Institutional Equity Investors and Corporate Debt Financing: A Cross-Market Perspective

Abstract

Institutional equity investors significantly influence corporate debt issuance due to their triple role as shareholders, equity market participants, and informational intermediaries to the debt market. Among U.S. non-financial public firms, a five-percentage-point increase in institutional equity ownership is associated with a 22% rise in debt issuance. Two novel mechanisms contribute to this relationship: a supply-side information channel where debt investors learn from equity investors, and a demand-side benchmarking channel that affects shareholders' effective risk aversion. Causal evidence is established using a regulatory shock to mutual fund disclosure and equity benchmarking intensity as an instrumental variable. A calibrated model featuring both mechanisms reveals that the information channel accounts for roughly one-fifth of the debt-equity holdings relationship, with the informational frictions in debt issuance representing about 1% of equity value. Additionally, a benchmarking-induced increase in institutional ownership comparable to Russell 2000 inclusion amplifies the relationship by 9%. These results highlight the importance of cross-market investor linkages and firm responses to investor characteristics in understanding financing outcomes.

Keywords: Institutional ownership, Capital structure, Information, Uncertainty, Capital markets segmentation.

JEL Classifications: G20, G32.

1 Introduction

Firms determine debt and equity issuance jointly to meet their financing demand, implying that investor characteristics in one financial market can influence financing outcomes in another. Yet existing research often overlooks this cross-market linkage, treating markets for different asset classes as segmented.

Institutional equity investors are a unique group that connects equity and debt markets. Over the past four decades, their share of publicly traded equity has tripled, rising from roughly 20% to about 60%. Beyond their role as equity market participants, these investors are also shareholders and transmit valuable information about firms to debt investors. This paper examines the role of institutional equity investors in corporate debt financing.

Among U.S. non-financial public firms from 1985 to 2018, institutional equity investors exhibit significant cross-market linkage with corporate debt issuance: a five percentage point increase in institutional equity shareholdings is associated with a 22% rise in debt issuance. I demonstrate that this relationship operates through both the supply (debt investors) and the demand side (firms) of capital markets. On the supply side, informed equity investors transmit information that affects debt investors' beliefs about firm value. On the demand side, the pervasive practice of benchmarking alters shareholders' effective risk aversion, making debt financing more attractive.

To show this, I proceed in two steps. First, I provide causal evidence for information transmission from informed equity investors to debt markets and the effects of equity benchmarking. I find limited support for the corporate governance channel often discussed in the institutional ownership literature. Second, I calibrate a dynamic model featuring endogenous institutional equity holdings and firms' financing decisions, which allows us to inspect and quantify each mechanism.

Institutional equity investors produce information about firms. Debt investors update their beliefs on firm values after observing equity investors' holdings disclosed to the public and information transmitted through interpersonal communications. This affects investors' valuation of debt securities and thus the supply of debt capital.

I exploit a 2004 regulatory change requiring more frequent public disclosure of mutual fund holdings to implement a difference-in-differences design. Firms with higher ownership by affected funds subsequently issue more debt, and this effect is stronger among firms with lower price informativeness, higher profitability and greater information asymmetry. This is consistent with improved information dissemination reducing uncertainty and revealing the quality of firms. There are no differential pre-trends in debt issuance for firms with different treatment intensity, providing support for the parallel trends assumption. Additional evidence from mutual fund families shows that equity and bond holdings within the same family comove positively, whereas holdings across families comove negatively—a pattern more pronounced among firms with greater information asymmetry. These patterns persist after controlling for firm-time fixed effects.

Equity index benchmarking further strengthens the link between institutional ownership and debt issuance. Prior work shows that equity index inclusion affects equity prices, but its implications for debt markets are less understood. Using an instrument based on equity benchmarking intensity and reconstitutions of Russell 1000/2000 indexes, I show that institutional ownership induced by equity benchmarking increases debt issuance, equity issuance, and debt maturity. Benchmarking introduces extra inelastic demand for firm shares, effectively decreasing shareholders' risk aversion. Debt financing, which incurs procyclical cash flow costs to firms, therefore becomes less costly. This increases firms' demand for debt capital.

While reduced-form evidence supports these channels, their magnitudes remain unclear due to endogeneity and the local nature of the shocks. To address this, I use the data to calibrate a dynamic equilibrium model where equity investors, debt investors, and firms interact, generating endogenous institutional ownership and financing choices. This model features both information transmission and equity benchmarking, and matches key moments on debt and equity issuance, institutional ownership, and how firm financing responds to institutional ownership.

With the model, I quantify intangible information frictions and the effects of equity benchmarking. Eliminating information transmission from the model reduces the magnitude of the relationship between debt issuance and institutional equity shareholdings by one-fifth. The magnitude of information frictions associated with debt issuance is also non-negligible, accounting for close to 1% of equity value. Equity benchmarking also contributes to the positive debt-equity holdings relationship. Stricter benchmarking mandates that leads to 27 bps rise in institutional ownership, comparable to the addition to Russell 2000, amplify the relationship by 9%.

By integrating empirical and structural approaches, this paper advances our understanding of how investor heterogeneity in one market spills over to influence financing outcomes in another.

Literature Review. This paper closely relates to four strands of literature. The first is the growing literature on the effects of financial capital supply on corporate policies and asset prices (Baker, 2009). Some studies adopt a reduced form approach. For instance, Baker and Wurgler (2002) show that firms issue more equity when market values are high relative to book values. Instruments or events affecting capital suppliers are used as (local) shocks to identify the effects of a shift in the capital supply curve, such as index inclusion, flow shocks and shocks to intermediary balance sheet (Leary, 2009; Lou, 2012; Kashyap et al., 2023). Using shift-share instruments Coppola (2025) studies the debt market and shows that firms whose bonds are predominantly held by insurers maintain more debt at lower costs. Other studies adopt a more structural way, using demand-based asset pricing approach to measure the shape of demand functions of equity and bond investors (Koijen and Yogo, 2019; Chaudhary, Fu and Li, 2023; Choi et al., 2025). However, in most studies debt and equity markets are studied separately, overlooking cross-market interactions. This paper fills the gap by showing that institutional equity investors connect equity and debt markets, thus affecting corporate debt financing. I also provide a structural model that endogenizes both investors' and firms' choices.

A closely related work is Choi et al. (2025) that combines supply and demand of financial capital and studies the effects of equity investor demand on equity issuance. This paper differs in two aspects. First, I fully characterize equity investors' investment choices instead of adopting a reduced form approximation as in their paper. There is no absolute advantage of one approach over another. Explicitly modeling key characteristics of equity investors allows us to understand the underlying forces more transparently. Second, I highlight the importance of interactions between different capital markets and the triple role of institutional equity investors in connecting debt market, equity market and the firm, while Choi et al. (2025) focuses on the equity market.

Second, this paper also contributes to the understanding of the impact of market integration[1]. The connection between different asset markets has been an unsolved debate. Yet it has important implications on asset prices (Chen, Chen and Li, 2023), corporate policies (Ma, 2019), and transmission of local shocks in one capital market to the whole economy, such as regulation or monetary policy shock (Greenwood, Hanson and Liao, 2018). Moreover, since debt and equity

[1] I define full market integration as the existence of a single discount factor that prices assets in both equity and debt markets. The breakdown of it could be due to cross-market transaction costs, informational frictions, short-selling constraints, etc.

holders come from different demographic backgrounds, fluctuations in different markets could affect wealth distribution. Empirical work has documented the existence of arbitrage opportunities utilized by firm managers and investors (Ma, 2019; Yu, 2006), suggesting equity and debt markets are segmented in reality. Using different approaches to measure market integration Schaefer and Strebulaev (2008); Chen, Chen and Li (2023); Sandulescu (2019) also confirm that debt and equity markets are not fully integrated.

This paper emphasizes informational frictions in capital markets. Market segmentation implies that arbitrage opportunities across markets cannot be fully exploited, at least within a short period. Examples of the frictions include short sale constraints, liquidity or funding constraints, investor inattention, etc. (Duarte, Longstaff and Yu, 2007; Kapadia and Pu, 2012; Ma, 2019). Equity and debt markets have vastly different investor bases, with equity market being much less institutionalized. Hence debt and equity investors may well have different preferences and information sets together with inelastic demand (Koijen and Yogo, 2019; Chaudhary, Fu and Li, 2023). We show that information asymmetry between debt and equity investors is a non-negligible impediment to arbitrage between asset markets.

Third, this paper also adds to the literature on information asymmetry, which researchers have long been interested in. Most research on the impacts of information asymmetry on corporate financing focus on information disadvantage of investors (buyers) relative to firms (sellers) (Akerlof, 1978; Holmstrom, 1982; Stiglitz and Weiss, 1981; Bernanke and Gertler, 1986; Yang, 2020). Discussions on the implications of heterogeneous information among investors and information sharing can also be traced back long time ago (Grossman and Stiglitz, 1980; Kyle, 1985; Panageas et al., 2020; Goldstein, Xiong and Yang, 2025). But most of these studies focus information sharing among investors for the same securities, instead of those from different capital markets. This paper contributes by highlighting the importance of information heterogeneity among investors from different asset markets (Jiang, Li and Shao, 2010; Addoum and Murfin, 2020).

Auh and Bai (2020) is the most relevant to this paper in this aspect. The authors provide evidence of information sharing between bond and equity mutual funds within the same fund family. This paper differs in three ways. First, my results are not restricted to 'dual' ownership, and information owned by institutional equity investors can be transmitted not only through interpersonal communications, but also through public disclosure of their holdings. Second, I show that information sharing has real impacts on firms' financing choices while Auh and Bai (2020) focuses on asset prices. Lastly, I provide a structural model that characterizes interactions between equity investors, debt investors and the firm.

Lastly, this paper contributes to the broad literature on firms' financing frictions. A large number of studies have documented the importance of financing costs to corporate financing and investment decisions (Whited, 1992; Hennessy and Whited, 2005). However, in most theoretical papers, financing costs are captured in a reduced form, such as bankruptcy costs, financing constraints and linear and quadratic financing costs. There are a few exceptions. Bernanke and Gertler (1986) micro found the financing costs based on agency costs between managers and shareholders which boils down to a collateral constraint on borrowing. Some other papers highlight financial frictions caused by disruptions in financial intermediation, and the incentive constraint implies a leverage constraint on the firm side (Gertler and Kiyotaki, 2010; Gilchrist and Zakrajšek, 2012; Krishnamurthy and Muir, 2017). This paper provides a new mechanism behind the debt financing cost 'parameter'. That is, debt investors have incomplete information about firm value and exhibit bounded rationality. This irrationality channel could potentially provide a complementary explanation to "credit spread puzzle" that is hard to be fully accounted for in a rational framework (Gilchrist and Zakrajšek, 2012; Huang and Huang, 2012; Chen, 2010; Ai, Frank and Sanati, 2020).

The rest of the paper proceeds as follows. Section 2 describes the data and sample. Section 3 provides empirical evidence on the strong relation between debt issuance and institutional equity ownership. In Section 4, evidence on private and public information transmission from equity to debt market is provided. Section 5 provides evidence on the effects of equity benchmarking on debt issuance. Section 6 and 7 present the theoretical framework and quantitative results. Section 8 concludes.

2 Data Description

The whole sample starts from fiscal year 1985 due to the availability (validity) of the main variables, and ends in fiscal year 2018 to avoid the effect of COVID-19 and account for the change in the definition of debt in financial statement[2].

2.1 Data

Holdings of institutional investors. I obtain institutional equity holdings from Thomson/Refinitiv Institutional (13f) Holdings-S34. Institutional investment managers (such as mutual funds, insurance companies, hedge funds, etc.) with AUM over \$100 million are required to report quarter-end 13F securities holdings[3] with maximum 45-day delay to SEC. Only long positions are reported. I calculate institutional ownership as the total shares held by all 13F institutions divided by firms' total shares outstanding, following the literature (Koijen and Yogo, 2019). I obtain holdings of mutual funds from Center for Research in Securities Prices (CRSP) Survivor Bias Free Mutual Fund Database. The inclusion rate of corporate bond funds before 2010 is low, so the sample period for this set of results starts from the year 2010. For the same reason, for tests using mutual fund equity holdings before 2008, the data is obtained from Thomson/Refinitiv Holdings-S12 instead of CRSP Mutual Fund Database.

Firm financials. I obtain firm financial from Compustat. I exclude firms with non-positive total asset, negative sale, negative long (short) term debt holding, negative dividend payment or stock sales. I focus on US firms listed in AMEX, NASDAQ or NYSE. All variables are winsorized at the 1st and 99th percentiles in each fiscal year to eliminate effects from outliers. Firms from financial, utilities and public administration industries are removed as they are either heavily regulated or have quite different capital structure[4]. The main dependent variable is firm's financing choices, debt issuance in particular. The baseline measure for debt issuance is annual growth rates of debt $\Delta Debt_t = \frac{Debt_t - Debt_{t-1}}{0.5(Debt_t + Debt_{t-1})}$, with $\Delta Debt_t$ set to 0 if $Debt_t = Debt_{t-1} = 0$ (Davis, Haltiwanger and Schuh, 1996; Eslava et al., 2010)[5], where $Debt$ is the total debt outstanding including both long term and short term debts, measured as dltt+dlc. Since debt takes non-negative values, this

[2]See "Notes on Operating Lease Accounting Post 2019" on Yueran Ma's webpagehttps://voices.uchicago.edu/yueranma/notes/

[3]https://www.sec.gov/rules-regulations/staff-guidance/division-investment-management-frequently-asked-questions/official-list-section-13f-securities

[4]Specifically, I remove firms whose four-digit SIC industry code is between 4900-4999, 6000-6999, or larger than 9000. For observations with missing historical SIC code, I first forward-fill then backward-fill missing values. For the rest missing observations, I use the header SIC code.

[5]The Davis-Haltiwanger-Schuh measure are symmetric and bounded, mitigating the concern that large outliers drive the results. In addition, if a variable changes from zero to nonzero values, a standard definition would produce missing values.

debt issuance variable takes a value within the range [-2,2].

Bond issuance and prices. I obtain corporate bond issuance information (offering amount, maturity date, issuer identity, coupon rate, bond yield at issuance) from FISD. The sample period starts from 1992 as there are substantial missing variables after matching to CRSP-Comustat. Following conventions in the literature (Ma, 2019), I exclude convertible bonds, asset-backed securities, Yankee bonds, Canadian bonds, putable bonds, and bonds issued in foreign currencies so that the issuance and prices are more comparable. Only US-issued bonds are kept. I use TRACE to construct transaction prices and yields of bonds in the secondary market. The bond yield data starts from the year 2002.

Information asymmetry measures. I use idiosyncratic volatility of stock returns (Bloom, 2009) and bid-ask spread to measure uncertainty about firm value. Higher idiosyncratic volatility directly measures the uncertainty about firm value owing to firm-specific information. As for bid-ask spread, a large gap between bid and ask prices indicates that investors disagree significantly about firms' value. This implies significant disagreement about firm value. Thus, higher bid-ask spread indicates that the firm is more likely to suffer from information asymmetry.
The daily stock returns used to construct idiosyncratic volatility are obtained from CRSP database. For each firm-fiscal year, I run the regression below based on CAPM

$$R_{it}^e = \alpha_i + \beta_i R_{mkt,t}^e + \epsilon_{it}. \tag{1}$$

The variable R_{it}^e is excess stock return, $R_{mkt,t}^e$ is excess stock market return. Both market returns and risk free rates are obtained from Ken French's webpage. The idiosyncratic volatility is then the standard deviation of the residual term ϵ_{it} times $\sqrt{252}$ for annualization. I require each firm-fiscal year to have at least 200 observations. I also construct idiosyncratic volatility using Fama-French three factor model in the same way, with the three factors obtained from Ken French's website. To measure bid-ask spread, I use the daily bid and ask information in CRSP (Chung and Zhang, 2014). I first calculate the daily gap between bid and ask prices, and then take the annual average. Again, I require at least 200 observations for each firm-fiscal year.

2.2 Summary Statistics

Table 1 presents the summary statistics. The average debt issuance $\Delta Debt$ is 3%. This means on average 24.6 (=802*0.03) million dollars of (net) debt is issued each year[6]. Debt issuance has large heterogeneity over time and across firms, with an overall standard deviation of 75%. The bottom quartile firm-year observations on average pay back debt ($\Delta Debt < 0$), while the top quartile observations experience debt growth of 22% corresponding to a debt issuance equivalent to 6.5% ($= \frac{802\times0.22}{2703.17}$) of total assets.

The average institutional equity ownership of U.S. public firms has tripled from about 20% to 60% during the period from 1985 to 2018. There is also noticeable variation in the cross-section. In 2018, about 11% of shares were held by institutions for bottom quartile firms, while this is roughly 68% among top quartile firms. The over time and cross-sectional variations are demonstrated in Appendix Figure A1. I further decompose institutions into different types using the classification codes from Bushee (2001). Investment companies (including independent investment advisors) are the largest shareholders among institutional investors, owning almost 30% of an average firm's shares, followed by bank trusts (6.21%), insurance companies (2.02%) and pension funds (1.51%). The shares held by pension funds seem small compared to the Flow of Funds data which shows that pension funds are the second largest player in the corporate equity market. This is because the shares reported in 13F only include shares directly managed by a 13F institution.

3 Institutional Equity Shareholdings and Debt Financing

In this section, I first discuss characteristics of institutional equity investors to prepare us with the information necessary to understand our empirical findings. Then I show that institutional equity ownership is strongly associated with debt issuance.

3.1 Characteristics of institutional equity investors

Institutional investors are not homogeneous, including mutual funds, pension funds, bank trusts, etc. Within each broad category, investors may adopt different investment styles, such as specula-

[6] $Debt$ includes both new debt issuance and repayment of past debts, measured by $dltt + dlc$ from Compustat.

tive, indexed, or long-term investing, among others. Given the purpose of this paper, I will focus on common characteristics among most institutional equity investors.

Institutional versus retail investors. Institutional equity investors tend to be more rational and more informed relative to retail investors (Ofek and Richardson, 2003; Berk and Van Binsbergen, 2015; Terry, Whited and Zakolyukina, 2023; Laarits and Sammon, 2024). This is because they have the scale and resources to obtain and process a large amount of information. One real-world example of the irrationality of retail investors is the GameStop short squeeze in 2021 led by activist individual investors. The informativeness of institutional equity investors implies that higher institutional equity shareholdings are associated with more information produced (Laarits and Sammon, 2024). In other words, institutional equity holdings indicate the amount of information produced by informed investors (Collin-Dufresne and Fos, 2015). Therefore, the disclosure of informed investors' position releases information on firm value, which I will explore in Section 4.2 as evidence for information sharing from institutional equity investors to the debt market.

The household sector also has a smaller price impact in the medium and long run. According to Gabaix et al. (2023), although capital flows of affluent households into equity market react to economic conditions and tend to be countercyclical, the amount and sensitivity of flows to return and aggregate market are quantitatively small. This is consistent with inertia, inattention and inelasticity of the retail demand. The relatively small price impact is also consistent with a low informativeness of retail trading flows. When the informativeness of transactions is lower, price reacts much less because the trading flows are perceived more as noise without much to learn from (Kyle, 1985).

Objectives of institutional equity investors. There is no consensus in the literature on the exact objective function of institutional investors, which is expected considering that each manager has her own target. For example, income mutual funds favor stocks that pay dividends, while pension funds have the goal of generating appropriate return-risk combinations over investors' lifecycles. Despite the heterogeneity, the general rule is the same, that is, to reach desirable returns for a given level of risk.

In reality, portfolios are under the discretion of managers and investors do not directly decide how many shares to hold for each stock. To incentivize managers to achieve an appropriate balance between returns and risks that aligns with investors' preferences, benchmarking is widely adopted by various institutional investors such as mutual funds, pension funds, endowments, insurers and so on (Kashyap et al., 2023; Chinco and Sammon, 2024). With benchmarking, managers' compensation is linked to funds' performance relative to a specific benchmark, such as Russell 2000 and S&P 500. According to Ma, Tang and Gomez (2019), at least 61.6% of US mutual funds explicitly base compensation on performance relative to a benchmark[7].

3.2 Institutional equity shareholdings and debt financing

In this subsection, I document a strong relationship between debt financing and institutional ownership. One standard deviation rise in institutional ownership is associated with 22% more debt issuance.

