Go with the Flow: Debt Structure Changes and Real Implications*

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Abstract

We show that firms' debt structures are strongly influenced by capital flows to debt investors. In the aggregate time series, the fraction of newly issued and outstanding corporate debt that is loans (vs bonds) and floating-rate (vs floating-rate) co-moves strongly with the relative flows to loan funds vs bond funds; when loan funds receive more net flows, firms issue more floating-rate loans. Based on sticky relationships between funds and portfolio companies, we construct firm-specific measures of relative loan and bond supply and show that they have significant explanatory power on debt structure changes in the *cross section* of firms. These flow-induced debt structure changes lead to real interest rate exposure. During interest rate hikes (e.g. 2022-2023), firms with more floating-rate debt due to more prior loan inflows (more prior bond outflows) invest less real capital. Using our capital supply measures as an instrument for floating-rate debt, we identify significantly larger effect of debt structure on monetary policy than previous literature.

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1 Introduction

Recent studies have demonstrated the importance of debt structure as an important factor influencing firm behavior, particularly the response to changes in interest rates induced by monetary policy. The general conclusion is that firms with more floating-rate debt or more debt maturing in the near-term respond more sharply to increases in interest rates (Ippolito et al., 2018; Gürkaynak et al., 2022; Jungherr et al., 2022). In contrast to the large literature on leverage choices (equity versus debt), there is still limited understanding of what determines the structure firms' debt, including the choice to issue fixed- or floating-rate debt. In this paper, we establish the relative supply of bonds and loans, which have unique investors and unique characteristics, as a key determinant of firms' debt structure choices. Moreover, we show that these flow-induced debt structure changes have real effects on firms by affecting their exposure to changes in interest rates.

We start by showing a very strong time series correlation between the aggregate flows into loans funds, relative to bond funds, and the aggregate issuance of loans as opposed to bonds. During periods when loans funds experience much stronger inflows than bond funds, such as the few years during the late 2010s when interest rates increased, firms are much more likely to issue loans than bonds. In a horse-race comparing fund flows with other macroeconomic aggregates, we find that fund flows have a higher marginal impact than any variable we try, including GDP growth, Treasury yields, credit spreads, and stock market returns. Fund flows even appear stronger than than Treasury issuance, which (Greenwood et al., 2010) show is a strong determinant of corporate debt maturity choices.

We next construct a firm-specific measure of the relative supply of bonds and loans. Our measure rests on the fact that funds tend to form relationships with the firms in their portfolios (Zhu, 2021). These relationships create two behaviors that are important for our measure. First, funds tend to hold relatively concentrated portfolios of investments. In our data, the typical mutual fund invests in less than 15 percent of the universe of potential issuers. Second, funds respond to outflows by selling existing investments and respond to inflows by purchasing more of their existing investments. We show, for example, that a 1% inflow into a loan fund (bond fund) leads, on average, to an increase in holdings of 0.57% (0.69%) in the loans (bonds) previously owned by the fund. We obtain similar sensitivities for outflows. Because of these two behaviors, fund-specific inflows have the potential to influence the availability of debt capital to the portfolio companies of mutual funds.

Based on this logic, we construct firm-specific measures of bond flows and loan flows. Intuitively, the measures capture the amount of buying or selling from the firm's existing debt holders if the funds perfectly proportionally scale up or down their portfolios in response to inflows or outflows. Combined with data on the portfolio holdings of a large sample of domestic and international funds that invest in bonds and loans, we construct this measure in each quarter for a representative sample of firms over the years 2010 to 2023.

We use this measure to examine how the relative supply of bonds and loans affects firms' debt choices, focusing on publicly-traded firms with a speculative-grade credit rating. We limit attention to these firms for three reasons. First, unlike bonds, loans are not considered securities, so private firms often prefer loans to avoid the disclosure requirements associated with issuing a public security. Within our sample of firms that are already public, the differences in incremental disclosure costs are minimal. Second, since a credit rating is important for bond investors, these firms have access to both the loan and bond markets. Finally, speculative-grade firms rely on loans much more so than investment-grade firms. Loan mutual funds invest primarily in so-called leveraged loans, which exclude firms with an investment-grade rating. The upshot is a sample of firms that can easily switch between loans and bonds.

Among this sample of firms, we show that our measures of loan and bond supply are important determinants of debt structure choices in the *cross section* of firms. We find an economically and statistically significant relationship between the measures of loan and bond supply and changes in debt structure – either new issuance or changes in levels. If, for example, a firm's existing bond investors experience inflows, the firm becomes more likely to issue a bond, as opposed to a loan, and the share of the firm's debt that is bonds will increase. Similarly for outflows or for inflows/outflows to a firm's loan investors. We include a host of control variables in the regressions and continue to find similar coefficient estimates. In our strictest specification, we include granular rating-time and industry-time fixed effects to rule out any spurious correlation.

The flow-induced issuance decisions of firms affect the composition of their balance sheets in important ways. We focus on two important differences between loans and bonds. First, loans are typically senior and secured obligations, and bonds are typically unsecured. When firms are induced to issue more loans, they end up with more secured debt on their balance sheets. Second, loans typically pay a floating-rate of interest, and bonds pay a fixed-rate. This conventional difference reflects the difference in investor bases. Outside of mutual funds, insurance companies are a large investor in bonds, and collateralized loan obligations (CLOs) are a large investor in loans. Insurance companies have long duration liabilities and prefer fixed-rate bonds, and CLOs have floating-rate liabilities and prefer floating-rate loans. When firms are induced to issue more loans, they end up with more floating-rate liabilities.

Finally, we show that flow-induced debt structure changes have real implications. Firms with more loan fund flows or less bond fund flows shift more towards floating-rate debt and are therefore more exposed to subsequent interest rate changes. Indeed, in response to interest rates hikes (e.g. during 2022-2023), firms with more flow-induced floating-rate debt invest significantly less in real capital. The underlying channel is consistent with active management of interest expense, where firms with more floating-rate debt experience larger increase in interest expenses on *existing* debt and hence constrained from constrained from issuing new debt in order to maintain interest coverage (Greenwald, 2019).

We use our capital supply measures as an instrument for firms' floating-rate debt ratio to re-visit the floating-rate channel of monetary policy (Ippolito et al., 2018; Gürkaynak et al., 2022; Jungherr et al., 2022). In comparison with the prior literature, we identify significantly larger effect. Specifically, our results using instrumented changes in floating ratios suggest that the effect of floating-rate ratio on corporate investment sensitivity to monetary policy is ten times larger than previous literature suggests, which uses observed floating-rate ratio. We argue that the floating-rate ratio that we capture using credit supply instruments is more likely to reflect interest rate exposure that is not hedged from asset-liability management.

1.1 Literature

Our results contribute to three strands of the existing literature. First, the results provide more insight into the determinants of corporate debt structures (Greenwood et al., 2010; Badoer and James, 2016; Bai et al., 2022). We establish the relative supply of loans and bonds a leading determinant of corporate debt structures. Most related to our paper is Becker and Ivashina (2014), who also study the choice between bonds and loans. Compared to their focus on aggregate bank credit supply, we construct firm-specific credit supply that allows us to exclude confounding effects in the time series. The construction of this firm-specific credit supply hinges on the existence of sticky fund-firm relationship, as established in Barbosa and Ozdagli (2022) and Coppola (2022). We also explore how changes in relative supply can impact other aspects of firms' balance sheets and subsequent investment.

Second, we contribute to the growing literature highlighting the impact of capital flows on corporate financing decisions (Zhu, 2021; Fang, 2023; Emin et al., 2021; Adelino et al., 2023). Building on this literature, we show that the relative flows into loan and bond funds directly affect the type of debt that firms issue. More importantly, we show important *indirect* effect, as flow-induced changes in issuance decisions can in turn affect firms' real investment due to interest rate exposure.

Our paper also contributes to our understanding of the effects of corporate debt structure on exposure to interest rates. A growing set of papers, including Ippolito et al. (2018), Gürkaynak et al. (2022) and Jungherr et al. (2022), are establishing that monetary policy operates, in part, by affecting the interest costs of existing debt. The collection of evidence suggests that monetary policy makers should monitor debt structures in the corporate sector to help understand the implications of their interest rate decisions. Compared with existing papers, we establish the relationship using firm-specific capital flows as shocks to firms' debt structure, which provides more confidence that we have identified the causal effect of changes in interest rates.

