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Capital Supply and Corporate Bond Issuances: Evidence From Mutual Fund Flows

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Capital Supply and Corporate Bond Issuances: Evidence From Mutual Fund Flows

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Dedicated to my wife, Wei, for her love and support.

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Capital Supply and Corporate Bond Issuances: Evidence From Mutual Fund Flows

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This dissertation examines how investment behavior of bond mutual funds affects corporate bond issuance decisions. Mutual funds that hold existing bonds of a company have a high propensity to acquire new bonds from the same firm. Therefore, capital flows to a firm's existing bondholders affects firm-specific capital supply. Companies with higher bondholder flow are more likely to issue bonds, while substituting away from equity financing and bank loans. These firms also enjoy lower bond financing costs. I find consistent results using Bill Gross' resignation as an exogenous shock to the capital supply of PIMCO's portfolio companies.

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Chapter 1

Introduction

1.1 Overview

Bond issuance is the main source of external financing for U.S. companies in terms of aggregate amount.[1] Does the supply of bond capital affects firm bond issuance decisions? In a frictionless financial market, capital supply should not matter (Modigliani and Miller (1958)). The supply of capital should be perfectly elastic and companies raise capital based their own demand. Even with financial frictions, the conventional wisdom about bond financing suggests that the capital availability of specific investors plays an limited role. Unlike bank loans, corporate bonds are offered on public markets with numerous potential investors, and firms with bond-market access are relatively immune to fluctuations in market conditions (e.g., Kashyap et al. (1994); Faulkender and Petersen (2006)). Perhaps surprisingly, however, in this paper I find a persistent and "sticky" connection between issuers and investors in the data. Institutional investors, such as mutual funds, are much more likely to provide capital for a new bond issuance if they are existing bondholders of the

[1]See Figure 1. During 1998–2014, U.S. non-financial companies issued USD 4.9 trillion of equity (gross of repurchases and M&A), USD 16.3 trillion of corporate bonds (gross), and obtained USD 5.8 trillion of commercial and industry loans (gross). Source: Federal Reserve Bank; SIFMA

company before the issuance. Such bond market segmentation implies that firm-specific capital supply for bond financing can be affected by the funding conditions of a small group of bond investors: firms' existing bondholders.

This segmentation may take place for at least two reasons: First, existing bondholders may have lower information costs in acquiring new bonds from their portfolio companies. They have conducted due diligence and therefore are more informed about the creditworthiness of the company. Therefore, they are less concerned about the adverse selection problem as in Myers and Majluf (1984). Second, existing bondholders may have some relationship with the issuer through investment banks, who serve both as underwriters for issuers and brokers for institutional investors. Regardless of the exact economic mechanism, the implication of the issuer-investor connection is similar for issuers: An expansion (contraction) of the amount of capital held by a firm's current bondholders increases (decreases) firm-specific capital supply. If corporate managers optimally respond to their financing conditions, they should adjust their financing policies accordingly.

The main hypothesis of this paper is that companies are more likely to issue new bonds when their firm-specific bond capital supply is higher. Moreover, the bond financing cost, as reflected in the offering yield spreads, are reduced when capital supply is higher. To test these hypotheses, I construct an empirical measure for the funding conditions of a firm's existing bondholders. Specifically, I focus on the mutual fund bondholder of a company: Mutual funds are an important class of investors in the corporate bond market: at the end of 2014, they acquire more than 21% of newly-issued corporate bonds. However, their funding is based on equity-like redeemable shares, and is more variable than that of other bond investors, such as insurance companies (Feroli et al. (2014), Adrian et al. (2015)). These features render capital flows to mutual funds particularly relevant for bond capital supply. For each firm-quarter, I aggregate flows to an issuer's mutual fund bondholders as a firm-specific capital supply measure. I call this variable bondholder flow ($BHFlow$). I verify that bondholder flow positive predicts the fraction of new bond issuance acquired by a firm's existing bondholders.

In a panel of U.S. public bond issuers between 1998 and 2014, I find that bondholder flow positively predicts the probability of firms' future bond issuance. Moreover, conditional on issuance, bondholder flow negatively predicts offering yield spreads, i.e. bond financing costs are lower. Controlling for time fixed-effects, a one standard deviation increase in $BHFlow$ predicts 0.94 percent points increase in issuance probability next quarter (14 percent to the unconditional likelihood) and 5.5 basis points lower offering yield spread. These findings are consistent with prior literature, which shows that corporate financing choices are shaped in important ways by the supply of capital (e.g., Faulkender and Petersen (2006), Leary (2009), Sufi (2009)). The supply shocks used in these papers are *systematic* in nature, in that they affect all capital suppliers at once. The findings in this paper, however, suggest that *idiosyncratic*, firm-specific shocks to capital supply can affect firms' financing decisions.

The relation between bondholder flow and corporate bond issuances is unlikely to be confounded by firms' demand for debt. In the baseline specification, I control for a host of firm characteristics, including the credit rating, industry classification, and past bond return of the issuing company. In order to further purge bondholder flow of fundamental-driven components, I build an alternative measure that first decomposes fund-level flow into the explained component and the residual (Goldstein et al. (2017)).[2] I then aggregate residual flows from fund-level to issuer-level, and call this alternative measure residual bondholder flow ($BHFlow^{res}$). Residual bondholder flow can positively predict issuance probability and negatively predict offering yield spreads.

Furthermore, firms' responses in other financing and investment margins also suggest that bondholder flow captures supply-side effects. First, a stronger bondholder flow predicts lower probability of future equity issuances and initiation of new bank loans. This alleviates the concern that bondholder flow covaries with firms' total financing needs. Second, issuers who raise bonds under strong bondholder flow spend a smaller fraction of their issuance proceeds in real investment, as compared to other bond issuers. They do not seem to have particularly strong investment opportunities. In contrast, there is some evidence that these firms use issuance proceeds to early-refinance their outstanding bonds.

To shed more light on the economic mechanisms through which existing

[2] The explanatory variables for fund flow include past fund performances, fund size, fund age, investment objective of a fund, and the expense ratio of a funds.

bondholders are particularly important for firms' bond financing, I examine the cross-sectional variation in mutual funds' investment behavior. Consistent with the information costs explanation, the propensity for existing bondholders to participate in new bond offerings is more pronounced for companies that have more severe information asymmetry. I proxy for information asymmetry by using (a) firm's credit rating, (b) the length of firm's issuance history, (c) the number of analysts covering the firm, or (d) the trading activity of the firm's outstanding bonds. I find that, for example, high-yield bond issuances rely more heavily on the capital contribution of existing bondholders. The tighter connection between high-information-asymmetry issuers and bondholders also implies that bond issuance decisions should be particularly sensitive to $BHFlow$ for these issuers, relative to firms that have low information asymmetry. This prediction is also confirmed in the data.

I further provide some suggestive evidence for the underwriter relationship explanation. By classifying participants of an underwriter's recent bond issuances as the underwriter's "relationship investors", I show that if a mutual fund is a relationship investor of a deal's underwriter, this mutual fund is more likely to acquire bonds during the issuance. Since existing bondholders have a higher probability to be underwriter's relationship investors in the data, this partially explains why bondholders are more inclined to participate in bond issuances.

Finally, I utilize an exogenous shock to fund flows, which is uncorrelated with the fundamental of bond-issuing companies, to further straighten the identification arguments. The shock derives from Bill Gross' resignation from the Pacific Investment Management Company (PIMCO), the largest fixed-income mutual fund family in the U.S.. Bill Gross was the founder and CIO of PIMCO and a well recognized fixed-income fund manager. Because of an internal power struggle with other PIMCO executives, he abruptly resigned from PIMCO in September of 2014, triggering large redemptions from all PIMCO mutual funds. I use this event as a negative capital supply shock for companies who have a significant portion of bonds held in PIMCO's portfolios. In a difference-in-differences setting, I find that PIMCO's portfolio companies became significantly less likely to issue new bonds after Gross' departure, relative to other similar issuers. This provides another piece of evidence that the relationship between capital supply and corporate bond issuances may be causal.

1.2 Literature

This paper contributes to several strands of the finance literature. First, it provides novel evidence for the supply effect on corporate capital structure. Traditional capital structure studies tend to focus on the corporate demand for debt, while taking capital supply as perfectly elastic, an assumption consistent with Modigliani and Miller (1958). Titman and Wessels (1988) and Frank and Goyal (2009) provide excellent reviews on the large set of literature which examine the determinants of capital structure from firms' demand side. Graham and Harvey (2001) and Titman (2002) provide survey and anecdotal evidence that corporate managers consider capital supply an important factor in making financing decisions. These studies call into attention the importance of capital supply in firms' financing decisions. Several recent papers empirically show that the supply of capital affects firms' financing decisions (e.g. Faulkender and Petersen (2006), Leary (2009), Sufi (2009), Lemmon and Roberts (2010)). They find that, particularly for firms that depend on bank loans, the lack of ability to borrow in the bond market and the capital supply for the banking sector significantly determine the leverage ratio of a company. A common challenge for this literature is how to distinguish the supply effect from firms' debt demand. To meet this identification challenge, Leary (2009), Sufi (2009) and Lemmon and Roberts (2010) establish causality by utilizing plausibly exogenous one-time shocks on the capital supply of specific market segments. Leary (2009) uses the introduction of certificates of deposit in 1961 and the 1966 Credit Crunch as shocks to bank-dependent firms; Sufi (2009) uses the introduction of syndicated bank loan ratings as a shock to loan-rated firms; Lemmon and Roberts (2010) uses the collapse of Drexel Burnham Lambert and the passage Financial Institutions Reform as events that affect speculative bond supply.

Compared to the aforementioned papers, this paper uses capital flows to a firm's existing bondholders as firm-specific capital supply measure. This measure is applicable to almost all bond issuers. This allows comparisons within large cross-sections. Controlling for firm characteristics and past return on a firm's outstanding bonds, it is plausible that capital flow to existing bondholders is uncorrelated with the firm's own demand for debt. In addition, the supply shocks used in these papers are *systematic* in nature, in that they affect all capital suppliers at once.[3] The findings in this paper, however, suggest that *idiosyncratic*, firm-specific shocks to bond investors can affect firms' financing decisions. Bond market is fragmented in a way such that existing bondholders is crucial for a firm's ability to issue bonds.

The findings of this paper are also related to the relationship banking literature. In this literature, it is understood that banks develop close relationships with a their borrowers (Boot (2000)). Banks have special relationships with their borrowing firms mainly for two reasons: First, banks monitor firms to alleviate the agency problem (Diamond (1984)); Second, banks are specialized in collecting borrower-specific information to overcome the asymmetry information problem (Ramakrishnan and Thakor (1984)). The financial health of lenders is therefore instrumental for the financing ability of bank-dependent firms. For example, Chava and Purnanandam (2011) document that firms that primarily relied on banks for capital suffered large valuation loss following the Russian crisis of Fall 1998. Murfin (2012) finds that negative shocks to lending bank's capital lead to tightening of covenants for the bank's new borrowers. In contrast, the working assumption for bond financing is that bond market in relatively integrated (Houston and James (1996), Denis and Mihov (2003)). Investors should view bond issues with certain characteristics

[3]For example, in Leary (2009), the 1966 Credit Crunch tightened the credit supply of all banks.

(e.g. credit ratings) as substitutes, and firms should be able to find a large number of potential bond investors to fill their financing needs.[4] My findings, however, suggest that existing bondholders have a particularly strong impact on the capital supply of their portfolio companies. This points to the similarity between bank lending and arm's-length financing: Even in the public bond market, the relationship between investors and borrowers seem still "sticky" and persistent.

My paper also relates to the market-timing literature in equity financing. Baker and Wurgler (2002); Baker et al. (2003); and Alti and Sulaeman (2012) examine equity SEOs and find that firms tend to time the market and conduct equity financing when their stock prices are higher (relative to their fundamentals). Alti (2006) examines IPOs and document that firms choose to go public when the equity market has a higher valuation for the firm's industry, though the impact of timing on capital structure is transitory. Recently, some papers point out that firms "arbitrage" between their own equity and debt, choosing to raise capital when one form of capital is less expensive than the other (Ma (2016)). My paper fits into this broad literature of market-driven corporate financing is that it shows corporate CEOs and CFOs understand well the market conditions for different means of external financing and constant seek to optimize the financing policies of the firm by switching to the least costly source of capital (Baker (2009)).

[4] One notable segmentation in the bond market, however, is the divide between investment-grade and high-yield bonds. See Kisgen and Strahan (2010), Ellul et al. (2011), and Chernenko and Sunderam (2012)

Compared to equity market, bond market may be more sensitive to market conditions induced by capital supply for two reasons: First, bond issuances are more frequent than SEOs, and many issuers repeatedly raise capital from bond market (Eckbo et al. (2007)). This creates flexibility for firms to shift around their timing for bond issuances. Second, the secondary market of corporate bonds is relatively less liquid. Previous literature has shown that the trading turnover is relatively low and trading cost is non-trivial in corporate bond market (e.g., Edwards et al. (2007); Bao et al. (2011); Spiegel and Starks (2017); Bessembinder et al. (2017)). Therefore, it is more difficult for bond investors to adjust their positions via secondary-market trading. As a result, companies are in a unique position to meet their investors' increased flow-driven appetite by issuing new bonds.

While this paper directly focuses at shocks to the supply of capital on the bond market, several existing papers ask related questions: How do different issuers compete for supply of capital and how do they affect each other's issuance decisions? For example, Greenwood et al. (2010); Badoer and James (2016); and Demirci et al. (2017) investigate how the change in the issuance amount of long-term government bonds influences firms' issuances of long-term bonds. The effect of government bond issuance on firms' financing can in turn affects corporate investments (Graham et al. (2014)). These studies rely on the explanation that bond investors have "preferred habitats" in terms of bond characteristics (e.g. maturity, liquidity), which is consistent with an alternative interpretation of this paper. If fund managers have extremely limited knowledge outside their portfolio, they may decide to only participate in the issuances of their portfolio companies. This effectively segments the bond market and ties the credit supply from bondholders to issuance prices.

The finding in this paper that lower-rated issuers are more responsive to bond capital supply is consistent with several studies that focus on the cyclicality of corporate financing. For example, Erel et al. (2012) find that bond financing is counter-cyclical for high-yield companies but cyclical for investment-grade companies. Becker and Ivashina (2014) document that bank credit supply is cyclical and firms choose to switch between bank loans and public bonds based on credit supply. Xu (2014) shows that lower-rated issuers tend to early-refinance their existing debt when market condition improves. Since firms with lower credit quality are more likely to be constrained in their external financing, they are more responsive when the market condition improves to replenish their capital.

The recent rapid increase of mutual funds' ownership share in the corporate bond market has spurred a body of research on bond mutual funds. Researchers are interested in how bond mutual funds manage liquidity (Chernenko and Sunderam (2016) and Jiang et al. (2017)), select portfolios (Choi and Kronlund (2017)), and generate performances (Cici and Gibson (2012)). One of the most hotly debated question is that since bond mutual funds have redeemable shares while the underlying assets (corporate bonds) are relatively illiquid, do bond mutual funds pose systemic instability to the financial market (Feroli et al. (2014), Adrian et al. (2015)). Indeed, Goldstein et al. (2017) document that bond fund flows are highly sensitive to poor fund performances. Zeng (2017) presents a model where the open-end nature of mutual funds can create a bank-run equilibrium. The results in my paper that bond fund flows have impact on firms' ability to issue new bonds on the primary market suggest that the fragility on bond fund flows have potential to affect real economic activities of the issuers. This may partially explain why some studies have found that bond fund flows predict future aggregate credit and business cycles (Ben-Rephael et al. (2016), Ben-Rephael et al. (2018)).

Other types of investors in the bond market, notably insurance companies, can also affect prices and quantities of corporate bonds. For example, Ellul et al. (2011) show that regulatory constraints on insurance companies create selling pressure when a bond is downgraded from investment-grade to high-yield.[5] The key feature of bond mutual funds is that they are funded on equity claims that can be redeemed by investors in short notice, while insurance companies are funded by long-term policies (Koijen and Yogo (2015)). Hence the bond capital supply from mutual funds are likely to be more variable and uncertain than the supply from insurance companies (Massa et al. (2013)).

Finally, this paper contributes to the growing literature that examines the impact of mutual fund flows. Coval and Stafford (2007) documents systematic equity-market price pressures induced by flow-driven trades from mutual

[5] Other related studies include Becker and Ivashina (2015); Manconi et al. (2015); Nanda et al. (2016)

fund investors (see also Frazzini and Lamont (2008); Dasgupta et al. (2011); Lou (2012)). Later studies use the price impact of mutual fund flows as an instrument for equity price changes. They find that such stock price fluctuations can affect corporate activities such as takeovers (Edmans et al. (2012)) and equity issuances (Khan et al. (2012)). In addition, with respect to the syndicated loan market, Ivashina and Sun (2011) document that flow-induced demand reduces the interest rate for institutional loans. For convertible bond market, Choi et al. (2010) document that the capital supply from specialized hedge fund determines the issuance of convertible bonds. Chernenko and Sunderam (2012) find that differences in flows to investment-grade relative to high-yield funds affect investment of lowly rated issuers. These real impacts of mutual fund flows create a feedback between stock market characteristics and firm policies. They show that financial market is more than just a "sideshow" and have important implications for real economic activities. The findings in this paper suggest another channel through which mutual fund flows can affect corporate decisions: corporate bond issuances. Given that bond financing is the main source of external financing for U.S. companies, changes in capital supply induced by bond fund flows are important consideration for real corporate activities.