The empirical model is as follows

$$y_{it} = \beta \times InstShare_{it-1} + C_{it}'\eta + \gamma_t + \theta_i + \epsilon_{it}, \tag{2}$$

where y_{it} is the outcome variables including firm i's financing and real decisions at fiscal year t. γ_t and θ_i are fiscal year and firm fixed effects respectively. ϵ_{it} contains unobserved variables. Time fixed effects is included due to the concern that aggregate economic conditions could affect both debt issuance (which is procyclical) and institutional equity ownership. I also control for firm fixed effects because institutional equity ownership is strongly correlated with time-invariant firm characteristics such as (average) firm size, location, industry, etc. C_{it} is a vector of control variables including previous period's cash holding, logarithm of total asset, ROA, distance to target leverage, asset growth, SIC-3 digit industry level book leverage, investor horizon (Cella, Ellul and Giannetti, 2013), percentage of shares held by block holders, share turnover, and y_{it-1} which controls for potential serial correlation of dependent variable (see Appendix Table A1 for variable definitions). I include cash holdings and profitability (ROA) to control for external financing needs. Size is also controlled because it is related to both external financing costs and institutional ownership. Asset growth is included as a proxy for expansion tendency to control for firms' financing needs. Industry level leverage and distance to target leverage ratio are controlled as these are important factors for corporate debt issuance. These are commonly used controls in studies on debt financing.

[7] $79.04\% \times 77.9\% = 61.6\%$

The literature has suggested that long term institutional ownership improves corporate governance. Thus we control for investor horizon, share turnover and blockholder ownership to rule out the monitoring channel.

Results are presented in Table 3 panel (a). In column 1, only firm fixed effects are included. Columns 2 to 4 show that this relationship is robust to removing time fixed effects and controlling for variables affecting firms' debt financing decisions documented in the literature[8]. The coefficient in column 2 implies that a 5 percentage point increase in institutional ownership is associated with 22% (=0.13*0.05/0.03) more debt issuance each year, which is quite sizable. Columns 5 and 6 examine alternative debt issuance measures, and similar results are obtained. Column 7 shows that the result also holds for bond issuance. The results also extend to the extensive margin shown in columns 8 and 9, suggesting that the fixed costs are small enough that firms do not completely substitute debt issuance frequency with a larger amount of debt issuance at each time.

Panel (b) examines the results for equity issuance. Column 1 shows that institutional equity shareholding is negatively related to equity issuance. This relation is mostly driven by the size effect. After controlling for firm size in column 2, institutional equity ownership is related to more equity issuance. This intensive margin effect is likely driven by the price impact associated with higher demand from institutional investors, either misvaluation or not. Column 3 shows that controlling for average Q[9] eliminates the effect.

For the extensive margin, institutional equity shareholdings negatively predict equity issuance shown in columns 4 and 5. One standard deviation increase in institutional equity shareholdings is associated with 61.5% (= (exp(1.086)-1)*31.34%) decrease in equity issuance probability. Overall, institutional equity shareholdings tend to benefit debt issuance over equity issuance. Consistent with this, we see an accelerating leverage growth in columns 6 and 7.

[8] Idiosyncratic and aggregate components of firm value may be affected differently by institutional ownership. For example institutional investors may on average have an advantage in exploring firm-specific information. Appendix A demonstrates that institutional ownership is positively associated with both market-related and firm-specific debt issuance, while the effect is stronger for idiosyncratic volatility. The difference between idiosyncratic and aggregate components has implications on how institutional ownership affects firms over business cycles, which is interesting but is not the focus of this paper.

[9] Baker and Wurgler (2002) uses market-to-book ratio as a proxy for equity misvaluation. This measure may also capture investment opportunity. We tried (1) controlling for the logarithm of market value instead; (2) controlling for average Q and current period investment rate. The coefficient significance decreases dramatically in both cases. In fact, if it is the investment opportunity that is driving the results, we should see more equity issuance because more funds are needed for investment.

Table 4 presents results on yields and interest payments.[10] The dependent variables in columns 1 and 2 are bond yields. Firm-level bond yields are calculated as the par value-weighted yields of all bonds held by the firm in a given fiscal year. BondYRtm is the par value-weighted year to maturity of bonds outstanding, and BondDur is the value-weighted duration of bonds. Interest payments ($xint/debt$) are examined in columns 3-4. Throughout different specifications, higher institutional equity ownership is related to lower debt financing costs. Decreasing debt costs (bond yields and interest expenses) suggest that the capital supply side plays a role.

3.3 Mechanisms

What are the forces driving the link between debt issuance and institutional equity ownership? This paper focuses on two novel mechanisms: information sharing from institutional equity investors to debt investors, and equity benchmarking.

As a descriptive evidence, Appendix C shows that the association between institutional equity ownership and debt issuance is stronger for firms with higher information asymmetry and in periods with high macro uncertainty. In untabulated results, ownership of index equity fund also turns out to be positively associated with debt issuance. There could exist other channels. Firm fundamentals are related to both institutional equity ownership and debt issuance, and are a non-negligible factor. This paper does not aim to provide causal evidence for this correlation. However, I will incorporate it into the structural model not only because it is very likely an important force, but it also generates interesting (firm-specific and aggregate) business cycle implications.

Why can these two channels explain the effects of institutional equity investors on debt issuance? Institutional equity investors produce information about firms. Debt investors update their beliefs on firm values after observing equity investors' holdings disclosed to the public and information transmitted through interpersonal communications. This affects the valuation of debt securities and hence the supply of debt capital. Meanwhile, the pervasive practice of benchmarking used by institutional equity investors increases shareholders' valuation of corporate cash flows by introducing additional inelastic demand for firm shares, effectively decreasing shareholders' risk aversion. Debt financing, which incurs procyclical cash flow costs to firms, therefore becomes less

[10] Total debt costs also include other monetary and non-pecuniary expenses such as the costs associated with compliance with covenants. These costs are hard to measure and are not captured by yields and interest payments.

costly. This increases firms' demand for debt capital.

The literature also discusses extensively about the corporate governance effects of institutional ownership. However, it is not clear why higher institutional ownership favors debt issuance. Appendix D shows that corporate governance is unlikely a driving force, together with other potential mechanisms.

Appendix B explores potential motives for debt issuance. It turns out that debt raised can be used for both real investment and share repurchase, neither of which contradicts the information and index benchmarking channels.

In the following sections, I will provide causal evidence to support the information transmission and equity benchmarking mechanisms, which motivates how we set up the structural model.

4 Information Transmission from Equity to Debt Investors

Investors and firms act on expectations that are formed based on the information they have. Due to its significance, information transmission is ubiquitous to financial markets and has big effects on professional investors' portfolio choices (Shiller and Pound, 1989; Goldstein, Xiong and Yang, 2025). This section provides empirical evidence that information flows from institutional (informed) equity investors to debt investors contributes to the positive association between institutional equity ownership and debt issuance.

In the following subsections, I provide causal evidence on information transmission from institutional equity investors to debt investors[11]. Before we jump into the results, let me first clarify how information can be transmitted between debt and equity markets.

First, information can be shared in private ways, for example among investors from the same geographic area or organization. Soft information is often transmitted in this way. This does not necessarily mean that investors trade on insider information. Privately shared information could be public news others do not pay attention to [12], or individual interpretation of the same public

[11]One may ask that if lower information asymmetry decreases firms' financing costs, what prevents firms from disclosing more information? First, production and disclosure of information are costly. Information production requires both monetary and non-pecuniary costs such as labor expenses. Information disclosure can also hurt firm value due to information leakage to competitors. Second, managers may misreport for their own interests (Terry, Whited and Zakolyukina, 2023).

[12]For example, "Chris Hansen ... had an early conviction the novel coronavirus would wreak havoc on the global economy" (Drechsler, Moreira and Savov, 2020).

signal [13]. Many investment managers such as Vanguard and JP Morgan have both equity and debt investment branches. Managers of equity and fixed income funds from the same fund family may work in the same building, or have regular meetings at the fund family level[14]. These facilitate inter-personal communications about target firms[15]. Through these communications, debt investors learn from equity investors.

Second, information can also be disclosed to debt investors due to regulations. For example, institutional equity investors are required to disclose their positions to the public (such as 13F filings). With costly information acquisition, price does not fully reveal firm value, therefore informed shareholders' positions provide additional information about firm value (Drechsler, Moreira and Savov, 2020). Through observing equity investors' holdings and analyst reports, debt investors can gauge their valuation of the firm.

4.1 Inter-personal information sharing across capital markets

In this subsection, I show that bond and equity holdings of the same firm move in the same direction, similar to Auh and Bai (2020). Mutual fund holdings are obtained from the CRSP Mutual Fund database. I remove balanced funds that invest in corporate bonds and stocks simultaneously. This is because when a fund manager can invest in both stocks and bonds, not only do the valuations, i.e. the first moment, of debt and stocks matter, the comovement of payoffs also matters. We do not want to capture the latter effect. In addition, I remove mutual funds with total net assets smaller than $15 million as transactions of small funds are less representative. I only focus on long positions as short positions are likely driven by speculative purposes which is not the focus of this

[13] One anecdotal evidence on private information sharing is that PIMCO organizes nationwide meetings regularly, during which managers from both equity and bond funds gather and share their views about for example macroeconomic outlook. Another example is 'JPMorgan debt and equity analysts collaborated to write a report on Delta analyzing the prospects of a Chapter 11 filing and the pricing implications for Delta's debt and equity securities' Johnston, Markov and Ramnath (2009). I do not take a stand on the cause of the different interpretations of public signals. It could be due to inattention to public information or individual bias about credibility of a new piece of information (Cheng and Hsiaw, 2022)

[14] I remain agnostic of what motivates private information sharing among investors from different capital markets. One reason is that fund families force or encourage information sharing within its institution to make more profits. For example, managers' compensation is sometimes linked to the profits of the entire asset management company (Ma, Tang and Gomez, 2019). Alternatively, managers may share ideas to exchange others' information or to receive feedback (Crawford, Gray and Kern, 2017).

[15] Anecdotal evidence from a corporate bond fund manager says she also communicates with her colleague from the equity fund about their investments.

paper.

The statistical model we estimate is as follows:

$$\Delta H^B_{fit} = \alpha + \sum_{k=0}^{1} \beta_k \Delta H^S_{fit-k} + C'_{ft}\eta + \theta_f + \theta_i + \theta_{it} + \theta_t + \epsilon_{fit}, \tag{3}$$

where ΔH^S_{fit} is the growth of fund family f's holding of firm i's stock shares at the end of quarter t, constructed as $\Delta H^S_{fit} = \frac{H^S_{fit} - H^S_{fit-1}}{|H^S_{fit-1}|}$. The dependent variable $\Delta H^B_{fit} = \frac{H^B_{fit} - H^B_{fit-1}}{|H^B_{fit-1}|}$ is the growth of fund family f's holding of firm i's bonds at the end of quarter t. For both equity and bond holdings, I use the growth in quantities instead of values to avoid the effect of price changes. Specifically, ΔH^S_{fit} and ΔH^B_{fit} are measured by changes in shares held by all equity funds in the fund family f and changes in par amount of bonds held by all bond funds from fund family f respectively. Compared to portfolio weights, these measures are free from price effects. C_{ft} represents a vector of control variables, including $log(TNA_{ft-1})$ and $\Delta log(TNA_{ft-1})$. TNA_{ft-1} is the total net assets of management firm f in the end of quarter t-1, and $\Delta log(TNA_{ft-1})$ is the change in total net assets from quarter t-2 to quarter t-1.[16] These two variables are used to control for the size effect that can affect changes in both bond and stock holdings. I also include one quarter lag of dependent variable to control for potential serial correlation.

Instead of the level of holdings, this test makes use of changes in holdings. This is because changes catch the arrival of *new* information, which sharpens the identification of the inter-personal communication of new information among debt and equity investors. Institutional ownership is a stock variable. Higher institutional ownership indicates more information is produced by professional equity investors and transmitted to debt investors. In contrast, *changes* in holdings are associated with *adjustment* in beliefs about firm value. Changes in holdings do not necessarily indicate the amount of information produced, and it is more of a proxy of the amount of *new* information. The goal of the tests in this section is to examine whether information is transmitted from equity investors to debt investors through inter-personal communications, and the exact independent variable is chosen to better capture the mechanism.

Since each observation is at mutual fund-firm-quarter level, we have enough freedom to control for firm-quarter fixed effects and thus eliminate the concern that firm characteristics (time variant

[16] All variables related to fund holdings are winsorized at 2.5th and 97.5th percentiles to avoid impact of outliers.

and invariant) drive both bond and equity holdings. We further control for management firm (for example, Vanguard, BlackRock) fixed effects to make sure the results are not driven by fixed characteristics of fund families such as their overall management strategy. For instance, some (small) fund families might have idiosyncratic investment mandates to invest or not invest in certain firms (e.g. 'sin' firms).

Results are shown in Table 5. Column 2 is the baseline setting with management firm, firm-quarter fixed effects and other controls. The variation used is that management firms have different holdings of different firms for a given time, which change over time. As is shown in columns 1 and 2, stock holdings and bond holdings of different funds from the same fund family comove both contemporaneously and with one-quarter lag, suggesting that information sharing can happen within one or two quarters. This timing does not contradict the baseline setup in Equation 2 which is estimated at the annual frequency. First, $InstShare_{t-1}$ is the institutional equity holding at the end of fiscal year t-1, and $\Delta debt_t$ is the debt issuance during the whole fiscal year t. The exact issuance time could be early in the year or later in the year[17]. Moreover, the holding changes in Table 5 capture transactions both in the secondary market and primary market where new bonds are issued[18]. Column 3 controls for capital flow shock at the fund family level to mitigate the concern that changes in both bond and stock holdings could be caused by capital inflows and outflows from the fund family. The magnitude and statistical significance are not affected, alleviating the common capital flow concern.

If the comovement is driven by information sharing, it should be stronger for firms with higher information asymmetry. This is confirmed in columns 4 to 6: coefficients on the interaction terms between changes in equity holdings and information asymmetry measure are positively significant.

As a falsification test, we examine whether a fund's stock holdings comove with bond holdings of funds from other fund families. If the comovement is due to private information sharing, we should not observe a positive comovement across funds from different fund families. It turns out that changes in stock holdings of a particular firm are inversely related to changes in bond holdings by other fund families, as shown in column 8. Given that total bond supply is stable in

[17]The reason we use annual data is because firms make financing decisions at a relatively low frequency and once it is set, it would not change significantly unless something unusual happens. According to a former vice president of finance in a company, employees in charge of financing tend to avoid 'bothering' treasurer for approval of out-of-plan financing during the midst of the fiscal year.

[18]Secondary market of corporate bonds is not as liquid as stocks.

the short term, this suggests that when a particular fund family increases its bond holdings, a large proportion comes from transactions with other mutual funds rather than financial institutions such as insurance companies and pension funds. This is expected given that insurance companies and pension funds do not frequently change their positions (Coppola, 2025). A similar test is done in column 9. Instead of examining how a particular fund family's stock holdings are related to bond holdings of all other fund families, we look at how other fund families' stock holdings are related to a particular fund family's bond holdings. Again, the coefficient is negative, although it is not significant. This is because a single fund's bond holdings change is likely to be small in response to a change in net bond supply. Both results provide further evidence that the comovement is due to private information sharing within a fund family.

4.2 Disclosure of institutional equity investors' holdings

This section provides evidence on the information transmission through public disclosure of equity holdings. I would like to clarify that this paper does not attempt to assess the relative importance of private versus public information transmission. Both evidence are used to support the information transmission mechanism.

The efficient market hypothesis implies that prices aggregate all information related to firm value. However, real financial markets have various frictions such as liquidity frictions, irrational trading, and informational frictions etc, so prices reflect not only firms' cash flows but also various transactional frictions and information sets of different investors. Therefore, shareholdings of informed equity investors reveal valuable information to other investors. Imagine you are a rookie who barely knows anything about the financial market and you observe that Warren Buffett invests heavily in Apple's stock, you might as well hold some Apple's shares.

Following this idea, I use a regulatory change in May 2004 that requires more frequent disclosure of mutual fund holdings as a shock that releases more information from informed equity investors to the public. The information produced privately may not change, but it is easier for outsiders, including debt investors, to observe holdings of informed equity investors, from which they can learn about firm values.

4.2.1 Institutional background

Before May 10, 2004 (after 1985), mutual funds were only required to disclose their holdings semiannually, while after that disclosure is required on a quarterly basis. The discussion about increasing the frequency of disclosure started in 2000s, when the SEC received several rulemaking petitions on that. The regulation rule was first proposed in January 2003, and finally released in February 2004[19]. This regulation change is an information shock to investors. After this regulation change, more information about institutional investors' holdings became available to the general public.[20]. In fact, the SEC explicitly states these changes 'are intended to provide better information to investors about fund costs, investments, and performance'.

4.2.2 Discussion on differences between compliers and always takers

Managers face multiple tradeoffs when they decide whether to disclose more frequently or not (Wermers, 2001). In terms of costs, disclosure can increase free-riding activity. Outside investors can duplicate the fund's strategy or adopt similar strategies, pushing up (down) prices of stocks the fund is holding (selling) and mitigating the fund's returns. This is potentially more harmful for funds that actively seek to beat the market and make profits from market misvaluation. Therefore, funds that focus on diversification and invest in a large number of stocks tend to suffer less. So do funds that focus on long term returns. Moreover, frequent disclosure requires additional paperwork that involves labor and material costs. This is mostly fixed cost and more costly for smaller funds. Voluntary disclosure is not always harmful. More disclosure can foster trust with investors and attract more investors.

Consistent with these tradeoffs, compliers tend to have smaller assets under management and hold fewer stocks shown in Table 6. In 2004Q1, the largest fund, measured by AUM, that was not affected by May 2004 regulation change is 'Dodge & Cox Stock Fund' which 'seeks long-term growth of principal and income' and primarily 'target(s) a diversified portfolio of U.S. equity

[19] https://www.sec.gov/rule-release/33-8393. Other related changes include requirements on the format of reports to shareholders. such as including "a tabular or graphic presentation of a fund's portfolio holdings by identifiable categories" and "Management's Discussion of Fund Performance". These also improve the quality of information disclosed to the public.

[20] Anecdotal evidence suggests that a wide range of investors pay attention to public disclosure such as 13F, N-CSR and N-Q (N-Port). An extreme case is that media and analysts care a lot about Warren Buffett's holdings https://www.wsj.com/finance/investing/warren-buffett-berkshire-hathaway-letter-2025-9c4530f8?st=1UyVYQ.

securities'. By contrast, the largest treated fund is 'Vanguard Health Care Fund' which invests 'solely within the health care sector'. In my sample, about 40% of mutual funds did not voluntarily disclose their holdings. Furthermore, as these funds are more likely to have private information about firm value. The enforcement of more disclosure is likely to release valuable information to the public including debt investors.

Overall, smaller and less diversified funds are less motivated to disclose their holdings in order to protect their strategies, which are likely to be more informative about firm value than funds willing to publicize their positions even without regulatory forces. This makes the regulatory change more effective in terms of information disclosure. This pattern could result from both fixed cost of paperwork and from avoiding information leakage. The former does not have a direct implication on the information produced. If the latter is true, our estimate would be the effect from more informed holdings, which is likely to be larger than the average effect. Note that this does not affect the explanation qualitatively, despite resulting in a coefficient with a larger magnitude than the disclosure of an average investor.

4.2.3 Data and results

Equity fund holdings are obtained from Thomson/Refinitiv S12 files. I identify affected funds by comparing their actual disclosure frequency to the number of quarters in a given period. This actual frequency is determined by how often mutual fund reportings are documented in S12 files. S12 files may not capture all N-CSR (N-Q) filings submitted to the SEC due to data input errors. Additionally, funds might also disclose positions on their own webpages or through other resources. To address this, I calculate reporting frequency over multiple years to avoid measurement errors for a single year. For funds classified as treated funds, they must satisfy the following two conditions: (1) $\frac{\#\ reporting}{\#\ quarter} \in [0.4, 0.5]$ from January 2001 to May 2004; (2) $\frac{\#\ reporting}{\#\ quarter} \geq 0.9$ from May 2004 to December 2006. Although quarterly disclosure became mandatory after 2004, S12 files do not capture all required filings as noted above. Therefore, I use condition (2) to filter for data collection errors. Funds with investment objective code of 1, 5, 6 or 7 are removed to focus on domestic equity funds. Index funds' holdings do not disclose much information about firm value because the composition of many major indices is public information[21]. Thus index funds are also dropped

[21] For example, one can find S&P 500 firms from Wikipedia.

from the sample[22]. Keeping index funds does not change the results. After identifying treated funds, I calculate the percentage of firms' shares held by these funds (MFExposure). The ownership of unaffected funds (MFShareNonTreat) and index funds (MFShareIdx) are also constructed for robustness checks.