2 Background and Data

2.1 Corporate Debt

Bonds and loans are the two main types of debt used by nonfinancial corporations. The two instruments share many similarities but also important differences. Chief among them is that bonds are securities and hence governed by securities law. Although bonds can be issued as private placements, many bonds are eventually registered, and issuance is concentrated among firms that comply with the SEC's disclosure requirements. Loans are not securities and therefore exempt from all securities-related regulations, which makes loans a popular choice among private firms. Since we examine only publicly-traded firms, who already comply with the SEC's disclosure requirements, there is little difference in the regulatory cost of issuing a bond or a loan.

Among publicly-traded firms, we focus on firms with a speculative-grade credit rating, firms whose credit ratings are below investment-grade, that is, rated BB+ or less. These firms are characterized by high leverage and hence high default risk. We make this restriction for two reasons. First, by restricting attention to firms with a credit rating, we examine firms that can easily issue a bond or a loan. The rating requirement removes small and unrated firms that face significant costs to issue a bond. Second, this restriction excludes investment-grade firms that rarely borrow from the loan market. Figure A2 shows the aggregate debt composition for investment-grade and speculative-grade firms. On average, speculative-grade firms debt is comprised of 30% loans and 70% in bonds. In comparison, less than 5% of investment-grade firms' debt is loans.[1] Due to the difference between investment-grade and speculative-grade firms, the emergence of nonbank investors into the loan market has concentrated on so-called "leveraged loans," which exclude borrowers with an investment-grade credit rating. The upshot of this restriction is a sample of firms that can easily switch between loans and bonds.

We also focus on the term loan portion of the loan market. Unlike corporate bonds, loans are sometimes provided on a revolving basis through a line of credit, typically funded by a single or small set of banks. We exclude lines of credit and focus exclusively on term debt, which can be offered either as a loan or as a bond, and can be funded by a large set of similar institutional investors.

Our restrictions generate a sample of firms that have access to both markets. According to data from Capital IQ, of the more than 4,000 speculative-grade non-financial firms that existed between 2010 and 2022, roughly one-half have ever issued a bond, and nearly all have ever issued a loan. To ensure that the loan-only firms also have access to the bond market, we require that the firm issue at least one bond during the sample period. Our sample firms also rely extensively on debt as a source of external financing. Table 1 shows that the median

[1] An additional reason to exclude investment-grade firms is that investors of speculative-grade debt are somewhat segmented from investment-grade debt investors because of investment mandates (e.g. investment-grade funds cannot invest in speculative-grade debt) and regulations (e.g. speculative-grade investments incur significantly larger capital charges than investment-grade investments).

speculative-grade firm has a leverage (debt-to-asset ratio) of 50%, significantly higher than then 10% for the median investment-grade firm.

Despite our focus on term loans and bonds, the two types of debt have many conventional differences, as documented in Nini and Smith (2024). Compared to loans, bonds usually have a longer maturity and pay a fixed as opposed to a floating interest rate. As a result, bonds have longer duration and are much more sensitive to changes in interest rates. Leveraged term loans are nearly always secured by collateral, and although bonds can be secured, the vast majority are unsecured. Bonds also carry looser covenants, reflecting the greater challenge in renegotiating a public security.

The conventional differences between loans and bonds correspond to differences in their investor bases. The major loan investors include banks, collateralized loan obligations (CLOs), and mutual funds who have come to expect floating-rate debt, a relatively robust collateral package, and some ability to monitor the borrower through covenants. CLOs, in particular, are structured with floating-rate liabilities and a contractual requirement to invest nearly exclusively in secured debt. Bond investors include mutual funds and insurance companies, who are attracted to the longer duration and higher coupons provided by the unsecured debt. The result is an set of investors that are rather segmented and focus on only one type of debt.

If firms are able to substitute between loans and bonds, the segmentation of investors permits borrowers to exploit differences in relative supply of the two instruments. Schwert (2020), examining the relative pricing of term loans and bonds for a sample of firms that have issued both, documents a persistent difference in pricing that cannot be explained by differences in duration, security, or optionality. Instead, Schwert (2020) provides some evidence that lender market power may explain why the difference, confirming the inability of bond lenders to easily enter the loan market. If the conditions affecting the supply of loans and bonds vary somewhat independently, we expect firms to switch between the instruments to take advantage of differences in relative prices.

2.2 Bond funds and loan funds

Fixed income mutual funds are one of the largest investors of corporate debt. Figure A1 shows that there has been tremendous growth in fixed income funds, particularly when bank regulations became more stringent after the 2008 financial crisis (Gopal and Schnabl, 2022). Mutual funds directly provide capital to firms in the primary market by purchasing corporate bonds (Zhu, 2021) or participating in syndicated loans (Emin et al., 2021).

Most funds have a clear mandate that restricts the type of debt that the fund can purchase. For example, BlackRock High Yield Fund states in its prospectus that: "Invests primarily in non-investment grade bonds with maturities of 10 years or less." As another example, the prospectus of Invesco Senior Floating Rate Fund states that: "This world-class bank loan fund targets floating-rate, high yield returns by investing in the senior secured debt of large companies."

We classify bond funds and loan funds based their actual holdings. We first calculate, for each fund in each period, the fraction of its corporate debt holdings that are bonds or loans. We then classify a fund as bond (loan) fund if the median value (across period) of its bond (loan) fraction is above 75%. We also exclude funds whose stated primary investment focus is in real estate, mortgages, or municipal bonds (e.g. Fidelity Real Estate High Income Fund).

2.3 Data

Data on mutual funds and ETFs come from CRSP and Morningstar. We focus on U.S. fixed income funds as well as funds domiciled in Ireland and Luxembourg. We include foreign funds because they hold 10-20% of U.S. corporate debt, as shown in Panel C of Figure A2.

The CRSP holdings data covers U.S. funds and starts in 2010. For foreign funds and funds with missing holdings, we manually download their holdings from Morningstar Direct.

To calculate a measure of firm-specific credit supply, we need to map holdings of bonds and loans to firms. To map bonds to firms, we rely on bond CUSIPs and the CUSIP-Compustat link developed by Fang (2023). Loans generally do not have CUSIPs, so we map them to firms using the borrower's name and a fuzzy matching algorithm similar to Chave and Roberts (2008). Specifically, we form a list of source names using the holding positions of mutual funds and a list of target names from Compustat firms and partition each name into a bag of words, excluding uninformative words such as "Inc" or "The". For each name in the source list, we find the name in the target list that has the highest overlap in number of words and manually remove an obvious false matches.

We use accounting data on U.S. non-financial firms from Compustat. We exclude financial firms (SIC code starting with 6) and restrict the sample to firms with an S&P credit rating that is below investment grade. We also require all firms to access both the bond market and the loan market at least once during our sample period from 2010Q1 to 2023Q4.

Data on firms' debt structure come from Capital IQ, which is based on debt information reported in 10K, 10Q and other SEC filings. We supplement this data with detailed bond-level data from FISD and Refinitiv. Specifically, we substitute the bond information in Capital IQ with our detailed bond-level data from these other sources. We leave information on other debt (e.g. term loans) intact. We make this alteration because firms sometimes report limited information about their outstanding bonds.[2] When measuring floating-rate debt, we include fixed-rate debt maturing in one year or less, as they will be repriced similarly to floating-rate debt.

We also use data on issuance of new debt. Data on newly issued bonds come from Mergent

[2]For example, Apple's 2019 10K lumps all the bonds together and gives a maturity range from 2022 to 2049 – a maturity difference of 27 years. Moreover, some companies report bonds as "Other Borrowings".

FISD, and data on loan issuance are from DealScan.

3 Capital Flows and Debt Structure Changes

3.1 Aggregate Evidence

We start by visually examining the aggregate time series in Figure 1. The blue bars show year-over-year net flows to loan funds relative to bond funds.[3] In Panel A, the red line plots the fraction of year-over-year new debt issuances that are loans. There is a strong positive correlation (0.62) between relative loan vs bond fund flows and aggregate issuances of loans relative to bonds. When there are more inflows (outflows) to loan funds or more outflows (inflows) to bond funds, firms issue more loans relative to bonds.