Chapter 2

Investment Behavior of Bond Mutual Funds

In this section, I first give an overview of the role mutual funds play in the corporate bond market. I then document an empirical pattern for mutual funds' investment behavior: Bond funds are much more likely to participate in new bond offerings if they are existing bondholders of the company. This effect is economically strong, and can be explained by information asymmetry and underwriter relationship. When existing bondholder funds receive fund flows, they provide capital supply for new bonds offered by their portfolio companies. Building on this observation, I construct a measure, *bondholder flows* ($BHFlow$), that aggregates the flows to all mutual fund bondholders of a given issuer. This measure positively covaries with the issuance-market capital supply available to the specific issuer. I further decompose the bondholder flows into performance-driven and non-performance-driven components.

2.1 Mutual Funds in the Corporate Bond Market

As a class of investors, mutual funds have grown substantially in the corporate bond market during the sample period of 1998 to 2014. According to the *Financial Accounts of the United States* published by the Federal Reserve

Board, mutual funds' collective ownership share has increased from 5% in 1990 to more than 20% by the end of 2015. Regulatory changes, increased risk aversion of mutual fund investors during the Financial Crisis, and increased use of mutual funds in retirement plans combined with aging demographics all contributed to mutual funds' rising market share in the bond market.

Figure 2 plots the time series of mutual funds' ownership share for all corporate bonds and for newly-issued bonds from 1998 to 2014, constructed from my sample.[1] In the segment of newly-issued corporate bonds, mutual funds collectively hold 16.3% of bonds on average. During the post-2010 period, their market share in newly-issued bonds exceeds 20%. One reason why mutual funds have a relatively larger market share in this segment is that newly-issued bonds are associated with more uncertainty, and mutual funds are thought to have greater capacity for analyzing security-specific information relative to other bond market participants (Massa et al. (2016)). Since much of this paper concerns the primary market of corporate bonds, the fact that mutual funds have considerable ownership share in new issues suggests that they may affects their prices and quantities.

Figure 3 plots the ownership share of mutual funds for investment-grade bonds and for high-yield bonds, both in terms of new issues. Mutual

[1] Since I only observe bond holdings at quarter-ends, I classify any bonds that are issued within the quarter as "newly-issued" bonds. I use mutual funds' holdings of these "newly-issued" bonds as a proxy for their real participation on the primary market. To the extent that secondary-market trading takes place between bond issuances and quarter-ends, it is a noisy measure.

funds' share is evidently greater for high-yield bonds than for investment-grade bonds (10.2% vs. 24.9% over the sample period for newly-issued bonds). An institutional reason for the disparity between the two segments is that many other bond investors, such as insurance companies, are often restricted by their investment mandates from holding non-investment-grade bonds (Ellul et al. (2011)). Mutual funds, on the other hand, are more flexible in investing in lowly-rated bonds that are associated with greater default risks. Results from later sections show that the impact of capital supply from mutual funds are particularly pronounced for high-yield issuers.

The rapid increase of mutual funds' ownership share in the corporate bond market has drawn attention from regulators and policy makers (e.g. Feroli et al. (2014), Adrian et al. (2015)). One chief concern associated with mutual fund bondholding is that mutual funds are open-end in their funding structure. The ultimate investors of mutual funds, often retail clients,[2] can purchase or redeem mutual funds shares at any time with short notice. This feature of mutual funds suggests that their participation in the corporate bond market can shift quickly – when they receive large inflows, they expand their bondholding positions; when they suffer large outflows, they have to liquidate part of their portfolios. This variability, coupled with the tendency of fund flows to chase past performance (Goldstein et al. (2017)), could potentially induce price instability for corporate bonds.

[2]According to the classification of CRSP Mutual Fund database, more than 70% of bond mutual funds are classified as retail-oriented funds.

The variability of capital funding sets mutual funds apart with other bond market investors, such as insurance companies and pension funds. Insurance companies, for example, are funded on insurance policies sold to customers. Those insurance policies often have long maturities, and insurance companies adjust the pricing of their insurance policies to maintain a stable funding supply (Koijen and Yogo (2015)). While the balance-sheet information of insurance companies is difficult to obtain, in untabulated test, I calculate the quarter-to-quarter changes in the total bond portfolio holdings for insurance companies and for mutual funds using eMaxx bond holdings data.[3] The quarterly changes in bond portfolio holdings are about 50% more volatile for mutual funds than those for insurance companies.[4]

The increasing ownership share of mutual funds in the corporate bond market and the variability of their funding structure imply that the amount of capital mutual funds invest in corporate bonds, and the variations therein, may play an important role in corporate bond issuance decisions.

2.2 Segmentation in the Bond Issuance Market

As a form of arm's length financing, bond issuance market is thought as relatively integrated: For a given issuer, there should be numerous potential

[3]In the Lipper eMaxx database, mutual funds are designated with "MUT" account class, while insurance companies are designated with "PIN" or "LIN".

[4]The average quarterly bond holdings change is 3.1% for mutual funds and 1.7% for insurance companies. The standard deviation for holdings changes is 17.7% for mutual funds and 11.9% for insurance companies.

buyers for its bonds. Perhaps surprisingly, I find strong empirical patterns in the data that suggest otherwise. When a firm offers new bond issues, existing bondholders are the main contributor of capital. This type of segmentation suggests that capital supply from a firm's existing bondholders may affect the firm's ability to finance through bond issuances.

To empirically examine the segmentation in the bond issuance market, I first examine mutual funds' acquisition of newly-issued corporate bonds. Due to the "quarterly snapshot" nature of the bond holding data, I define newly-issued bonds as bonds that are offered within the current calendar quarter. Since I am particularly interested in how being an existing bondholder of the company affects mutual funds' decision to provide funding for the firm's future bond issuance, I define a mutual fund that holds outstanding bonds of the company in previous quarter-end as an "existing bondholder".

I run regressions on both the extensive margin and the intensive margin of the investment decisions mutual funds make in the bond issuance market. On the extensive margin, I examine whether a mutual fund is more likely to participate in a given bond issuance if it is an existing bondholder. On the intensive margin, I examine whether existing bondholders tend to acquire a larger fraction of the new issues, conditional on participating.

To examine the probability a mutual fund participates in the bond issuance, I conduct the following regression analysis. For issuance i, fund j, and quarter t:

$$D(Participation_{i,j,t}) = \alpha_{i,t} + \alpha_{j,t} + \beta D(Bondholder_{i,j,t-1}) + \epsilon_{i,j,t}$$

Each observation represents a pair of a bond issuance and a mutual fund that exists in the bond offering quarter (regardless of its positions).[5] For each new corporate bond issuance in the sample, dummy variable $D(Participation)$ is set to one for a issue-fund pair if the fund has a positive amount of holdings of the issue at the end of the offering quarter. The key explanatory variable is a dummy variable, $D(Bondholder)$, which indicates that the fund is an existing bondholder of the company. The characteristics of bond issuances and the characteristics of issuers are subsumed by issuance fixed-effects and fund-by-quarter fixed-effects. To accommodate for these fixed-effects, I primarily rely on linear probability models, although a logit regression yields qualitatively similar results.

Panel A of Table 1 shows the regression results for the new-issuance participation. To fix the idea for the economic magnitude, a fund with no prior ownership in the issuer's existing bond has a probability of 2.6 percentage points in investing in a given bond issuance. A fund's prior ownership in the issuer's outstanding bonds has a positive predictive power on the fund's participation in the new issues. Column (1) shows that being an existing

[5] Only domestic non-financial corporate bond offerings are included in the sample. An offering must not be issued as an "exchange" for an outstanding bond issue. There are 6,339 distinct bond issuances and 1,211 distinct mutual funds. The sample construction results in 5,644,426 pairs of issuance-funds.

bondholder increases the probability of acquiring additional new issues from the same issuer by 12.8 percentage points. This is almost five times higher than the baseline probability. The effect of being a bondholder is highly significant ($t = 15.09$) when the standard errors are two-way clustered by fund and quarter.

This strong relation between being an existing bondholder and the participation in new issuances is robust to the inclusion of both issuance fixed-effects and fund-by-time fixed-effects. It suggests that this association is not driven by the fact that some issuances are larger and more popular than other issuances, since such variation is captured by issuance fixed-effects. Neither is the statistical relation driven by the size and number of positions of the bond funds, since such relation should be subsumed by fund-by-quarter fixed-effects.

What is not addressed by the fixed-effects is the possibility that the observed relationship between being an existing bondholder and participation is driven by mutual funds' investment objective. For example, some funds may focus on investment-grade bonds, and are prohibited from holding high-yield bonds. To account for this alternative explanation, I construct a subsample that only includes pairs of investment-grade issuances and investment-grade-focused funds, or pairs of high-yield issuances and high-yield-focused funds.[6] Within this subsample, being an existing bondholder increases the probability

[6] I define *investment-grade-focused* funds as funds whose holdings are mainly investment-grade bonds, and *high-yield-focused* funds as funds whose holdings are mainly high-yield. The definition of investment focus is done in the quarter prior to the issuances.

of a fund's participation in the new offering by 12.1 percentage points (Column (2)). Hence, restrictive investment objectives are not a main driver for the observed patterns.

Another potential explanation is that some bondholder mutual funds have maturing bonds from the issuer, and are simply rolling over their positions. This is also unlikely to drive the observed results, as mutual funds rarely hold corporate bonds to maturity.[7] In Column (3) of Panel A, Table 1, I exclude all bond offerings where the issuer has maturing bonds in the offering quarter or the subsequent quarter. The result shows that the coefficient on $D(Bondholder)$ actually increases slightly from 0.128 to 0.136, as compared to the baseline result in Column (1). This suggests that rolling over existing bonds cannot explain why existing bondholders are more likely to participate in new offerings.

Now that I have shown evidence for the extensive margin, I turn to the intensive margin of mutual fund investment decisions. Conditional on participating in bond offerings, do existing bondholders purchase larger fractions of the new issue relative to other participants? To answer this question, I estimate the following equation:

$$allocation_{i,j,t} = \alpha + \beta_1 D(Bondholder)_j + \beta_2 X_{j,t} + \epsilon_{i,j,t}$$

where *allocation* is defined as the par value a mutual fund holds as a fraction of

[7] Most bond mutual funds benchmark themselves against a corporate bond index that has minimum maturity rule. For example, bonds that have maturity shorter than one year are excluded from Bloomberg Barclays U.S. Aggregate Bond Index.

the total par value issued in the offering. $X_{j,t}$ are the characteristics of mutual fund j. One characteristic is the size of mutual funds. $X_{j,t}$ also include the past flows to fund j, as fund flows represent the amount of available capital fund managers can dispose to acquire newly-issued bonds. I include an interaction term between $D(Bondholder)$ and fund flows. The conjecture is that fund flows will have a stronger impact on the amount of capital used in purchasing new issues if the mutual fund is an existing bondholder.

Results in Panel B of Table 1 show that existing bondholders on average acquire larger fractions of new bond offerings, conditional on participating. In Column (1), existing bondholders on average purchase 0.289 percentage points larger fraction of new issues, relative to other participants. This difference is statistically significant at 1% level when the standard errors are double-clustered at fund and quarter level. The increase in allocation is economically large, because on average, a participating bond fund is allocated with 0.6 percentage points of a new issue. In Column (2), the coefficient on fund flow is positive, indicating that stronger fund flows are associated with having more shares in a given bond issuance. More importantly, the interaction between fund flows and $D(Bondholder)$ is positive and significant, and the magnitude of the coefficient is similar to the coefficient on fund flows (0.281 and 0.316, respectively). This is consistent with the notion that bondholders are particularly inclined to use newly available capital to acquire new issues offered by companies that are already in their portfolios.

In Column (3) of Panel B, Table 1, in addition to the $D(Bondholder)$

binary variable, I include a continuous variable – the portfolio weight of firm i's outstanding bonds in fund j's portfolio prior to the issuance. For existing bondholders this variable is positive and continuous, while for non-bondholders this is set to zero. The coefficient on *existing bond portfolio weight* is positive and significant. For a one percentage point increase in the weight of firm i's bond in fund j's portfolio, fund j will purchase 0.134 percentage points larger fraction in firm i's new bond offering. This result shows that *both* a mutual fund's status of being an existing bondholder and its size of portfolio position in the issuing company increases the amount of its new-issue acquisition.

2.3 Bondholder Flow: A Firm-Level Capital Supply Measure

The previous section shows that existing bondholders have a high propensity to supply capital for a firm's new bond issuances. Using this observation, I construct a firm-specific capital supply measure by tracking how the funding conditions change for a firm's existing bondholders. Because mutual funds are funded on investors' redeemable claims and their fund flows can be highly variable, I focus on the change of capital from a firm's mutual fund bondholders. To this end, I first aggregate the product of fund flows and the amount of issuer's bond held by the fund for all existing bondholder mutual funds of issuer i. The aggregate dollar flows are then scaled by the total amount of bonds outstanding for issuer i at quarter $t-1$. I call this measure *bondholder flow* ($BHFlow$).

$$BHFlow_{i,t} = \sum_{j \in J_i} (Flow_{j,t} * \frac{BondHoldings_{i,j,t-1}}{OutstandingBonds_{i,t-1}}) \tag{2.1}$$

This measure is calculated quarterly. In my main tests, displayed in the next section, I take the sum of $BHFlow$ from the four preceding quarters as the key explanatory variable.

$BHFlow$ resembles the measure used in the mutual fund "fire sale" literature that examines the price impact of equity trading by distressed portfolio managers.[8] A notable distinction is that $BHFlow$ sums over holdings of mutual funds that own the *outstanding* bonds of the issuer, but not the particular bond *to be* issued (since it is nonexistent when $BHFlow$ is calculated). The denominator of $BHFlow$ is the amount of bonds outstanding for the issuer, rather than the total amount of bonds held by mutual funds. This construction takes into account the economic importance of mutual fund ownership for a given issuer. If mutual funds collectively own a small fraction of a firm's bonds, the variation derived from mutual funds flows would be small in magnitude. In that case, one would not expect $BHFlow$ to materially affect the firm's decisions.[9]

[8] For example, Coval and Stafford (2007), Edmans et al. (2012), and Lou (2012)

[9] An alternative version of the $BHFlow$ variable uses the total mutual fund ownership as the scaler:

$$BH\tilde{F}low_{i,t} = \sum_{j \in J_i} \frac{Flow_{j,t} * BondHoldings_{i,j,t-1}}{\sum_{j \in J_i} BondHoldings_{i,j,t-1}}$$

In the Internet Appendix, I run the main regressions with this alternative $BHFlow$ variable, and the results remain qualitatively the same.

Mutual fund flows are not randomly assigned. One important determinant of fund flows is the past performance of mutual funds. The flow-performance relationship has been shown by the literature to be significant not only for equity mutual funds (e.g., Sirri and Tufano (1998)), but also for bond mutual funds (Goldstein et al. (2017)). To further isolate the variations in bondholder flow that is not driven by performances or characteristics of mutual funds, I construct an alternative measure called *residual bondholder flow* ($BHFlow^{res}$). The construction of this variable follows a two-step procedure. First, I regress fund-level flows on the past performances of the mutual fund and other fund characteristics, and extract the unexplained flows ("residual flows"). Second, I aggregate the residual flows to bond issuer level.

To implement the first step, I measure bond funds' performance by calculating their 12-month rolling alpha. For each fund-quarter, I estimate the following regression over the most recent 12 monthly fund excess returns:

$$ExRet_{i,t} = \alpha + \beta_1 StockExRet_t + \beta_2 BondExRet_t + \epsilon_{i,t}$$

where $StockExRet$ denotes the CRSP value-weighted stock market excess return and $BondExRet$ denotes the aggregated bond market excess return, proxied by Vanguard Total Bond Market Index fund return minus risk-free rate.[10] The estimate for the intercept, $\hat{\alpha}$, is used as the performance measure for the following quarter. To flexibly account for the non-linearity in the flow-performance relationship, I rank bond funds in each cross-section by their

[10]The choice of benchmarks follows Goldstein et al. (2017).

performance measure (rolling 12-month raw returns or alphas) and calculate their performance ranks.

I then run a flow decomposition regression for all fund-quarters:

$$Flow_{i,t} = \alpha + \beta_1 Low_{i,t-1} + \beta_2 Mid_{i,t-1} + \beta_3 High_{i,t-1} + \gamma CatFlow_{i,t} + Controls + \epsilon_{i,t}$$

where $Low_{i,t-1}$ represents the performance rank in the lowest quintile, $Mid_{i,t-1}$ represents the performance rank in quintile 2-4, and $High_{i,t-1}$ represents the performance rank in the highest quintile (similar to Sirri and Tufano (1998)).[11] $CatFlow_{i,t}$ is the average flow of mutual funds in the same investment category.