4.2.4 Dynamic effects estimated using difference-in-differences

In this section, I analyze the dynamic effects of increased public disclosure of mutual fund holdings. I estimate dynamic treatment effect models in the following form at the semiannual frequency[23]

$$y_{it} - y_{i,2004S1} = \beta_t \overline{MFExposure}_{i,2001S1-2004S1} \times \sum_{\tau=2001S1,\tau\neq 2004S1}^{\tau=2007S2} \mathbf{1}\{t=\tau\} + \gamma_t + \theta_i + C'_{it}\eta + \epsilon_{it}, \tag{4}$$

where the treatment intensity $MFExposure_i$ is firm i's exposure to the regulatory change, measured by the percentage of firm i's shares held by treated mutual funds averaged during the pre-treatment period from 2001S1 (first half of year 2001) to 2004S1 (first half of year 2004). γ_t is time fixed effects, and θ_i is firm fixed effects.

As discussed in Section 4.2.2, treated funds and funds that voluntarily disclose holdings are different, and so are firms that are held more by treated funds and those that are held less. Firms with higher exposure to treated funds tend to be larger, more profitable, with fewer cash holdings, larger asset growth rate, smaller distance to target leverage and shorter investor horizon. Therefore, it is necessary to control for firm characteristics related to treatment and outcomes. C'_{it} denotes the vector of control variables[24]. It includes the same set of controls as in Equation (2). In addition, I

[22]Index funds are identified based on fund names in S12 files. Based on Appel, Gormley and Keim (2016), funds are classified as passive funds if their names include any of the following strings: "INDEX, IDX, INDX, IND_ (where _ indicates a space), RUSSELL, S & P, S AND P, S&P, SANDP, SP, DOW, DOW, DJ, MSCI, BLOOMBERG, KBW, NASDAQ, NYSE, STOXX, FTSE, MORNINGSTAR, 100, 400, 500, 600, 900, 1000, 1500, 2000, 5000". We exclude 'WILSHIRE' from Appel, Gormley and Keim (2016) because Wilshire also has non-passive funds during the sample period.

[23]Because it takes time for firms to issue debt and quarterly debt issuance exhibits seasonal fluctuations, I aggregate quarterly debt issuance to semiannual. Results using quarterly frequency are similar.

[24]I also implemented propensity score matching within each one-digit SIC industry, matching firms on profitability, size, asset growth, distance to target leverage, cash holdings, and investor horizon. Treatment firms are defined as those with MFExposure above the industry median, while the remaining firms serve as potential controls. Using one-to-one nearest-neighbor matching without replacement, I pair treatment and control firms based on logit propensity scores

control for illiquidity and market leverage. More frequent disclosure may influence debt issuance by enhancing the liquidity of firms' securities and reducing market leverage (mechanically, due to increases in market value) (Agarwal et al., 2015), rather than through debt investors' learning. Illiquidity is measured using Amihud (2002) illiquidity ratio based on price impact of trading flows. Finally, to address concerns that the results could be driven by changes in total institutional ownership—which is likely correlated with shares held by treated funds—I also include total institutional ownership as a control variable.

Consider two otherwise similar firms, where Firm A is held more heavily by affected funds. The regulatory change will trigger more frequent disclosure of Firm A's shareholder holdings. This increased transparency disseminates privately known information from informed investors, thereby enhancing debt investors' ability to infer the firm's fundamentals.[25] The disclosure regulation change does not necessarily motivates institutional equity investors to produce more information,[26] but it decreases the cost for debt investors to learn from holdings of informed equity investors even if the total amount of information produced by them remains constant. In other words, for a given amount of information known to institutional equity investors, when the cost of learning this information is lower, debt investors can learn more.

Figure 1 presents the dynamics coefficients estimated using Equation 4. The baseline period is the first half of year 2004 (2004S1). The outcome we are interested is corporate debt issuance $\Delta Debt$, presented in panel (a). The estimates are insignificant for $\tau = \{-6, -5, ..., -1\}$, so there is no evidence of differential pre-trends in how more treated firms adjust their debt issuance bonds relative to less treated ones.

The estimates start to rise in the second half year after the treatment and become significant at $\tau = 3$, indicating that firms more affected by the regulatory change issue more debt about 1 year after the treatment. This lag is expected because in practice, corporate debt issuance and debt investors' learning take time. Similarly, the coefficients do not continuously increase with time. This is because if the firm already increased its debt issuance last period, it needs less debt

while enforcing common support. The caliper width is chosen to ensure covariates are balanced at 5% significance level. I obtain similar results, but with larger confidence intervals due to a smaller sample.

[25] I also tried using the number of treated funds to measure treatment intensity. We also see a significant rise in debt issuance about six quarters after the treatment. The ownership intensity is preferred because it gives more variation in treatment intensity and captures funds' information production efforts due to skin in the game.

[26] The disclosure may discourage equity investors from producing more information due to the free-riding of other funds (Agarwal et al., 2015).

financing at least for a short period, resulting in gaps between periods with more debt issuance. The slight increasing trend since $\tau = 2$ may underestimate the effects of holdings disclosure on treated firms. Mutual fund managers may engage in window dressing around disclosure periods to conceal their strategies and prevent others from free-riding on their information. This mitigates the informativeness of shareholdings.

Panel (b) displays the results when the outcome is corporate bond yield. Similar to the timing of actual debt issuance, estimates for bond yields start to decline after the treatment and become significant at $\tau = 3$. The decline in bond yields is consistent with the demand driven story: debt investors, who demand debt securities, are willing to pay more for a given amount of debt purchased due to decreased uncertainty about firm value through learning, leading to lower cost of debt.

In Figure 2, I conduct two sets of falsification tests. First, instead of using the ownership of treated active mutual funds, panels (a) and (b) use the ownership of index funds and non-treated active mutual funds respectively. The estimates are much less significant and do not exhibit an increasing pattern post-treatment. In particular, if we look at panel (a), the estimate is (marginally) negative in the second period. This suggests that debt investors may substitute debts from firms that are not treated with those from firms that are treated. In fact, if we use total institutional ownership to replace $MFExposure$ and re-estimate Equation (4), the coefficients are always insignificant, consistent with substitution happening among firms held by different equity investors instead of an overall rise in debt capital supply.

Second, do these results arise from more disclosure or simply some random time trend related to the ownership of affected funds? To address this concern, panels (c) and (d) conduct falsification tests based on timing. Instead of using 2004S1 as the treatment period, I use 1997S1 and 2011S1 as fake treatment periods respectively. We do not see significant and persistent rise in debt issuance after treatment.

The specification in Equation (4) is based on the hypothesis that the holdings of informed equity investors provide valuable information to debt investors. However, if the efficient market hypothesis holds, price should fully reveal all information. Therefore, for equity investors' holdings to reveal additional information about firm value, it must be public information, including stock price, does not fully reveal all information known to equity investors. The prediction is that the results we document in Figure 1 should be stronger for firms with lower price informativeness. Figure 3 divide firms into different groups based on the informativeness of their prices, measured based on abnormal price changes around earnings announcements (Sammon, 2024) and the proportion of price movements explained by aggregate (industry) returns (Chen, Goldstein and Jiang, 2006). We can see that consistent with our hypothesis, estimates for firms with lower price informativeness (top panels) are stronger for those with higher price informativeness (bottom panels).

Public disclosure of equity mutual funds' holdings reveals the quality of firms, and decreases debt investors' uncertainty about firm values. Information embedded in mutual funds' holdings helps investors gauge the true level of firm value, benefiting well-performing firms. Besides, lower uncertainty also increases values of debt securities due to decreased downside risk. Panels (a) and (b) in Figure 4 illustrate that the positive effects are much stronger for firms with higher return on assets, consistent with the quality-revealing hypothesis. Panels (c) and (d) divide sample based on firms' information asymmetry proxied by idiosyncratic volatility. We can see the effects are more significant statistically for firms with high information asymmetry, consistent with the uncertainty mechanism.

Discussion on corporate bond holdings disclosure. A potential concern is that the regulatory change affects the entire mutual fund industry, encompassing both equity and fixed-income funds.[27] While this study focuses on domestic equity funds, the observed effects could theoretically stem from correlated disclosures by corporate bond funds. Specifically, firms with greater equity ownership by affected equity funds might also have higher bond ownership by affected bond funds, raising the possibility that debt investors learn from bond fund disclosures rather than equity fund disclosures.

However, this is unlikely to drive the results we find. First, equity holdings are more informative about individual firm valuation than bond holdings. The secondary market for stocks is significantly more liquid than for corporate bonds, suggesting limited information discovery simply based on holdings of bond. Most bonds (56%) traded between 11 and 50 times during the whole period from November 1999 to October 2000 (Harris and Piwowar, 2006). Second, primary market allocations in bond markets often reflect factors unrelated to firm values such as other investors' liquidity needs or underwriter relationships (Coppola, 2025). Therefore, bond holdingds

[27] Loan market is much less liquid and small in size (Cetorelli, La Spada and Santos, 2022)

are less informative about firms' fundamentals. Third, I conduct additional analysis using an indicator variable for whether firms had an S&P credit rating during the pre-treatment period. As only rated firms can issue public bonds, unrated firms should not be directly affected by corporate bond funds' disclosure changes. The insignificant interaction term between this rating dummy and MFShareTreat suggests no differential effect based on rating status (pre-treatment). This finding further undermines the alternative explanation that the results are driven by correlated disclosures from corporate bond funds rather than equity fund disclosures.

4.2.5 Effects estimated using difference-in-differences

In this subsection, I estimate the overall effect of the treatment on debt issuance. Given patterns illustrated in Figure 1, I turn to annual frequency and focus on one year before and after the event time. The empirical model is as follows

$$\Delta Debt_i^{post} - \Delta Debt_i^{pre} = \alpha + \beta \overline{MFExposure}_{i,2001S1-2004S1} + C_i' \eta + \epsilon_i, \tag{5}$$

where C_i is the vector of control variables same as in Equation (4). I use the average value of each of these controls three years before the treatment (2001S1 to 2004S1). Equation 5 is a weak version of DID in that we do not tease out all firm-specific time-invariant characteristics by including firm fixed effects. This setting is preferred because the average percentage of shares held by treated mutual funds is only 1%, with a standard deviation of 1%. Given this small magnitude, removing all firm time-invariant characteristics removes too much variation available to identify the information effects. Results are displayed in Table 7.

Column 1 implies that 5 percentage point increase in $MFExposure$ causes 4.2 percentage point (=0.05*3.065-0.111) rise in debt issuance. This is larger than baseline results in Table 3. However, these two magnitudes are not comparable because first, they are estimated using different samples; second, β estimated from Equation (2) captures more than the effects due to information disclosure. In untabulated results, if we replace $MFExposure$ with $InstShare$ in column 1, the coefficient is marginally significant (t-stat = 1.56) at 0.175. This suggests that the total amount of capital remains relatively stable. In other words, post the regulation change, capital is reallocated from non-treated firms to treated firms, and the combined effect is not salient. Overall, despite the estimate being the local effect of a particular regulation change, Table 3 suggests that information transmission through public disclosure is an economically important force.

Treatment intensity is not necessarily exogenous despite exogeneity of the regulation shock. Specifically, mutual fund ownership may be correlated with some omitted firm characteristics and debt issuance at the same time. To address this concern, columns 2 and 3 examine the result using shares held by non-treated mutual funds and index funds respectively (similar to panels (a) and (b) in Figure 2). The coefficients are insignificant. Column 4 includes all three types of shares, so the remaining portion (for comparison) consists of shares held by non-mutual-fund institutions. The coefficient on treated shares is still significant, while coefficients of the other two types of shares are not.

Columns 5 and 6 exploit the heterogeneity in the type of debts. Corporate loans are mostly issued by in private ways through banks. Therefore, loan lenders may possess a large amount of information about firms. Even though equity investors' information is unknown to this group of investors, the value-added is likely small to them compared to corporate bond investors who purchase bonds from the public market. Following Crouzet (2021), I measure the firm-level loans using the sum of two variables: notes payable (np) and other long-term debt (dlto) from Compustat.[28] Outstanding bonds are approximated using the remaining debt. Comparing the last two columns in Table 7, the effect is indeed stronger for non-loan debts (mostly bonds).

4.3 Discussion on information flows from debt to equity market

This paper examines the role of institutional equity investors in corporate debt issuance. While the reverse channel of equity investors learning from debt investors lies beyond the scope of this paper, I briefly discuss potential information flows from debt to equity markets to provide a more comprehensive perspective on cross-market information transmission.

First, I want to clarify that the information transmission mechanism discussed in previous sections does not require equity investors to possess an absolute information advantage over debt investors. Rather, it is only assumed that: (1) equity investors have some private information un-

[28]These two items are not available at the quarterly frequency in Compustat. np includes bank acceptances, bank overdrafts, and loans payable. dlto includes all revolving credit agreements, and construction and equipment loans. It excludes senior nonconvertible bonds, convertible or subordinate bonds. Both np and dlto include commercial paper outstanding.

known to debt investors, and (2) debt investors view institutional equity investors' signals about firm value as informative rather than pure noise. This assumption is well-grounded as institutional investors are documented to be informed traders as discussed in Section 3.

Second, while directly comparing the quantity of cross-market information transmission is challenging, institutional equity investors likely generate more information that is readily accessible to debt investors than vice versa. First, as shareholders equity investors benefit from both public disclosures and private communications with management, granting them superior access to firm-specific information. Second, the convex payoff structure of equity creates stronger incentives for information production. The higher benefit-cost ratio motivates equity investors to overcome fixed costs of conducting extensive research about firms' fundamentals that debt investors might find uneconomical. Third, because of riskiness of stocks, equity investors face more stringent disclosure requirements such as 13F filings. In addition, equity analysts, particularly those on the sell-side, regularly publish reports to inform clients and the public about investment opportunities. These reports are more prevalent and publicly accessible compared to those in the bond market. This coverage disparity arises because equity markets cater more to retail investors who demand analyst opinions to guide decisions, while bond markets remain predominantly institutional. Sell-side equity research, especially for investment banks or brokerages, also serves as an indirect revenue generator by attracting clients and facilitating trade execution.

Debt investors could also have information equity investors can benefit from (Ivashina and Sun, 2011; Addoum and Murfin, 2020). For example, banks have private information on firms' transaction history through their deposit relationships. However, it could be very costly to obtain due to operational and legal costs. Moreover, public disclosures of loan holdings are substantially more limited than equity holdings, which are subject to stringent SEC reporting requirements at least for large institutional investors. These constraints make it unclear whether equity investors could effectively learn from bank information sources at reasonable cost. In terms of bonds, although bond market information has become more accessible since the 2000s, the connection between bond holdings and firm fundamentals is not as tight as equity as discussed in Section 4.2.4.

What are the implications for previous findings if equity investors learn from debt investors? Consider the case where debt investors possess information indicating a firm is undervalued by the market. This increases demand for debt securities, inducing firms to issue more debt due to lower costs of debt. However, the impact on institutional equity shareholdings is not that straightforward. Institutional equity investors may purchase more of the firm's shares in response to higher expected firm value. However, the decrease in uncertainty due to information sharing decreases the value of equity that has with convex payoff as a function of firm value. Thus institutional equity shareholdings can decrease. The ultimate effect depends on the relative magnitude of each effect, which could vary across different aggregate conditions. Moreover, if this reverse information channel is quantitatively important, we should observe that higher institutional equity shareholdings predicts more equity issuance. This is because if higher institutional equity shareholdings are caused by learning from debt investors about good quality of firms, demand for firm shares should increase and we should see more equity issued. But this is not the case as shown in Section 3. This suggests that while such reverse information flows may exist, they are unlikely to drive the association between institutional ownership and debt issuance.

5 Equity Benchmarking

Benchmarking is widely adopted by institutional investors to evaluate managers' performance. Among mutual funds that compensate managers based on their performance, more than three quarters use certain benchmark (Ma, Tang and Gomez, 2019). Although previous studies have shown equity index inclusion leads to lower future stock return[29], it remains unclear how debt issuance is affected. The literature suggests that equity index inclusion increases investor demand for firms' shares (Pavlova and Sikorskaya, 2023). This could lead to more equity issuance due to higher valuation of firm stocks. Substitution between debt and equity financing would result in less debt issuance.

However, this overlooks the fact that equity investors are shareholders of firms, whose discount factor is used to price firms' projects: not only investment but also financing projects such as debt financing. Cash flows related to debt financing are risky in the presence of equity and debt issuance costs: debt repayment is more costly exactly when the firm is hit by negative shocks as firms may

[29] A traditional argument is that the passive demand should be arbitraged away, and should have no effects on firm value. However, this relies on two major assumptions. First, corporate cash flows are not affected by index inclusion. Second, there is no limit to arbitrage and firm stocks are perfectly substitutable. However, neither is doomed to hold (Collin-Dufresne and Fos, 2015; Koijen and Yogo, 2019).

not have enough internal funds to repay debt. When a firm's stock is included in some equity index, this effectively adds an extra demand for the firm's shares. Therefore, shareholders value each unit of firm cash flows more regardless of the risk. This decreases risk premium required by equity holders so risky projects' cash flows are discounted less. Therefore, for a given level of debt price, the firm is more inclined to issue debt with reduced concern over costs associated with debt repayment. In other words, the supply curve of debt (securities) shift to the right, resulting in more debt issuance in equilibrium [30]. Recall that impacts of equity index inclusion on equity issuance are mostly driven by an upward shift in demand curve for firm shares. Thus we have different implications on cost of stock versus cost of debt. The former is demand driven so costs of stock (price of stock) decrease (increase), while costs of debt rise because of increased supply.

In this section, we show that institutional equity shareholdings lead to more debt issuance due to equity benchmarking by estimating the local average treatment effects (LATE) using benchmarking intensity (Pavlova and Sikorskaya, 2023) as instrumental variable.

5.1 Benchmarking intensity

Institutional equity shareholdings are equilibrium outcomes of firm and investor characteristics. To empirically show that equity index benchmarking is one mechanism via which institutional equity shareholdings affect debt issuance, we need to extract variation in institutional equity shareholdings that comes from equity index inclusion. Previous studies have used Russell 1000/2000 cutoff as instrument for passive ownership (Appel, Gormley and Keim, 2016, 2019). However, this instrument has low power in the first stage when the variable to be instrumented is overall institutional equity ownership (Appel, Gormley and Keim, 2020).

To solve this, we use the benchmarking intensity (BMI) measure constructed by Pavlova and Sikorskaya (2023)[31]. The idea is that index inclusion dummy used in previous studies only takes two values, 0 and 1, so the variation is too small to be a strong instrument for overall institutional ownership. BMI introduces more variation by aggregating all demand from equity mutual funds

[30] See Appendix J for the proof on the effect of equity index inclusion on debt issuance based on the model presented in Section 6.

[31] We obtain this measure from authors' website.

and ETFs that track equity indexes. Specifically, the definition is given in Equation 6.

$$BMI_{it} = \frac{\sum_{j=1}^{J} \lambda_{jt} w_{ijt}}{MV_{it}} \tag{6}$$

where λ_{jt} is the AUM of mutual funds and ETFs benchmarked to index j in month t. w_{ijt} denotes the weight of stock i in index j in month t. MV_{it} is the market capitalization of stock i in month t.

Heuristically, BMI measures the percentage of a firm's market value held by mutual funds and ETFs due to indexing and benchmarking demand[32]. Replacing the weight w_{ijt} with its definition, we have

$$BMI_{it} = \sum_{j=1}^{J} \frac{\lambda_{jt} 1_{ijt}}{IndexMV_{jt}} \tag{7}$$

where 1_{ijt} equals 1 if stock i belongs to index j at time t, 0 otherwise. $IndexMV_{jt}$ denotes the total market capitalization of all stocks in index j at time t.

λ_{jt} and $IndexMV_{jt}$ terms are plausibly exogenous to characteristics of individual firm i, especially after we exclude mega firms such as the 'magnificent seven' in 2020s [33]. Therefore, part of the variation in BMI is already exogenous, and the only term that is related to individual firm characteristics is 1_{ijt}. To deal with the endogeneity of 1_{ijt}, we must find exogenous variation in index inclusion. This is where the Russell 1000/2000 cutoff can help.

The Russell indexes are reconstituted every June. All eligible stocks are ranked based on their market cap value on a fixed date in May[34]. The top 1000 stocks are assigned to Russell 1000 in June, and stocks ranking 1001-3000 are assigned to Russell 2000[35]. This is where the exogenous assignment kicks in. Because the assignment is based on stock market cap on one specific date, any noise or idiosyncratic shock can move a stock from the left of the cutoff to the right or the other way around. This process is plausibly random. For example, firms that rank 999th and 1001st are

[32] Active and passive shares are treated equally.