In Panel B, which shows quarterly rather than monthly values, we add year-over-year changes in the fraction of outstanding debt that is: 1) loans, 2) fixed rate, or 3) secured. The level changes follow similar trajectories as new issuances and are similarly strongly correlated with relative loan vs bond fund flows. The advantage of using changes in levels is that levels capture not only in new issuances but also retirements of existing debt. For example, firms might respond to bond fund outflows by letting bonds mature, which would lead to a larger fraction of existing debt being loans.

To ensure that the co-movement between relative loan and bond fund flows and debt structure changes are not spuriously driven by other variables, we run the following multivariate regression using quarterly aggregate time series:

$$Y_t = \alpha + \beta(LoanFundFlow_t - BondFundFlow_t) + \gamma Controls + \epsilon_t \quad (1)$$

[3]Figure A1 shows that both loan fund flows and bond fund flows are important in driving their difference.

Y_t denotes share of loans in new debt issuances during year t or the year-over-year change in the structure of existing debt. The main regressor is the difference in year-over-year loan fund flows versus bond fund flows. For controls, we include the annual amount of Treasury bond issuance to account for the well-established gap-filling channel for bond issuance (Greenwood et al., 2010; Badoer and James, 2016), changes in risk-free interest rates and credit spreads, and several macroeconomic variables, including GDP growth and CPI inflation. All variables are scaled to have unit standard deviation, so the regression can be easily interpreted as a horse race among the regressors.

The results are shown in Table 2 and confirm that, even when we include a large set of controls, relative flows to loan funds versus bond funds still has a large effect on aggregate corporate debt choices, both in terms of new issuance of loans and bonds and in terms of changes in the outstanding stock of loans and bonds. Relative loan versus bond fund flows has a large and statistically significant effect on both dependent variables and wins the horse race against other variables in explaining corporate debt structure. Based on the estimated coefficients, relative fund flows has a larger effect on corporate debt structure than all other variables, including changes in government debt maturity, which is the main measure of the gap-filling theory (Greenwood et al., 2010).

3.2 Firm-Specific Capital Flows

Despite the very strong time series correlation, we are reluctant to draw a causal interpretation through just the aggregate evidence. Although we include a large set of controls, it is certainly plausible that some latent macroeconomic variables drive the simultaneous movement of capital flows and debt structure changes. In this subsection, we exploit firm-specific capital flows and examine cross-sectional differences in debt structure choices to bolster the evidence that the relative supply of bonds and loans affects corporate debt choices.

Our firm-specific measure of the relative supply of capital relies on the fact that portfolio investments by fixed income funds are "sticky." This fact follows from two features of the behavior of portfolio managers. First, funds tend to hold relatively concentrated portfolios. At year-end 2015, for example, there were 729 non-financial speculative-grade firms with at least \$10 million in debt outstanding. The median bond fund, however, held the bonds from only 92 firms, and the median loan fund held loans from only 70 firms.

Second, funds develop relationships with underwriters and borrowers (Zhu, 2021; Barbosa and Ozdagli, 2022), so to a first-approximation, funds respond to inflows or outflows by nearly proportionally scaling their existing holdings. We confirm this behavior by running the following regression:

$$NetPurchase_{i,t,t+4} = \alpha + \beta FundFlow_{i,t,t+4} + \epsilon_{i,t,t+4} \tag{2}$$

where $NetPurchase_{i,t,t+4}$ denotes fund i's net purchases of corporate debt, either in total or just the issuers who are already in the fund's portfolio, which we label portolio debt. Net purchases are the difference in holdings between quarter-end t -and quarter-end $t+4$, scaled by total corporate debt outstanding at quarter-end t. The relevant independent variable is $FundFlow_{i,t,t+4}$, which denotes fund i's net flows from quarter-end t to $t+4$, scaled by total net assets at quarter-end t. We separate fund inflows ($FundFlow > 0\%$) and fund outflows ($FundFlow < 0\%$). We separately examine bonds funds and loan funds and examine net purchases of bonds and loans separately.

Table 3 confirms that fixed income funds near-proportionally scale up existing holdings in response to flows. Panel A shows that, for the average bond fund, a 1% inflow leads to an increase in bond holdings by 0.92%, and 75% (0.69 / 0.92) of the net purchases come from portfolio bonds, i.e. bonds whose issuers are already held by the fund. Outflows lead to a similar scaling down of portfolio bonds. Columns (3) and (4) show that the average bond fund's loan holdings are much less sensitive, largely because bond funds do not hold many loans.

Panel B shows a similar pattern applies to loan funds. For the average loan fund, in response to 1% inflow (outflow), its loan holdings increase (decrease) by 0.84% (0.79%), and 69% (0.57 / 0.84) of the purchases (70% (0.55 / 0.79) of the sales) come from loans whose issuers are already held by the fund. In contrast, the average loan fund's bond holdings change very little.

The behavior of funds suggests that variation in flows across funds will lead to differential access to capital across firms. We create a measure of access to debt capital, for firm j, arising from fund flows during a period t to $t+h$ by:

$$DebtFlow_{j,t,t+h} = \frac{\sum DebtHeld_{i,j,t} FundFlow_{i,t,t+h}}{DebtOutstanding_{j,t}} \tag{3}$$

where i denotes different funds that held the firms debt at time t. Intuitively, this measure captures the amount of buying or selling by the firm's debt holders (relative to the firm's total debt outstanding) if the funds proportionally scale up or down their portfolios in response to inflows or outflows. For each firm, we separately measure its capital flows from bond funds ($BondFlow$) and from loan funds ($LoanFlow$).

We argue that these firm-specific capital flows can be treated as exogenous shocks to credit supply, akin to the canonical Bartik instrument (Goldsmith-Pinkham et al., 2020). In the canonical Bartik setting, geographically diverse counties have differential exposure to industries that face imperfectly correlated supply shocks. Ex-ante variation in exposure to the industries can generate exogenous county-level supply shocks. In our setting, existing relationships create variation across firms in their exposure to mutual funds who fac imperfectly correlated flows. Flows to a fund disproportionately affect the firms that have higher ex-ante exposure to that fund. In Section 4, we will formalize the use of these firm-specific capital flows as instruments for debt structure changes.

3.3 Firm-Level Debt Structure Changes

We run the following regression on the panel of speculative-grade firms from 2010Q1 to 2023Q4:

$$Y_{j,t,t+4} = \beta_1 LoanFlow_{j,t,t+4} + \beta_2 BondFlow_{j,t,t+4} + \gamma Controls + FE + \epsilon_{j,t,t+4} \tag{4}$$

$Y_{j,t,t+4}$ denotes the change in firm j's debt structure from quarter t to $t+4$. $LoanFlow_{j,t,t+4}$ and $BondFlow_{j,t,t+4}$ are capital flows from loan funds and bond funds defined in the previous subsection. Controls include the log of total assets, the ratio of cash to total assets, leverage, and contemporaneous profitability. Standard errors are two-way clustered by firm and by quarter.

We include firm fixed effects to purge persistent differences between firms in the tendency to issue loans versus bonds, and we include quarter fixed effects to control for aggregate cyclicality. In the most stringent specification, we include rating- by-quarter fixed effects and Fama-French 12 industry-by-quarter fixed effects, so effectively we compare firms with the same rating and in the same industry at the same time.

Table 4 shows the results. In Panel A, the dependent variable is new debt issuance, so we restrict the sample to firm-quarters with positive debt issuance during the year. The results show that both loan flows and bond flows are important determinants of the choice between issuing a loan or issuing a bond, regardless of the specification. In Column 5, where we compare firms with the same rating and in the same industry at the same time, 1 percentage point higher loan flows (bond flows) is associated with 1.72 p.p. higher (2.20 p.p. lower) fraction of loans. This effect is statistically significant at the 1% level and economically meaningful in representing around 5% of the variable's standard deviation (46.18).