Table 2 shows the flow decomposition results when performance rank is sorted by raw returns (Column (1)) and alphas (Column (2)). Bond mutual fund flows respond to past fund performances, as β_1, β_2, and β_3 are all estimated to be positive and significant. More importantly, fund flows are more sensitive to extreme poor performance and and extreme strong performance, relative to performances in quintile 2-4. For example, in Column (1), a ten percentage points increase of performance in the lowest quintile raises the quarterly fund flow by 1.45 percentage points ($t = 7.68$), while the same magnitude of increase in the middle quintiles only corresponds to 0.199 percentage points increase in fund flows. This is consistent with the findings in Goldstein et al. (2017) that bond fund investors are sensitive to extreme losses in fund returns.

[11]Specifically, for fund i with performance percentile $Rank_{i,t-1}$, the definition is as follows: $Low_{i,t-1} = Min(Rank_{i,t-1}, 0.2)$,$Mid_{i,t-1} = Min(0.6, Rank_{i,t-1} - Low_{i,t-1})$, and $High_{i,t-1} = Rank_{i,t-1} - Low_{i,t-1} - Mid_{i,t-1}$

The determinants in the above regressions collectively explain 12.6% to 12.9% of the variation in quarterly fund flows. Using the residual fund-level flows from the specification in Column (2) of Table 2, I calculate the alternative capital supply measure, residual bondholder flow:

$$BHFlow_{i,t}^{res} = \sum_{j \in J_i} \frac{Flow_{j,t}^{res} * BondHoldings_{i,j,t-1}}{\sum_{j \in J_i} BondHoldings_{i,j,t-1}} \tag{2.2}$$

The difference between this measure and the $BHFlow$ measure is that I replace the raw fund flows with residual fund flow $Flow^{res}$.

Since I argue that bondholder flows have a strong impact on the capital supply coming from existing bondholders, in the data I empirically relate $BHFlow$ and the ex-post allocation to existing bondholders. Although ex post allocation is not the same as ex-ante capital supply, the results are indicative. In Figure 4, I sort issuances based on their $BHFlow$, and calculate the average allocation to existing bondholders within each group. In both the investment-grade segment (upper panel) and the high-yield segment (lower panel), the new-issue allocation to existing bondholders is monotonically increasing in $BHFlow$. For Investment-Grade issues, existing bondholders in the top quintile group are allocated about 3 percentage points more as compared to existing bondholders in the bottom quintile group. For High-Yield issues, the gap between the top and bottom group is about 5 percentage points. In untabulated regressions, I find that $BHFlow$ has a positive and significant coefficient on the total allocation to existing bondholders, controlling for the characteristics of the issuance. These results serve as an empirical validation that $BHFlow$ is an effective measure for firm-specific bond capital supply.

Chapter 3

Corporate Bond Issuances In Response to Capital Supply Shocks

The main goal of this section is to establish the relation between capital supply from firms' existing bondholders and corporate decision to issue new bonds. Higher bondholder flow increases the probability of issuances, and lowers the financing costs associated with the new issues. Firms substitute away from equity financing and bank loans in response to stronger bond capital supply. The impact of bondholder flow is unlikely to be confounded by firms' demand for debt.

3.1 Sample and Empirical Methodology

I first detail how the firm-level sample is constructed. I then lay out the main hypotheses of the paper and the associated empirical specifications.

3.1.1 Sample Construction and Summary Statistics

To conduct firm-level analysis, I construct a panel of bond-issuing companies. To be included in the sample, a firm-quarter has to have outstanding straight bonds that has at least one mutual fund bondholder. This requirement means that all new bond issuances in my sample are seasoned bond offerings (SBOs). For new issuances, I filter for non-convertible corporate bonds that are issued by U.S. companies. Following the literature, I drop bonds with put options or with floating rates. Finally, to ensure the availability of firm-level accounting data, only U.S. public companies are included in the sample. In the end, my sample has 52,247 firm-quarters with 1,126 distinct issuers. The sample period spans from 1998 to 2014.

In Table 3, I show the summary statistics for all the firm-quarters in my sample. In Panel A, the cumulative $BHFlow$ in the most recent four quarters is on average 0.80% of a firm's total outstanding bonds, with a standard deviation of 2.54%.[1] In Panel B, I sort firms into quintile groups based on their $BHFlow$ each quarter. The probability of bond issuance is 10 percent for the group of firm-quarters with the highest $BHFlow$ while firms in quintile 1-4 on average have an issuance probability of 6 to 7 percent. Examining the characteristics of firms in different quintile groups, I find that firms in high-flow groups tend to be larger, and are more likely to have an investment-grade rating. With respect to other observables, it appears that there is no clear association between $BHFlow$ and market-to-book ratio, book leverage, capital expenditure, R&D expense, asset tangibility, ROA, or stock returns. Perhaps surprisingly, there is no strong relationship between the past returns of an issuer's outstanding bonds and $BHFlow$.

[1] The average size of new issuance is 35% of the firm's total outstanding bonds.

3.1.2 Empirical Specifications

I have documented in the previous chapter that existing bondholders of a given issuer are the main contributors of capital for firms' bond issuances. Building on this stylized empirical pattern, I conjecture that an expansion of bondholders' capital should lower the financing costs of issuing bonds for the portfolio companies. If firms understand the relation between investors' capital supply and the financing costs, I expect firms to be more likely to issue additional bonds when their bondholder flow is high. The two major hypotheses of this paper are:

Hypothesis 1. *Bondholder flow positively predicts firms' new bond issuances.*

Hypothesis 2. *Bondholder flow negatively predicts firms' costs of bond financing.*

To test Hypothesis 1, I conduct panel regressions as follows:

$$D(Issuance_{i,t+1} > 0) = \alpha_t + \beta BHFlow_{i,t-3,t} + \gamma X_{i,t}^{firm} + \epsilon_{i,t} \tag{3.1}$$

where $X_{i,t}^{firm}$ is a vector of firm-level characteristics, including the past returns of the issuer's outstanding bonds. The choice of a liner probability model mainly accommodates the fixed-effects specifications, although a logit model gives qualitatively similar results. The standard errors are two-way clustered by quarters and by issuers (Petersen (2009)). All regression specifications include time fixed-effects.

If a firm issues a bond at any time during Quarter t+1, the dependent variable, $D(Issuance > 0)$, is assigned a value one (and zero otherwise).[2] The independent variable of interest, $BHFlow$, is measured as the cumulative quarterly fund flows defined in Equation (2.1) during the four quarters that precede the issuance quarter (Quarter t-3 to Quarter t). For ease of interpretation, I standardize the $BHFlow$ variable displayed in the tables shown in this paper. For some specifications, I use the alternative capital-supply measure, $BHFlow^{res}$ (defined in Equation (2.2)).

To control for firms' fundamentals, which may be associated with corporate demand for debt financing, I include a wide range of firm-level characteristics. The capital structure literature has shown that large companies have better access to the bond capital markets and hence are more likely to issue. Market-to-book ratio proxies for the growth opportunity of the firm, and firms with stronger growth opportunities have more to lose from the hold-up problem associated with debt-financing. Capital expenditure ($CAPX$) measures the firm's need of general financing. Asset tangibility is correlated with the firm's ability to post collateral for debt. Return on Assets (ROA) evaluates a firm's profitability and its need for tax shields. To account for firms' need to refinance their existing debt obligations, I calculate the maturing debt as the fraction of debt in current liabilities (DLC) scaled by total assets. The rating of the issuer summarizes the creditworthiness of the firm. Finally, the past

[2] I multiply all coefficients/marginal effects by 100 to ease the exposition. The magnitude can be interpreted as percentage points in the likelihood of issuing new bonds.

returns of the firm's stock and outstanding bonds capture the unobservable changes to the investment opportunities and creditworthiness. Past studies have shown that these control variables can explain a large part of the demand for debt financing for a given company.[3]

To test Hypothesis 2, I regress the offering yield spread of bond i issued at quarter $t+1$ on both bond-specific variables and firm-level controls:

$$yield\_spread_{i,t+1} = \alpha_{i,t+1} + \beta BHFlow_{i,t-3,t} + \gamma X^{firm}_{i,t} + \phi Z^{bond}_{i,t+1} + \epsilon_{i,t+1} \quad (3.2)$$

The capital supply variable $BHFlow$ is evaluated as the average of the four preceding quarters. Again, I control for time fixed-effects to subsume any time-series variation in market conditions. In addition to firm characteristics, I also control for bond-specific characteristics, since the regression is run at bond-issue level.

The bond-specific control variables include the offering amount of the bond (in logarithm), the maturity of the bond (in logarithm), whether the bond is privately placed under Rule 144A, numerical bond ratings,[4] and two dummies that indicates the credit rating of the bond at issuance (whether it is below A- rating and whether it is below BBB- rating).[5] Bonds that have larger offering amounts and longer maturities carry higher risks and usually

[3]See, e.g., Titman and Wessels (1988), Frank and Goyal (2009)

[4]I assign value 1 for bonds with "AAA" rating, 2 for bonds with "AA+", 3 for "AA", and so forth.

[5]I do not include coupon rate of the bond. Campbell and Taksler (2003), in investigating the secondary bond market, point out that bonds with a higher coupon rate are at a tax disadvantage and are associated with higher yields. However, since many issuers target to issue at par, coupon rate and offering yield is highly correlated ($corr = 0.99$) in the sample.

command higher yields. Lower-rated bonds also require a higher offering yield spread.

3.2 Main Results

In this section, I present the main empirical findings of this study. The findings suggest that higher firm-specific bond capital supply, proxied by $BHFlow$, predicts higher probability of bond issuances in the future. Conditional on issuing new bonds, firms with higher $BHFlow$ enjoy a lower bond offering yield spread.

3.2.1 Capital Supply and Bond Issuance Decisions

Table 4 displays the regression results from Equation (3.1). Unconditionally, 7.1% of the firms issue new bonds at a given quarter. Columns (1) shows that a one standard deviation change in $BHFlow$ is positively associated with a 0.94 percentage points change in the probability of issuing new bonds in the next quarter. This effect is about 13.3 percent to the mean level of issuance probability, and it is statistically significant ($t = 4.90$). The standard error are two-way clustered by issuer and quarter. Hence, the supply of capital on the corporate bond market has an economically meaningful impact on the issuance decision of companies, confirming the first main prediction of this paper.

Most of the control variables have the anticipated relation with bond issuances as well. For example, larger firms, more profitable firms, and firms with more investment needs (i.e. high $CAPX$) are more likely to issue bonds, while growth firms and high-leverage firms tend to issue bonds less often. Importantly, the relationship between $BHFlow$ and the ensuing bond issuance activities is robust to controlling for past returns of the issuer's outstanding bonds. This addresses the concern that $BHFlow$ may be correlated with the future prospect of the issuer, through the channel of fund performances. While 12-month issuer bond return is positively associated with likelihood of new issuances, the effect of $BHFlow$ is highly significant.

Columns (2) and (3) of Table 4 further use fixed-effects to absorb variation that may confound the interpretation of the baseline results. In Column (2), I include industry-by-quarter fixed-effects, where industries are classified by two-digit SIC. It further sharpens the identification since firms' demand for debt is likely to comove within industries. In a given time period within the same industry, firms with a one standard deviation higher $BHFlow$ issue new bonds with a probability that is 0.883 percentage points higher. In Column (3), I include investment-grade-by-quarter fixed-effects. Bond funds are often segmented into investment-grade funds and high-yield funds. Hence the flow-induced capital supply $BHFlow$ is likely to have a component that covaries within each segment. After controlling for the fixed-effects, a one standard deviation increase in capital supply is still associated with a 0.812 percentage point increase in the probability of issuing new bonds ($t = 3.84$). These findings suggest that the explanatory power of $BHFlow$ is likely to come from its impact on the capital supply, instead of unobservable demand for debt.

In Column (4), I use a logistic model with only quarter fixed-effects. The marginal effect evaluated at sample mean is 0.706 percentage points for a one standard deviation of $BHFlow$. Comparing the marginal effects obtained from the logistic model with coefficients from linear probability model, it is reassuring that the effects for most of the explanatory variables are similar across specifications.

I interpret the relationship between $BHFlow$ and corporate bond issuance as a capital-supply effect. The identifying assumption is that, conditional on firms' bond performance and other characteristics, $BHFlow$ is uncorrelated with firms' demand for debt. This is a plausible assumption, since there are many factors determining the flow to a firm's mutual fund bondholders. For example, what other companies' bonds are held together in a same portfolio with the issuer's bonds may have nothing to do with the debt demand of the issuer in question. Nevertheless, I further narrow down the fraction of bondholder flow variation used in predicting future bond issuances. In particular, I decompose fund-level flows into an explained component and an unexplained component. The unexplained component of fund flows are then aggregated to firm level as $BHFlow^{res}$ (Equation 2.2). In Columns (5) to (7) of Table 4, I replace the $BHFlow$ measure with residual bondholder flow, $BHFlow^{res}$. The identifying assumption associated with $BHFlow^{res}$ is more relaxed than the original assumption: it only requires that non-fundamental-driven fund flows to a firm's bondholders is (conditionally) uncorrelated with firm demand for debt.

In Column (5) of Table 4, a one standard deviation increase in $BHFlow^{res}$ positively predicts a 0.656 percentage points increase in quarterly bond issuance probability. The effect is statistically significant at 1% level ($t = 3.39$). Although the magnitude of this coefficient is about one third smaller than the coefficient on $BHFlow$, the predictive power of $BHFlow^{res}$ is still economically important. In Columns (6) and (7), I show that the predictive power of $BHFlow^{res}$ is robust after controlling for quarter-by-industry fixed-effects and quarter-by-investment-grade fixed effects.

Overall, the results in Table 4 show that capital supply provided by existing mutual fund bondholders is an effective driver in corporate bond issuance decisions. These findings are consistent with recent capital supply research, which mainly focuses on firms' bank loans (e.g., Faulkender and Petersen (2006), Leary (2009), Sufi (2009)). My findings suggest that, even for bond issuances, there is significant segmentation. As a result, firms' financing abilities are affected by the funding conditions of their existing bondholders.

3.2.2 Capital Supply and Bond Financing Costs

Why do fund flows from an issuer's existing bondholders induce more bond issuances? The most direct explanation is that the increased capital supply reduces the financing costs for the associated firms. In this section I examine this relation in the data.

Table 5 shows the OLS regression results on the offering yield spread of newly-issued corporate bonds. The offering yield of bond issuances is arguably the most important parameter in a firm's decision on issuances. It directly affects the financing cost for the firms. At issuance, I calculate the offering yield spread between the yield of a bond and the treasury bond with the closest maturity. The key variable, $BHFlow$, is standardized to facilitate the interpretation. In Column (1), a one standard deviation increase in $BHFlow$ is associated with a 5.55 basis points decrease in the offering yield spread. The relation is statistically significant as $t = 2.92$ when the standard errors are two-way clustered by offering quarters and issuers. Quarter fixed-effects absorb variations in macroeconomic environments. This negative association indicates that when an issuer's existing bondholders receive higher fund flows, the firm can raise bond capital at a lower cost.

The negative relation between the offering yield spread and the bond capital supply cannot be attributed to macroeconomic conditions, bond characteristics, or the financial standings of the issuer firm. Most control variables have the expected sign with respect to the offering yield spread. For example, deals with a larger offering amount, longer maturity, and higher coupon rates demand a higher yield to compensate for the risks, as do privately placed bonds. Firms that are smaller, more highly-levered, less profitable, and have lower credit ratings have a higher bond offering yield as well. Issuers with better past equity returns or bond returns tend to have lower offering yield as well.

In terms of the economic magnitude for the change in offering yield, if we take a median bond in my sample (10-year maturity, 5.95% YTM), a decrease of 5.55 basis points in offering yield corresponds to an increase in offering price by about 40 basis points. This is quite comparable to the amount of money issuers pay to their underwriters for bond issuances, which typically about 60 basis points in my sample.

In Column (2) of Table 5, quarter-by-industry (SIC2) fixed-effects are included, and the term spread and credit spread variables are dropped from the regression. The effect of bondholder flows is slightly weaker but still negative and highly significant at -5.10 basis points ($t = 2.67$). This specification indicates that for bonds issued in the same time period by firms within the same industry, stronger capital supply is still associated with lower financing costs.

The specification in Column (3) includes quarter-by-rating fixed-effects to control for time-varying, unobservable heterogeneity between different ratings. Each rating (for example, “AA” and “AA-”) is assigned with a numerical value. Even within the tight specification of same-rated bonds issued in the same quarter, a one standard deviation increase in $BHFlow$ is associated with a 4.43 basis points lower offering yield spread.

In Columns (4) to (6), I repeat the analyses with the residual bondholder flow, $BHFlow^{res}$, as the proxy for firm-specific capital supply. This proxy captures the non-fundamental-driven component of mutual fund flows aggregated to the issuer level. $BHFlow^{res}$ is shown to also have a negative relationship with bond offering yield spread as well. In Column (4), a one standard deviation increase in $BHFlow^{res}$ predicts a 5.75 basis points decrease in the offering yield spread ($t = 2.55$). The magnitude of the coefficient is about the same as the magnitude of the coefficient on $BHFlow$. In Columns (5) and (6), when quarter-by-industry and quarter-by-rating fixed-effects are included, the effect of $BHFlow^{res}$ reduces moderately to between 3.10 to 4.02 basis points, but is still statistically significant.