[33] The Magnificent 7 is a group of major tech companies with stock growth that, on average, far outpaced the high-performing S&P 500 over the past decade, and particularly in 2023 and 2024. The group consists of Alphabet, Amazon, Apple, Meta Platforms, Microsoft, Nvidia, and Tesla.

[34] The exact date varies in different years, but the key is that the rank day is only one day instead of a window consisting of several days.

[35] FTSE Russell introduced banding policy in 2007 to mitigate unnecessary turnover between indexes, so the change in a stock's ranking has to pass certain threshold for it to be reassigned. See https://www.lseg.com/content/dam/ftse-russell/en_us/documents/ground-rules/russell-us-indexes-construction-and-methodology.pdf.

likely similar. However, they receive very different amount of passive demand because they are included in different indexes. As implied in Equation 7, BMI is affected in two ways: (1) stock membership in indexes, (2) and the ratio between AUM and IndexMV. If we focus on Russell 1000 and 2000, what drives the differences in BMI of firms to the left of the cutoff and those to the right of the cutoff is that the ratios between AUM and market cap of indexes differ. Russell 1000 constitutes a much larger market cap than Russell 2000, accounting for about 94% of Russell 3000 index as of April 2023[36]. Overall, BMI for firms to the left of the cutoff is significantly smaller than those to the right as shown in Pavlova and Sikorskaya (2023). This validates the relevance condition for instrument variable estimation.

5.2 Empirical results

In this subsection, I use BMI as the instrument variable and estimate local average treatment effects of institutional equity shareholdings on firms' financing choices.

To address endogeneity concerns related to the index inclusion dummy 1_{ijt} in BMI, I exploit the Russell 1000/2000 index reconstitutions as previously discussed. Following Pavlova and Sikorskaya (2023), firms are ranked by market capitalization in May[37]. The analysis focuses on observations near the cutoff (using a rectangular kernel). Due to the availability of the BMI measure, the sample period spans 1998 to 2018.

Ideally, we want to compare firms within a very small bandwidth around the cutoff to maximize comparability. However, an excessively small bandwidth would severely reduce sample size and weaken identification power. As a trade-off, I adopt a default bandwidth of 400 stocks around the cutoff (Ben-David, Franzoni and Moussawi, 2019). To further mitigate potential endogeneity in index inclusion, I include controls for the determinants of index inclusion, following prior studies using Russell 2000 index membership as an instrument (Pavlova and Sikorskaya, 2023; Ben-David, Franzoni and Moussawi, 2019; Appel, Gormley and Keim, 2016). Specifically, I control for the logarithm of stock market cap in May used for ranking, the distance to rank 1000, and banding controls to adjust for the banding policy adopted since 2007. The banding controls

[36]https://www.lseg.com/en/ftse-russell/indices/russell-us/russell-1000

[37]While I do not have lack access to Russell's proprietary market capitalization data, I follow Ben-David, Franzoni and Moussawi (2019) to adjust the market value calculated using CRSP to approximate Russell's calculations.

include dummies for being in the band, being in the Russell 2000, and their interaction in May of the previous year. I further incorporate the baseline controls in Section 3, and include both firm and year fixed effects. Therefore, the identification relies on cross-sectional variation in index inclusion interacted with the ratio of fund AUM to index market capitalization, after accounting for time-invariant firm characteristics. Importantly, this approach differs from relying solely on index inclusion switches, as it additionally captures variation stemming from differences in fund and index sizes.

The first stage regression is

$$InstShare_{it} = \beta_0 BMI_{it} + \xi_0 C'_{it} + \gamma_{0t} + \theta_{0i} + \epsilon_{it}.$$

The second stage is

$$\Delta Debt_{it} = \beta \widehat{InstShare}_{it-1} + \xi C'_{it-1} + \gamma_{0t} + \theta_i + \nu_{it}.$$

Table 8 displays the results. In panel (a), columns 1 to 4 show that higher institutional equity shareholdings lead to more debt and equity issuance through equity benchmarking, especially in the intensive margin. Equity benchmarking affects the stock market through increased supply of capital from equity investors, whereas it affects the debt market via increased demand for debt capital from firms. This predicts a lower expected stock return but higher costs of debt in response to being included in Russell 2000. Indeed column 5 shows that future stock return decreases. The average increase in BMI due to Russell 200 inclusion is 1.526, thus column 5 implies that inclusion in Russell 2000 leads to 2.75% (=1.526*0.018) rise in annual stock return, close to 2.8% estimated in Pavlova and Sikorskaya (2023). Column 6 examines the results for bond yield. The coefficient is positive as expected, but it is insignificant. The low significance could be due to a smaller sample size.[38]

The last two columns examine how equity benchmarking affects the maturity of firms' debt. In column 7, the dependent variable is the logarithm of the ratio between long term debt (maturity

[38]The associated first stage F-stat is smaller than other results, and it does not pass the Anderson-Rubin weak instrument test. In addition, bond yield is only one part of debt financing costs. For example, issuance costs and costs associated with fulfilling covenant requirements are not included.

larger than 1 year) and total debt. In column 8, the dependent variable is the logarithm of the ratio between long term debt (maturity longer than three years) and total debt. If the impact of equity benchmarking on debt issuance is through the risk premium channel, debt with longer maturity should benefit more.[39] The results support this hypothesis: greater institutional equity ownership leads to a shift in the debt term structure toward longer maturities.

Panel (b) examines alternative mechanisms. Columns 1 to 3 test the information channel by analyzing the interaction between institutional shareholdings and proxies for information asymmetry (instrumented). All interaction terms are insignificant, suggesting that information sharing from passive investors is unlikely a driving force. Existing studies have documented that index inclusion affects stock liquidity and volatility. These might affect debt issuance not through the risk premium channel. To address this concern, columns 4 and 5 control for contemporaneous liquidity (proxied by Amihud illiquidity measure (Amihud, 2002)) and total volatility respectively. The coefficient is barely affected.

A potential concern is that the Russell 1000 and 2000 indexes represent only part of BMI construction, meaning that index transitions could potentially reflect membership changes in other benchmarks. First, both indexes are among the most widely followed benchmarks, likely dominating other index effects. For example, Pavlova and Sikorskaya (2023) show that the split of shares between Russell value and growth indexes does not strongly affect changes in BMI around the Russell cutoff. Second, as the sample is restricted to firms close to a cutoff, changes in the membership of other indexes are less likely. Third, the goal of this exercise is not to identify the effects of Russell 2000 inclusion. Instead, what we need is an exogenous shock in passive ownership, regardless of the source. Lastly, including firm characteristic controls further addresses potential confounding factors.

6 Model

The economy consists of a representative firm and a continuum of investors. Equity and debt markets are segmented: Equity investors only invest in corporate shares, and debt investors only invest

[39]More precisely, the positive effect should be strongest for debt instruments most sensitive to changes in borrowing costs.

in corporate debt. This segmentation fits this paper's findings that emphasize distinct information sets of debt and equity investors, and is consistent with the actual behaviors of investors. [40]

The equity market has two types of equity investors. One is institutional investors who choose the amount of consumption and the number of shares to invest to maximize lifetime utility. The other is retail investors who are assumed to have an infinitely elastic demand for shares. For the debt market, debt investors live for two periods. They are assumed to deviate from agents with full information rational expectations. Instead they update their beliefs about firm future value through Bayesian updating after observing signals produced by equity investors. The exact belief formation process will be discussed later.

In this economy, institutional shareholding relates to debt financing mainly through three mechanisms. First, firm fundamentals affect both institutional ownership and debt issuance simultaneously. For the former, it is because equity price enters investors' budget constraints, while for the latter, corporate cash flows affect both the marginal costs and marginal benefits of debt financing. Second, debt investors form their beliefs about firm value using information generated by institutional equity investors. In particular, higher institutional ownership indicates that more information is produced by equity investors. Therefore, this channel predicts that higher institutional ownership benefits debt issuance. Third, institutional equity ownership directly affects the discount factor used to price corporate cash flows due to the additional demand introduced by equity benchmarking. This demand is independent of corporate cash flows and only depends on the distance between investors' shareholdings and the target shareholdings (Kashyap et al., 2021).

6.1 Equity Investors

In this subsection, I describe behaviors of the equity supply side, i.e. investors in the equity markets. In this economy, equity investors only invest in equity, while debt investors only invest in corporate bonds and an exogenous riskless investment opportunity. This captures previous empirical findings that debt investors do not have the same information sets as equity investors. This assumption is also consistent with the fact that equity and debt markets are not fully integrated

[40] For example, most mutual funds only invest in one asset class. The literature has also documented that market segmentation is prevalent, which is also indicated by the relatively weak link between prices of debt and equity securities of the same firm (Ma, 2019; Greenwood, Hanson and Liao, 2018; van Binsbergen, Brandt and Koijen, 2012)

in the US market (Sandulescu, 2019; Ma, 2019; Chen, Chen and Li, 2023). In 2021, only 10.3% of mutual funds' total net assets were held by balanced funds that invest in both equity and debt securities (Parker, Schoar and Sun, 2023)[41].

The economy has two types of equity investors with a total measure of 1: institutional investors of measure μ^I and retail traders of measure $1-\mu^I$. Retail investors have infinitely elastic demand and purchase shares at the prevailing price. They have no price impact and can be regarded as liquidity providers (Laarits and Sammon, 2024; Gabaix et al., 2023; Drechsler, Moreira and Savov, 2020).[42]

As the economy only has two types of equity investors, the distribution of investors in the equity market is fully captured by s_t^I, i.e. the shares held by institutional equity investors. Denote exogenous states by $\Theta_t \equiv \{z_t, f_t\}$.

Institutional investors maximize their lifetime utility taking prices as given

$$\begin{aligned} V_t(b_t^I; \Theta_t, s_t^I) = \max_{s_{t+1}^I, c_t} log(c_t) + \beta E[V_{t+1}^i(b_{t+1}; \Theta_{t+1}, s_{t+1}^I)], \qquad (8) \\ s.t.\ c_t + s_{t+1}^I(P_t - e_t) + \phi_s(s_{t+1}^I - \bar{s})^2 = I(z_t) + s_t^I P_t + cb_t\tau, \\ I(z_t) = \gamma_1 e^{\gamma_2[log(z_t) - log(\mu_z)]}, \end{aligned}$$

where $I(z_t)$ represents income from sources other than equity investment that is not explicitly modeled. For example, it captures investors' labor income.

Equity index benchmarking is captured by the term $\phi_s(s_{t+1}^I - \bar{s})^2$. As the economy only has one firm, $\bar{s}$ represents the share that the market index portfolio requires. This assumes symmetric punishment for deviation from the index portfolio. We could allow for more (less) punishment for higher shareholdings, but there is no clear advantage of doing this for the purpose of this

[41]Why market segmentation arises in the first place? One explanation is that due to agency and informational problems, investors are only willing to give asset managers the discretion to adjust their portfolios quickly if the manager accepts a narrow, specialized mandate (Greenwood and Vayanos, 2014). Pension funds invest in both fixed income and equity funds. However, a large portion of pension funds are funds of funds. In other words, pension funds purchase specialized equity and fixed income funds managed by other investment companies instead of doing portfolio management themselves. Moreover, because pension funds and insurance companies are subject to stricter mandates on the type of assets and transactions they can make, the capital movements among funds within their portfolio combination are still slow.

[42]Retail investors are not modeled as noise traders in the sense of Kyle (1985). Retail investors' trading does not directly depend on information on equity value similar to noise traders in Kyle (1985), but their demand function is infinitely elastic different from noise traders whose demand is inelastic.

paper. In particular, $\phi_s(s_t - \bar{s})^2$ aims to capture inelastic demand due to investment mandate, so introducing this one more parameter to calibrate does not add more economic insights but requires extra moments sensitive to this asymmetry. The current modeling is consistent with Pavlova and Sikorskaya (2023) and Kashyap et al. (2021) [43].

Effects of benchmarking on debt financing. Benchmarking affects shareholders' budget constraints and therefore valuation of corporate cash flows. To understand how this affects debt financing, let's look at the trade-off of institutional investors, summarized by first order condition and Envelope condition below

$$\frac{1}{c_t}(P_t - e_t + \phi_s(s_{t+1} - \bar{s})) = \beta E_t[V_s(t+1)],$$
$$V_s(t) = \frac{1}{c_t} P_t.$$

Reorganization give

$$1 = E_t\left[\beta \frac{c_t}{c_{t+1}} \frac{1}{1 + \frac{\phi_s(s_{t+1} - \bar{s})}{P_t - e_t}} R^s_{t+1}\right] \tag{9}$$

When $s_{t+1} < \bar{s}$, SDF is larger than the traditional value ($\phi_s = 0$). Intuitively, for firms inside a benchmark, their cash flows are discounted less by shareholders when investors' shareholdings are smaller than the target value $\bar{s}$.

From the firm's first order condition below (Equation 12), the net present value of issuing b_{t+1} amount of debt is

$$NPV = (1 - \frac{\partial \Psi^d_t}{\partial d_t}) \left(q_t + \frac{\partial q_t}{\partial b_{t+1}} b_{t+1}\right) - E_t\left(M_{t,t+1}[(1 + c - c\tau)(1 - \frac{\partial \Psi^d_{t+1}}{\partial d_{t+1}})]\right).$$

The difference in the NPV of issuing b_{t+1} amount of debt with and without benchmarking is there-

[43] For example, Pavlova and Sikorskaya (2023) show that equity benchmarking implies that the demand for shares is a linear combination of index share and the optimal share without benchmarking. If the index share $\bar{s}$ is high, investors want to hold more than the ordinary case, and if $\bar{s}$ is low, they want to hold less.

fore

$$NPV - NPV_{\phi_s=0} = (1-\frac{\partial \Psi^d_t}{\partial d_t})\left(q_t + \frac{\partial q_t}{\partial b_{t+1}} b_{t+1}\right) - (1-\widehat{\frac{\partial \Psi^d_t}{\partial d_t}})\left(\hat{q}_t + \widehat{\frac{\partial q_t}{\partial b_{t+1}}} b_{t+1}\right)$$
$$+ E_t\left(\beta \frac{c_t}{c_{t+1}} \frac{1}{1+\frac{\phi_s(s_{t+1}-\bar{s})}{P_t - e_t}} [(1+c-c\tau)(1-\frac{\partial \Psi^d_{t+1}}{\partial d_{t+1}})]\right)$$
$$- E_t\left(\beta \frac{\hat{c}_t}{\hat{c}_{t+1}} [(1+c-c\tau)(1-\widehat{\frac{\partial \Psi^d_{t+1}}{\partial d_{t+1}}})]\right).$$

If $NPV - NPV_{\phi_s=0} > 0$, benchmarking increases the value of debt financing projects and hence contributes to more debt issuance. Assuming endogenous variables $c_t,\ c_{t+1}$ and d_t have the same values as $\hat{c}_t,\ \hat{c}_{t+1}$ and $\hat{d}_t$, the difference then comes from (1) the level of $\frac{1}{1+\frac{\phi_s(s_{t+1}-\bar{s})}{P_t-e_t}}$, and (2) the covariance between $\frac{1}{1+\frac{\phi_s(s_{t+1}-\bar{s})}{P_t-e_t}}$ and debt repayment costs in the next period $(1+c-c\tau)(1-\frac{\partial \Psi^d_{t+1}}{\partial d_{t+1}})$.

The former lowers the discount for each unit of cash flow when shares held are smaller than the target value. Hence the present value of negative cash flows associated with debt financing (future debt repayment and related equity issuance costs, if any) is larger. This predicts a negative relation between debt issuance and benchmarking when s_{t+1} is smaller than the target value. However, due to the introduction of an additional less elastic demand (captured by $\frac{\phi_s(s_{t+1}-\bar{s})}{P_t-e_t}$), benchmarking also decreases the covariance between the discount factor and debt issuance costs, reducing the present value of debt repayment costs. This is because costs associated with debt financing consist of first the debt repayments, and second equity issuance (negative dividend) costs incurred by the repayments. Compared to consumption c_{t+1} which directly relies on corporate dividends at $t+1$ and hence the second payment, the additional term $\frac{\phi_s(s_{t+1}-\bar{s})}{P_t-e_t}$ introduced by benchmarking has a lower correlation with debt cash flows.

The overall effect depends on the relative magnitude of changes in the level versus covariance of SDF. When firms' cash flows are risky and equity issuance costs are non-negligible, the covariance effects tend to dominate. This is supported by our empirical results using benchmarking intensity as an instrument, which find that higher benchmarking intensity leads to more debt issuance.

6.2 Firm

The economy has a representative firm with the profit function of $F(z_t, f_t) = z_t - f_t$[44]. The evolution of fixed costs f_t follows a three-state Markov process. For parsimony, I assume that the Markov transition matrix is derived from the discretization of an AR(1) process $logf_{t+1} = (1-\rho_f)f + \rho_f logf_t + \sigma_f \epsilon_{f,t}$. The variable z_t is the idiosyncratic revenue of the firm and the logarithm of it follows an AR(1) process

$$logz_{t+1} = \rho_z logz_t + \sigma_z \epsilon_{z,t}.$$

Apart from internal funds from operations $F(z_t, f_t)$, firms can also use external financing including debt and equity issuance. The debt is a one-period debt (Cooley and Quadrini, 2001), and repayments are made in the next period upon solvency.

For tractability, I assume that the default probability of the representative firm is zero. Specifically, the firm exercises self-discipline and does not borrow more than $\bar{b}$ to maintain solvency, which is large enough that it does not bind. This assumption is similar to the credit rationing constraint used in DeAngelo, DeAngelo and Whited (2011). The difference is that instead of a constraint imposed by lenders, my assumption is based on the firm's risk management. Because there is no de facto bankruptcy cost, creditors' and shareholders' interests are aligned in the sense that the firm owner always tries to maximize the total firm value.

The economy has one representative firm, and the implication is that the investment mandate associated with this single firm has non-negligible effects on the discount factor derived from equity investors' problem. This is motivated by the equity benchmarking results presented in previous sections. [45]

[44]Suppose the firm's production function is $y_t = \tilde{z}_t k_t^\alpha$, where y_t is output, $\tilde{z}_t$ reflects shocks to demand, input prices, or productivity. k_t is flow input (e.g. rented capital), p_{kt} is the input (rental) price of k_t which is exogenously given. $\alpha < 1$ denotes returns to scale. The inverse demand function is $p_t = D_t y_t^{-1/\epsilon}$. Then the firm's profit is given by $\max_{k_t} p_t y_t - p_{kt} k_t - f_t$. Solving this gives a profit function of the form $F(z_t, f_t) = z_t - f_t$.

[45]An alternative setup commonly used in the literature is an economy with a continuum of firms (Bordalo et al., 2021). However, with a large number of firms that are highly substitutable, benchmarking of one firm's stock does not affect the discount factor. In untabulated exercises, I experimented with introducing 30 and 60 additional firms to the economy assuming investors' exposure to these firms takes the form of $e^{-\gamma_j \Delta z_j}$ following the production-based asset pricing literature (Zhang, 2005). In this economy, the firm will issue more debt. As information transmission decreases per unit debt financing costs, this implies the information channel has larger quantitative effects. As for the benchmarking channel, adding more firms to investors' portfolio makes the impact of benchmarking a single firm on SDF smaller. The effects of introducing more firms are mostly quantitative, and the key takeaways do not change.

The firm pays out dividends to shareholders if they have positive cash flows after debt issuance (repayment), otherwise they have to issue equity to provide external funds to meet operational needs given non-default. I do not explicitly model share issuance since it is not the focus of this paper, instead equity financing costs take the form below following the literature (Hennessy and Whited, 2005; Jermann and Quadrini, 2012).

$$\Psi^d(d_t) = \psi_d |d_t| 1_{\{d_t<0\}},$$

which captures capital gain taxes, adverse selection, underwriting fees, etc.

Therefore, in each period, the firm's distributions to existing shareholders e_t is net equity payout d_t minus equity financing costs Ψ^d_t

$$e_t = \underbrace{d_t}_{\text{Net payout}} - \underbrace{\Psi^d_t}_{\text{Equity issuance costs}}, \tag{10}$$

$$where\ d_t = \underbrace{(1-\tau)(z_t - f_t)}_{\text{Profits}} - \underbrace{(1+c)b_t}_{\text{Debt repayment}} + \underbrace{q_t(b_{t+1})b_{t+1}}_{\text{Debt issuance proceeds}} + \underbrace{cb_t\tau}_{\text{Tax benefits}}.$$

Debt investors' inverse demand function $q_t(b_{t+1})$ is derived from debt investors' portfolio choices (see Section 6.3).