Panel B focuses on the change in debt outstanding and shows a similar result. Column (1) shows that 1 p.p. higher loan flow (bond flow) is associated with 0.69 p.p. higher (1.09 p.p. lower) fraction of loans in total debt, which is both statistically significant at 1% level and economically meaningful at around 5% of the variable's standard deviation (17.26). As loans and bonds tend to have different characteristics, these loan flows and bond flows lead to large changes in firms' interest rate and security structure. Columns (2) and (4) show that a 1 p.p. higher loan flow (bond flow) is associated with 0.85% higher (0.86% lower) floating-rate ratio and 0.53% higher (0.76% lower) ratio of secured debt. These effects are all highly statistically significant and economically meaningful in magnitude.

4 Implications of Flow-Induced Debt Structure Changes

After establishing in the previous section that capital flows have large effects on firms' debt structures, we next explore whether the flows have a meaningful effect on corporate investment. There are at least two reasons why flows may affect debt structure but have little effect on investment. First, the variation in debt structure generated by capital flows may be insufficient to materially change corporate investment plans. Although we establish that capital flows have an important impact on the split between fixed and floating debt and between secured and unsecured debt, this variation may not meaningfully affect corporate investment. Second, firms may take deliberate actions to undo changes in debt structure. Firms may, for example, change their hedging behavior to undo the impact of changes in the split between fixed- and floating-rate debt. If firms simultaneously issue more floating-rate loans and enter into more floating-to-fixed interest rate swaps, capital flows may not lead to any real effect. In this section, we investigate whether flow-induced debt structure changes affect investment by changing firms' exposure to interest rates.

4.1 Interest Rate Exposure and Corporate Investment

Recent research has established that firms with more floating-rate debt are more exposed to changes in monetary policy (Ippolito et al., 2018; Gürkaynak et al., 2022; Jungherr et al., 2022). The recent interest rate hike serves as a nice illustration of the mechanism. During one and a half years starting in early 2022, to combat high inflation, the Federal Reserve raised the target for the federal funds rate from near zero to over 5.25 percent. As a result, a firm with 100% floating-rate debt would see its interest expenses increase substantially more than a firm with 100% fixed-rate debt, at least until the firm with fixed-rate debt has to refinance. Existing research has shown that the firm with more floating-rate debt responds more strongly to the increase interest rates.

We ask whether firms that experience larger loan inflows or bond outflows–who are more likely to increase their reliance on floating-rate debt–become more exposed to subsequent changes in interest rates. To examine this question, we estimate the following regression for the set of speculative-grade firms at year-end 2021, just before rate hike commenced:

$$Y_j = \beta_1 LoanFlow_j + \beta_2 BondFlow_j + \gamma Controls + FE + \epsilon_j \tag{5}$$

Y_j denotes firm j's capital expenditures during the eight quarters from 2022Q1 to 2023Q4, as a ratio to the firm's total assets at year-end 2021. $LoanFlow_j$ and $BondFlow_j$ denote loan flows and bond flows during the two years *prior* to the rate hike, from 2020Q1 to 2021Q4. By using loan flows preceding the rate hike, we are asking whether shocks to the supply of capital have a lasting impact on firms by changing their exposure to interest rates. In the regression, we control for the 2021 level of the log of total assets, cash ratio, leverage, and firm's profitability measured contemporaneously with investment. We include rating letter fixed effects and Fama-French 12 industry fixed effects to compare firms with the same rating in the same industry. These variables help control for investment opportunities and other factors that might affect investment during 2022 and 2023.

The results are shown in Column 1 of Panel A of Table 5. The estimate of β_1 is significantly negative, meaning that firms with larger flows to their loan funds prior to the rate hike (from 2020 to 2021) invested less during the rate hike (from 2022 to 2023). Similarly, the estimate of β_2 is significantly positive, meaning that firms with larger prior bond fund flows subsequently invested more. The estimated effects are sizeable. A 1 percentage point increase in loan (bond) flows prior to the rate hike is associated with lower (higher) capital expenditure during the rate hike of 2.22% (1.34%) of total assets. From 2022 to 2023, the mean of capital expenditure as ratio of total assets is 13.91% and the standard deviation is 15.64%, so the estimated effect is economically large at 8-16% of mean or standard deviation.

We can also address the question using time periods outside of the recent interest rate hike. To do so, we examine the full panel of firms from 2010Q1 to 2023Q4 and augment equation 5 by adding the interaction of the flow variables with changes in the federal funds rate:

$$Y_{j,t,t+4} = \beta_1 \Delta FFR_{t,t+1} \times LoanFlow_{j,t-8,t} + \beta_2 \Delta FFR_{t,t+1} \times BondFlow_{j,t-8,t} + \gamma Controls + FE + \epsilon_{j,t} \tag{6}$$

where $\Delta FFR_{t,t+1}$ denotes change in federal funds rates from quarter-end t to quarter-end $t+1$, which is the first quarter during which capital expenditures is measured. In this specification, β_1 (β_2) captures how the impact of loan (bond) flows on subsequent investment varies with changes in interest rates. Using the full panel of data offers more statistical power and permits more granular controls. We include firm fixed effects to account for persistent differences in capital expenditures and rating letter-by-quarter fixed effects and Fama-French 12 industry-by-quarter fixed effects to flexibly control for time series variation in investment opportunities and access to capital. The regression also includes $LoanFlow_{j,t-8,t}$ and $BondFlow_{j,t-8,t}$, so the interaction terms capture just changes in the relationship between capital flows and investment.

The results are reported in Panel B of Table 5. Column 1 shows that lagged loan and bonds flows have no significant impact on investment during periods when the federal funds rate is unchanged. However, when interest rates increase, investment is negatively related to lagged loan flow and positively related to lagged bond flow. If the federal funds rate increases by 1 percentage point, then a 1 percentage point increase in loan (bond) flows is associated with lower (higher) capital expenditure equal to 0.66% (0.23%) of total assets during the rate hike. If the federal funds rate were to increase by 5 percentage points, the analogous estimated effect sizes are -3.3% and 1.2% of total assets, similar in magnitude to the estimates in Panel A.

The results in Table 4 and in the first column of Table 5 suggest an instrumental variable (IV) strategy to identify the causal impact of floating-rate debt on the sensitivity of investment to changes in interest rates. We propose that lagged capital flows–which depend on flows to mutual funds that own a firm's debt–provide variation in the floating-rate debt ratio that should be exogenous with respect to subsequent investment. Table 4 confirms a strong first-stage relationship between capital flows and changes in the floating ratio, and if capital flows have no impact on subsequent investment other than by changing a firm's exposure to interest rates, then fund flows provide a valid instrument. We use this strategy to identify the causal impact of debt structure on the sensitivity of investment to changes in interest rates.

We implement this strategy by running the following regression with change in floating ratio as the main explanatory variable:

$$Y_{j,t,t+4} = \beta \Delta FFR_{t,t+1} \times \Delta FloatingRatio_{j,t-8,t} + \gamma Controls + FE + \epsilon_{j,t} \tag{7}$$

where $\Delta FloatingRatio_{j,t-8,t}$ denotes the change in firm j's floating ratio (the percentage of floating-rate debt in total debt) over the previous two years, from quarter-end $t-8$ to quarter-end t. In the IV estimation of 7, we instrument for $\Delta FloatingRatio_{j,t-8,t}$ with loan flows and bond flows over the same period, $LoanFlow$ and $BondFlow$.

Column 2 of Table 5 shows the ordinary least squares (OLS) estimates of 7. In Panel A, the coefficient estimate on $DeltaFloatingRatio_{j,t-8,t}$ implies that firms that increased their floating-rate ratio by 1 percentage point prior to the rate hike (from 2020 to 2021) had lower investment by 0.092% of assets during the rate hike (from 2022 to 2023). In Panel B, we again use the full panel and add the interaction between $\Delta FloatingRatio_{j,t-8,t}$ and the change in the federal funds rate. The OLS estimates imply that when the federal funds rate increases by 1 percentage point, a 1 percentage point increase in the floating-rate ratio is associated with lower capital expenditure equal to 0.014% of total assets. The estimates are similar to the findings in Ippolito et al. (2018), Gürkaynak et al. (2022), and Jungherr et al. (2022).