To summarize, I find that firms' bond financing costs are *lower* when firm-specific capital supply is higher. Both $BHFlow$ and $BHFlow^{res}$ negatively predict offering yield spreads. The joint observations that stronger bondholder flows are associated with more bond issuances and higher bond prices suggest that bondholder flow captures a shift in the supply curve of credit on the corporate bond market.

3.3 Additional Evidence

In examining the relation between firms' bond issuances and bondholder flow, I control for a host of observable firm characteristics. The purpose is to isolate capital supply variations from firms' unobservable demand for debt. In this section, I conduct a multitude of additional tests to further rule out potential demand-side explanations for the observed bond issuance activity patterns. I examine (1) the relation between bondholder flow and firms' alternative sources of financing, (2) firms' investment decisions following bond issuance, and (3) early refinancing activities in relation to bondholder flow. Finally, I use an exogenous source of variation in bondholder flow induced by Bill Gross' Resignation from the Pacific Investment Management Company

(PIMCO).

3.3.1 Substitution Effects on Other Forms of Financing

If $BHFlow$ captures changes in firms' fundamentals that correlate with their total financing demand, one should expect a higher likelihood of issuing equity when bondholder flow is high. In contrast, if $BHFlow$ captures a shift in capital supply curve that is specific to bond financing, firms should move away from equity financing and satisfy their financing needs via bond issuances when $BHFlow$ is high. To distinguish these two alternative hypotheses, I regress firms' equity issuance on $BHFlow$ and other explanatory variables.

I estimate the following regression:

$$D(EquityIssue_{i,t+1} > 0) = \alpha_t + \beta BHFlow_{i,t-3,t} + \gamma X_{i,t}^{firm} + \epsilon_{i,t+1} \tag{3.3}$$

The dependent variable is a dummy indicating that Firm i conducts a seasoned equity offering (SEO) in Quarter $t+1$. All specifications include quarter fixed-effects to absorb the effect of macroeconomic environments.

Panel A of Table 6 shows that $BHFlow$ negatively predicts the future likelihood of issuing equity. For example, in Column (1), a one standard deviation increase in $BHFlow$ decreases future probability of equity issuance by 0.132 percentage points. Considering that SEOs are unconditionally quite rare (1.9% per quarter), this drop in issuance probability is economically meaningful. The negative relation is statistically significant (t = 2.04) when the standard errors are two-way clustered by firm and by quarter. It is robust to the inclusion of quarter-by-industry fixed-effects (Column (2)) or quarter-by-investment-grade fixed-effects (Column (3)). In Columns (4) to (6), I use the amount of new equity issuance, scaled by total assets, as the dependent variable. $BHFlow$ is shown to have a negative relation with equity issuance activities. The negative relation between bondholder flows and equity issuance suggests that $BHFlow$ is unlikely to correlate with unobserved firms' total financing needs.

A second concern that I address is that bondholder flow captures unobserved increase in a firm's optimal debt ratio. To provide empirical evidence against this argument, I examine a subset of companies in my sample that use both public debt via the bond market and private debt through bank loans. If changes in bondholder flow coincide with an increase in the optimal leverage ratio, one should expect a positive association between bondholder flows and bank loans as well. On the contrary, if bondholder flows only shock the capital supply conditions with respect to bond financing, firms should substitute private debt for public debt.

To ensure that a firm has both bank loans and public bonds in their choice set, I require a firm-quarter to have initiated term loans in the past five years. I then intersect these firm-quarters with the sample of firms that have outstanding bonds. The resulting sample consists of 17,596 firm-quarters that in theory have access to both public and private debt. I then examine whether bondholder flow induces more or less private debt issuances by running the following regression:

$$D(NewBankLoan_{i,t+1} > 0) = \alpha_t + \beta BHFlow_{i,t-3,t} + \gamma X_{i,t}^{firm} + \epsilon_{i,t+1} \quad (3.4)$$

The dependent variable is a dummy indicating that Firm i initiates a new term loan in Quarter $t+1$.

The results in Panel B of Table 6 show a negative relation between $BHFlow$ and firms' probability of initiating new bank loans. On average, firms in my sample have a probability of 5.8% to obtain new term loans from their bank each quarter. In Column (1), a one standard deviation increase in $BHFlow$ lowers firms' chance of initiating new loans by 0.4 percentage points, or 6.9 percent to the mean. The negative relation between $BHFlow$ and firms' decisions to obtain new bank loans is robust to the inclusion of quarter-by-industry fixed-effects (Column (2)) and quarter-by-investment-grade fixed-effects (Column (3)). Moreover, in Columns (4) to (6), I replace the binary dependent variable of future bank loan initiations with a continuous variable that represents the amount of newly-initiated bank loans, scaled by lagged total assets. The average amount of new bank loans decreases by 0.0362% to 0.0525% following an increase in the bond capital supply.

Taken together, the negative relation between bondholder flow and both firms' equity issuance and the their new bank loans indicates that bondholder flow captures capital supply shock specific to bond financing. Stronger bondholder flows make public debt more attractive to the issuers and these firms take advantages of the less expensive source of capital. In addition, these patterns also suggest that capital supply conditions on the bond market affect firms' composition of debt.

3.3.2 Use of Issuance Proceeds

To further rule out the alternative explanation that the relation between bondholder flow and firms' bond issuances is driven by unobservable investment opportunities, I examine issuers' investment decisions after bond issuances. If bondholder flow covaries with firms' investment opportunities, one should expect that firms that issue under a high bondholders flow spend a larger fraction of proceeds in investments. In this section, I show that this is not the case.

I estimate an equation conditional on bond issuances on firm-year (i, t), similar to the settings of Kim and Weisbach (2008). Since the various uses of proceeds are reported by the firms at annual interval, I aggregate the each firm's $BHFlow$ by summing up the quarterly $BHFlow$ during year $t-1$. To answer whether firms use their issuance proceeds any differently if they issue following strong bondholder flows, I create $D(HighFlow)$, an indicator that equals one if an issuance takes place following a firm-year in which the

$BHFlow_{t-1}$ is in the top quartile.[6]

$$\begin{aligned} Y_t = & \alpha_t + \beta_1 \frac{IssueAmt_{i,t}}{TotalAssets_{i,t}} + \beta_2 D(HighFlow_{i,t-1}) * \frac{IssueAmt_{i,t}}{TotalAssets_{i,t}} \\ & + \beta_3 D(HighFlow_{i,t-1}) + \epsilon_{i,t} \end{aligned} \tag{3.5}$$

The outcome variable Y_t represents capital expenditure ($\frac{CAPX_t}{AT_t}$), R&D expense ($\frac{RnD_t}{AT_t}$), acquisition expenses ($\frac{Acq_t}{AT_t}$), total investments ($\frac{InvestTotal_t}{AT_t}$), change in cash holdings ($\frac{\Delta Cash_t}{AT_t}$), and equity dividends and repurchases ($\frac{Payout_t}{AT_t}$).

The coefficient of interest is β_2, which indicates whether firms that issue bonds with higher $BHFlow$ behave differently relative to firms that issue bonds under normal capital supply. If an unobservable demand for debt confounds the observed issuance behavior, one should expect firms that issue under higher $BHFlow$ to invest a larger fraction of their proceeds into new projects. If, instead , firms issue bonds mainly to take advantage of the lowered costs of bond financing, one should expect a *weaker* reaction in the investments made by high-$BHFlow$ firms.

Empirically, I find that firms that issue under higher $BHFlow$ tend to invest *less*, as compared with other issuers. Columns (1) through (3) of Table 7 display the regression results for investment items. For issuers who offer bonds under normal $BHFlow$, for every dollar raised on bond issuances, firms spend 14.3 cents on capital expenditure, 5.07 cents on research and development,

[6] The firm-years with $D(HighFlow) = 1$ have an average cumulative $BHFlow$ of 6.68% at year $t-1$, while the firm-years with $D(HighFlow) = 0$ has an average cumulative $BHFlow$ of 0.39%.

and 39.4 cents on acquisitions. Importantly, however, the investment response of firms that issue under strong capital supply tends to be more muted. For example, compared to the rest of the issuance sample, a firm that issued under the highest quartile of $BHFlow$ invests 12.7 cents *less* on capital expenditure ($t = 2.54$), 2.39 cents more on research and development ($t = 1.58$), and 7.86 cents less in acquisitions ($t = 1.46$). If one adds up the three investment items (Column (4)), a firm that issued bonds under the bottom three quartiles of $BHFlow$ invests 58.5 cents for every dollar of proceeds, while a firm that issued bonds under the highest quartile of $BHFlow$ invests 18.3 cents less. The reduction in incremental investment spending is highly significant ($t = 2.91$). The reduced amount of incremental investments indicates that it is unlikely that firms that issue under high $BHFlow$ have an unobserved improvement in investment opportunities. This further supports the argument that $BHFlow$ captures a supply-side effect.

Columns (5) and (6) of Table 7 examine other uses of issuance proceeds: cash savings and payouts to equity holders (as dividends or repurchases). In Column (5), firms that issue bonds hold 11.9 cents, on average, out of every dollar as a cash cushion. There is no statistical difference for the cash savings if a firm issues bonds under high $BHFlow$, though the point estimate is positive ($\beta_2 = 0.0725$). In addition, firms that issue bonds under high $BHFlow$ tend to pay out more proceeds to their equity holders: For every dollar raised through bond offerings, the average firm pays out 4.38 cents to their shareholders, while a firm under high $BHFlow$ pays out an additional 6.87 cents, more than doubling the baseline amount. This difference is statistically significant at conventional level ($t = 1.81$). This is another piece of evidence suggesting that some firms that issue bonds under high $BHFlow$ consciously take advantages of the mispricing in their fixed-income securities: They raise cash through bond offerings and use it to pay their shareholders right away.

In summary, I do not find evidence that bondholder flow is positively associated with the tendency for firms to make more investments. This suggests that unobserved investment opportunities are unlikely to coincide with bondholder flow. It supports my argument that the relation between bondholder flows and firms' issuance responses captures a capital supply effect.

3.3.3 Early Refinancing of Existing Bonds

Most corporate bonds in the sample have call options attached to them. Such call options either have a fixed price ("traditional call option") or have "make-whole" provisions that are not sensitive to firm-specific capital supply shocks.[7] In either case, a strong capital supply for firms' new bonds offered is likely to create a relative distortion of bond prices and encourages firms to exercise the call option on existing bonds. In this subsection, I examine whether firms refinance their existing bonds early by simultaneously issuing new bonds and buying back its outstanding ones.

To empirically test whether bondholder flow affects firms' decision to

[7] In the case of make-whole call options, the call prices are indexed to the contemporaneous treasury yields plus certain spreads.

refinance their existing bonds, I follow Xu (2014)'s definition for early refinancing. Conditional on a new bond issuance, I examine the three-month window surrounding the bond offering. If the issuer exercises any call option on its outstanding bonds in that window, I define the issuance as associated with early refinancing. On average, 8 percent of the bond offerings in my sample are associated with early refinancing. Xu (2014) shows that early refinancing is a common practice among lower-rated firms as a precautionary measure against adverse future changes in market conditions.

I then estimate the following regression:

$$D(EarlyRefi) = \alpha_{i,t+1} + \beta BHFlow_{i,t-3,t} + \gamma X_{i,t}^{firm} + \delta Market_{t+1} + \epsilon_{i,t+1} \quad (3.6)$$

If strong bondholder flow induces companies to early refinance their existing bonds using new issuances, one should expect the coefficient β to be positive.

Table 8 shows the results from Equation (3.6). It seems that when $BHFlow$ preceding the issuance date is higher, call options are more likely to be exercised in tandem with new bond issuances. In Column (1), for example, a one standard deviation increase in $BHFlow$ is associated with 1.478 percentage points higher probability of early refinancing. This effect is statistically significant at 5% level ($t = 2.01$). The impact of bondholder flow on early refinancing is robust to inclusion of quarter-by-industry fixed-effects and quarter-by-investment-grade fixed effects. When I use a logistics model instead of linear probability model, the effect of $BHFlow$ is reduced to 0.909 percentage points, but still highly significant.

The positive relation between capital supply and early refinancing suggests that firms actively monitor market conditions and take advantages of changes in financing bond financing costs. This is consistent with, but distinct from, the corporate market timing behavior documented in the equity market (e.g. Baker and Wurgler (2002)).

3.4 Exogenous Shocks: Bill Gross' Resignation from PIMCO

The findings in this paper so far show a strong and robust relation between flows to a firm's existing bondholders and the issuance decisions of companies. Additional evidence shows that this relation is most likely a capital supply effect. Still, one may argue that investors may *anticipate* future financing needs of a fund's portfolio companies, and allocate their capital towards such funds. In this section, I further strengthen the identification of this paper by using an exogenous shock to the amount of capital held by a major bond mutual fund, PIMCO.

The Pacific Investment Management Company (PIMCO) is the largest fixed income investment company in the U.S., holding about 240 billion dollar worth of corporate bonds at the end of 2013. On September 26th, 2014, Bill Gross, the chief investment officer of PIMCO, abruptly announced his departure from the company he founded. As a famous fixed-income investor who had been called "Bond King" on the Wall Street, Bill Gross helped PIMCO grow into the most successful fixed-income fund families in the U.S. Although there were reports of internal power struggle between Gross and other PIMCO executives before the resignation, PIMCO's investors, and the market at large, were surprised by the news that Bill Gross was stepping down as CIO and was joining a much smaller rival, Janus.[8] Bill Gross' departure from PIMCO triggered large outflows from the funds he managed at PIMCO and, to some extent, all PIMCO funds. Investors are uncertain about the future prospects of PIMCO and the future leadership structure without Bill Gross. In Figure 5, I plot the monthly flows and cumulative flows for Gross' Total Return Funds and all other funds in the PIMCO family. During the first twelve months after Gross' departure, PIMCO lost about 25% of its total net assets.[9]

Suppose that a firm has PIMCO as a major bondholder. Given PIMCO's size and prominence in the bond market, the firm is likely to rely on PIMCO as a main capital contributor for bond issuances. When Bill Gross left, PIMCO funds suffered large and persistent outflows and were less able to contribute capital to future bond offerings.[10] If this firm decides to issue new bonds, it must either convince additional investors to fill the void left by PIMCO, or ask other frequent investors to contribute larger amount of capital. Both are difficult. Hence, one should expect a decrease in issuance activities by these PIMCO-affected companies.

[8] For example, see "Bill Gross, King of Bonds, Abruptly Leaves Mutual Fund Giant PIMCO", *The New York Times*, September 26, 2014

[9] For the 12-month period prior to Bill Gross' resignation, the performance of PIMCO Total Return Fund was ranked at 49th percentile within its investment style by Morningstar.

[10] Janus Capital Management, the fund family Bill Gross joined, was too small to step up to provide enough capital for these firms. Janus only managed about 14.1 billion dollars in corporate bonds, less than 6% of PIMCO's assets.

A difference-in-differences framework is suitable to test this hypothesis. I define treated firms as issuers whose bonds were overweighted by PIMCO portfolios at the end of 2014Q3.[11] A potential selection bias is that asset managers such as PIMCO tend to hold more bonds which are recently issued. Issuers in PIMCO's portfolios are, on average, 2.6% more likely to have issued bonds relative to a random issuer (untabulated). To overcome this selection problem, I construct a "synthetic portfolio" by combining the holdings of Prudential Investment Management and Vanguard funds, the second and the third largest corporate bond holders in my sample.[12] Firms in this combined portfolio should be more suitable as the counterfactual had Bill Gross not left PIMCO. If a firm has a large fraction of outstanding bonds held by Prudential or Vanguard portfolios at the end of 2014Q3, it is included in the control group.[13]

In the end, I obtain 108 issuers in the treated group and 278 issuers in the control group. In Table 9, I compare the characteristics of the two groups of firms before the event. Treated firms and control firms are similar in most dimensions (e.g. market cap, leverage, capital expenditure, past bond returns). The two characteristics that they differ significantly before the event are market-to-book (treated firms have higher MB ratio) and return on

[11]Since PIMCO's market share of corporate bonds at the time of Gross' departure is three percent, my treated group consists of firms that have three percent of their outstanding bonds in PIMCO portfolios.

[12]At the end of 2014Q3, PIMCO has the largest corporate-bond holdings at 236 billion dollars. Prudential and Vanguard has 168 and 148 billion dollars corporate bonds, respectively.

[13]I use the same three percent cutoff rule as in the treated group.

assets (control firms have higher ROA). Since treated firms and control firms are mostly similar along observables, it is reasonable to attribute subsequent changes in issuance behavior to the exogenous shock of Bill Gross' departure. The before-event period is the eight quarters between 2012Q4 and 2014Q3, while the post-event period is between 2014Q4 and 2016Q3.[14]

To formally test the impact of PIMCO's outflows on bond issuances of its portfolio companies, I run regressions with a linear probability model:

$$\begin{aligned} D(Issuance_{i,t} > 0) = &\alpha + \beta_1 D(PIMCO) * D(post) + \beta_2 D(PIMCO) \\ &+ \beta_3 D(post) + \gamma Control_{i,t} + \epsilon_{i,t} \end{aligned} \tag{3.7}$$

where the coefficient of interest is β_1, which is expected to be negative. The standard errors are two-way clustered by quarter and by issuer.