Firm's Optimization Problem. The firm determines debt issuance and net payout to maximize shareholders' value, i.e. the present value of all future dividends distributed to shareholders.

The firm's optimization problem is

$$\begin{aligned} P_t(b_t; \Theta_t, s^I_t) = \max_{b_{t+1}} d_t - \Psi^d_t + E_t[M_{t,t+1}P_{t+1}(b_{t+1}; \Theta_{t+1}, s^I_{t+1})], \\ s.t. d_t = (1-\tau)(z_t - f_t) - (1+c)b_t + q_t b_{t+1} + cb_t\tau, \\ \Psi^d(d_t) = \psi_d |d_t| 1_{\{d_t<0\}}, \\ b_{t+1} \le \bar{b}. \end{aligned} \tag{11}$$

The function $P_t(b_t; \Theta_t, s^I_t)$ is the cum-dividend market value of the firm's equity. $M_{t,t+1}$ is the stochastic discount factor derived from the institutional investor's optimization problem. Retail investors have infinitely elastic demand, so effectively their discount factor does not affect firm value. This is justified by the scattered trading and the lack of voting power of retail investors. Although all traders' SDF must price equity and generate the same price due to the law of one price, trading of retail investors is much more scattered so institutional investors are more likely to be the 'marginal' investor on average over time. From corporate governance perspective, institutional investors on average are more capable of engaging in corporate management, because of their connections with firm managers or their concentrated shareholdings.

Debt issuance decisions. The model does not have a closed-form solution, but we can inspect the forces driving firms' debt financing decisions using the first order condition with respect to debt issuance b_{t+1} (assuming interior solution):

$$(1-\frac{\partial\Psi_t^d}{\partial d_t})\left(q_t+\frac{\partial q_t}{\partial b_{t+1}}b_{t+1}\right)=E_t\left(M_{t,t+1}[(1+c-c\tau)(1-\frac{\partial\Psi_{t+1}^d}{\partial d_{t+1}})]\right). \tag{12}$$

The firm benefits from debt issuance due to extra funds raised that (1) increase current dividend and (2) avoid (or decrease) equity issuance costs. However, more debt issuance obliges firms to pay back principal and coupon in the next period which (1) directly decreases next period dividend due to debt repayment and (2) can incur future equity issuance costs.

6.3 Debt Investors

There is a continuum of identical debt investors in the debt market.

Learning process of debt investors. Debt investors do not know the true future value of the firm for given states. This could be because they are irrational (or bounded rational) or do not have full information about future firm value. I do not take a stand in this paper.

Debt investors have priors about firm value. They observe signals produced by institutional investors, and update their beliefs based on these signals. Institutional equity investors produce information about firm value, while retail investors are noisy traders whose transactions are scattered (small each time) and contain no information. Two assumptions are made. First, institutional shareholders' belief about firm value equals the true firm value $P_{t+1}(\Theta_{t+1}|\Theta_t, s_{t+1}^I, b_{t+1})$ plus a measurement error term η_t^e (Assumption 6.1). Second, debt investors Bayesian update their beliefs about future firm value after observing signals produced by equity investors (Assumption 6.2)[46].

[46]Depending on the terminology one prefers, we could also say debt investors apply Kalman filter to update their

Assumption 6.1. *Institutional investors' belief about future firm value is* $P^e_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) = P_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) + \epsilon_t$*, where* $\epsilon_t \sim Normal(0, \rho_\epsilon^{-1})$*. Their belief is consistent with the current transaction price such that*

$$P_t = d_t + E_t[M_{t,t+1}P^e_{t+1}].$$

The measurement error ϵ_t *realizes at time t, so* $\epsilon_t = P^e_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) - P_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1})$ *represents the misvaluation of equity investors at time* t*.*

Note that the true firm value *for a given state* Θ_{t+1}, $P_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1})$ is a constant. Equity investors make investment decisions based on their beliefs about firm value in the next period, but they have measurement error η^e_t that is formed at the beginning of period t. Therefore, $P^e_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1})$ is also a constant *for a given state*.

Assumption 6.2. *Debt investors update their beliefs about future firm value using Bayes' rule. Their prior is* $P^b_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) = P^e_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) + e_t \sim N(P^e_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}), \rho_{et}^{-1})$*. They receive signal about firm value produced by institutional equity investors* $\eta(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) = P^b_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) + \eta^b_t \sim N(P^b_{t+1}, \rho_{bt}^{-1})$*. Combining the prior and signal, debt investors update their beliefs on future firm value state by state.*

The functional form of ρ_{bt} is below.

Signal production. Each institutional equity investor produces information about firm value and generates a signal η^b_t to debt investors. The more they hold firms' equity, the more capable and motivated they are to produce precise information (Collin-Dufresne and Fos, 2015). The precision of η^b_t is produced using a CES-type technology.

$$\rho(s^I_t) = \nu(\int_0^{\mu_I} (s^I_{it})^\rho di)^{\frac{\zeta}{\rho}},$$

where ζ represents the return to scale, $\frac{1}{1-\rho}$ represents elasticity of substitution and ν guages the level of precision. I assume $\rho = 1$ so that s^I_i's are perfect substitutes. Since all institutional equity investors are identical, $s^I_{it} = s^I_t$. This gives Proposition 6.3, which captures the idea that when

beliefs.

institutional equity ownership is higher, more precise information is produced about future firm value.

Proposition 6.3. *The precision of the signal produced from the CES production function is* $\rho_{b,t}^{-1} = (\mu_I s_t^I)^{\zeta}$.

Belief updating. Debt investors' beliefs are updated according to Bayes' rule, and thus the perceived distribution of future firm value after receiving the signal η_t is[47]

$$
\begin{aligned}
& P_{t+1}^b(\Theta_{t+1}|\Theta_t, s_{t+1}^I, b_{t+1})|\eta_t \sim N(\tilde{\mu}_t, \tilde{\rho}_t^{-1}), \\
\text{where } \tilde{\mu}_t = & \frac{\rho_{e_t}}{\rho_{e_t}+\rho_{b_t}} P_{t+1}^e + \frac{\rho_{bt}}{\rho_{et}+\rho_{bt}}\eta_t \equiv \varrho_t^e P_{t+1}^e + \varrho_t^b \eta_t \\
& \tilde{\rho}_t = \rho_{et} + \rho_{bt}.
\end{aligned}
$$

Therefore, the payoff of each unit of debt perceived by debt investors is[48]

$$
y_{t+1}(\Theta_{t+1}|\Theta_t, s_{t+1}^I, b_{t+1}) = \begin{cases} 1+c & \text{with probability } \pi_{lt+1} \equiv \pi(P_{t+1}^b \leq 0|\Theta_{t+1}, \Theta_t, s_{t+1}^I, b_{t+1}), \\ \xi(1+c) & \text{with probability } 1-\pi_{lt+1}. \end{cases}
$$

This gives debt investors' perceived default probability as in Proposition 6.4.

Proposition 6.4. *Based on Assumptions 6.1, 6.2 and Proposition 6.3, the perceived default probability can be approximated by*

$$
\pi_{lt+1} \approx \delta_{0t} - \delta_{1t}(\mu_I s_t^I)^{\tilde{\zeta}}. \tag{13}
$$

The exact form of δ_{0t}, δ_{1t} and the proof can be found in the Appendix F. Intuitively, δ_{0t} captures the perceived default probability if debt investors learn nothing from institutional equity shareholdings. δ_{1t} is the sensitivity of the perceived default probability to changes in the precision of the signal.

Debt investors' portfolio choice. Debt investors have mean-variance utility and live for two periods as in the overlapping generation model (Greenwood and Vayanos, 2014). The two-period

[47] The model does not distinguish between information asymmetry and irrational expectation, i.e. biased belief given information set.

[48] Debt price is not fully revealing because all debt investors receive the same signal.

investor horizon reflects the shorter maturity structure of corporate debt relative to equity, consistent with observed debt market characteristics. Each period the economy has two types of debt investors: the first and second generations. The first generation is born in the current period. They have an endowment W_t and face two investment options: one is a risk free asset with return R_{ft}, and the other is corporate debt. Investors allocate their portfolio to maximize expected utility over terminal wealth W_{t+1} realized in the next period. The second generation was born one period prior. In the current period, they receive debt payouts, consume the proceeds, then exit the market. In each period, the population measure of each generation is normalized to unity.

The portfolio choice problem of (the first generation) debt investors is as follows:

$$\max_{b_{t+1}} E_t[W_{t+1}|s_t^I, b_t, \Theta_t] - \frac{\alpha}{2} Var_t[W_{t+1}|s_t^I, b_t, \Theta_t],$$
$$s.t.\ W_{t+1} = (W_t - q_t b_{t+1})R_{ft} + b_{t+1}y_{t+1} = W_t R_{ft} + b_{t+1}(y_{t+1} - rq_t)$$

where y_{t+1} represents the actual payoff in period $t+1$. If the firm never defaults, $y_{t+1} = 1+c$ under rational expectation. y_{t+1} captures not only interest and principal payments, but also other related expenses such as covenant (monitoring) costs[49] that increase with the amount of debt issued. I assume that R_{ft} equals $\frac{1}{E_t[M_{t,t+1}(1+c)]}$. This arises from informed competitive primary dealers who trade riskless assets but have the option to enter the corporate bonds market[50].

This gives us the inverse demand function

$$q_t = -\gamma_{0t} b_{t+1} + \gamma_{1t}, \tag{14}$$

where $\gamma_{0t} \equiv \frac{\alpha Var_t}{R_{ft}} = \frac{1+c}{R_{ft}} \alpha \tilde{\pi}_{lt}(1-\tilde{\pi}_{lt})(1+c)(1-\xi)^2$, $\gamma_{1t} \equiv \frac{E_t}{R_{ft}} = \frac{1+c}{R_{ft}}(1-\tilde{\pi}_{lt}(1-\xi))$, where $\tilde{\pi}_{lt} = \sum_{S_{t+1}} \Pi_{ij}\pi(S_{t+1})$. γ_0 captures the disutility from variance. For a given level of debt purchased, a higher variance discourages investors from paying a high price q_t, leading them to demand a higher yield. γ_1 captures the utility gain from higher expected level of payoff. For a given level of debt purchased, higher expected payoff incentivizes investors to pay a higher price q_t and thus demand lower yield.

Equilibrium outcome in the debt market. Within each period, the firm and (the first genera-

[49]From the firm's perspective, this would include costs associated with complying with covenants.
[50]The competitiveness implies that the fair value of corporate bonds are priced at shareholders' pricing kernels.

tion) debt investors play a sequential game. At the very beginning of each period, investors submit a demand schedule[51], i.e. $q_t(b_{t+1})$. Knowing this demand schedule, firms decide how much debt b_{t+1} to issue. In particular, the firm knows that its issuance will affect the market clearing price, as it is the sole supplier of debt securities in the market. This market power arises from the illiquidity and high transaction costs characterizing the secondary market for corporate debt (Coppola, 2025).[52] Debt investors then purchase securities at the market clearing price. In the subsequent period, debt investors collect the payoffs.

Therefore, the firm's periodic profit can be rewritten as[53]

$$(1-\tau)(z_t - f_t) - (1+c)b_t + (-\gamma_{0t}b_{t+1} + \gamma_{1t})b_{t+1} + cb_t\tau.$$

With this, we have Proposition 6.5.

Proposition 6.5. *Using Proposition 6.4 and appropriate approximations, the firm's optimization problem can be transformed to*

$$\begin{aligned} &\max_{b_t} d_t - \Psi^d(d_t) + E[M_{tt+1}P_{t+1}], \\ s.t. &d_t = (1-\tau)(z_t - f_t) - (1+c)b_t + q_{ft}b_{t+1} - \Psi^b_t b^2_{t+1} + cb_t\tau, \\ &\Psi^d(d_t) = \psi_d|d_t|1_{\{d_t<0\}}, \\ &b_{t+1} \leq \bar{b}, \end{aligned} \tag{15}$$

where $q_{ft} = E_t[M_{tt+1}(1+c)]$ *and* $\Psi^b_t = \frac{\psi_b}{2}(\mu_I s^I_t)^{-\zeta}$.

Intuitively, if debt investors believe that the firm will never default, the firm can raise q_{ft} from

[51] This setup is similar to the equity issuance modeled in Begenau, Farboodi and Veldkamp (2018) and debt issuance modeled in Ai, Frank and Sanati (2020); Ottonello and Winberry (2020). Unlike the equity market where shares are traded actively in the secondary market. Bond markets are much less liquid in the secondary market and firms are dominant suppliers in markets of corporate bonds (He and Milbradt, 2014). When firms issue bonds in the primary market, investors submit their preliminary orders in the form of indications of interest (IOIs) to the underwriters, and underwriters help firms to decide on final (single) price and allocations (Nikolova, Wang and Wu, 2020). I also want to emphasize that elasticity and market power are not the same concept. An infinitely elastic demand schedule (high market power on the demand side) does not mean suppliers take prices as given when making issuance decisions. It depends on the market structure, such as the size of each supplier relative to the whole market.

[52] Note that the assumption that firms are not price takers does not mean their issuance will have large impacts on market-clearing price. The equilibrium price effect depends on the demand function of debt investors.

[53] Firms with negative taxable income do not receive a tax rebate. Instead, losses may be carried back 2 years and carried forward 20 years(Hennessy and Whited, 2005).

each unit of debt issuance, which is the price of risk-free debt with a coupon payment of c. As discussed before, the firm does not default, thus the price of debt equals q_{ft} under rational expectation. However, debt investors do not know the exact firm value and hence can exaggerate firms' default probability. This is captured by the term Ψ_t^b. When institutional equity shareholding is higher, more precise information is produced, reducing the uncertainty about firm value and lowering perceived default probability. Therefore, when s_t^I increases, Ψ_t^b declines and debt financing costs decrease, encouraging more debt issuance. Hence Ψ_t^b also captures the price impact of one additional amount of debt issued. For the derivation of Proposition 6.5, see Appendix F. The definition of the recursive equilibrium is given in Appendix G.

7 Quantitative Analysis

I use corporate financing data to calibrate the model, using which we can inspect the mechanisms and quantify the magnitudes of variables we are interested in.

7.1 Calibration

Table 9 presents the calibrated parameter values. One set of parameters is calibrated using values from relevant studies or by directly matching empirical moments in the data. The remaining parameters—including those governing debt financing costs, fixed costs, investment mandates, and the interaction between debt financing costs and institutional ownership—are identified through the following six moments: equity issuance, the debt-to-sales ratio, average institutional ownership, the persistence of institutional ownership, and coefficients from auxiliary regressions below

$$\Delta Debt_{it} = \beta^B InstShare_{it} + \gamma_t + \theta_i + e_{it},$$
$$\Delta MLev_{it} = \beta^{\Delta Lev} InstShare_{it} + \gamma_t' + \theta_i' + \xi_{it}.$$

β^B measures the sensitivity of debt issuance to institutional equity ownership, and $\beta^{\Delta Lev}$ measures the sensitivity in the *change* of market leverage to institutional holdings, instead of the level of leverage. The main difference between these two coefficients is that the leverage level depends on the relative change in debt and equity value in response to institutional ownership, while $\Delta MLev$

depends on the relative *speed* of change in response to institutional ownership.

Both can capture how debt and equity values vary with changes in institutional ownership. I choose to match $\Delta MLev$ because these two auxiliary regressions are used to pin down parameters governing information and equity benchmarking. However, both leverage level and institutional ownership are significantly affected by other parameters to be calibrated, making β estimated in this way less sensitive to ψ_s, the parameter I want to pin down[54].

While the six moments are related to all model parameters, some moments are particularly useful for certain parameters. Let's start with parameters related to debt issuance costs arising from information frictions. First, ζ governs the sensitivity of debt financing to institutional equity ownership. Institutional equity ownership decreases debt investors' uncertainty about firm value and hence lowers the required costs of debt. Lower ζ implies that debt investors' beliefs are less affected by institutional equity investors' information production. Thus β^B would decrease if ζ is lower. $\beta^{\Delta Lev}$ also tends to rise as debt issuance increases. Second, ψ_b affects the level of information costs in debt issuance. It is thus mainly identified through debt-to-sales ratio, although β^B also tends to increase if ψ_b is larger. The difference between these two parameters is that ζ is more sensitive to the covariance between institutional ownership and corporate financing, while ψ_b governs the level of costs.

Next, consider the identification of parameters related to equity benchmarking. First, lower $\bar{s}$ means investors purchasing a large number of shares will be punished more, hence the average institutional ownership will be lower. Second, ϕ_s governs the strictness of equity benchmarking. Consider an extreme case where $\phi_s \to \infty$, the economy would have no variation in s_t^I leading to an AR(1) coefficient of 1 and average institutional ownership of $\bar{s}$. More importantly, larger ϕ_s introduces a stronger inelastic demand for the firm's shares, affecting the valuation of corporate debt and equity. Thus, both β^B and $\beta^{\Delta Lev}$ will change accordingly. The change of β^B depends on the relative magnitude of change in the level of SDF and the covariance of SDF with debt financing costs as will be discussed in Section 7.2. As ϕ_s affects SDF, both debt issuance and equity value will change and hence $\beta^{\Delta Lev}$ with larger ϕ_s.

The critical distinction between equity benchmarking and the information mechanism lies in

[54] Another advantage of not using leverage level is that it is known to be difficult to match the empirical value using traditional models (Strebulaev and Yang, 2013)

their differential impact on equity values. Equity benchmarking operates on the demand side by influencing shareholders' discount factor, thereby altering their valuation of debt issuance and reshaping the demand curve. In contrast, the information mechanism operates on the supply side by affecting debt investors' pricing of corporate bonds, leading to shifts in the supply curve. This implies that the benchmarking channel has a larger effect on equity value compared to the information channel which mainly affects a small portion of each period's cash flow[55].

Lastly, larger fixed costs f lower corporate internal funds and therefore the firm's net equity issuance for external funding source.

The model matches data well as shown in Table 10. This model underestimates the risk premium quantitatively, and costs of debt are mainly captured by cash flow costs Ψ_t^b.

7.2 Inspect Mechanisms

In this subsection, I inspect mechanisms through which institutional equity ownership affects debt financing by varying one parameter at a time, and see how model-implied moments change. Before we check out the exercises, let me first explain the main mechanisms in words.

In this model, institutional equity holdings relate to debt issuance through three channels. First, higher institutional holdings s_t^I decrease debt financing costs due to decreased uncertainty about firm value (which is always non-negative), captured by the Ψ_t^b term. This mechanism implies that higher institutional equity ownership leads to more debt issuance.

Second, equity benchmarking introduces additional inelastic demand for the firm's shares when shareholding is lower than the target value, which decreases the costs of debt issuance. This is because benchmarking effectively decreases investors' risk aversion by introducing an extra demand less correlated with firms' cash flows. Because debt financing cost is procyclical[56], a lower risk aversion increases the present value of debt financing for a given amount of debt to be issued. In the simulated data, institutional equity ownership can be larger than the target share $\bar{s}$. However, the overall effect is dominated by extra positive demand for shares introduced by equity benchmarking when shareholdings are low. This is because institutional equity ownership tends

[55] In simulated data, periodic information costs in debt issuance account for roughly 0.1% of revenue on average.

[56] When firms' operating profits are high, firms can repay debt using internal funds without incurring equity issuance costs. By contrast, when operating profits are low, firms have to raise more equity, incurring extra equity financing costs, to repay debt.

to be lower than the target value when the firm is in a bad state: this is also the time when debt repayment is especially costly[57]. The changes in discount rate matter more when debt financing is more costly, i.e. in bad states.

Third, institutional equity holdings also affect corporate debt issuance via the part of SDF irrelevant to equity benchmarking. Institutional holdings affect the current wealth and thus the consumption of institutional equity investors. Therefore, the discount factor shareholders use to value future cash flows are influenced. This effect tends to result in a negative debt-equity holdings relationship. First, higher s_t^I means investors are wealthier, enabling them to consume more today, raising the discount factor used to value future cash flows.[58] This predicts a negative relationship between institutional ownership s_t^I and debt issuance as the present value of debt repayment costs increases. Second, in equilibrium higher institutional shareholdings are associated with higher firm value. Thus not only are investors wealthier, purchasing one new share also becomes more expensive. The income effect incentivizes investors to purchase more shares, while the substitution effect decreases next period shareholdings. If the substitution effect dominates[59], the next period consumption becomes lower and hence the discount factor further increases, making debt even more costly. Both forces lead to potentially lower consumption growth, implying a negative relation between debt issuance and institutional ownership through the SDF channel.[60]

Overall, the equilibrium relationship between institutional equity shareholdings and debt issuance is driven by the relative magnitude of information transmission, equity benchmarking and SDF effects.