Column 3 of Table 5 reports the two-stage least squares estimates. The first-stage Cragg-Donald statistic is 27.85, higher than the 5% critical value of 11.04 according to Stock and Yogo (2005), confirming the strength of the instrument.[4] In Panel A, the coefficient on $\Delta FloatingRatio_{j,t-8,t}$ is -0.396, which is considerably stronger than the OLS estimate. Similarly, in Panel B, the IV estimate is -0.179, which is more than an order of magnitude larger than than the OLS estimate of -0.014. The large differences between the OLS and IV estimates suggest that corporate choices between fixed- and floating-rate debt is endogenous with respect to subsequent investment. A likely explanation is that firms choosing a higher floating-rate ratio do so knowing that they are somewhat hedged from changes in interest rates, perhaps because their assets have become more sensitive to changes in interest rates. If firms choose the structure of their debt cognizant of how exposure to interest rate changes might affect their investment, the OLS coefficient will be biased towards zero. By using a

[4] We refer to Table 1 Column 5 of Stock and Yogo (2005), which shows the 5% critical value for two endogeneous regressors – change in floating ratio and its interaction with change in FFR – and four instruments – loan flows, bond flows and their interactions with change in FFR.

supply-side factor to instrument for changes in debt structure, we use variation that captures deviations from firms' natural structure and identify a much larger impact of interest rates on investment.

The coefficient estimates in column 3 suggest that corporate investment is quite sensitive to change in interest rates. In Panel A, the coefficient estimate on $\Delta FloatingRatio$ implies that firms that increased their floating-rate ratio by 1 percentage point during 2020 and 2021 had lower investment by .391% of assets during 2022 and 2023. In Panel B, the estimate implies that when the federal funds rate increases by 1 percentage point, a 1 percentage point increase in the floating-rate ratio is associated with lower capital expenditure equal to 0.179% of total assets, again in the ballpark of one-third of the estimate in Panel A, which is consistent with the magnitude of the rise in interest rates during 2022 and 2023. These estimates are considerably larger than those provided in prior research that does not instrument for firms' debt structure.

The remaining columns in Table 5 provide some evidence on the mechanisms that explain the large effect of debt structure changes on the sensitivity of capital expenditures to interest rates. Specifically, we ask the question: where does the reduction in capital expenditure come from? We use the IV version of 7 and replace capital expenditures with three other cash flow variables that are measured over the same period and all scaled by total assets. In column 4, we examine interest expense and hypothesize that firms with more floating-rate debt will have higher interest expenses when interest rate rise. In columns 5 and 6, we examine net issuance of equity and debt and hypothesize that firms with more floating-rate will be constrained to issue less debt and actively reduce their leverage by issuing more equity.

The results are shown in columns 4, 5, and 6 of Table 5. In column 4, the estimates are close to zero and not significantly different from zero, meaning that firms with more floating-rate debt do not pay higher interest expenses. This is surprising since the interest expense on floating-rate debt increases mechanically when interest rates rise. However, column 6 shows that firms with more floating-rate debt raise significantly less debt, so despite the increase in interest expense on existing debt, the lack of new debt issuance–or debt repayments–keep total interest expense comparable to other firms. In column 5, we see that firms with more floating-rate debt issue more equity, confirming some active deleveraging as firms shift from debt to equity. The size of the coefficient in column 5 is smaller than the coefficient in column 6, so the shift from debt to equity is incomplete. When interest rates rise, firms with more floating-rate debt raise less external financing and are forced to have lower capital expenditures.

The evidence in Table 5 is consistent with firms actively managing their interest expenses. When interest rates rise, firms with more floating-rate debt see a larger increase in interest expenses on *existing* debt, which discourages them from issuing new debt to avoid a further rise in their interest expenses. Greenwald (2019) shows that covenants in credit agreements that limit interest coverage are very common and argues that these covenants could be a reason why firms manage their interest expenses. Firms with more fixed-rate debt escape the impact of a rise in interest rate but issue more new debt, which increases their interest expense to about match that of firms with more floating-rate debt. The firms with more floating-rate debt shift their external financing to equity–which avoids tightening any limits on interest expense–but are somewhat constrained so forced to cut back on investment.

5 Conclusion

The structure of firm' *existing* debt has an important effect on their exposure to shocks, including changes in monetary policy. In this paper, we show that the supply of capital is an important determinant of firms' debt structures. Using capital flows to provide exogenous variation in debt structures, we revisit the floating-rate channel of monetary policy and estimate considerably larger sensitivities.

Our findings suggest that the impact of monetary policy on corporate investment depends on the structure of firms' existing debt. Monetary policy makers would be well served to incorporate measures of floating-rate debt in corporate capital structures into their policy-making decisions. Moreover, the results suggest that today's monetary policy can influence the efficacy of future monetary policy decisions. Existing research (Fang, 2023; Cetorelli et al., 2023) shows that monetary policy can influence the relative flows into loan and bond funds, which, based on our findings, may affect the *future* transmission of monetary policy to real investment. This dynamic adds an additional level of foresight needed for optimal monetary policy.

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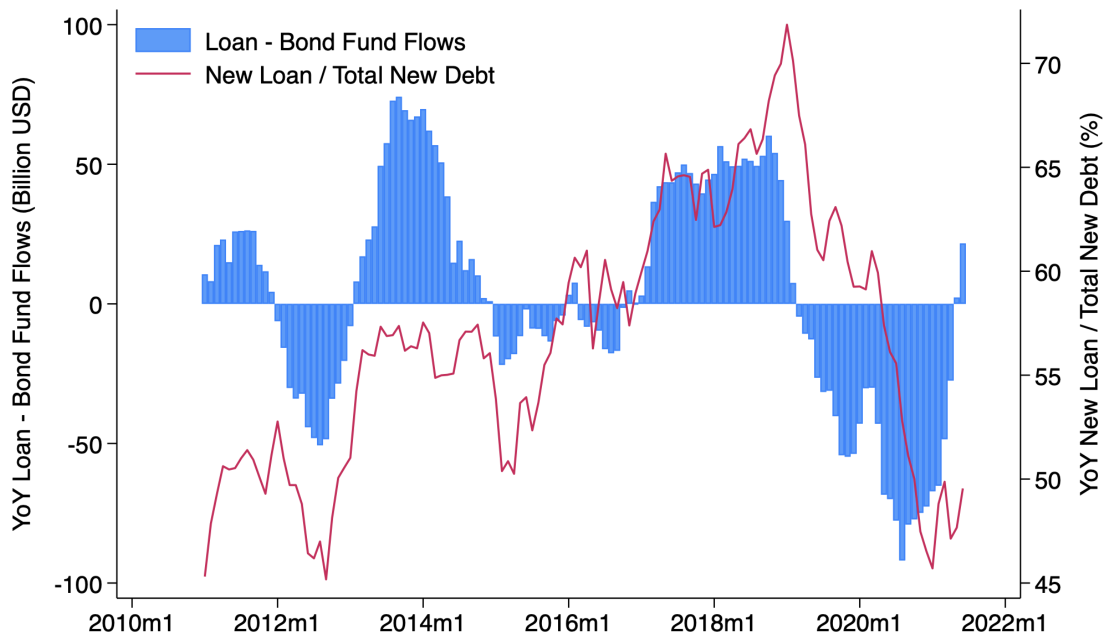
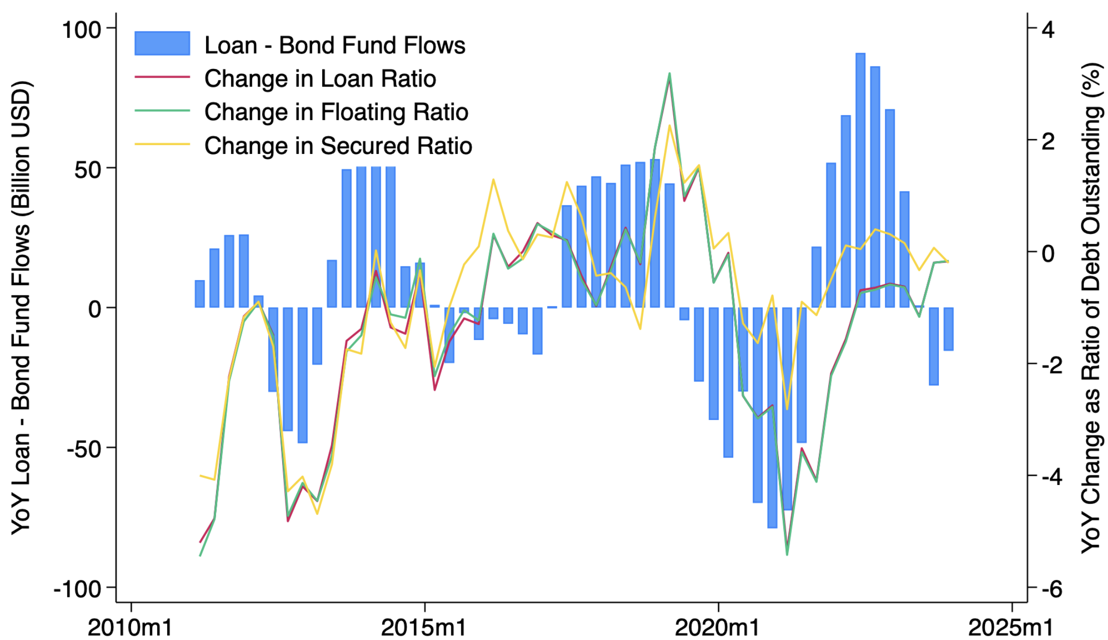
Figures