The results are shown in Table 10. The findings confirm the hypothesis that firms in PIMCO's portfolio were impaired in their ability to issue new bonds after Gross' exit. In the simplest diff-in-diff setting, Column (1) shows that β_1 is -0.0345, which indicates that the quarterly probability of new issuances is 3.45 percentage points lower for a treated firm after the event when compared to the probability before the event, relative to control firms. This effect is both statistically significant ($t = 1.98$) and economically large. The pre-event average issuance probability in this sample is 15.1 percentage points,

[14] Since Bill Gross left PIMCO days before the end of 2014Q3, it is reasonable to expect that the impact on firms' issuance activities take effect after 2014Q3. Hence, the quarter of the event itself is grouped into the before-event period.

and the drop in issuance probability caused by the PIMCO event is equal to 23 percent of the baseline probability. Also important is the fact that issuers in the treated group and issuers in the control group do not seem to differ in their pre-event issuance probability. It reassures that the change in issuance probability for the treated firms is likely to be caused by Bill Gross' sudden resignation.

In Column (2) of Table 10, I control for various firm characteristics and macroeconomic variables. In Column (3), I include quarter fixed-effects to account for changes in market conditions from year to year. In Column (4), issuer fixed-effects are included to further absorb unobservable heterogeneity among firms. In each case, the interaction term between the treated dummy and post-event dummy has negative coefficient between 3.31% and 3.48%.

In Figure 6, I plot the average issuance probability for the treated and control firms over the 2012Q4-2016Q3 period. The figure shows a clear pattern: Before Bill Gross' departure, both treated firms and matched firms have similar probabilities of issuance. After the event (2014Q3), firms that were overweighted by PIMCO funds have a significantly lower chance of issuing new debt, while the issuance rate of the control firms remains steady. This divergence of issuance behavior after the exogenous change in fund management again suggests that the relation between existing bondholder's flow and corporate issuance activities is causal in nature.

Taken together, the evidence presented in this section is consistent with the primary findings of this paper: The variation in bond capital supply, induced by fund flows, significantly affects firms' decisions to issue new bonds. In this particular case, the massive outflows from PIMCO funds triggered by Bill Gross' departure affect the bond-issuing ability for firms who have relied on the capital contributions from PIMCO funds. Since the source of fund outflows is known and plausibly orthogonal to the debt demand of the treated firms, one can plausibly claim a causal relation between capital supply and corporate bond issuance decisions.

3.5 Economic Mechanisms

The relationship between capital supply from existing bondholders and corporate bond issuances is built upon the empirical pattern that existing bondholders have a strong propensity to provide capital to their portfolio companies. In this section, I examine two potential economic mechanisms through which existing bondholders are particularly likely to affect firms' bond financing. These two explanations are *information costs* and *underwriter relationship*.

3.5.1 Information Costs

Investors incur information costs when investing in newly-issued corporate bond. They need to spend effort and money to be able to analyze the issuer's creditworthiness. Investors who are uncertain about companies' creditworthiness are only willing to pay for the average quality of the issuing firms. As a result, some firms prefer not to issue new bonds because pooling with lower-quality firms is too costly. This is the adverse selection problem described in Myers and Majluf (1984). Existing bondholders may have lower information cost than an average investor. The fact that they hold outstanding bonds of the same company indicates that they have established the capacity to value the issuers' bonds. In some sense, there is an increasing return to scale for their information (Van Nieuwerburgh and Veldkamp (2010)). It is similar to the information "reusability" (Chan et al. (1986)) in the banking literature.

If information costs explain the propensity for existing bondholders to acquire new bonds from the same companies, one implication is that such association should be more pronounced for companies with higher information asymmetry. To empirically examine this, I revisit mutual funds' participation decisions in the bond issuance market. Specifically, I construct several proxies for firm-level information asymmetry, and interact the bondholder dummy with the dummy indicating high level of information asymmetry. According to the information costs explanation, the coefficient on the interaction term, β_2, is expected to be positive.

$$\begin{aligned} D(Participation_{i,j,t}) &= \alpha_{i,t} + \alpha_{j,t} + \beta_1 D(Bondholder_{i,j,t-1}) \\ &+ \beta_2 D(InfoAsym_{i,t}) * D(Bondholder_{i,j,t-1}) + \epsilon_{i,j,t} \end{aligned} \tag{3.8}$$

Note that the base level of $D(InfoAsym_{i,t})$ is dropped from the regression because of firm-quarter fixed-effects.

To proxy for information asymmetry, I use four different measures: (1)

bond ratings, (2) the length of bond issuance history, (3) analyst coverages, and (4) the number of secondary market trades for the firm's outstanding bonds. Worse bond ratings suggest that a firm is more likely to default, which increases the uncertainty for investors. Therefore, one would expect high-yield bonds to be more informational sensitive. A borrower's reputation is another factor with respect to information asymmetry (Diamond (1991)). I hypothesize that firms with a shorter issuance history are less reputable and thus subject more to the adverse selection problem. Analyst coverage is another proxy for the amount of available public information about a company. Issuers who have fewer analyst following them are more opaque, and may rely more on existing bondholders. Finally, secondary market trading on firms' outstanding bonds may provide information on the value of a firm's new bond offerings. Therefore, I hypothesize that firms whose outstanding bonds have been less actively traded should have more severe information asymmetry.

Table 11 presents the results for how information asymmetry affects the participation of existing bondholders relative to non-bondholders. In Column (1), the coefficient on the interaction between bondholder dummy and indicator for high-yield bond is positive and highly significant. The effect of being an existing bondholder ($D(Bondholder)$) is 5.52 percentage points for investment-grade bonds, but 20.8 percentage points ($0.0552 + 0.153$) for high-yield bonds. The difference is highly significant, and indicates that the issuances of lower-rated bonds rely more on the participation of existing bondholders.

In Column (2) of Table 11, I interact bondholder dummy with a binary variable indicating that the firm's length of issuance history (since it first issued bonds) is shorter than the median issuer. The coefficient on the interaction is positive and significant at 2.81 percentage points ($t = 3.75$). It suggests that firms with a shorter issuance history are more reliant on existing bondholders when it comes to new bond offerings.

In Column (3), I interact bondholder dummy with an indicator that is set to one if the number of analysts following a firm's equity is below the cross-sectional median. The positive and significant coefficient on the interaction term (6.49 percentage points, $t = 8.54$) suggests that firms with less analyst coverage, and hence more informational opaque, rely more on the financing from existing bondholders.

In Column (4), I interact bondholder dummy with an indicator for fewer previous bond trades. For each issuer-quarter, I calculate the number of trades on the firm's outstanding bonds during the previous quarter. Firm-quarters with below-median number of trades are assigned with value one for the indicator variable, and zero otherwise. The effect of being an existing bondholder is 1.92 percentage points larger for fewer-trade firms than for more-trade firms. This suggests that capital contribution of existing bondholder is more pronounced when the issuer has fewer trades to reference upon.

These findings show that for companies with more severe information asymmetry, their bond issuances rely more on the capital contribution from existing bondholders. A natural implication of this finding is that the bond issuance decisions of high-information-asymmetry issuers should be more sensitive to the $BHFlow$ measure. I therefore examine the cross-sectional variation in bondholder flow sensitivities. Specifically, I re-estimate the corporate bond issuance decisions for the panel of firm-quarters:

$$\begin{aligned} D(Issuance_{i,t+1} > 0) = \alpha_t + \beta_1 BHFlow_{i,t-3,t} \\ + \beta_2 BHFlow_{i,t-3,t} * D(InfoAsym_{i,t}) + \gamma X_{i,t}^{firm} + \epsilon_{i,t} \end{aligned} \tag{3.9}$$

If firms with more severe information asymmetry are indeed more sensitive to capital supply from existing bondholders, one should expect β_2 to be positive. I use the same set of dummies to proxy for higher level of information asymmetry (as the previous regressions) by sorting firms in the cross-sections based on ratings, length of issuance history, analyst coverage, and number of secondary bond market trades.

Table 12 shows that results. To ease the exposition, I suppress the coefficients on firm characteristics (including $D(InfoAsym)$) in the table. In Columns (1), firms with non-investment grades are more sensitive to bondholder flow. A one standard deviation increase in $BHFlow$ raises the issuance probability of an investment-grade firm by 0.678 percentage points, while it raises the issuance probability of a high-yield firm by 1.12 percentage points (0.678+0.438). This result is consistent with the findings in previous literature that firms with lower credit quality are more sensitive to the supply conditions of their capital (e.g., Erel et al. (2012)).

In Column (2), I interact $BHFlow$ with an indicator that a firm has a relatively short history of issuing bonds compared to cross-sectional median. Firms with shorter issuance histories seem to be more reliant on capital supply from existing bondholders, though the coefficient on the interaction term is positive but statistically insignificant.

In Column (3) of Table 12, I interact $BHFlow$ with an indicator that an issuer has fewer analysts covering its equity than the median firm. Consistent with my hypothesis, firms with less analyst coverage, hence more opaque information environment, are more sensitive to capital supply variations from their bondholders. For a low coverage firm, its bond issuance decision is 0.858 percentage points more responsive to $BHFlow$ than a high coverage firm. The difference in sensitivities is statistically significant ($t = 2.60$).

In Column (4), the interaction is between $BHFlow$ and the dummy indicating that an issuer's outstanding bonds are less frequently traded than the median firm. The coefficient on the interaction term is positive at 0.75 percentage points and significant ($t = 2.41$). It suggests that firms with thinly traded bonds are particularly reliant on the capital contribution from their existing bondholders.

Taken together, the findings in this section indicate that the impact of existing bondholders flows on bond issuances is more pronounced for firms with more severe information asymmetry. This is consistent with the notion that companies rely on their bondholders because existing bondholders have advantages in analyzing the information about the issuers.

3.5.2 Underwriter Relationship

A second explanation for why existing bondholders play a particularly important role in bond issuances is their relationship with the underwriter. In the bond issuance market, investment banks typically serve as underwriters for issuers. In the meantime, the same set of investment banks usually also act as brokers when asset managers trade bonds. Some practitioners claim that underwriters favor their asset-manager clients in allocating "hot" bond issuances, which drew attention from the regulators.[15] Two contemporary working papers, Chakraborty and MacKinlay (2018) and Daetz et al. (2017), provide empirical evidence for the underwriter relationship in the corporate bond market. If existing bondholders are more likely to have relationship with the underwriter, and if investors who have relationship with the underwriters are more likely to obtain allocation of new issues, then underwriter relationship can explain the tendency for existing bondholders to keep investing in the company.

To empirically evaluate this explanation, I collect the identity of underwriter(s) for each bond offering from SDC database. Since I cannot directly observe which mutual funds are the "relationship investors" associated with an underwriter, I construct the set of relationship investors as follows: Each quarter, for a given underwriter, I summarize all the bond offerings that it has underwritten during the past year. Any mutual fund that has participated

[15] "Regulators Are Probing How Goldman, Citi and Others Divvied Up Bonds", *Wall Street Journal*, Feb. 28, 2014

in those bond offerings are defined as "relationship investors" of the said underwriter. Since some investment banks underwrite a large number of bond offerings, if there are more than 50 mutual fund participants, I sum up the dollar amount of purchase made by each mutual fund from the underwriter, and only keep the top 50 as relationship investors.

When there is a new bond offering, I define the "underwriter-related funds" as mutual funds that are the relationship investors of the deal's underwriter(s). For example, if General Mills issues a bond, which is underwritten by Goldman Sachs, then all the relationship investors of Goldman Sachs are considered underwriter-related funds of this issuance. In the cases of multiple underwriters, I take the union set of the relationship investors from each underwriter.

I create a dummy variable for underwriter-related funds in the issuance-participation regression and examine whether being an underwriter-related investor changes a mutual fund's probability of investing in a new bond offering. If relationship to the underwriter partially explains why existing bondholders are more inclined to invest in bond issuances, then one should expect (1) the status of underwriter-related funds increases the participation rate, and (2) the inclusion of underwriter-related funds dummy reduces the predictability of being existing bondholders.

$$\begin{aligned} D(Participation_{i,j,t}) = \alpha_{i,t} + \alpha_{j,t} + \beta_1 D(Bondholder_{i,j,t-1}) \\ + \beta_2 D(UnderRelated_{i,j,t-1}) + \epsilon_{i,j,t} \end{aligned} \tag{3.10}$$

Column (5) of Table 11 shows the result from the above regression. The coefficient on $D(UnderRelated)$ is positive at 5.13 percentage points and significant at conventional level ($t = 9.63$). This indicates that mutual funds that have participated in the recent bond issuances underwritten by the same book runners are more likely to participate in the bond issuance in question. This is consistent with the argument that underwriters are more likely to allocate new issuances to asset managers who have maintained a business relationship with them. Since existing bondholders are 14.9 percentage points more likely to have relationship with the underwriter (shown in Column (6)), a fraction of the explanatory power of existing bondholder on participation rate derives from the fact that mutual funds with relationships to the bond underwriter are more likely to participate in bond offerings.

Equally importantly, the coefficient on $D(Bondholder_{i,j,t-1})$ in Column (5) is 12.0 percentage points, which is slightly lower than the baseline estimate at 12.8 percentage points (Column (1), Panel A of Table 1). This suggests that underwriter relationship alone does not completely explain existing bondholders' propensity to participate. In fact, it only accounts for an economically small fraction of the explanatory power of $D(Bondholder)$. This indicates that other factors, such as information costs, may be responsible for the effect of being an existing bondholder.

To summarize, the findings in this section lend credence to both information asymmetry and underwriter relationship as explanation for why existing bondholders play an important role in providing capital for companies' new bond issuances.

3.6 Conclusion

In this paper, I examine the impact of bond capital supply on the issuance decisions made by corporations. The key innovation is to recognize that firms' ability to issue bonds can be affected by the capital supply from a small group of investors: their existing bondholders. Therefore, I can measure firm-specific capital supply by calculating the flows to a firm's existing mutual fund bondholders. I show that strong bondholder flows predict a higher probability that a firm will issue new bonds in the future. Conditional on issuing new bonds, firms with higher capital supply enjoy lower offer yields. The association between issuers and existing bondholders are likely explained by bondholders' informational advantages in analyzing the firms' creditworthiness. It may also be induced by the relationships between issuers and asset managers through investment banks.

These findings are unlikely to be explained by simultaneous changes in firms' demand for debt. First, bondholder flows have a negative relation with firms' propensity to issue equity or initiate new bank loans. Second, firms that issue bond under higher bondholder flows spend a smaller proportion of their proceeds in investments, compared with other issuers. Third, the supply effect is also observed using an exogenous shock to fund flows when Bill Gross abruptly left PIMCO funds.

The findings in this paper suggest that financial market frictions create segmentation in the bond issuance market and have an important impact on the capital structure decisions made by firms. Although this general theme has been explored in the literature (e.g., Faulkender and Petersen (2006)), it is somewhat surprising that, even for firms with access to the bond market, their financing activities are still subject to market conditions. Particularly for firms with lower credit quality, their issuance ability is subject to shocks unrelated to the fundamentals of the firm. It also shed lights on how the increasing presence of mutual funds in the corporate bond market may change the way firms conduct bond financing. The finding that fund flows affect bond issuances, when considered along with previous studies on mutual fund "runs" (Goldstein et al. (2017), Zeng (2017)), suggests that bond mutual funds have the potential to transmit fragility in fund flows to the real sector.