[57]This is because fundamental shocks are persistent, future profit is also likely to be low if the current profit is low. More debt issuance means more debt repayment in the next period, and this is more likely to trigger equity financing costs especially when the firm is in a bad state at the current state.

[58]Mathematically, this is because with log utility the discount factor is $\frac{c_t}{c_{t+1}}$. Intuitively, when today's consumption is already high, consumption brings little marginal utility today. So investors are more willing to give up one unit of consumption today to obtain one more unit of consumption tomorrow.

[59]Income and substitution effects are known to cancel out for log utility and price will have no effect on consumption. However, in this economy investors face an additional friction, i.e. investment mandate, that breaks down the property.

[60]In addition, the relationship between institutional equity shareholdings and debt finance results from the fact that both outcomes are determined by characteristics of corporate profits. I run the model for 10,000 simulations with 420 periods and then kick profitability shock up to its highest level in period 401 and then let the economy continue to operate as before. That is, this exercise simulates the response to a one period impulse and its gradual decay. Figure 5 plots the impulse responses of debt issuance, institutional equity shareholdings and equity value of the benchmark model. We can see that ceteris paribus, a positive profit shock raises both debt issuance and institutional shareholdings upon the shock. Subsequent changes would be a mix of all forces mentioned above. This captures the 'endogeneity' when one wants to estimate the effects of institutional equity ownership on debt issuance, which is not our focus here.

Magnitude of information transmission. In the first exercise in Table 11, I eliminate the information channel by setting $\zeta = 0$ while keeping all other parameters unchanged. The regression coefficient of debt issuance on institutional equity ownership decreased from 0.128 to 0.102 in the simulated data. This implies a 20.3% (=(0.128-0.102)/0.128) drop in the relation between institutional ownership and debt financing costs, which is sizable.

Inelastic demand introduced by equity benchmarking. Prior studies suggest that index benchmarking decreases future stock returns and boosts risky investment due to the introduction of additional inelastic demand (Pavlova and Sikorskaya, 2023; Kashyap et al., 2021). As institutional equity investors are shareholders, debt financing should also be affected. This is because the inelastic demand associated with benchmarking decreases the effective risk aversion of shareholders. This lowers the marginal costs of debt issuance because debt financing incurs procyclical cash flows.[61]

This mechanism is confirmed by the second and third exercises in Table 11. I vary the benchmarking intensity parameter, ϕ_s, such that the model-implied change in institutional ownership following index inclusion matches the empirical magnitude observed in the data. In particular, Pavlova and Sikorskaya (2023) document that the addition to Russell 2000 results in a roughly 27 bps rise in active funds' ownership[62]. Therefore, I increase benchmarking intensity ϕ_s from 0.2 to 0.4 to generate the 27 bps rise. The debt-equity holdings relationship rises by 9.4% (=(0.140-0.128)/0.128) in response. Consistent with the mechanism, the risk premium decreases by 5.3% (=(0.57-0.54)/0.57).

Lastly, to examine the impact of risk aversion (SDF), I set $\gamma = 0$ in the third exercise so that institutional investors are risk neutral. In this case, risk premium becomes negative (-0.8%) due to the additional demand introduced by equity benchmarking. The association between debt issuance and institutional ownership also becomes stronger, because the negative effect from the third channel (SDF excluding equity benchmarking) is eliminated.

[61] The timing here is not exactly the same as the empirical evidence in the previous section, where current s_t^I is shown to benefit future debt issuance. More precisely, the end of year institutional ownership due to equity benchmarking leads to more debt issuance in the following year. Since debt issuance, similar to other real choices, takes time, this lag is expected. In the model, we impose a penalty on new share purchases. Therefore, we regress debt issuance on new share purchases in the simulated data. Investment mandate (equity benchmarking) exists throughout the firm's lifetime and is stationary in our model. Thus s_t^I is also a proxy for the amount of mandate faced by institutional investors.

[62] As the number 27 bps is based on active funds that benchmark Russell 2000, it is likely a lower bound.

7.3 Economic implications

As discussed above, information frictions and investment mandates (equity benchmarking) have significant effects on corporate decisions. The former influences through the capital supply side (investors), and the latter affects the capital demand (firm) side. In this subsection, I explore broader implications of these frictions on welfare and business cycles.

Magnitude of information frictions. Information frictions are prevalent, but also hard to measure. Unlike physical inputs such as raw materials, information is intangible. Unless it is directly tradeable such as datasets, the best we can do is to infer its value from observables or with the help of structural models fit to the data. In the economy modeled above, information frictions associated with debt financing costs are captured by the term $\frac{\psi_b}{2}(\mu_I s_t^I)^{-\zeta} b_{t+1}^2$.

From simulated data, I first calculate the average information frictions $\frac{\psi_b}{2}(\mu_I s_t^I)^{-\zeta} b_{t+1}^2$. Then I discount this value by either the average R_{ft} or R_t, treating the costs as a perpetuity with constant cash flow and discount rate. This gives information costs accounting for 0.7% and 0.6% of equity value respectively. This number may seem small, but it is comparable to the costs of managers' short-termism estimated by (Terry, 2023). Alternatively, starting from the first period in the simulated data, I discount all periodic information costs back using each period's discount factor. The total costs account for 5% of equity value, comparable to the costs of earnings misreporting estimated by (Terry, Whited and Zakolyukina, 2023). Which number to use depends on our perspective. If we stand from shareholders' perspective, we should focus on the 5%, while if we think from a risk neutral investor's perspective, 0.7% is a more important number.

The periodic information costs are also countercyclical, with the low state value 15% lower than the high state value. This countercyclicality means information frictions are even more costly. Policies enhancing information disclosure, especially in bad times, could significantly improve social welfare. This paper suggests that institutional equity investors help improve debt markets' information efficiency. Do they help mitigate the countercyclicality of information frictions? Below I discuss the dynamics of the effects of institutional ownership on debt issuance.

Dynamics of institutional equity ownership and debt issuance. The dynamics of institutional equity ownership affect the dynamics of debt financing costs. In particular, the model implies that institutional ownership and marginal benefits of debt move in the same direction. The former is procyclical: in the simulated economy, the correlation between institutional ownership and profitability is significantly positive (0.108). The same applies to the real economy with a similar correlation coefficient of 0.111 after detrending. However, the marginal benefit of issuing debt is procyclical both in the simulated data and real data (Kiyotaki and Moore, 1997; Gertler and Kiyotaki, 2010). The procyclical movements of institutional ownership and demand for debt imply that institutional ownership is low exactly when it is likely needed the most to mitigate debt issuance costs.

To illustrate the state-varying property of effects of institutional ownership on debt issuance, I estimate the statistical model below in the simulated data, where profit is measured by $z - f$[63]

$$\Delta Debt_{it} = \beta_0 InstShare_{it-1} + \beta_1 log(profit_{it-1}) + \beta_2 log(profit_{it-1}) \times InstShare_{it-1} + \gamma_t + \theta_i + \epsilon_{it}.$$

With baseline parameters, $\beta_2 = -0.03$ (significant at 1% significance level)[64], suggesting that the marginal effect of institutional ownership on debt issuance is more positive in bad states. Estimating the same model in the real data gives a significantly negative β_2[65]. For an average level of $InstShare_{it-1}$ (0.414), a five percentage point rise in institutional ownership is associated with 2.0 percentage points (=0.07*0.414*(0.53+0.16)) higher debt growth in the lowest profit state relative to the highest profit state.

This provides an alternative explanation for higher debt financing costs in bad states (Kiyotaki and Moore, 1997) based on investors' characteristics[66]. In bad states, institutional investors have limited attention to produce information about firm value when it is needed the most. Moreover, shareholders flee from risky assets leading to lower demand for capital[67]. In the simulated data, the correlation between institutional equity ownership and risk free rate is -0.34. Considering the institutional equity ownership has more than tripled in the past four decades, this potentially provides an alternative explanation for the trend of falling interest rates documented in the literature (Kroen et al., 2021).

[63] Because profits can be negative, $log(profit)$ represents $log(prfit + min\{profit\} + 1)$.

[64] $\beta_0 = 0.03$, $\beta_1 = 0.05$.

[65] The magnitudes of coefficients are not comparable because we do not match the level of profit.

[66] The current model fits the quantity of security prices poorly, so it cannot show the quantitative importance of institutional ownership for credit spread. The debt costs in this model are mostly captured by cash flow costs.

[67] The story applies to most funds that benchmark certain index, but not to index funds that are required to hold exactly the index share.

8 Conclusion

Traditional models such as Merton (1974) implicitly assume full integration between different asset markets. Nevertheless, due to frictions such as transaction costs and informational frictions, these two markets are segmented (Ma, 2019; Chen, Chen and Li, 2023). Studying how equity and debt markets are related has important implications on asset prices, corporate policies, government policies aimed at either market, as well as social welfare considering that debt and equity are held by investors from different demographic backgrounds.

I demonstrate that institutional equity investors affect debt financing outcomes through both capital supply (debt investors) and capital demand (firm) side. The information transmission implies that a deviation from full information and rational expectation (FIRE) model is important in understanding debt market dynamics and corporate financing. Information is without doubt critical to decisions by investors and firms. However, due to the difficulty of measuring information, FIRE is widely assumed in both asset pricing and corporate finance literature. This paper suggests that frictional information environment is important to understand how firms operate. The finding that equity benchmarking affects firms' valuation of debt issuance illustrates that equity investors' mandate not only affects the equity market, but also spills over to other asset markets via reshaping security issuance by firms.

Overall, capital markets are essentially the same as goods and service markets in the sense that demand and supply combined determine the equilibrium. Focusing on either demand or supply could potentially lead to non-negligible biases.

Table 1: Summary Statistics

This table presents the summary statistics of main variables constructed from Compustat-CRSP. All variables are deflated to 2017 dollars using GDP deflator from FRED. Institutional investors' shareholdings are expressed in percentages.

	mean	p50	sd	p25	p75	count
$\Delta Debt$	0.03	0.00	0.75	-0.19	0.22	112955
InstShare	40.63	36.51	31.34	10.99	67.59	112955
logAT	5.51	5.41	2.10	3.97	6.94	112955
ROA	0.01	0.06	0.25	-0.03	0.13	112894
Tobin's Q	1.46	1.19	0.83	0.93	1.70	112819
IT	0.51	0.43	0.25	0.31	0.66	109021
Block share	14.15	10.70	14.29	0.00	23.05	109020
Share turnover	0.00	0.00	0.01	0.00	0.01	112705
DtoLev	0.01	-0.04	0.29	-0.15	0.12	111983
Book lev (sic3 average)	0.23	0.21	0.11	0.15	0.29	112955
Asset growth	0.05	0.03	0.30	-0.08	0.16	112955
Book leverage	0.23	0.19	0.22	0.03	0.36	112955
Market leverage	0.26	0.19	0.26	0.02	0.44	112839
Debt	802.00	24.78	5540.53	1.50	252.65	112955
AT	2703.17	222.69	14370.96	52.90	1037.57	112955
$\frac{Debtissue}{L.AT}$	0.03	0.00	0.18	-0.03	0.04	112955
$1\{$Net debt issue$\}$	0.40	0.00	0.49	0.00	1.00	112955
Gross Equity issuance	0.13	0.00	0.52	0.00	0.00	106201
Observations	112955					

Table 2: Correlation Matrix

This table presents the correlation between institutional shareholdings and firm characteristics. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

	InstShare
logAT	0.691***
ROA	0.301***
DtoLev	-0.065***
SIC3 Book leverage	-0.011***
Asset growth	0.125***
Observations	112955

Table 3: Debt Issuance and Institutional Equity Ownership

This table presents the relationship between institutional equity ownership and corporate outcomes estimated using Equation 2. Panel (a) presents the results on debt issuance. In column 1, only firm fixed effects is included. Column 2 further adds the fiscal year fixed effects. Column 3 includes all the controls (cash holding, logarithm of total asset, ROA, distance to target leverage, asset growth, SIC-3 digit industry level book leverage, investor horizon, percentage of shares held by block holders, share turnover and one year lag of dependent variable). Column 4 adds SIC 3-digit industry-year fixed effects to control for time varying industry level variables. Columns 5 and 6 use alternative measures of debt issuance. Column 7 looks at growth in bond issuance. In columns 8 and 9, the dependent variable is a dummy variable indicating net debt issuance and bond issuance respectively. The number of observations is much smaller because firms that have never issued debt (bond) or issued debt (bond) every year during the sample period are dropped. For columns 7 and 8, the sample period starts from 1992 due to large missing after FISD is matched to Compustat. Panel (b) presents results on equity issuance and change in leverage ratios. Pseudo R^2 is reported when the dependent variable is a dummy variable. Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

(a) Debt issuance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$	$\frac{Debt-L.Debt}{L.AT}$	$\frac{DebtCashFlow}{L.AT}$	$\Delta Bond$	$1\{NetDebtIss\}$	$1\{BondIss\}$
L.InstShare	0.070***	0.130***	0.201***	0.211***	0.098***	0.083***	0.070***	0.439***	0.266**
	(0.007)	(0.017)	(0.028)	(0.030)	(0.008)	(0.011)	(0.019)	(0.048)	(0.121)
L.logAT			-0.087***	-0.101***	-0.044***	-0.049***	-0.040***	-0.122***	0.297***
			(0.006)	(0.007)	(0.002)	(0.003)	(0.003)	(0.010)	(0.037)
FirmFE	Y	Y	Y	Y	Y	Y	Y	Y	Y
YearFE	N	Y	Y	Y	Y	Y	Y	Y	Y
SIC3Year	N	N	N	Y	N	N	N	N	N
Controls	N	N	Y	Y	Y	Y	Y	Y	Y
NObs	112955	111423	94941	94143	94941	89221	73879	89479	20549
Adj.R2	0.011	-0.001	0.048	0.037	0.129	0.355	0.185	0.071	0.132

(b) Equity issuance and leverage

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta Equity$	$\Delta Equity$	$\Delta Equity$	$1\{EquityIss\}$	$1\{EquityIss\}$	$\Delta MarketLev$	$\Delta BookLev$
L.InstShare	-0.213***	0.187***	0.004	-1.086***	-0.448***	0.082***	0.027***
	(0.014)	(0.018)	(0.016)	(0.051)	(0.085)	(0.005)	(0.004)
L.Q			0.176***				
			(0.007)				
L.logAT		-0.165***	-0.124***		-0.303***	0.001	0.002**
		(0.006)	(0.005)		(0.017)	(0.001)	(0.001)
Firm/Year FE	Y	Y	Y	Y	Y	Y	Y
Controls	N	Y	Y	N	Y	Y	Y
NObs	87557	87557	87557	81628	65540	94864	94864
Adj.R2	0.240	0.297	0.330	0.153	0.165	0.122	0.037

Table 4: Institutional Shareholdings and Costs of Debt

This table presents the relation between institutional equity ownership and financing costs related to debt. In columns 1 and 2, the dependent variable is bond yield. In columns 3 and 4, the dependent variable is the logarithm of this variable (interest payment are all positive for firms with non-zero debt stock after winsorization). The level variable suffers from the problem that the control variables include debt in $Dtolev$ and $sic3blev$ and the high correlation between dependent and control variables could remove the variation we need. Columns 5 and 6 use cumulative stock return as the dependent variable. Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	bondYTM	bondYTM	$\log(\frac{int}{debt})$	$\log(\frac{int}{debt})$	CumRet	CumRet
L.InstShare	-0.022***	-0.022***	-0.266***	-0.297***	-0.655***	-0.452***
	(0.008)	(0.007)	(0.024)	(0.031)	(0.022)	(0.027)
FirmFE	Y	Y	Y	Y	Y	Y
YearFE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
NObs	8095	8095	73310	73310	94505	94505
Adj.R2	0.427	0.510	0.359	0.369	0.130	0.158

Table 5: Mutual funds equity and corporate bond holding comovement

This table presents the comovement between fund families' holdings of the same firms' equity and bond. Columns 1-3 show that equity and bond holdings comove across mutual funds within the same fund family across different specifications. In columns 4-6, we test whether this comovement is stronger for firms with more information asymmetry. Column 7 examines whether a fund family's stock holdings comove with bond holdings of the same firm but held by other fund families. Column 8 examines whether other fund family's stock holdings comove with a given fund family's bond holdings of the same firm. Standard errors are clustered at the management firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ΔH^B_{fjt}	ΔH^B_{fjt}	ΔH^B_{fjt}	ΔH^B_{fjt}	ΔH^B_{fjt}	ΔH^B_{fjt}	ΔH^B_{-fjt}	ΔH^B_{fjt}
ΔH^S_{fjt}	0.001**	0.001**	0.001**	0.002**	0.002**	-0.007***	-0.000**	
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.002)	(0.000)	
L.ΔH^S_{fjt}	0.000*	0.000*	0.000*	0.000*	0.000*	0.000*	-0.000**	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
$\Delta H^S_{-f,jt}$								-0.010
								(0.007)
L.$\Delta H^S_{-f,jt}$								-0.004
								(0.003)
MgmtFlowshock			0.019**					
			(0.008)					
ΔH^S_{fjt} × idiovol				0.006*				
				(0.004)				
ΔH^S_{fjt} × idio3factor					0.006*			
					(0.003)			
BASGroup=2 × ΔH^S_{fjt}						0.000		
						(0.000)		
BASGroup=3 × ΔH^S_{fjt}						0.001***		
						(0.000)		
ΔH^S_{fjt} × logsizeat						0.001***		
						(0.000)		
L.$\Delta H^B_{-f,jt}$							-0.008	
							(0.007)	
L.ΔH^B_{fjt}	-0.028***	-0.032***	-0.032***	-0.032***	-0.032***	-0.032***	-0.036***	-0.032***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
L.log(TNA)	-0.002**	-0.002**	-0.002**	-0.002**	-0.002**	-0.002**	0.000	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
LD.log(TNA)		-0.001	-0.001	-0.001	-0.001	-0.001	0.000	-0.001
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
MgmtFE	Y	Y	Y	Y	Y	Y	Y	Y
Quarter	Y	N	N	N	N	N	N	N
Firm	Y	N	N	N	N	N	N	N
F-Q	N	Y	Y	Y	Y	Y	Y	Y
Nobs	3806170	3775325	3758360	3775325	3775325	3558285	3769403	3769403

Table 6: Characteristics of mutual funds

This table compares the characteristics of mutual funds reporting voluntarily before the regulation change (always-takers) and those whose reporting frequency increased due to the regulation change (compliers). Assets under management (AUM) are in million dollars.