Figure 1: **Aggregate Evidence.**

New Debt Issuance



Change in Debt Outstanding



Tables

Table 1: **Summary Statistics.** This table shows summary statistics of our sample of 1,117 non-financial speculative-grade firms from 2010Q1 to 2023Q4.

	N	Mean	SD	P25	P50	P75
Loan Flow / Debt (%)	39368	0.01	1.05	-0.01	0.00	0.00
Bond Flow / Debt (%)	39368	-0.12	1.33	-0.57	0.00	0.11
New Loan / New Debt (%)	16971	48.77	46.18	0.00	47.41	100.00
Loan Debt / Total Debt (%)	39368	63.15	36.14	31.65	68.63	100.00
Change	36944	-1.36	17.26	-2.01	0.00	1.30
Floating Debt / Total Debt (%)	39368	63.56	35.89	32.59	69.22	100.00
Change	36944	-1.39	17.27	-2.04	0.00	1.23
Maturing Debt / Total Debt (%)	39368	63.57	35.88	32.64	69.22	100.00
Change	36944	-1.39	17.27	-2.04	0.00	1.24
Secured Debt / Total Debt (%)	39368	69.01	34.42	42.55	80.35	100.00
Change	36944	-0.92	15.99	-1.06	0.00	0.89
Capital Expenditure / TA (%)	37138	9.78	13.66	2.22	5.01	10.91
Interest Expense / TA (%)	37138	3.03	2.05	1.65	2.53	3.87
Net Debt Issuance / TA (%)	37138	2.94	12.22	-2.43	0.00	4.55
Net Equity Issuance / TA (%)	37138	-1.06	5.72	-2.51	-0.26	0.00
Log Total Assets	39368	7.99	1.15	7.18	7.91	8.76
Debt / TA (%)	39368	9.20	9.29	2.45	6.22	12.79
Cash / TA (%)	39368	45.89	22.85	30.32	42.98	57.90
Net Income / TA (%)	35082	0.33	10.91	-2.03	1.97	5.25

Table 2: **Aggregate Time Series.** This table shows determinants of corporate debt structure in the aggregate time series from regression (1). All variables are scaled to have unit standard deviation to facilitate direct comparison.

Dependent Variable	New Loan / Total New Debt (%)		Change in Loan Debt / Total Debt (%)	
	(1)	(2)	(3)	(4)
Lagged Loan – Bond Fund Flow	3.992***	3.552***	1.021***	1.098**
	(3.871)	(6.592)	(3.952)	(3.307)
ΔTreasury Debt Maturity	-2.552*	-3.611***	-0.532*	-0.307
	(-2.596)	(-6.934)	(-2.179)	(-0.931)
ΔFFR		4.046***		-0.260
		(5.074)		(-0.789)
Δ10Y Treasury Yield		-0.981		-0.008
		(-1.634)		(-0.028)
ΔBAA – AAA Spread		-1.487*		0.429
		(-2.290)		(1.078)
GDP Growth		-2.797***		-0.548
		(-3.807)		(-1.659)
CPI Inflation		2.210***		-0.095
		(3.763)		(-0.255)
Standard Errors	Newey-West (1994)			
Observations	41	41	51	51
R2	0.448	0.772	0.349	0.416

Table 3: **Fixed income fund investment stickiness.** This table examines whether the investments of bond funds and loan funds are sticky, according to regression (2). t-statistics are reported in parentheses. *, **, and *** denote p-values less than 0.10, 0.05, and 0.01, respectively.

Panel A: Bond Funds

Dependent Variable	Net Purchase (% of Corporate Debt Holding)			
	All Bonds (1)	Portfolio Bonds (2)	All Loans (3)	Portfolio Loans (4)
Fund Inflow (%)	0.92***	0.69***	0.08***	0.02***
	(21.83)	(10.95)	(4.23)	(2.95)
Fund Outflow (%)	0.96***	0.74***	0.04***	0.02*
	(7.14)	(6.01)	(3.60)	(1.92)
Fund FE	Y	Y	Y	Y
Firm FE x Quarter FE	Y	Y	Y	Y
Standard Errors	Clustered by fund and by quarter			
Observations	10258	11304	10258	11304
R2	0.77	0.76	0.18	0.56

Panel B: Loan Funds

Dependent Variable	Net Purchase (% of Corporate Debt Holding)			
	All Bonds (1)	Portfolio Bonds (2)	All Loans (3)	Portfolio Loans (4)
Fund Inflow (%)	0.11***	0.05*	0.84***	0.57***
	(3.82)	(1.99)	(25.94)	(12.63)
Fund Outflow (%)	0.11**	0.09	0.79***	0.55***
	(2.62)	(1.50)	(6.96)	(8.43)
Fund FE	Y	Y	Y	Y
Firm FE x Quarter FE	Y	Y	Y	Y
Standard Errors	Clustered by fund and by quarter			
Observations	2340	2623	2340	2623
R2	0.22	0.24	0.90	0.68

Table 4: **Firm-specific capital flows and debt structure changes.** These tables examine how firm-specific loan flows and bond flows (constructed in Section 3.2) affect firms' debt structures. t-statistics are reported in parentheses. *, **, and *** denote p-values less than 0.10, 0.05, and 0.01, respectively.

Panel A: New Debt Issuance

Dependent Variable	New Loan / Total New Debt (%)				
	(1)	(2)	(3)	(4)	(5)
Loan Flow (%)	1.469***	1.632***	1.937***	1.427***	1.718***
	(4.026)	(3.965)	(4.261)	(3.402)	(3.640)
Bond Flow (%)	-2.800***	-2.183***	-2.057***	-2.278***	-2.198***
	(-6.964)	(-5.636)	(-4.757)	(-5.933)	(-5.130)
Controls	Log Total Assets, Cash Ratio, Leverage, Profitability				
Firm FE	Y	Y	Y	Y	Y
Quarter FE		Y			
Quarter FE x Rating FE			Y		Y
Quarter FE x Industry FE				Y	Y
Standard Errors	Clustered by Firm and by Quarter				
Observations	16388	16388	14021	16387	14020
R2	0.569	0.580	0.589	0.598	0.608

Panel B: Change in Debt Outstanding

Dependent Variable	ΔLoan Ratio	ΔFloating Ratio	ΔSecured Ratio
	(1)	(2)	(4)
Loan Flow (%)	0.688***	0.685***	0.440***
	(4.005)	(3.962)	(3.058)
Bond Flow (%)	-1.088***	-1.052***	-0.912***
	(-4.429)	(-4.319)	(-4.767)
Controls	Log Total Assets, Cash Ratio, Leverage, Profitability		
Firm FE	Y	Y	Y
Quarter FE x Rating FE	Y	Y	Y
Quarter FE x Industry FE	Y	Y	Y
Standard Errors	Clustered by Firm and by Quarter		
Observations	31019	31019	31019
R2	0.133	0.133	0.132

Table 5: **Flow-induced debt structure changes and interest rate exposure.** These tables examine how flow-induced debt structure changes expose firms to interest rate changes, according to regression (5) to (7). t-statistics are reported in parentheses. *, **, and *** denote p-values less than 0.10, 0.05, and 0.01, respectively.