Tables and Figures

Table 1: Mutual Funds' Investment Decisions for Newly-Issued Bonds

Panel A: Extensive Margin			
Dependent Variable: $D(Participation)$			
Sample	All	Rating-matched	Non-Rollover
	(1)	(2)	(3)
D(Bondholder)	0.128***	0.121***	0.136***
	(15.09)	(14.71)	(15.28)
Observations	5,644,426	2,355,298	4,486,992
Adjusted R^2	0.105	0.153	0.104
Bond Issuance FE	Y	Y	Y
Fund * Quarter FE	Y	Y	Y

Panel B: Intensive Margin			
Dependent Variable: $allocation * 100$			
	(1)	(2)	(3)
D(Bondholder)	0.289***	0.221***	0.171***
	(6.62)	(6.87)	(4.22)
Existing Bond Portfolio Weight			0.134***
			(3.41)
Fund Flow		0.314***	0.316***
		(6.45)	(6.48)
D(Bondholder) * Fund Flow		0.264***	0.281***
		(2.80)	(3.08)
Ln(Fund TNA)		0.163***	0.164***
		(13.05)	(13.09)
Observations	159,949	159,949	159,949
Adjusted R^2	0.153	0.352	0.353
Bond Issuance FE	Y	Y	Y
Fund + Quarter FE	Y	Y	Y

This table examines a fund's decision to participate in new bond issuances and its allocation conditional on participation. The observations are at is issue-quarter-fund level.$D(Bondholder)$ is a binary variable indicating if a fund has ownership in outstanding bonds offered by the same issuer before the issuance. In Column (2) of Panel A, the sample only includes investment-grade issues for investment-grade-focused funds and high-yield issues for high-yield-focused funds. In Columns (3) of Panel A, I exclude bond offerings where the issuer has maturing bonds. "Existing Bond Portfolio Weight" denotes the weight in mutual funds' portfolio of issuer's outstanding bonds. Standard errors are two-way clustered at the fund and quarter level. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 2: Determinants of Bond Mutual Fund Flows

Dependent variable: Quarterly Fund Flows		
Performance sorted by	12-Month Raw Returns	12-Month Alphas
	(1)	(2)
Low Performance Rank	0.145***	0.126***
	(7.68)	(5.49)
Mid Performance Rank	0.0199***	0.0355***
	(3.92)	(7.15)
High Performance Rank	0.177***	0.170***
	(6.81)	(6.19)
Average Category Flow	0.741***	0.742***
	(27.99)	(28.14)
Ln(Lagged TNA)	-0.00278***	-0.00284***
	(-4.05)	(-4.13)
Expense Ratio	-1.323***	-0.856***
	(-3.73)	(-2.66)
Ln(Fund Age)	-0.0381***	-0.0376***
	(-18.57)	(-18.31)
Observations	181408	181408
Adjusted R^2	0.126	0.129
Quarter FE	Y	Y

This table examines the determinants of bond mutual fund flows. The observation is at fund-quarter level. Each quarter, bond funds are ranked by their past 12-month raw returns or alphas and assigned fractional rank $Rank_{i,t-1}$. I then define "low performance rank" as $Min(Rank_{i,t-1}, 0.2)$, "mid performance rank" as $Min(0.6, Rank_{i,t-1} - Low_{i,t-1})$, and "high performance rank" as $Rank_{i,t-1} - Low_{i,t-1} - Mid_{i,t-1}$. "Average Category Flow" is the average flow of funds in the same investment category. Standard errors are two-way clustered at fund and quarter level. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 3: Firm-level Summary Statistics

Panel A: Full Sample

	N	Average	Std	10th pct	Median	90th pct
$BHFlow$ (%)	52,247	0.80	2.54	-0.28	0.07	3.61
Bond Issuance Dummy	52,247	0.07	0.26	0	0	0
Issuance Amount/Total Assets (%)	52,247	0.66	4.53	0.00	0.00	0.00
Market Capitalization ($million)	52,247	12,099	33,522	265	2,842	26,177
Total Assets ($million)	52,247	11,461	18,763	666	4,006	31,212
Market-to-Book	52,247	1.59	0.84	0.88	1.32	2.67
Book Leverage (%)	52,247	31.40	16.27	10.59	30.68	54.08
Capital Expenditure (%)	52,247	6.33	5.85	1.38	4.51	13.58
R&D Expense (%)	52,247	1.51	3.51	0.00	0.00	4.91
Tangibility (% PP&E/Total Assets)	52,247	66.20	39.98	15.58	63.05	120.88
Return On Assets (%)	52,247	13.67	6.61	6.26	12.80	22.74
Maturing Debt/Total Assets (%)	52,247	3.67	5.85	0.00	1.54	9.54
Issuer Investment-Grade Dummy	52,247	0.39	0.49	0	0	1
Past 12-Month Stock Return (%)	52,247	14.26	38.76	-33.49	14.62	60.78
Past 12-Month Bond Return (%)	52,247	6.61	14.46	-6.23	5.67	19.26
$BHFlow^{res}$ (%)	52,247	0.59	1.43	-0.25	0.28	1.58

Panel B: Sorted by Bondholder Flows

	1(Low)	2	3	4	5(High)
$BHFlow$ (%)	-0.95	-0.03	0.16	0.95	3.86
Bond Issuance Dummy	0.07	0.06	0.06	0.07	0.10
Issuance Amount/Total Assets (%)	0.65	0.66	0.62	0.65	0.71
Market Capitalization ($million)	9,574	11,235	10,501	13,024	16,132
Total Assets ($million)	9,481	11,569	10,543	11,286	14,407
Market-to-Book	1.52	1.61	1.63	1.63	1.55
Book Leverage (%)	33.56	29.64	29.15	30.62	34.03
Capital Expenditure (%)	6.40	6.58	6.44	6.19	6.07
R&D Expense (%)	1.21	1.66	1.76	1.57	1.33
Tangibility (% PP&E/Total Assets)	66.08	67.56	66.75	65.66	64.96
Return On Assets (%)	13.36	13.79	13.79	13.95	13.47
Maturing Debt/Total Assets (%)	3.49	3.68	3.57	3.63	3.98
Issuer Investment-Grade Dummy	0.32	0.34	0.36	0.46	0.48
Past 12-Month Stock Return (%)	14.38	14.88	15.19	13.93	12.94
Past 12-Month Bond Return (%)	6.23	6.66	6.70	6.75	6.73
$BHFlow^{res}$(%)	0.26	0.33	0.52	0.48	1.07

This table summarizes bondholder flows and firm characteristics in the main sample. The observations are at the firm-quarter level. (Residual) Bondholder Flow is cumulated over the most recent four quarters. In Panel A the full sample is pooled together. In Panel B, firms are sorted into five group depending on their cross-sectional ranking on bondholder flow. The sample period spans from 1998 to 2014.

Table 4: Bondholder Flow and Firm Bond Issuance Decisions

Dependent Variable: $D(Issuance_{t+1} > 0)$								
Specification	Linear Probability			Logit	Linear Probability			Logit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$BHFlow$ (standardized)	0.940***	0.883***	0.812***	0.706***				
	(4.90)	(4.94)	(3.84)	(6.17)				
$BHFlow^{res}$ (standardized)					0.656***	0.681***	0.680***	0.655***
					(3.39)	(3.31)	(3.52)	(4.29)
Ln(Equity Capitalization)	2.459***	2.455***	2.459***	2.318***	2.512***	2.510***	2.509***	2.372***
	(10.12)	(10.36)	(10.13)	(20.35)	(10.13)	(10.41)	(10.12)	(25.05)
Market-to-Book	-1.470***	-1.132***	-1.451***	-1.395***	-1.521***	-1.187***	-1.499***	-1.425***
	(-4.99)	(-3.95)	(-4.97)	(-8.17)	(-5.20)	(-4.16)	(-5.17)	(-8.70)
Book Leverage	-0.0899***	-0.0740***	-0.0896***	-0.0924***	-0.0949***	-0.0795***	-0.0944***	-0.0965***
	(-6.60)	(-5.26)	(-6.56)	(-9.51)	(-6.91)	(-5.57)	(-6.87)	(-9.78)
CAPX/Total Assets	0.124***	0.146***	0.123***	0.117***	0.119***	0.142***	0.118***	0.113***
	(3.55)	(3.44)	(3.51)	(4.99)	(3.37)	(3.31)	(3.34)	(4.60)
Asset Tangibility	-0.00373	0.00224	-0.00332	-0.00356	-0.00425	0.00209	-0.00383	-0.00394
	(-0.61)	(0.33)	(-0.54)	(-1.03)	(-0.68)	(0.30)	(-0.61)	(-1.14)
Return on Assets	0.0650**	0.0147	0.0608**	0.0800***	0.0666**	0.0161	0.0623**	0.0836***
	(2.13)	(0.47)	(2.01)	(3.61)	(2.17)	(0.51)	(2.03)	(3.87)
Maturing Debt/Total Assets	0.0900**	0.125***	0.0892**	0.0555***	0.0885**	0.122***	0.0876**	0.0555***
	(2.50)	(3.64)	(2.49)	(3.63)	(2.46)	(3.53)	(2.44)	(3.60)
Issuer Investment Grade	0.733	0.472		0.809***	0.806	0.544		0.884***
	(1.30)	(0.85)		(3.05)	(1.40)	(0.97)		(3.10)
12-Month Issuer Equity Return	0.00375	-0.00105	0.00248	0.00542	0.00363	-0.000979	0.00236	0.00518
	(1.01)	(-0.29)	(0.69)	(1.57)	(0.97)	(-0.27)	(0.66)	(1.49)
12-Month Issuer Bond Return	0.0449**	0.0394**	0.0338**	0.0394***	0.0472**	0.0415**	0.0357**	0.0415***
	(2.30)	(2.04)	(2.11)	(2.72)	(2.43)	(2.16)	(2.24)	(2.84)
Observations	52247	52247	52247	52247	52247	52247	52247	52247
R^2	0.062	0.107	0.065	0.069	0.062	0.106	0.065	0.69
Quarter FE	Y	N/A	N/A	Y	Y	N/A	N/A	Y
Quarter-by-Industry FE	N	Y	N	N	N	Y	N	N
Quarter-by-IG FE	N	N	Y	N	N	N	Y	N

This table presents estimates from Equation (3.1). The observation level is firm-quarter. $BHFlow$ is defined in Equation 2.1, and $BHFlow^{res}$ is defined in Equation 2.2. Both are measured from Quarter $t-3$ to Quarter t. It is standardized to have zero mean and unit standard deviation. All firm characteristics are measured at Quarter t. In Columns (4) and (8), marginal effects evaluated at mean are shown instead of coefficients. The coefficients are multiplied by 100 to ease interpretation. Standard errors are two-way clustered by issuer and quarter, with the exception of Columns (4) and (8), which are clustered at quarter level. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 5: Bondholder Flow and Bond Offering Yield Spreads

Dependent Variable: Yield Spread (%)	(1)	(2)	(3)	(4)	(5)	(6)
$BHFlow$ (standardized)	-0.0555***	-0.0510***	-0.0443*			
	(-2.92)	(-2.67)	(-1.85)			
$BHFlow^{res}$ (standardized)				-0.0575**	-0.0402*	-0.0310*
				(-2.55)	(-1.94)	(-1.76)
Treasury Yield of Matched Maturity	-0.679***	-0.722***	-0.699***	-0.682***	-0.683***	-0.684***
	(-10.75)	(-11.55)	(-10.73)	(-10.77)	(-10.06)	(-10.46)
Merrill Lynch Index Yield of Matched Credit Rating	0.123***	0.0775		0.121***	0.114**	
	(3.30)	(1.66)		(3.21)	(2.42)	
Ln(Equity Capitalization)	-0.211***	-0.238***	-0.191***	-0.219***	-0.236***	-0.330***
	(-9.22)	(-9.74)	(-9.27)	(-10.04)	(-11.85)	(-13.01)
Ln(Issue Offering Amount)	0.0813***	0.0968***	0.109***	0.0924***	0.104***	0.141***
	(3.06)	(3.74)	(4.02)	(3.84)	(5.31)	(6.90)
Ln(Maturity in Years)	0.268***	0.266***	0.268***	0.271***	0.238***	0.261***
	(4.86)	(4.71)	(4.74)	(5.06)	(3.32)	(4.00)
Book Leverage	-0.000297	0.00402*	0.000789	-0.000514	0.000646	0.00231
	(-0.16)	(1.86)	(0.48)	(-0.28)	(0.33)	(1.06)
Return on Assets	-0.00621	-0.00307	-0.00241	-0.00623	-0.00683*	-0.0129**
	(-1.59)	(-0.60)	(-0.64)	(-1.59)	(-1.80)	(-2.76)
Rule 144A	0.131*	0.119	0.173**	0.132*	0.0987	0.286***
	(1.77)	(1.31)	(2.44)	(1.79)	(1.26)	(4.35)
Credit Rating (numerical)	0.0948***	0.0906***		0.0971***	0.1000***	
	(4.27)	(3.48)		(4.50)	(3.66)	
Below A- Grade	0.0862	0.148		0.0721	0.0306	
	(0.98)	(1.57)		(0.83)	(0.30)	
Below BBB- Grade	0.772***	0.792***		0.748***	0.758***	
	(6.75)	(7.01)		(6.81)	(7.41)	
12-Month Equity Return	-0.477***	-0.468***	-0.442***	-0.465***	-0.450***	-0.361***
	(-6.19)	(-5.71)	(-5.54)	(-6.10)	(-5.75)	(-4.25)
Equity Return Volatility	6.146***	5.905***	4.827***	6.077***	5.532***	7.064***
	(8.51)	(6.46)	(6.61)	(8.49)	(7.27)	(8.30)
12-Month Issuer Bond Return	-0.00728	-0.0103**	0.00320	-0.00673	-0.00774	-0.00370
	(-1.46)	(-2.37)	(0.73)	(-1.36)	(-1.61)	(-0.66)
Observations	5183	5183	5183	5183	5183	5183
R^2	0.650	0.731	0.725	0.650	0.667	0.644
Quarter FE	Y	N/A	N/A	Y	N/A	N/A
Quarter-by-Industry FE	N	Y	N	N	Y	N
Quarter-by-Rating FE	N	N	Y	N	N	Y

This table presents estimates from Equation (3.2). $BHFlow$ is defined in Equation 2.1, and $BHFlow^{res}$ is defined in Equation 2.2. *Rule 144A* indicates that the bond issue is privately placed under the SEC Rule 144A. Credit ratings are measured at bond issue level. Standard errors are double clustered by both issuer and quarter. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 6: Substitution Effects on Equity Issuances and Bank Loans

	Panel A: Equity Issuances					
Dependent Variable:	$D(EquityIssue_{t+1} > 0)$			$EquityIssue_{t+1}/TotalAssets_t(\%)$		
Mean Value:	1.9(%)			0.23(%)		
Specification	Linear Probability			OLS		
	(1)	(2)	(3)	(4)	(5)	(6)
$BHFlow$ (standardized)	-0.132**	-0.132*	-0.137**	-0.0172*	-0.0250**	-0.0177*
	(-2.04)	(-1.95)	(-2.17)	(-1.73)	(-2.22)	(-1.97)
Observations	52247	52247	52247	52247	52247	52247
R^2	0.018	0.086	0.020	0.021	0.081	0.022
Firm-level Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	N	N	Y	N	N
Quarter-by-Industry FE	N	Y	N	N	Y	N
Quarter-by-IG FE	N	N	Y	N	N	Y
	Panel B: New Term Loans					
Dependent Variable:	$D(NewLoan_{t+1} > 0)$			$NewLoan_{t+1}/TotalAssets_t(\%)$		
Mean Value:	5.8(%)			0.51(%)		
Specification	Linear Probability			OLS		
	(1)	(2)	(3)	(4)	(5)	(6)
$BHFlow$ (standardized)	-0.400*	-0.452*	-0.266	-0.0485**	-0.0525**	-0.0362**
	(-1.80)	(-1.79)	(-1.31)	(-2.41)	(-2.38)	(-2.04)
Observations	17802	17802	17802	17802	17802	17802
R^2	0.032	0.168	0.039	0.035	0.171	0.042
Firm-level Controls	Y	Y	Y	Y	Y	Y
Quarter FE	Y	N	N	Y	N	N
Quarter-by-Industry FE	N	Y	N	N	Y	N
Quarter-by-IG FE	N	N	Y	N	N	Y

This table examines the relation between bondholder flows and equity issuance (Panel A), and bondholder flows and corporate bank loan initiations (Panel B). $BHFlow$ is defined in Equation 2.1, and measured from Quarter $t-3$ to Quarter t. It is standardized to have zero mean and unit standard deviation. In Panel A, the sample contains all bond-issuing firm-quarters as in Table 4. The dependent variable in Columns (1)-(3) is a dummy indicating if a firm issues equity in Quarter $t+1$. The dependent variable is Columns (4)-(6) is a continuous variables of the amount of equity issuance scaled by total assets. In Panel B, the sample contains firm-quarters where the firm has outstanding bonds and has initiated bank loans during the past five years. The dependent variable is an indicator that the firm has a new term loan initiated at Quarter $t+1$ (Columns (1)-(3)) or a continuous variable of the amount of newly-initiated bank loans (Columns (4)-(6)). Firm-level control variables include Ln(Equity Capitalization), Market-to-Book Ratio, Book Leverage, Asset Tangibility, Return on Assets, CAPX over Total Assets, Issuer Investment-Grade Dummy, 12-month Issuer Equity Returns, and 12-month Issuer Bond Returns. All firm characteristics are measured at Quarter t. The coefficients are multiplied by 100 to ease interpretation. Standard errors are double clustered by both issuer and quarter. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 7: Use of Issuance Proceeds: Investments, Cash Holdings, and Payouts

Dependent Variable (%)	$\frac{CAPX_t}{AT_t}$ (1)	$\frac{RnD_t}{AT_t}$ (2)	$\frac{Acquisition_t}{AT_t}$ (3)	$\frac{InvestTotal_t}{AT_t}$ (4)	$\frac{\Delta Cash_t}{AT_t}$ (5)	$\frac{Payout_t}{AT_t}$ (6)
Issuance Amount	0.143***	0.0507***	0.394***	0.585***	0.119***	0.0438
	(4.84)	(4.43)	(8.58)	(14.18)	(4.59)	(1.35)
D(High BHFlow) * Issuance Amount	-0.127**	0.0239*	-0.0786	-0.183***	0.0725	0.0687*
	(-2.54)	(1.91)	(-1.46)	(-2.91)	(1.60)	(1.81)
D(High BHFlow)	0.436	-0.0114	0.572	1.005	-0.413	0.165
	(0.75)	(-0.07)	(1.21)	(1.64)	(-1.30)	(0.32)
Ln(Total Assets)	-0.411**	0.345***	0.104	0.0144	0.115	0.836***
	(-2.29)	(8.80)	(0.62)	(0.07)	(1.09)	(7.97)
Adjusted R^2	0.074	0.024	0.124	0.212	0.042	0.097
Observations	3512	3512	3512	3512	3512	3512
Year FE	Y	Y	Y	Y	Y	Y