	(1) Always-takers	(2) Compliers
AUM (mean)	696.07	482.06
AUM (median)	149.56	37.36
Number of stocks (mean)	86.53	62.47
Number of stocks (median)	65	30
Number of funds	801	515
Reporting quarters (Pre)	96.24%	46.45%

Table 7: Debt issuance before and after disclosure regulation change in May 2004

This table estimates the effects of May 2004 regulation change on debt issuance. The dependent variable is the change in debt issuance one year before and after May 2004. MFExposure, MFShareNoTreat, MFShareIdx and control variables are average values between 2001Q1 and 2004Q1. Control variables are the same as those included in the baseline setting in Table 3. $\Delta Debt_{2005} - \Delta Debt_{2003}$ is the dependent variable in columns 1 to 4. Column 1 presents the results estimated based on Equation (5). Columns 2 and 3 use the percentage of shares held by mutual funds that already reported quarterly (MFShareNoTreat) and those held by index funds (MFShareIdx) as the independent variable. Column 4 includes all three types of shares together to further mitigate the concern that mutual fund ownership in general leads to more debt issuance. Columns 5 and 6 examine the effects on the issuance of non-loan debt securities and loans respectively. Loans are defined as the sum of notes payable (np) and other long-term debt (dlto) following Crouzet (2021), and non-loans are defined as the remaining debts (dltt+dlc-np-dlto). The number of observations is slightly different for these two columns because I drop observations with negative non-loans (mostly bonds) and loans respectively. Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$	$\Delta NonLoan$	$\Delta Loan$
MFExposure	3.065**			3.066**	2.508*	3.225
	(1.387)			(1.400)	(1.314)	(3.720)
MFShareNoTreat		0.247		0.191		
		(0.631)		(0.629)		
MFShareIdx			0.209	-0.160		
			(1.692)	(1.730)		
InstShare	0.001	0.001	0.001	0.000	-0.000	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Amihud	-0.104***	-0.105***	-0.105***	-0.105***	-0.114***	-0.048
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.041)
MarketLev	1.393***	1.394***	1.394***	1.393***	0.819***	0.664***
	(0.102)	(0.102)	(0.102)	(0.102)	(0.101)	(0.196)
Controls	Y	Y	Y	Y	Y	Y
NObs	2868	2868	2868	2868	1546	1544

Table 8: Equity benchmarking and financing

This table presents 2SLS results using BMI as the instrument variable. The sample is restricted to firms whose market cap values fall in the 400 bandwidth on the ranking date in May. The sample period is from 1998 to 2018. Panel (a) presents the effects on debt and equity issuance. Columns 1 and 2 examine the effects on the intensive and extensive margin of debt issuance respectively. Dependent variables in columns 3 and 4 are equity issuance and a dummy for equity issuance respectively. Columns 5 and 6 present results on stock return and bond yield (value-weighted). Stock return is the cumulative daily stock returns in each fiscal year. The dependent variable in column 7 is the logarithm of the ratio between long term debt (maturity longer than 1 year) and total debt, while that for column 8 is the logarithm of the ratio between debt with maturity longer than 3 years and total debt. Panel (b) tests for alternative mechanisms. Whenever the interaction term $x \times InstShare$ is included, the level variable x is always included but it is not displayed for the sake of space. Columns 1 to 3 test whether coefficients on interaction terms between $InstShare$ and four proxies for information asymmetry are significant. Columns 4 and 5 test for the liquidity and volatility channels respectively. Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

(a) Financing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta Debt$	$1\{NetDebtIss\}$	$\Delta Equity$	$1\{EquityIss\}$	CumRet	BondYTM	Maturity	Maturity
L.InstShare	0.018**	0.012*	0.004**	0.003	-0.018***	0.001	0.007	0.116**
	(0.008)	(0.006)	(0.002)	(0.003)	(0.007)	(0.001)	(0.006)	(0.055)
Firm/Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y
NObs	6720	6720	6720	6720	6720	1611	5484	4221
First stage F-stat	30.98	30.67	30.72	30.66	31.65	14.36	27.59	25.23

(b) Alternative mechanisms

	(1)	(2)	(3)	(4)	(5)
	Info	Info	Info	Liquidity	Volatility
L.InstShare	0.039*	0.043	0.019**	0.019**	0.017**
	(0.023)	(0.027)	(0.008)	(0.008)	(0.007)
L.InstShare × L.idioVol	0.730				
	(0.455)				
L.InstShare × L.TotVol	-0.666	-0.667			
	(0.411)	(0.447)			
L.InstShare × L.idio3factor		0.746			
		(0.506)			
BASGroup=2× L.InstShare			-0.001		
			(0.002)		
BASGroup=3× L.InstShare			-0.001		
			(0.003)		
Amihud				1.963*	
				(1.036)	
TotVol					0.296**
					(0.118)
Firm/Year FE	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y
NObs	6720	6720	6720	6720	6720

Table 9: Calibration

This table presents the model's calibrated parameters. The model is solved at an annual frequency.

Parameter	**Value**	**Source**
β	0.976	five year real Treasury bond rate
γ	1	log utility
ρ_z	0.7	AR1 coef of (real) nonfinancial corporate revenue and real GDP
σ	0.03	conditional volatility of nonfinancial corporate revenue
coupon rate	0.039	FISD average
τ	0.2	Gomes and Schmid(2010)
ρ_f	0.63	AR1 coefficient of (revenue-profits)
σ_f	0.18	conditional volatility of (revenue-profits)
ψ_d	0.051	Altinkilic and Hansen (2000)
μ	0.54	Survey of Consumer Finance
γ_I	0.1	SCF wage income
$\bar{s}$	0.74	benchmarking target
ψ_b	0.0028	debt financing costs due to info frictions
ζ	0.28	sensitivity of debt financing costs to institutional ownership
f	0.78	fixed costs
ϕ_s	0.2	equity benchmarking intensity

Table 10: Moments

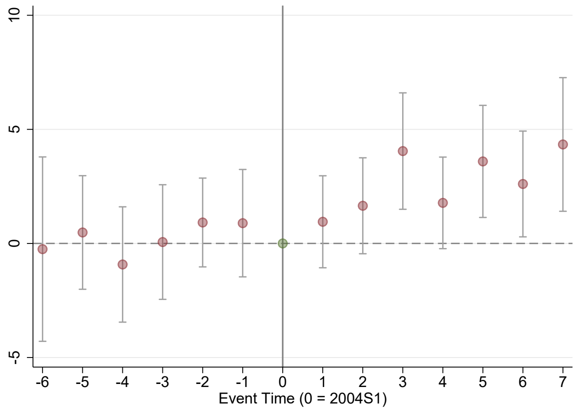
This table compares moments estimated from real data and those estimated using simulated data. I simulate 6 artificial panels with 10,000 firms each consisting of 340 periods (burn-in period is 1000), and report the cross-sample averages.

	Data	**Model**	***External Validity***	**Data**	**Model**
Regression coef of debt growth on s^I	0.130	0.128	$\frac{Dividend}{\text{Equity value}}$	0.036	0.034
Regression coef of $D.MLev$ on s^I	0.081	0.086	Freq of debt issuance	0.530	0.565
$\frac{\text{Net equity issuance}}{\text{Equity value}}$	-0.022	-0.017	σ_R	0.177	0.144
$\frac{Debt}{Sale}$	0.510	0.516	σ_{rf}	0.021	0.038
Average institutional ownership	0.406	0.414	r_f	2.50%	2.18%
AR1 of s^I	0.936	0.969	R	10.10%	2.74%

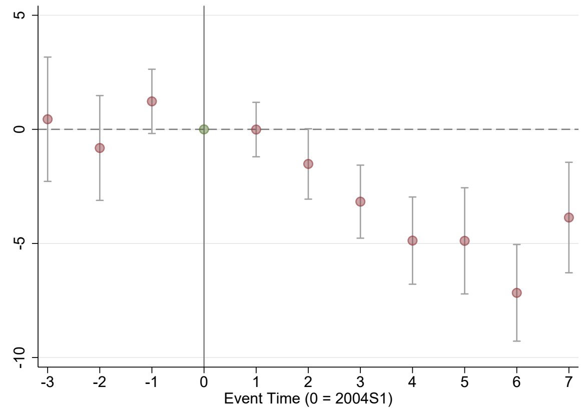
Table 11: Counterfactual analysis

	β^B	β^{lev}	Debt issuance freq	r_f	$r - r_f$
Baseline	0.128	0.086	0.516	2.18%	0.57%
			Information sharing		
$\zeta = 0$	0.102	0.075	0.497	2.19%	0.53%
			Benchmarking intensity		
Higher intensity $\phi_s = 0.4$	0.140	0.150	0.524	2.17%	0.54%
			Investor risk aversion		
Risk neutral $\gamma = 0$	1.027	-0.014	0.521	2.50%	-0.80%

Figure 1: Dynamic difference-in-differences



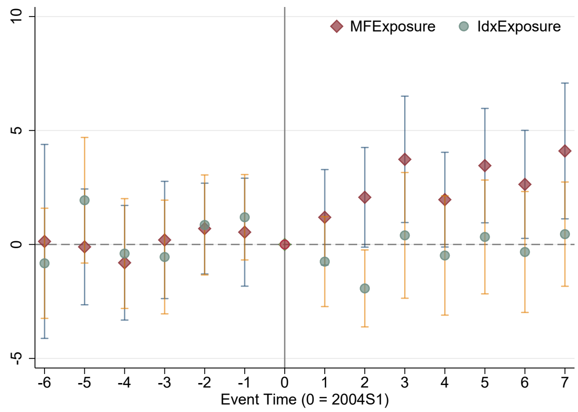
(a) $\Delta Debt$



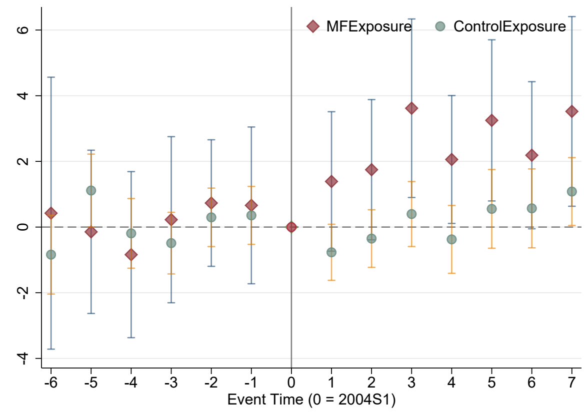
(b) Bond yield

This figure presents the dynamic coefficients estimated using Equation 4 at the semi-annual frequency from 2001S1 to 2007S2. Gray solid line segments represent 90% confidence interval. Panel (a) gives the dynamics of coefficients estimated using the whole sample. Panel (b) presents the coefficients estimated when changes in bond yields are used as the dependent variable. Bond yield is constructed using TRACE so the sample starts in the second half year of 2002.

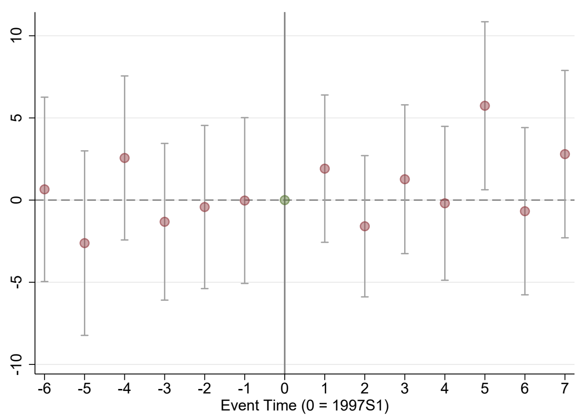
Figure 2: Falsification tests: other funds and fake treatment time



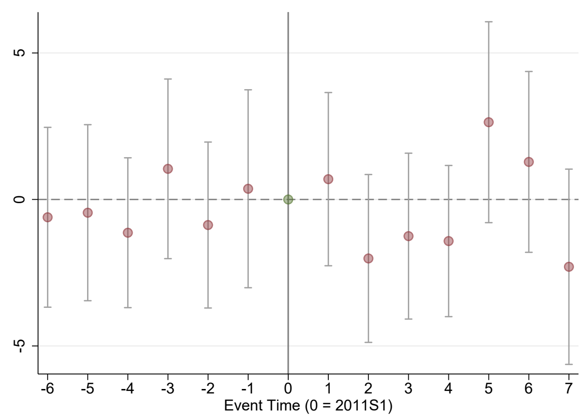
(a) $\Delta Debt$ (Index funds)



(b) $\Delta Debt$ (Other active funds)



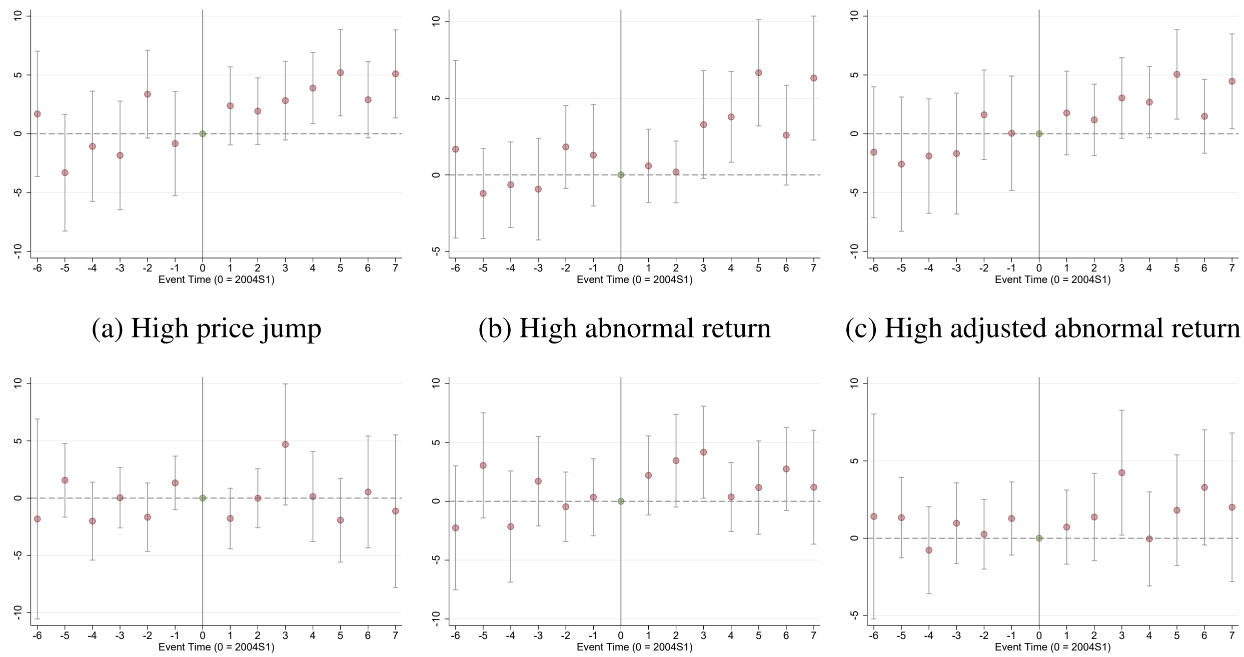
(c) 1997



(d) 2011

This figure presents the dynamic coefficients estimated using Equation 4 at the semi-annual frequency from 2001S1 to 2007S2. Gray solid line segments represent 90% confidence interval. Panels (a) and (b) add interaction terms using the percentage of shares held by index funds and non-treated active mutual funds respectively. Green dots and orange bars represent the point estimates for the coefficients on the interaction terms of index fund shares (other active fund shares). Red dots and blue bars represent those for the coefficients on the interaction terms of treated fund shares. Panels (c) and (d) illustrate the coefficients estimated during 1994-2000 and 2008-2014 respectively, with 1997 and 2011 being the fake treatment years.

Figure 3: Dynamics DID for firms with different price informativeness

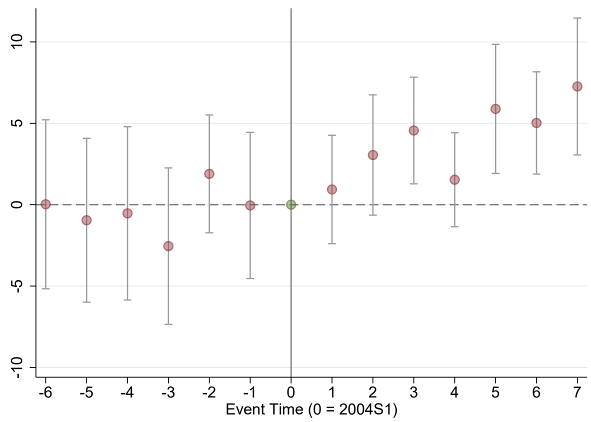


(a) High price jump (b) High abnormal return (c) High adjusted abnormal return

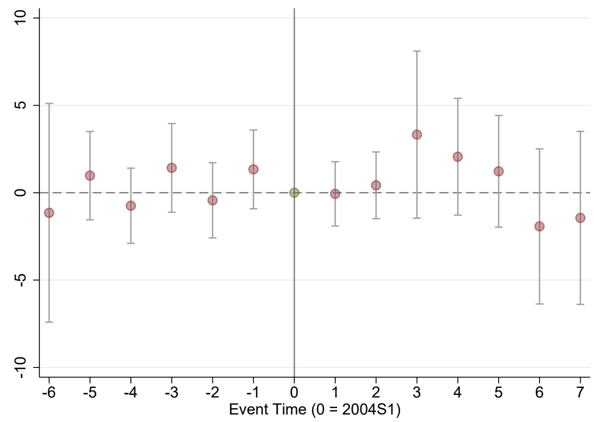
(d) Low price jump (e) Low abnormal return (f) Low adjusted abnormal return

This figure presents the dynamic coefficients estimated using Equation 4 at the semi-annual frequency from 2001S1 to 2007S2 for subsamples divided based on price informativeness. Gray solid line segments represent 90% confidence interval. Panels (a)-(c) use the sample of firms with low price informativeness, while panels (d) to (f) use those with high price informativeness. Higher price jumps (panel (a)), abnormal returns (panel (b)) and adjusted abnormal returns (panel (c)) around earning announcements indicate lower price informativeness, while low price jumps (panel (d)), abnormal returns (panel (e)) and adjusted abnormal returns (panel (f)) around earning announcements indicate higher price informativeness. All these measures are based on abnormal returns around corporate earnings announcements (Sammon, 2024).

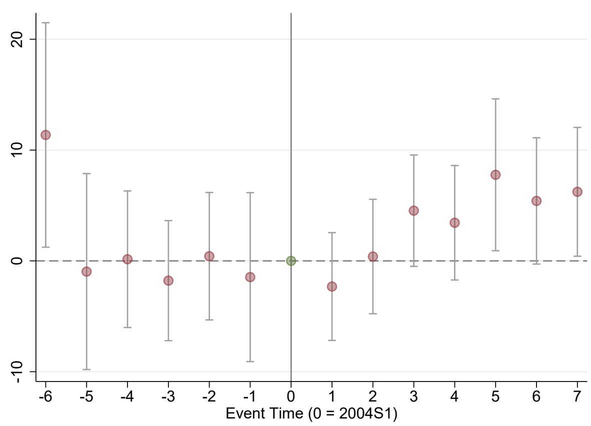
Figure 4: Dynamics DID for firms with different profitability and distance to default



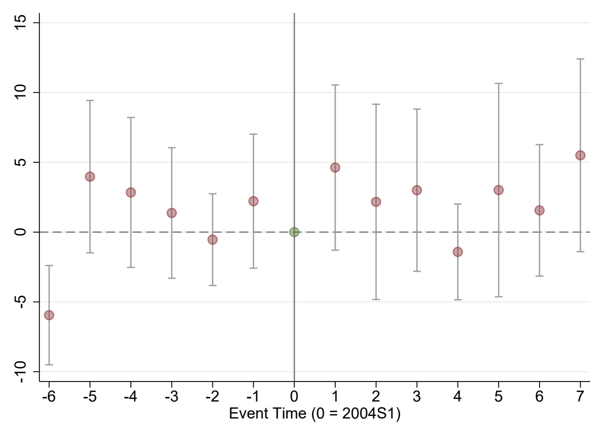
(a) High ROA



(b) Low ROA



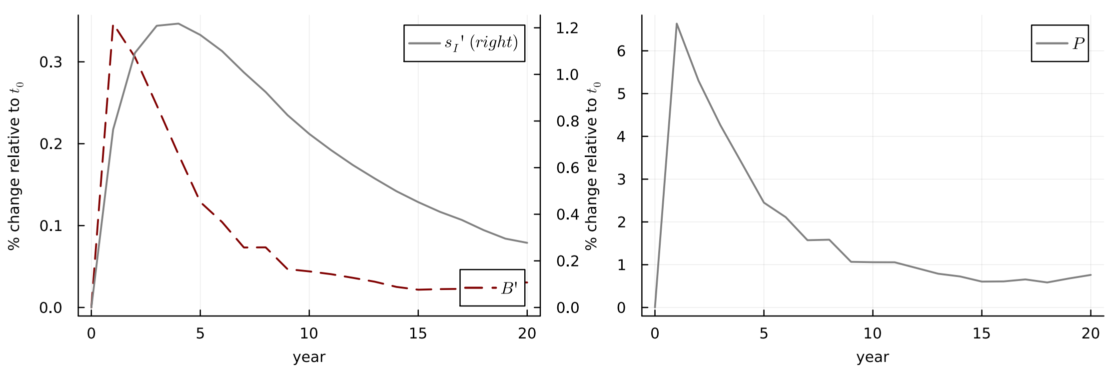
(c) High idiosyncratic volatility (conditional)



(d) Low idiosyncratic volatility (conditional)

This figure presents dynamic coefficients estimated using Equation 4 at the semi-annual frequency from 2001S1 to 2007S2 for subsamples divided based on price informativeness. Gray solid line segments represent 90% confidence interval. In panels (a)-(b), I divide firms based on return on assets as a proxy for firms' fundamental performance into two subsamples equally. ROA used here is the value one year before the treatment. Panel (a) gives the coefficients estimated using firms with high ROA, while panel (b) using firms with low ROA. Panels (c) and (d) divide firms based on their idiosyncratic volatility calculated as the volatility of residuals from CAPM. Instead of unconditionally dividing firms, I first divide firms based on ROA into terciles and drop the bottom tercile. This is to deal with the high negative correlation (-0.38) between ROA and idiosyncratic volatility. The reason for not using the High ROA group in panel (a) is that I will further divide the sample based on idiosyncratic volatility, and if the sample size is small in the first step, the coefficients estimated would be more noisy. Then I categorize the remaining firms as the high group if their idiosyncratic volatility ranks among the top two quintiles, and low if the bottom two quintiles.