Panel A: Recent Rate Hike

Dependent Variable (% of Total Assets)	CAPX	CAPX	CAPX	XINT	NEI	NDI
	OLS	OLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Loan Flow (%)	-2.195*					
	(-1.782)					
Lagged Bond Flow (%)	1.339***					
	(2.921)					
Lagged Change in Floating Ratio (%)		-0.092***	-0.396**	0.006	0.065	-0.230*
		(-3.292)	(-2.322)	(0.210)	(0.758)	(-1.834)
Controls	Log Total Assets, Cash Ratio, Leverage, Profitability					
Rating FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Observations	499	499	499	499	499	499
R2	0.223	0.228	0.223	0.587	0.411	0.076
Cragg-Donald F-statistic			8.312	8.312	8.312	8.312

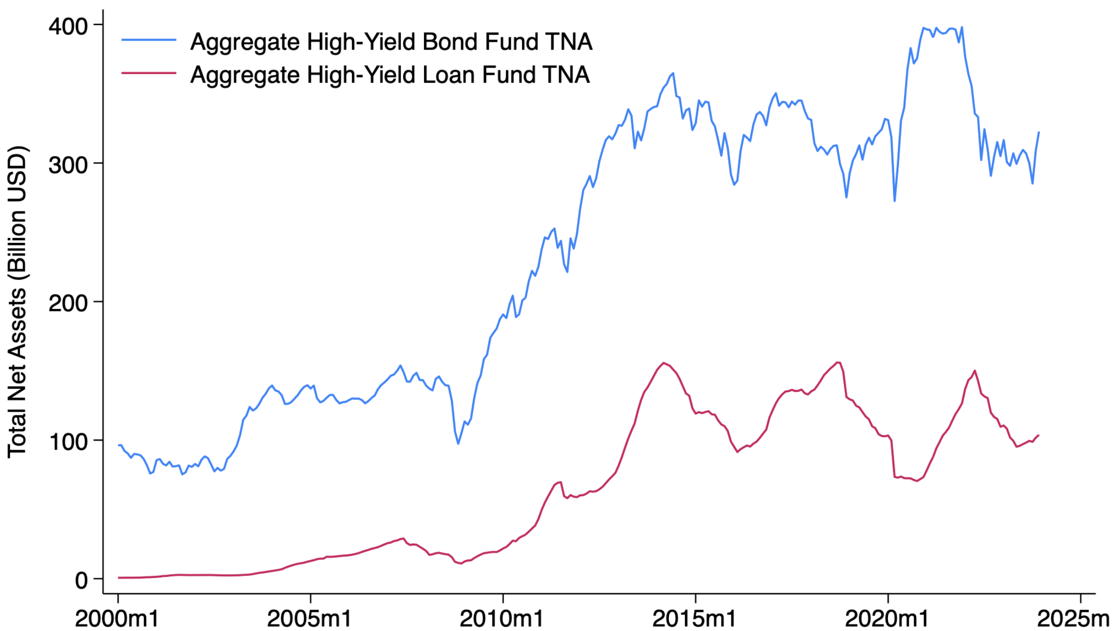
Panel B: 2010Q1-2023Q4

Dependent Variable (% of Total Assets)	CAPX	CAPX	CAPX	XINT	NEI	NDI
	OLS	OLS	2SLS	2SLS	2SLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Loan Flow (%)	-0.053					
	(-0.694)					
× Change in Federal Funds Rate (%)	-0.663***					
	(-3.183)					
Lagged Bond Flow (%)	0.017					
	(0.255)					
× Change in Federal Funds Rate (%)	0.226**					
	(2.062)					
Lagged Change in Floating Ratio (%)		-0.006	0.002	-0.001	-0.004	0.168
		(-1.149)	(0.036)	(-0.111)	(-0.115)	(1.581)
× Change in Federal Funds Rate (%)		-0.014*	-0.179**	0.002	0.001	-0.199*
		(-1.868)	(-2.487)	(0.322)	(0.065)	(-1.641)
Controls	Log Total Assets, Cash Ratio, Leverage, Profitability					
Firm FE	Y	Y	Y	Y	Y	Y
Rating FE × Quarter FE	Y	Y	Y	Y	Y	Y
Industry FE × Quarter FE	Y	Y	Y	Y	Y	Y
Observations	24699	24699	28136	28136	28136	28136
R2	0.484	0.484	0.484	0.852	0.510	0.338
Cragg-Donald F-statistic			27.851	27.851	27.851	27.851