This table presents estimates from Equation 3.5. *Issuance Amount* is the amount of bond issuance at year t scaled by total assets. D(High $BHFlow$) is a dummy variable that equals one if $BHFlow$ in year $t-1$ is in the highest quartile of the issuance sample. The dependent variables in Columns (1)–(3) are capital expenditure, research and development costs, and acquisition costs scaled by total assets. In Column (4), the dependent variable is the total investment, which is the sum of (1) to (3). In Column (5), the dependent variable is the change in cash holdings. In Column (6), the dependent variable is the equity payout, measured by adding cash dividends and equity repurchases. Standard errors are clustered at the year level. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 8: Bondholder Flow and Early Refinancing

Dependent Variable:	$D(\text{Early Refinancing}_{t-1,t+1})$			
	Mean Value = 7.99 (%)			
Specification	Linear Probability			Logit
	(1)	(2)	(3)	(4)
BHFlow (standardized)	1.478**	1.937**	1.386*	0.909**
	(2.01)	(2.58)	(1.91)	(2.20)
Ln(Equity Capitalization)	-1.631***	-1.300***	-1.631***	-1.035***
	(-4.24)	(-2.89)	(-3.88)	(-4.08)
Market-to-Book	-1.804**	-2.265**	-1.742*	-2.362***
	(-2.05)	(-2.23)	(-1.98)	(-2.71)
Book Leverage	8.004*	10.97**	8.847**	5.087*
	(1.77)	(2.24)	(2.02)	(1.93)
CAPX/Total Assets	-17.31**	-8.798	-17.61**	-13.41*
	(-2.10)	(-0.78)	(-2.17)	(-1.96)
Asset Tangibility	2.495	3.176	2.209	1.581
	(1.30)	(1.04)	(1.16)	(1.23)
Return over Assets	12.18	21.24	11.14	12.50
	(1.10)	(1.66)	(1.03)	(1.50)
Issuer Investment Grade	-1.426	-0.558		-0.931
	(-1.04)	(-0.37)		(-0.92)
12-Month Issuer Equity Return	1.545	1.785	1.540	0.968
	(1.28)	(0.40)	(1.32)	(1.29)
12-Month Issuer Bond Return	-1.314	-2.793	-1.349	-1.783
	(-0.29)	(-0.44)	(-0.31)	(-0.53)
Observations	5147	5147	5147	5147
R^2	0.066	0.076	0.090	0.117
Quarter FE	Y	N/A	N/A	Y
Quarter-by-Industry FE	N	Y	N	N
Quarter-by-IG FE	N	N	Y	N

This table presents the relation between bondholder flows and the probability that a bond issuance in month t is accompanied by exercises of call options on existing bonds during month $t-1$ to $t+1$. $BHFlow$ is defined in Equation 2.1, and measured from Quarter $t-3$ to Quarter t. It is standardized to have zero mean and unit standard deviation. Columns (1) to (3) use linear probability models, and Column (4) uses a logistic model. The coefficients are multiplied by 100 to ease interpretation. Standard errors are two-way clustered by both issuer and quarter. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 9: Firm characteristics of PIMCO-treated and control firms

	Treated Firms	Control Firms	$P(Treated = Control)$
Number of Firms	108	278	
Market Capitalization ($ million)	15,721	16,764	0.80
Market-to-Book Ratio	1.65	1.87	0.08
Book Leverage (%)	35.6	33.5	0.32
Capital Expenditure (%)	5.16	5.56	0.53
Asset Tangibility (%)	57.3	58.6	0.78
Return on Assets (%)	12.3	14.0	0.02
D(Investment-Grade Rating)	0.47	0.51	0.23
12-Month Equity Returns (%)	33.39	31.04	0.16
12-Month Bond Returns (%)	10.19	9.76	0.49
Mautring Debt/Total Assets (%)	2.92	2.93	0.99

This table tabulates the issuer characteristics for the treated firms in the Pimco study. It also compare the characteristics difference between treated firms and match firms using t-tests. I define treatment firms as issuers whose bonds have a weight larger than 3% in Pimco's portfolios at the end of 2014Q3. The control firms are issuers whose bonds have a weight larger than 3% in Vanguard's or Prudential's portfolios. The probability of treated and control firms on average having the same characteristics comes from t-tests.

Table 10: Bill Gross' Departure from PIMCO: Impact on Firms' Bond Issuances

Dependent Variable:	$Dummy(Issuance_t > 0)$			
	(1)	(2)	(3)	(4)
Firm in PIMCO*Post Gross Departure	-0.0345**	-0.0336*	-0.0331*	-0.0348**
	(-1.98)	(-1.91)	(-1.89)	(-2.05)
Firm in PIMCO	0.00566	0.0235	0.0229	
	(0.34)	(1.52)	(1.49)	
Post Gross Departure	0.00291	-0.0162		
	(0.35)	(-1.44)		
6-Month Treasury Yield		-0.0331		
		(-0.80)		
Treasury 10Y-6M		-0.0235		
		(-1.57)		
Log(Equity Capitalization)		0.0499***	0.0504***	-0.00853
		(8.22)	(8.22)	(-0.46)
Market-to-Book		-0.00686	-0.00338	0.0777***
		(-0.47)	(-0.23)	(2.95)
Book Leverage		-0.00126***	-0.00133***	0.00439***
		(-2.60)	(-2.75)	(4.70)
CAPX/Total Assets		0.00226	0.00251	-0.000387
		(1.38)	(1.52)	(-0.11)
Return over Assets		0.00142	0.000991	0.000378
		(0.95)	(0.65)	(0.18)
Issuer Investment Grade		-0.0167	-0.0165	0.0402
		(-1.19)	(-1.19)	(1.15)
12-Month Equity Return		-0.0000944	0.00000598	-0.000338
		(-0.46)	(0.03)	(-1.41)
12-Month Issuer Bond Return		0.000416	0.000347	0.000682
		(0.66)	(0.43)	(0.85)
Observations	5701	5701	5701	5701
R^2	0.001	0.027	0.031	0.141
Quarter FE	N	N	Y	Y
Issuer FE	N	N	N	Y

This table examines the relation between firms' bond issuance and whether they were held by Pimco portfolios prior to Bill Gross' departure from. *Firm in PIMCO* is an dummy variable that equals one if a firm's outstanding bonds were overweighted by Pimco's portfolios at the end of 2014Q3. The control group are firms whose outstanding bonds were overweighted by Prudential's or Vanguard's portfolios. *Post Gross Departure* dummy is set to one for quarters between 2014Q4 to 2016Q3, and zero for quarters between 2012Q4 to 2014Q3. The dependent variable is a dummy variable indicating bond issuance at Quarter t. Standard errors are double clustered by both issuer and quarter. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 11: Mutual Funds' Investment Decisions for Newly-Issued Bonds: Cross-sectional Variations

Dependent Variable:	$D(Participation)$					$D(UnderRelation)$
	(1)	(2)	(3)	(4)	(5)	(6)
D(Bondholder)	0.0552***	0.116***	0.101***	0.121***	0.120***	0.149***
	(8.11)	(15.06)	(13.27)	(14.40)	(14.79)	(6.35)
* D(High Yield)	0.153***					
	(11.34)					
* D(Shorter Issuance History)		0.0281***				
		(3.75)				
* D(Less Analyst Coverage)			0.0649***			
			(8.54)			
* D(Fewer Previous Bond Trades)				0.0192***		
				(3.06)		
D(UnderRelation)					0.0513***	
					(9.63)	
Observations	5,644,426	5,644,426	5,644,426	5,644,426	5,644,426	5,644,426
Adjusted R^2	0.108	0.105	0.106	0.105	0.107	0.027
Bond Issuance FE	Y	Y	Y	Y	Y	Y
Fund * Quarter FE	Y	Y	Y	Y	Y	Y

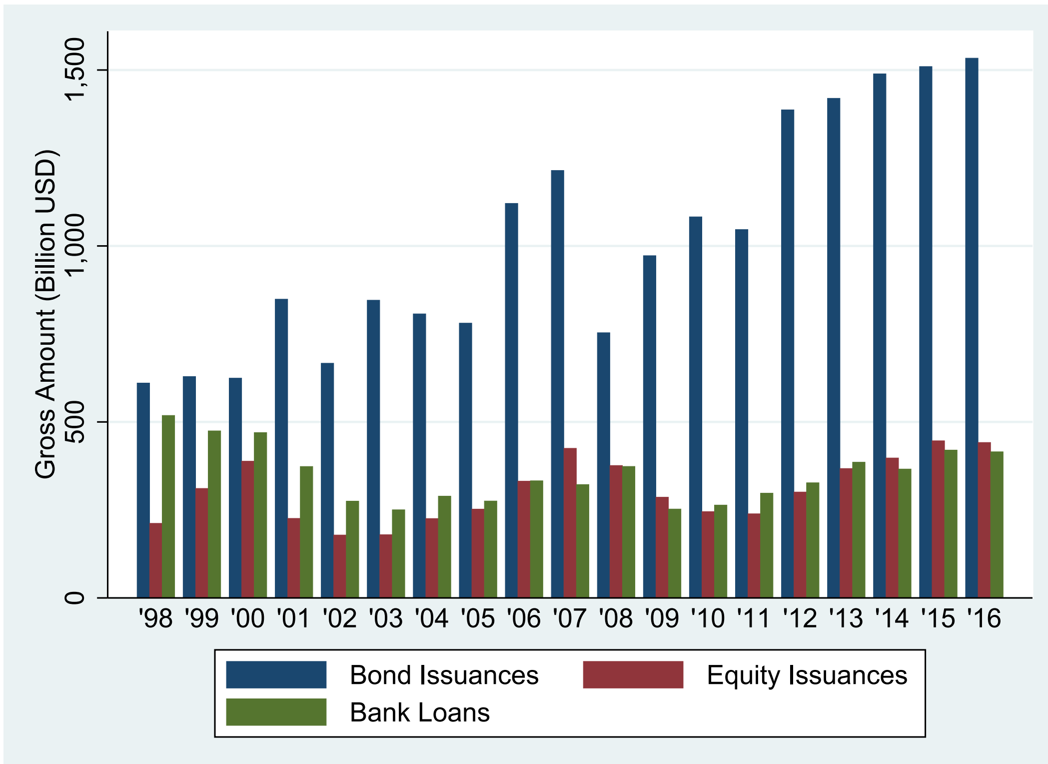
This table examines the cross-sectional variation in mutual funds' investment decisions to participate in new bond issuances. The observations are at is issue-quarter-fund level. $D(Participation)$ is set to one is the mutual fund hold positive amount of bond at the end of the bond's issuance quarter. $D(UnderRelation)$ is set to one if a mutual fund has participated in the underwriter's recent bond issuances. $D(Bondholder)$ is a binary variable indicating if a fund has ownership in outstanding bonds offered by the same issuer before the issuance. D(High Yield) is an indicator for high-yield bonds. D(Shorter Issuance History) is an indicator if a firm has a history of issuing bonds that is shorter than the cross-sectional median. D(Less Analyst Coverage) is an indicator if a firm has fewer-than-median number of analysts covering. D(Fewer Previous Bond Trades) is an indicating if a firm's outstanding bonds has fewer-than-median secondary market trading during past quarter. Standard errors are two-way clustered at the fund and quarter level. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Table 12: Bondholder Flow and Firm Bond Issuance Decisions: Cross-sectional Variations

Dependent Variable: $D(Issuance_{t+1} > 0)$				
	(1)	(2)	(3)	(4)
$BHFlow$ (standardized)	0.678^{***}	0.896^{***}	0.481^{**}	0.444^{*}
	(2.87)	(3.49)	(2.43)	(1.68)
* D(Non-Investment Grade)	0.438^{*}			
	(1.83)			
* D(Shorter Issuance History)		0.121		
		(0.31)		
* D(Less Analyst Coverage)			0.858^{**}	
			(2.60)	
* D(Fewer Previous Bond Trades)				0.750^{**}
				(2.41)
Firm Characteristics	Y	Y	Y	Y
Observations	52247	52247	52247	52247
R^2	0.062	0.062	0.063	0.063
Quarter FE	Y	Y	Y	Y

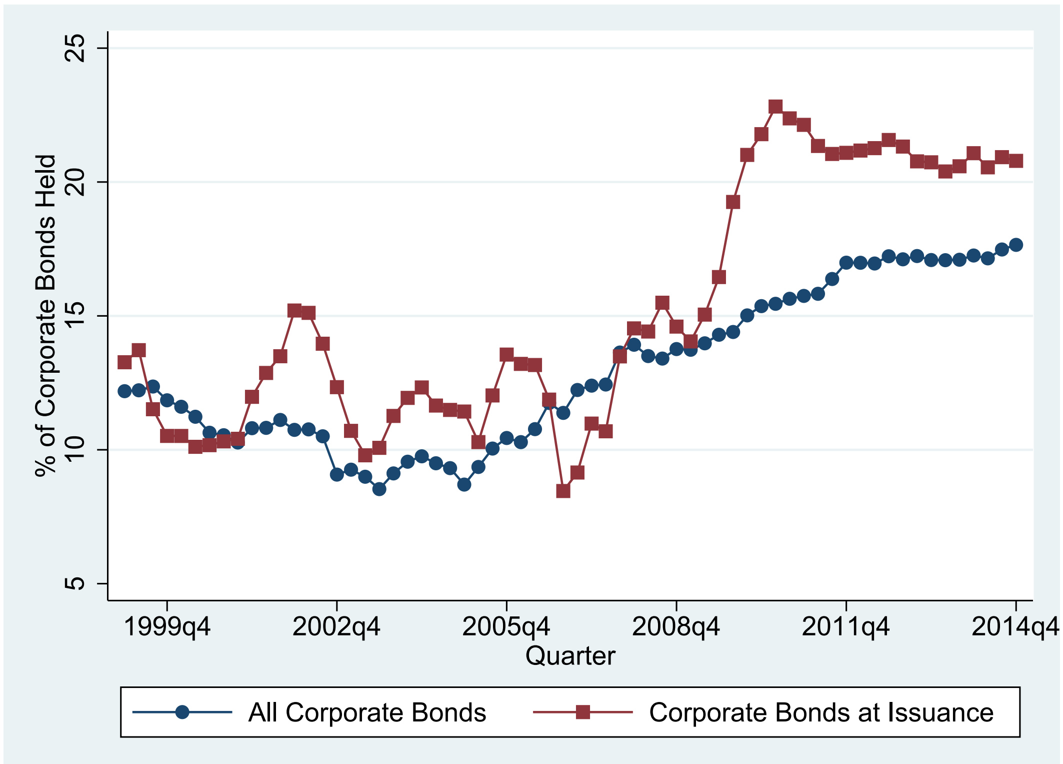
This table examines the cross-sectional variation in the relationship between bondholder flow and firm bond issuance decisions. The observation level is firm-quarter. $BHFlow$ is defined in Equation 2.1, and is measured from Quarter $t-3$ to Quarter t. D(High Yield) is an indicator for high-yield bonds. D(Shorter Issuance History) is an indicator if a firm has a history of issuing bonds that is shorter than the cross-sectional median. D(Less Analyst Coverage) is an indicator if a firm has fewer-than-median number of analysts covering. D(Fewer Previous Bond Trades) is an indicating if a firm's outstanding bonds has fewer-than-median secondary market trading during past quarter. Other firm characteristics are the same as in Table 4, and are suppressed from exposition. The coefficients are multiplied by 100 to ease interpretation. Standard errors are two-way clustered by issuer and quarter. *, **, and *** and indicate 10%, 5%, and 1% significance respectively.

