index fund and ETF/ETN flags from the CRSP Mutual Fund database after manually matching eMAXX FUNDID to funds in CRSP by fund names. We further identify passive funds by searching keywords in fund names related to ETFs/index funds/bond index providers. We restrict corporate bond holdings to dollar bonds issued by US firms that have trade records in the Enhanced TRACE database.

Obs	FUNDID	FUNDNAME
1	170047	iShares Core Total USD Bond Market ETF
2	126137	iShares Broad USD Investment Grade Corporate Bond ETF
3	81464	iShares Core US Aggregate Bond ETF
4	189653	Vanguard USD Corporate Bond UCITS ETF
5	29844	Vanguard Total Bond Market Index Fund
6	136739	Vanguard Total Bond Market II Index Fund
7	156760	Schwab US Aggregate Bond ETF
8	29969	Vanguard Balanced Index Fund
9	191887	Schwab US Aggregate Bond Index Fund
10	142023	TIAACREF Bond Index Fund
11	29242	Vanguard Total Bond Market Index Portfolio
12	44906	U.S. Total Bond Index Master Portfolio
13	136745	SPDR Barclays Intermediate Term Corporate Bond ETF
14	126141	iShares Intermediate Government/Credit Bond ETF
15	153656	SPDR Barclays Issuer Scored Corporate Bond ETF
16	133663	LVIP SSgA Bond Index Fund
17	191555	iShares ESG Aware USD Corporate Bond ETF
18	126144	iShares Government/Credit Bond ETF
19	191556	iShares ESG Aware US Aggregate Bond ETF
20	195989	Vanguard Global Aggregate Bond UCITS ETF
21	174293	State Street Aggregate Bond Index Portfolio
22	144043	iShares 10+ Year Investment Grade Corporate Bond ETF
23	32593	EQ/Core Bond Index Portfolio
24	136743	SPDR Barclays Long Term Corporate Bond ETF
25	123766	iShares 1-3 Year Credit Bond ETF

Table A3: Passive Ownership and Other Lending Outcomes

This table presents the results from regressing other bond lending outcomes on ownership of institutional investors. The dependent variables are quarterly averages of utilization rate, loan tenure, fee risk, recall risk, and half spreads. *Passive Fund*, *Active Fund*, and *Insurer* represent factions of bond par amount held by passive mutual funds, actively managed mutual funds, and insurance firms, respectively. Bond control variables include the log value of amount outstanding, rating, time to maturity, and the fraction of zero-trading days. The variable definitions can be found in Table 1. All continuous independent variables are standardized to have a mean of zero and a standard deviation of one. We include bond and firm × quarter effects in each regression. We double cluster standard errors by firm and year-quarter, and t-statistics are in parentheses. *, **, and *** indicate the significance at the 10%, 5%, and 1% levels, respectively. The sample period is from 2006 Q3 to 2022 Q4.

	Utilization (1)	Loan Tenure (2)	Fee Risk (3)	Recall Risk (4)	h^{Buy} (5)	h^{Sell} (6)
	Panel A: Passive Funds Only					
Passive Fund	−0.257***	−0.214	0.025***	−0.026***	0.011**	−0.007
	(−3.95)	(−0.74)	(4.12)	(−3.37)	(2.59)	(−1.53)
Bond Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	280,330	280,330	236,392	274,079	268,866	267,494
Adjusted R^2	0.629	0.381	0.353	0.502	0.259	0.272
	Panel B: Passive Funds Plus Other Investors					
Passive Fund	−0.270***	−0.221	0.025***	−0.026***	0.011**	−0.008
	(−4.12)	(−0.74)	(4.10)	(−3.35)	(2.63)	(−1.58)
Active Fund	0.985***	0.575	−0.010	0.041***	−0.026***	0.016**
	(7.11)	(0.86)	(−0.94)	(2.81)	(−4.22)	(2.31)
Insurer	0.638***	10.778***	−0.029*	−0.129***	0.065***	0.038***
	(3.32)	(6.10)	(−1.75)	(−4.78)	(6.38)	(3.25)
Bond Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	280,330	280,330	236,392	274,079	268,866	267,494
Adjusted R^2	0.631	0.381	0.353	0.502	0.259	0.272