Appendix A Additional Figures

Figure A1: **Aggregate bond funds and loan funds.**

Fund Size



Fund Flows

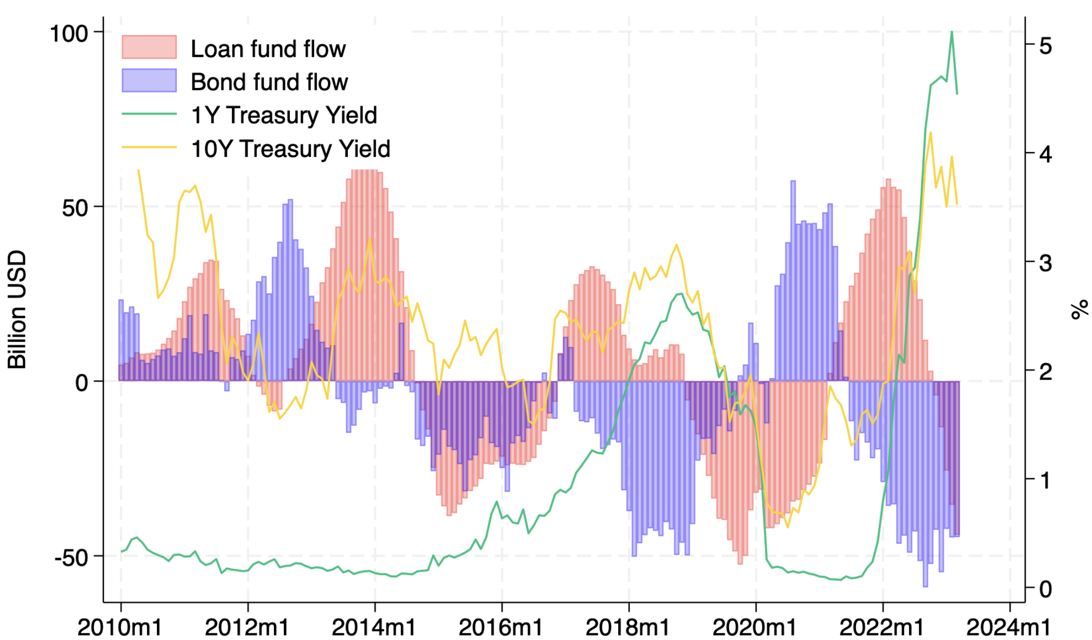
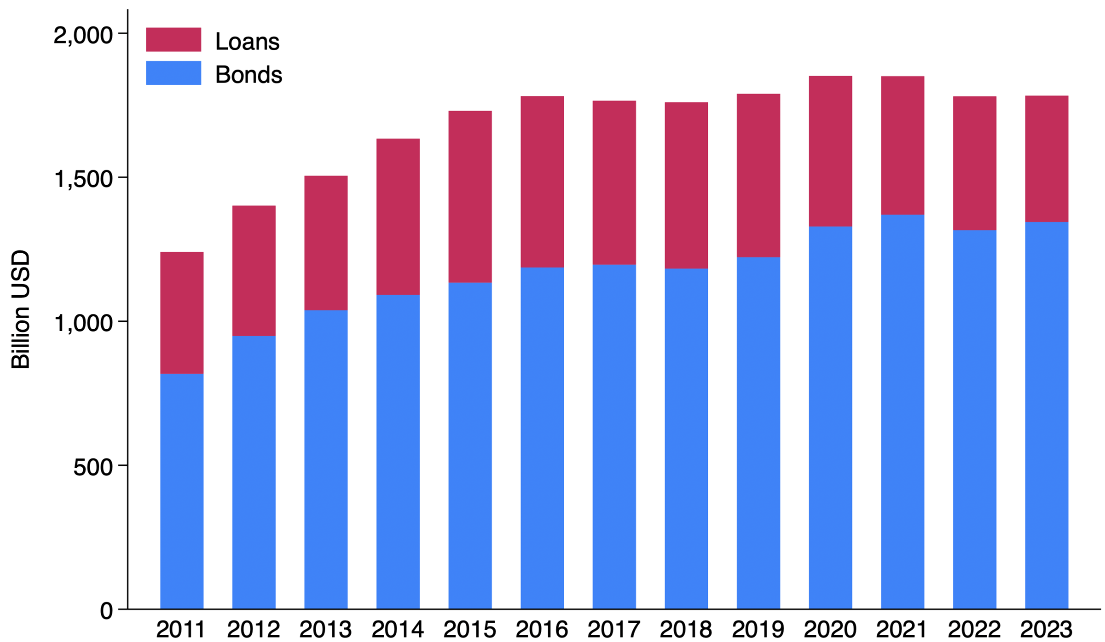
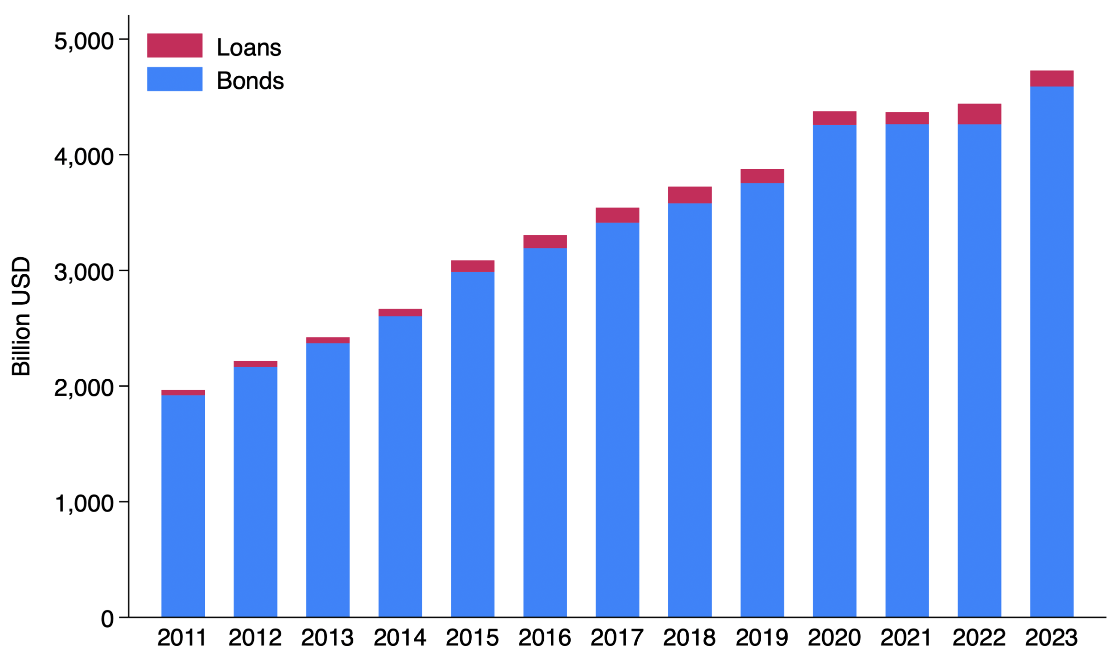


Figure A2: **Aggregate Firm Debt.**

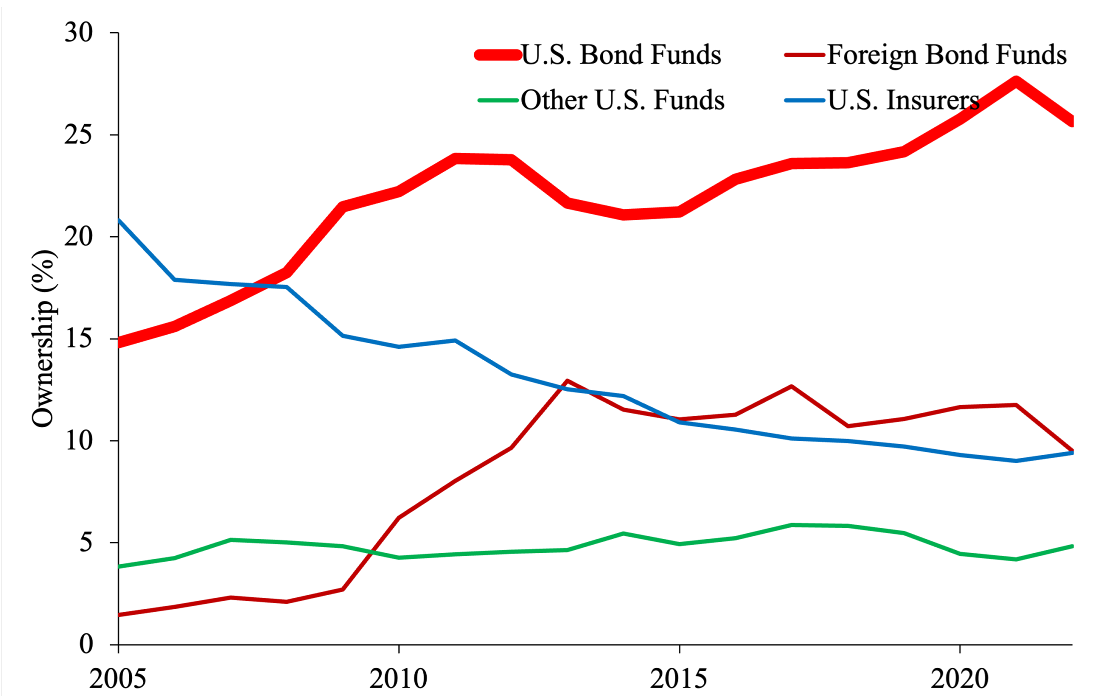
speculative-grade Firms, Total Debt



Investment-Grade Firms, Total Debt



speculative-grade Firms, Investor Ownership



Appendix B Additional Tables

Table A1: Firm-specific capital flows and debt structure changes, robustness.

Dependent Variable	Change in Loan Debt / Total Debt (%)				
	(1)	(2)	(3)	(4)	(5)
Loan Flow (%)	0.254*	0.838***	0.852***	0.812***	0.840***
	(1.825)	(4.979)	(4.914)	(4.681)	(4.465)
Bond Flow (%)	-1.020***	-0.686***	-0.875***	-0.687***	-0.876***
	(-5.333)	(-3.012)	(-4.322)	(-2.867)	(-4.096)
Log Total Assets	-0.094	-1.085**	-3.315***	-1.056**	-3.429***
	(-0.207)	(-2.283)	(-5.278)	(-2.107)	(-5.329)
Cash / TA (%)	0.131***	0.147***	0.151***	0.150***	0.155***
	(4.172)	(4.903)	(4.450)	(4.904)	(4.537)
Debt / TA (%)	-0.006	-0.027	-0.106***	-0.025	-0.099***
	(-0.338)	(-1.564)	(-5.643)	(-1.419)	(-5.111)
Net Income / TA (%)	-0.092***	-0.109***	-0.078***	-0.096***	-0.071***
	(-3.133)	(-3.973)	(-3.131)	(-3.630)	(-2.843)
Firm FE	Y	Y	Y	Y	Y
Quarter FE		Y			
Quarter FE x Rating FE			Y		Y
Quarter FE x Industry FE				Y	Y
Standard Errors	Clustered by Firm and by Quarter				
Observations	32736	32736	28070	32734	28069
R2	0.089	0.103	0.131	0.116	0.147