Figure 1: Aggregate Sources of Financing for U.S. Non-Financial Firms



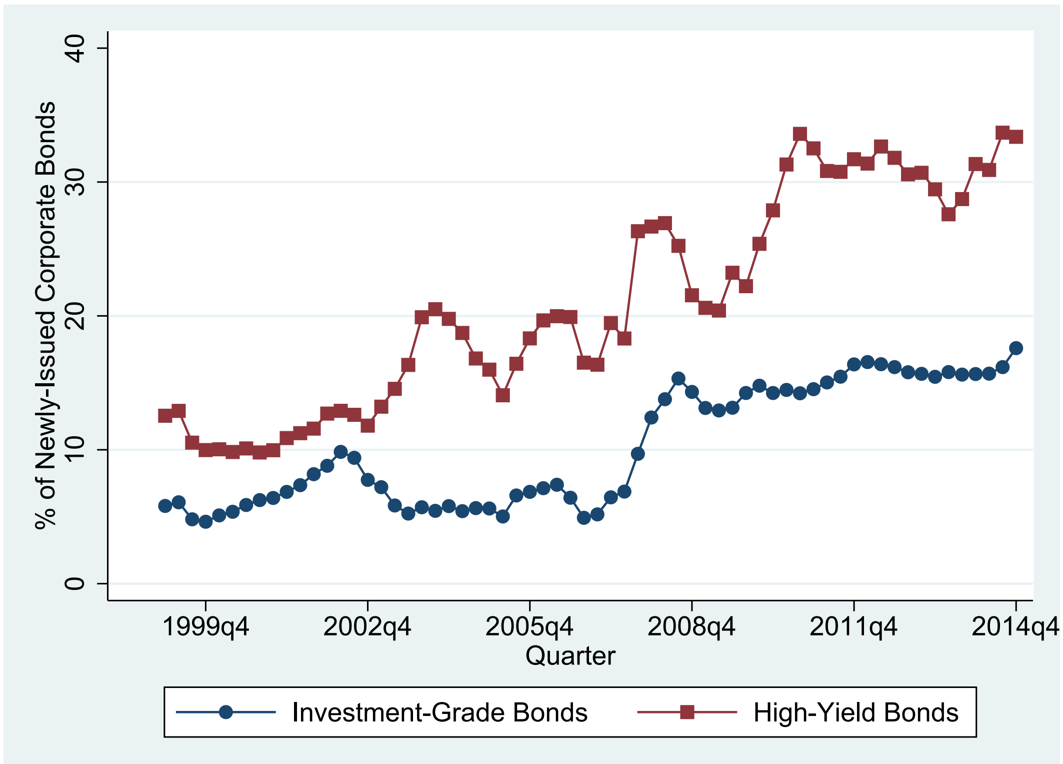
This figure shows the aggregate amount of external financing raised from bond issuance, equity issuance, and commercial and industry loans by U.S. non-financial companies from 1998 to 2016. The amount of equity issuance is gross of share repurchases and merger and acquisitions. Bond issuance data come from SIFMA. Equity issuance data come from *Financial Accounts* by the Federal Reserve Board. Commercial and industry loan data come from the St. Louis Fed.

Figure 2: Mutual Funds' Corporate Bond Ownership Share



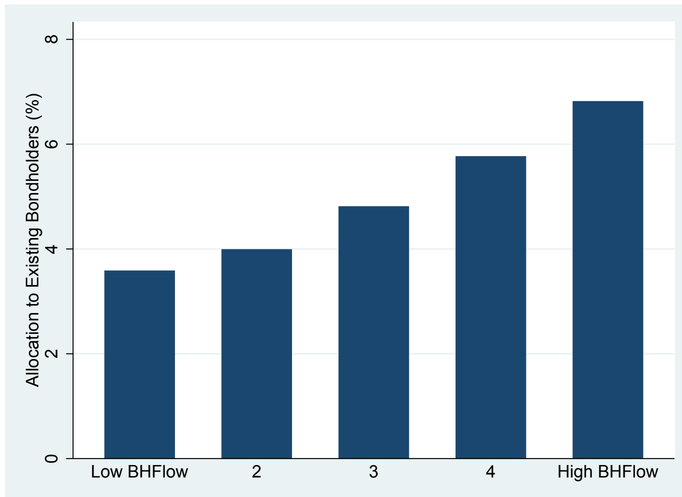
This figure shows the ownership share of all mutual funds in the corporate bond market. The blue line represents the ownership share for all outstanding corporate bonds, while the red line represents the ownership share among corporate bonds that are issued within a quarter.

Figure 3: Mutual Funds' Corporate Newly-Issued Bond Ownership Share

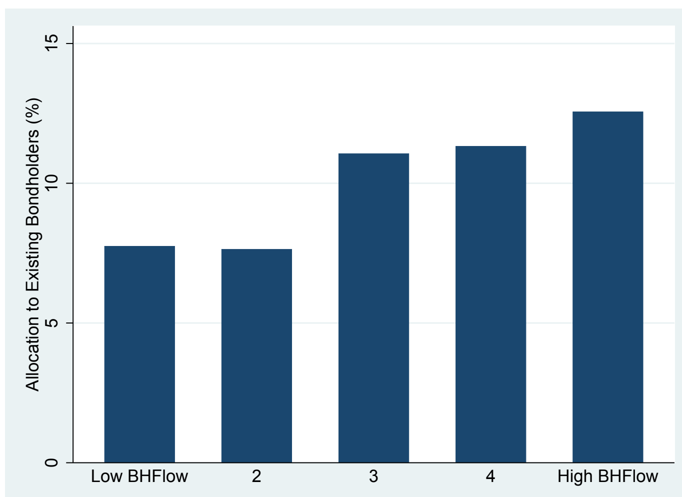


This figure shows the ownership share of all mutual funds for newly-issued corporate bonds. The blue line represents investment-grade corporate bonds, while the red line represents high-yield corporate bonds

Figure 4: Allocation to Existing Bondholders: Sorted by $BHFlow$



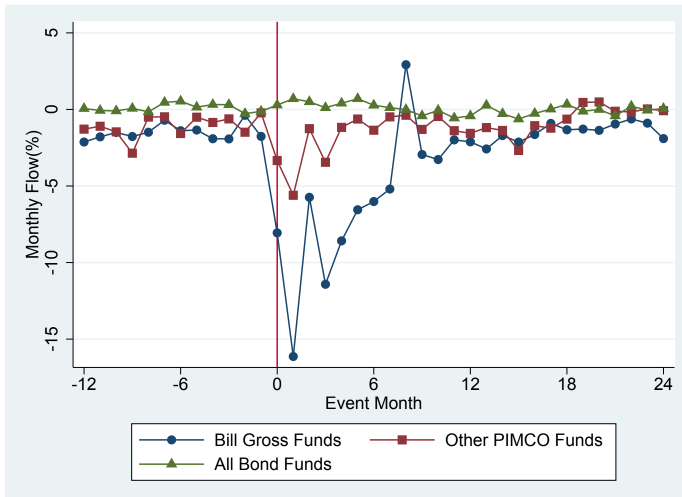
(a) Investment-Grade Issues



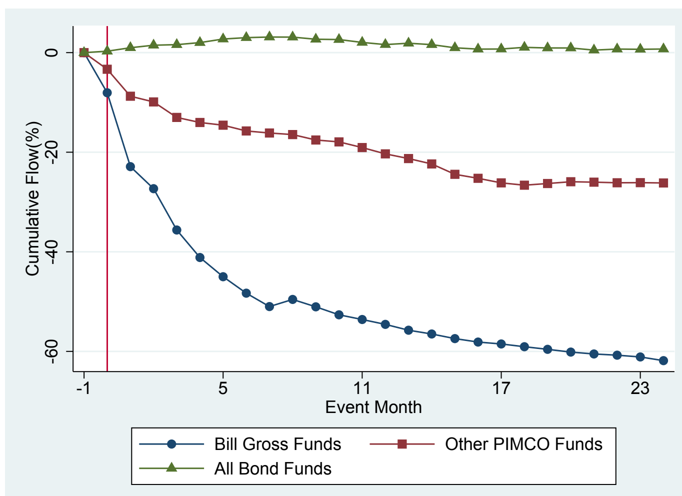
(b) High-Yield Issues

This figure plots the aggregate allocation of new bond issuances to the existing bondholder funds in the Investment-Grade segment (Panel (a)) and the High-Yield segment (Panel (b)). Corporate bond issuances in the sample are sorted into quintile groups based on their $BHFlow$. $BHFlow$ is the aggregate fund flows of an issuer's existing bondholders. The value is calculated quarterly and averaged across four quarters preceding the issuance. Allocation is calculated as the total par value of a bond issue held by a group of mutual funds scaled by total amount offered in the issuance.

Figure 5: PIMCO's Fund Flows After Bill Gross' Departure



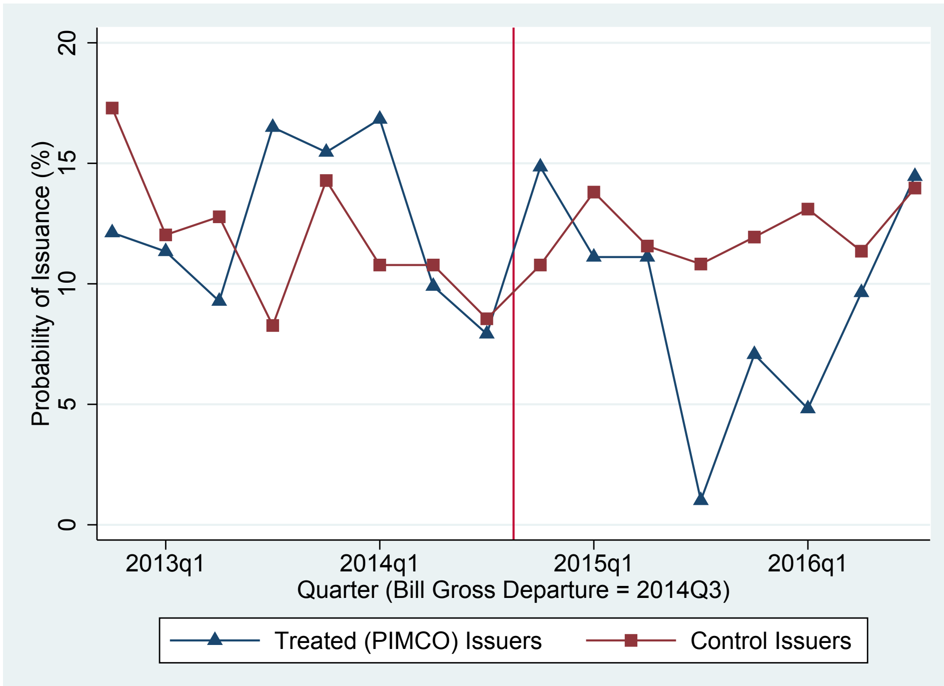
(a) Monthly Flow



(b) Cumulative Flow

This figure shows the fund flows for (a) Bill Gross' Total Return Funds, (b) other funds in the PIMCO fund family, and (c) all bond funds after Bill Gross' departure from PIMCO in September 2014. Panel (a) exhibits monthly flows, and Panel (b) exhibits cumulative flows.

Figure 6: Issuance Probability of Firms in PIMCO Portfolios After Gross' Departure



This figure displays the probability of new bond issuance for treated firms (*PIMCO Issuers*) and control firms. Treated issuers are firms whose outstanding bonds were overweighted PIMCO portfolios at the end of 2014Q3 (when Bill Gross left PIMCO). Control issuers are firms whose bonds were held by Prudential or Vanguard portfolios, the second and third largest bond managers at the time, for more than 3 percent.

Appendices

Appendix A

Data Sources

Data used in this paper are derived from several sources. The quarterly disclosures of mutual funds' bond holdings are obtained from the Thomson Lipper eMAXX dataset (formerly Lipper eMAXX). The issuances of new bonds, including information about the issuers, terms of the bonds (e.g. maturity, coupon rate, call option), and offering yields, come from the Thomson SDC database. Mutual fund flows and total net assets (TNA) are obtained from the CRSP Mutual Fund Database. The secondary market bond pricing, return, and trading volume data come from the Trade Reporting and Compliance Engine (TRACE database).[1] Firm-level accounting information is sourced from the Compustat.

The Thomson Lipper eMAXX database contains quarterly fixed-income holdings for nearly 20,000 insurance companies, mutual funds, and pension funds, as well as some hedge funds. The coverage on holdings by U.S. insurance companies and mutual funds is comprehensive because insurance companies are required to disclose their holdings to the National Association of Insurance

[1]Since TRACE starts reporting bond transactions on 1 July 2002, I supplement the bond pricing data using transactions reported by National Association of Insurance Commisioners (NAIC) from 1998 to June 2002.

Commissioners (NAIC) and mutual funds are required to disclose information to the Securities and Exchange Commission (SEC). Each entry in the eMAXX holdings data contains information on the bond (identified by the CUSIP), the holding institution (identified by an internal *Account_id* maintained by Lipper), the type of holding institution (e.g. mutual fund, insurance company), the par amount of the position, and the reporting date.

I start by keeping all institutions that are categorized as mutual funds in the eMAXX database, and I manually link the *Account_id* to CRSP Mutual Fund database by matching funds by their names. Of the 3,807 funds that appear in the eMAXX dataset, 3,077 (81%) are matched by funds in the CRSP dataset. I focus on mutual funds that primarily invest in corporate bonds, since flows to such funds are primarily accommodated by changes in buying and selling corporate bonds. Therefore, I require a fund to hold at least 50% of its assets in corporate bonds.

The Thomson SDC database provides information about bond issuances. Each bond issuance contains the identity of the issuer, the offering amount at par value, the offering yield, and other characteristics. The bond-level information is then merged to the mutual fund bond holdings by the CUSIP of the bond. Prior research has shown that Lipper eMAXX has a comprehensive coverage for corporate bond holdings (Dass and Massa (2014)).

I extract mutual fund flows and TNAs data from the CRSP Mutual Fund database. Fund share classes are aggregated to the fund level by parsing the fund names. Fund flows are calculated quarterly as

$$Flow_{i,t} = \frac{TNA_{i,t} - (1 + Return_{i,t}) * TNA_{i,t-1}}{TNA_{i,t-1}}$$

To calculate the returns of corporate bonds on the secondary market, I use the reported transaction prices on the Trade Reporting and Compliance Engine (TRACE) database. In order to filter out erroneous reporting from TRACE, I follow the procedure provided by Dick-Nielsen (2009). Since many corporate bonds are infrequently traded, the month-end price of a bond is defined as (a) the weighted-average price on last trading day of the month; and, if this price is not available, (b) the price at the which the bond was last traded in the month. The monthly return of a bond is then calculated as

$$Return_{i,t} = \frac{Price_t + AccruedInterest_t + CouponPayment_t}{Price_{t-1} + AccruedInterest_{t-1}}$$

I construct firm-level characteristics using accounting information retrieved from Compustat. These variables include total assets, capital expenditure, asset tangibility, return on assets (ROA), book leverage ratio, cash holdings, tangibility, R&D expenses, fraction of maturing debt, and S&P issuer long-term rating. Stock-level information is supplemented to calculate market capitalization, market-to-book ratio, past 12-month stock return, and return volatility. Firm characteristics are then matched to the firm's bond issuance activities using the 6-digit CUSIP.

Finally, I obtain seasoned equity offering (SEO) data from the Thomson SDC database. For bank loans, The Thomson Reuters DealScan provides comprehensive data coverage on private debt for U.S. companies. I focus on term loans in studying firms' substitution between bonds and private debt.[2] Each loan is supposed to be initiated on the start date of the loan facility. The firm-level link between DealScan and Compustat is done through the link table provided by Professor Michael Roberts.[3]

[2] I focus on term loans in my analysis and drop revolvers, 364-day facilities, or bridge loans. Term loans typically have maturities longer than one year. As noted by Rauh and Sufi (2010), for low-credit-quality firms that tend to use a mixture of unsecured debt and bank debt, short-term bank debt is not easily replaceable by unsecured debt because the timeliness of short-term bank debt. In contrast, long-term bank loans and public bonds are more likely to be substitutes.

[3] I thank Professor Roberts for sharing the DealScan-Compustat linking table on his website. For details on the construction of the data, see Chava and Roberts (2008).

Appendix B

Variable Definitions

Variables	Definition
$BHFlow$	Bondholder flow. Defined in Equation 2.1. Value-weighted aggregate flow of an issuer's mutual fund bondholders, scaled by total amount of bond outstanding for the issuer.
Bond Issuance Dummy	A binary variable that is set to one if a firm issues new straight bonds at current quarter, and zero otherwise.
Issuance Amount	The dollar amount of new straight bonds an issuer offers in a given quarter.
Market Capitalization	Stock price * Shares Outstanding
Total Assets	Book value of assets
Market-to-Book	The ratio between market value of equity and book value of equity
Book Leverage	The ratio between book value of debt (*dltt*+*dlc*) and book value of equity
Capital Expenditure	The ratio between capital expenditure (*capx*) and total assets
R&D Expense	The ratio between research and development expenses (xrd) and total assets
Tangibility	The ratio between property, plants, and equipments (*ppegt*) and total assets
Return on Assets	The ratio between operating income before depreciation (*oibdp*) and total assets
Maturing Debt	The ratio between debt in current liabilities (*dlc*) and total assets
Issuer Investment-Grade	A binary variable indicating that the issuer has a S& P long-term rating above BBB-
Past 12-Month Stock Return	The cumulative return of an issuer's equity during the past 12 months
Past 12-Month Bond Return	The (weighted-average) cumulative return of an issuer's outstanding bond(s) during the past 12 months
Equity Return Volatility	The standard deviation of an issuer's month equity returns during the past 12 months.
$D(HighYield)$	A binary variable indicating that an issuer has a S&P long-term rating below BBB-
$D(ShorterIssuanceHistory)$	A binary variable indicating that an issuer's history of issuing bonds is shorter than the cross-sectional median
$D(LessAnalystCoverage)$	A binary variable indicating that the number of equity analysts covering an issuer is fewer than the cross-sectional median
$D(FewerPreviousBondTrades)$	A binary variable indicating that the number of secondary market trades on an issuer's outstanding bonds during the last quarter is fewer than the cross-sectional median
Issue Offering Amount	The dollar amount of bonds offered in the issuance
Maturity	The length of maturity in number of years
Credit Rating (numerical)	The issue-specific S& PS credit rating expressed in numerics. For example, AAA rating corresponds to 1, AAA- corresponds to 2, BBB+ corresponds to 3, and so forth.
Rule 144A	A binary variable indicating that an issue is privately-placed under Rule 144A.

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