Figure 5: Impulse response to profitability shock

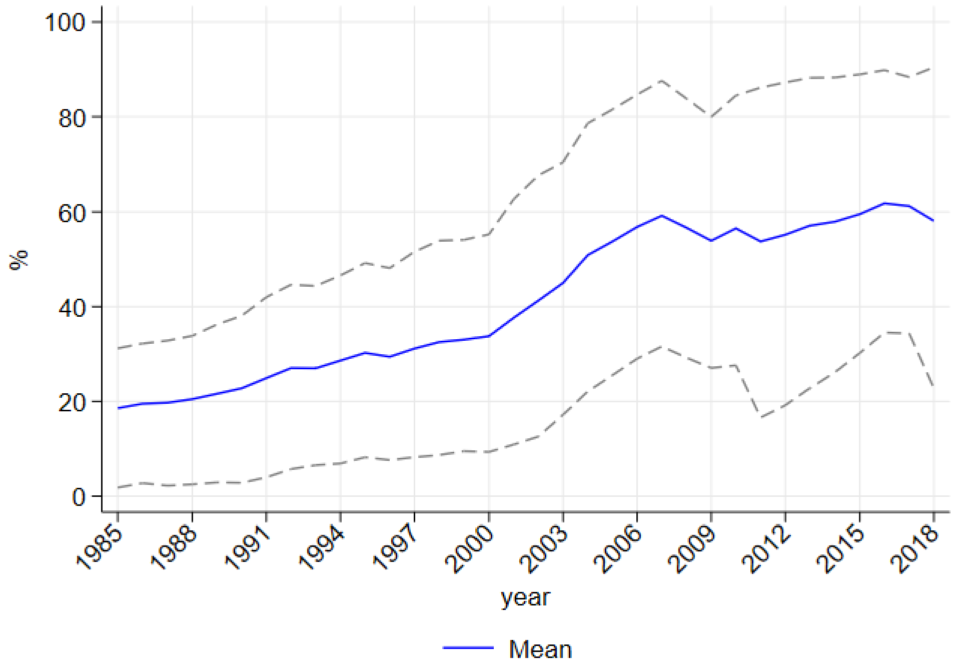


Appendix

Table A1: Variable definition

Variables	Definitions
AT	at
Debt	dltt+dlc
Debt interest payment	xint
me (Market value)	$csho \times prcc_f$
$\Delta Debt$	$\frac{Debt_t - Debt_{t-1}}{0.5(Debt_t + Debt_{t-1})}$, set to 0 if $Debt_t = Debt_{t-1} = 0$
$\frac{\text{Debt cash flow}}{L.AT}$	$\frac{dltis_t + dlcch_t}{at_{t-1}}$, where $dlcch$ is set to 0 if $dlcch < 0$
$\Delta Equity$	$\frac{sstk_t - 0.03((me_t + me_{t-1})/2)}{ceq_{t-1}}$, set to missing if $ceq < 0$, 0 if $sstk_t - 0.03((me_t + me_{t-1})/2) < 0$
$\frac{\text{Net equity issuance}}{\text{Equity value}}$	$\frac{sstk - prstkc - dv}{me}$, where dv is set to 0 if missing
DtoLev (Distance to target leverage)	Ex ante distance to target leverage (Fama and French, 2002)
Book leverage	$\frac{dltt_t + dlc_t}{at_t}$
Market leverage	$\frac{dltt + dlc}{dltt + dlc + me}$
Tobin's Q	$\frac{at + me - ceq - txdb}{0.9at + 0.1(at + me - ceq - txdb)}$, where $txdb$ is set to 0 if missing
Cash holding	$\frac{che_t}{at_{t-1}}$
ROA	$\frac{ebit_t}{at_{t-1}}$
Asset growth	$\frac{at_t - at_{t-1}}{0.5(at_t + at_{t-1})}$
IT	Investor turnover (Cella, Ellul and Giannetti, 2013)
Institutional ownership	$\frac{\text{Shares held by 13F institutions}}{\text{Total shares outstanding}}$
Blockholder ownership	$\frac{\text{Shares held by blockholders}}{\text{Total shares outstanding}}$ (blockholders are institutional investors with ownership $>5\%$)
Share turnover	Trading volume divided by shares outstanding, adjusted for double-counting (Anderson and Dyl, 2005)
CumRet	Cumulative daily stock returns
TotVol	Standard deviation of daily stock returns for each firm-fiscal year, annualized by multiplying $\sqrt{252}$ (at least 200 observations)
idiovol	Standard deviation of ϵ estimated using Equation (1), annualized by multiplying $\sqrt{252}$ (at least 200 observations)
idio3factor	Standard deviation of ϵ estimated using Equation (1) with R_{mkt} replaced by Fama-French three factors. Annualized by multiplying $\sqrt{252}$ (at least 200 observations)
BAS (bid ask spread)	First calculate the daily gap between bid and ask prices, then take the annual average (at least 200 observations)

Figure A1: Institutional equity shareholdings over time



This figure illustrates the institutional equity shareholdings from 1985 to 2018. The blue solid line plots average institutional equity shareholdings in each fiscal year. The two gray lines represent the 25th and 75th percentiles respectively.

Table A2: Relationship between institutional ownership and debt issuance for firms with different exposure to aggregate shock

This table presents the baseline results for firms with different exposure to aggregate conditions. Columns 1-3 test whether the relationship between institutional ownership and debt issuance is stronger for firms more exposed to aggregate conditions. We measure firm's exposure to aggregate conditions in three ways. Columns 1 and 2 regress each firm's stock return on market factor and Fama-French three factors respectively. Column 3 regresses each firm's market equity growth $\frac{ME_{it}-ME_{it-1}}{ME_{it-1}}$ on the growth of total market equity $\frac{\sum_i ME_{it}-\sum_i ME_{it-1}}{\sum_i ME_{it-1}}$. R^2 is used as a proxy for each firm's exposure to the aggregate condition. Higher R^2 indicates the firm's value is more exposed to the market condition.

In columns 4-7, I decompose $\Delta Debt$ into market-related and idiosyncratic components using the equation below

$$\Delta Debt_{it} = \beta_0 + \beta_{i1}\overline{\Delta Debt}_t + \epsilon_{it}.$$

$\overline{Debt}_t$ is the average $\Delta Debt$ across all firms in fiscal year t, either equally weighted or value-weighted based on total asset. For each firm i, the equation above is estimated. $\hat{\beta}_{i1}\overline{\Delta Debt}_t$ is the aggregated component, and the rest is idiosyncratic component. I require each firm to have more than three observations in the estimation. Dependent variables in columns 4-7 are normalized by standard deviations. Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

	(1) $\Delta Debt$	(2) $\Delta Debt$	(3) $\Delta Debt$	(4) Agg $\Delta Debt$ Value-weighted	(5) Idio $\Delta Debt$ Value-weighted	(6) Agg $\Delta Debt$ Equal-weighted	(7) Idio $\Delta Debt$ Equal-weighted
L.InstShare	0.218***	0.198***	0.206***	0.071***	0.193***	0.066***	0.202***
	(0.038)	(0.038)	(0.036)	(0.018)	(0.030)	(0.019)	(0.030)
$R^2_{mkt}Group = 2$	0.036***						
	(0.012)						
$R^2_{mkt}Group = 3$	0.084***						
	(0.016)						
$R^2_{mkt}Group = 2 \times$ L.InstShare	-0.016						
	(0.028)						
$R^2_{mkt}Group = 3 \times$ L.InstShare	-0.064**						
	(0.032)						
$R^2_{3factor}Group = 2$		0.033***					
		(0.012)					
$R^2_{3factor}Group = 3$		0.091***					
		(0.016)					
$R^2_{3factor}Group = 2 \times$ L.InstShare		0.008					
		(0.029)					
$R^2_{3factor}Group = 3 \times$ L.InstShare		-0.055*					
		(0.032)					
$R^2_{ME}Group = 2$			0.023**				
			(0.011)				
$R^2_{ME}Group = 3$			0.074***				
			(0.016)				
$R^2_{ME}Group = 2 \times$ L.InstShare			0.004				
			(0.027)				
$R^2_{ME}Group = 3 \times$ L.InstShare			-0.050*				
			(0.030)				
Firm/Year FE	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y
NObs	94941	94941	94930	93198	93198	93198	93198

A Idiosyncratic shocks versus exposure to aggregate shocks

What information matters for firm values? Firm value constitutes two broad categories: firms' idiosyncratic productivity and their exposures to the aggregate economy. These combined affect firm decisions and ultimate firm value[68]. An example of idiosyncratic profitability shock is the outcome of a firm's R&D projects. An example of aggregate shock is the introduction of generative AI tools. Firms that can quickly integrate current capital and labor force with AI tools will benefit more, and hence have stronger positive exposure to this aggregate shock. Institutional equity shareholdings could foster the sharing of both types of information. Appendix Table A2 shows that institutional ownership is positively associated with both market-related and firm-specific debt issuance, while the effect is stronger for idiosyncratic volatility.

B Use of funds

External funds are raised mainly for two reasons. One is for real investment such as purchasing machines or developing new products: when firms do not have enough cheap internal funds, they have to seek for external funds. The other is due to the arbitrage motive (Ma, 2019; Begenau and Salomao, 2019). When debt and equity are overvalued, firms may take advantage of this misvaluation and raise funds to pay back shareholders. One reason for equity misvaluation to affect debt issuance is that debt investors who learn from equity investor holdings inherit the misbelief of equity investors. The exact motivation of debt issuance is not the focus of this paper and either motive is consistent with at least one channel to be discussed later, but it is useful to know which motivation exists for us to understand the mechanisms behind the link between institutional equity ownership and debt issuance.

[68] Consider a simple case where a firm's profits only constitute an aggregate productivity component A_t and an idiosyncratic component z_{it}

$$R_{it} = A_t^\alpha z_{it}^\beta.$$

A firm's exposure to the macro shock is $\frac{A_t^\alpha}{A_t^\alpha z_{it}^\beta}$, and $\frac{z_{it}^\beta}{A_t^\alpha z_{it}^\beta}$ for idiosyncratic shock. One could add endogenous choices such as capital or labor. These choices will be determined by both aggregate and idiosyncratic shocks. Firms with different z_{it} have different exposure to the aggregate shock. For a given firm, the exposure also changes as A_t and z_{it} evolve over time. As outside debt investors, they do not exactly know values of $A_t, z_{it}, \alpha, \beta$ standing at time $t-1$. They have a prior belief about firm i's profits, the variance of which is positively related to the variance of A_t and z_{it}, denoted by $f(\sigma_{A_t}, \sigma_{z_{it}})$ with f being an increasing function in both arguments. Through learning from (more) informed equity investors, uncertainty about profits and firm value decreases.

If the first motive explains what we observe in Table 3, the results should be stronger for more financially constrained firms, e.g. firms that want to invest but do not have enough funds to do so. Table A3 panel (a) confirms this hypothesis. Columns 1 and 2 use the financial constraint measures constructed by Whited and Wu (2006) and Hadlock and Pierce (2010) respectively. Both measures use information related to corporate fundamentals and hence mainly capture to what extent firms want to raise funds for real investment but find it hard to. The third measure is a dummy variable that equals one if the firm has a credit rating from S&P, 0 otherwise. Credit rating is necessary for firms to issue public bonds, and also provides useful information to lenders when firms want to issue other types of debts. Therefore, firms with a credit rating are less financially constrained. A concern is that firms planning to issue bonds this period need to have credit rating ready. This introduces a mechanical relationship between having a credit rating and debt issuance. To mitigate this concern, I use the three-year lag of the rating dummy. Across all three measures, the relationship between debt issuance and institutional equity shareholdings is stronger for firms that are more financially constrained, suggesting that institutional equity shareholdings relax firms' financing constraints and help with firms' real investment needs. Consistent with this, firms indeed increase their physical investment and employment as shown in columns 1 and 3 of panel (b). In addition, firms also repurchase more shares and save more cash (columns 4 and 6). Hence arbitrage and pre-cautionary saving motive can also exist [69], echoing what we see in column 2 of Table 3 panel (b).

C Heterogeneity in information asymmetry

In this section, I provide descriptive evidence supporting the information transmission mechanism by demonstrating that: (1) the debt-equity holdings relationship is stronger for firms with greater information asymmetry; (2) this relationship is further amplified in periods with elevated macro-uncertainty.

Firm value consists of both idiosyncratic component and (firm-specific) exposure to aggregate conditions. When macro uncertainty is high, one more piece of information is more valuable

[69] In untabulated results, sale growth also increases. This can happen due to relaxed financing constraints so that firms can produce more.

Table A3: Reason for debt financing

This table presents evidence on the uses of funds. In panel (a), Whited and Wu index (Whited and Wu, 2006), Size-Age index (Hadlock and Pierce, 2010) and S&P rating are used as measures of financial constraints respectively. Panel (b) examines the relationship between institutional equity shareholdings and real investment as well as other financing decisions. Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

(a) Relax financing constraints

	(1) Whited and Wu	(2) Size-Age	(3) S&P rating
L.InstShare	0.142***	0.155***	0.107***
	(0.028)	(0.029)	(0.029)
L.SADummy	-0.084***		
	(0.019)		
L.SADummy × L.InstShare	0.114***		
	(0.032)		
L.WWDummy		-0.071***	
		(0.015)	
L.WWDummy × L.InstShare		0.068***	
		(0.025)	
L3.RatingDummy			-0.157***
			(0.021)
L.InstShare × L3.RatingDummy			0.140***
			(0.029)
Firm/Year FE	Y	Y	Y
Controls	Y	Y	Y
NObs	92417	92417	81647
Adj.R2	0.048	0.048	0.048

(b) Use of funds

	(1) IvstRate	(2) $\frac{R\&D}{Sale}$	(3) ΔEmp	(4) Repurchase	(5) Dividend	(6) $\Delta Cash$
L.InstShare	0.094***	-1.105	0.152***	0.024***	-0.003	0.188***
	(0.006)	(1.395)	(0.009)	(0.004)	(0.002)	(0.023)
Firm/Year FE	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
NObs	93672	93561	92904	81634	90355	94934
Adj.R2	0.470	0.339	0.181	0.400	0.633	0.105

to investors. Macroeconomic uncertainty is measured based on (1) stock market volatility; (2) macroeconomic uncertainty in equity market (Baker et al., 2019); (3) economic policy uncertainty (Baker, Bloom and Davis, 2016). The first measure is constructed based on daily stock market return. The second measure is based on US equity market volatility index constructed by Baker et al. (2019). It is a newspaper-based measure of equity market uncertainty. Each month, authors first count newspaper articles that contain at least one term in E (economic, economy, financial), M (stock market, equity, equities, Standard and Poors (and variants)) and V (volatility, volatile, uncertain, uncertainty, risk, risky) from major US newspapers, then they standardize the measure so that it is comparable over time[70]. I focus on the uncertainty related to macroeconomic condition so I further restrict those articles to have terms related to “macroeconomic news and outlook". I choose not to focus on other topics such commodity markets, healthcare matter, fiscal policy, etc. because I am interested in macroeconomic condition uncertainty that has a broad impact on firm revenues and hence firm value. The last one measures policy-related economic uncertainty. Similar to the second measure, it is text-based by counting words related to economic, policy and uncertainty in newspapers[71]. Each of these measures captures different aspects of economic uncertainty. The fact that I obtain similar results across different measures indicates the robustness of the results.

I further control for R^2 obtained from estimating Equation (1) to account for firms' heterogeneous exposure to the market[72]. The average R^2 from CAPM model is about 10%, suggesting idiosyncratic volatility and total volatility are highly correlated (correlation coefficient 0.99). Thus I also control for the interaction between institutional equity ownership and total volatility when idiosyncratic volatility is used as a proxy for information asymmetry.

As shown in columns 1 and 6 in Table A4, the coefficients of the interaction terms are positively significant. This is consistent with the hypothesis that institutional equity ownership decreases information asymmetry faced by debt investors and hence benefits debt issuance. Further, I divide

[70]See the data page for more details https://www.policyuncertainty.com/EMV_monthly.html

[71]See https://www.policyuncertainty.com/us_monthly.html for details.

[72]Using changes in market equity instead of price change to measure the sensitivity of firm value to market conditions does not change results. Specifically, I estimate the equation below using daily market value information from CRSP and use R^2 as the measure

$$\frac{ME_{it} - ME_{it-1}}{ME_{it-1}} = \beta_{0i} + \beta_{1i} \frac{\sum_i ME_{it} - \sum_i ME_{it-1}}{\sum_i ME_{it-1}} + \epsilon_{it}$$

the sample based on macro uncertainty. The interaction term coefficient is more significant during high uncertainty period. We obtain similar results when bid-ask spread is used to measure the difficulty of measuring the firm's value.[73]

For a given level of information asymmetry, firms' debt values are more sensitive to information when firms are closer to default, but still have default probability smaller than 50%[74]. Therefore, information sharing from institutional equity investors should have stronger effects for firms closer to bankruptcy. Panel (c) of Table A4 confirms this prediction. Altman Z score is used to measure firms' default probability. A higher Altman Z score means a firm is farther from bankruptcy. In column 1, the interaction term is negative, consistent with the hypothesis that as firms move away from bankruptcy, the effect of institutional ownership is weaker as information is less important for debt values. This does not support the alternative argument that higher institutional shareholdings and debt issuance are both caused by better firm performance. One concern is that lower uncertainty in general only benefits firms that are not expected to default soon. To deal with this, column 1 removes firms that exit the sample immediately in the next period. The statistical magnitude of the interaction term is slightly stronger despite a smaller sample.

Overall, institutional equity ownership tend to be more important when macro uncertainty is high. This suggests a complementary relationship between macro and firm-specific uncertainty. This paper does not provide direct evidence on what exactly contributes to this complementarity. It could be due to more information produced when macro uncertainty is high. During periods of high economic uncertainty, one more piece of evidence is more valuable so analysts are motivated to put more efforts and produce more information[75]. Additionally, firms' productivity and demand are affected by aggregate conditions. When aggregate uncertainty is high, investors' prior belief about firm value is likely to be less precise. In this case, one unit of decrease in uncertainty introduced by institutional shareholders is more valuable. It is likely that both more information production and firm exposure to aggregate conditions are at work.

[73]I also examined dispersion and forecast error in analysts' one-year ahead EPS forecasts, constructed using IBES data. The results are similar. The coefficient in high macro uncertainty periods is positively significant. The interaction term coefficient is positive but statistically insignificant in the whole sample. This could be due to smaller sample (sample size is smaller than 60% of the sample using idiosyncratic volatility as a proxy), and larger measurement error in belief dispersion data with only a few reported analyst forecasts. We also tried implied volatility, and the interaction term is positively significant. The data is taken from Alfaro, Bloom and Lin (2024).

[74]This is due to the concavity of the debt payoff function.

[75]For example, see the Wall Street Journal article "Data-Hungry Investors Dive Deep for Economic Clues".

Institutional equity ownership indicates information transmission from equity investors to debt investors. An implicit assumption is that professional equity investors produce (or acquire) information about firms useful to debt investors. If investors do not produce valuable information [76], their holdings would be less useful signals for debt investors. In Appendix Section E, I show that the relationship between institutional equity shareholdings and debt issuance is stronger for firms held by more informed institutional investors measured by net alpha, gross alpha and value added of mutual funds.

D Alternative Mechanisms

This paper focuses on three mechanisms: information sharing from informed equity investors to debt investors, equity benchmarking, and firm characteristics. In this section, we discuss alternative explanations that may lead to a positive correlation between institutional equity ownership and debt issuance. We provide evidence suggesting either those channels do not explain more debt financing, or they cannot be the only driving force for the positive relationship between institutional equity shareholdings and debt issuance.

D.1 Corporate governance

Previous studies show that ownerships of long term and passive investors could improve corporate governance (Harford, Kecskés and Mansi, 2018; Appel, Gormley and Keim, 2016). Better corporate governance could improve firm performance and hence firm value. These would decrease capital financing costs in general. But this does not necessarily imply more debt financing. With better corporate governance, firms may be able to generate more internal funds, reducing needs for external financing. If corporate governance is an important channel, we should expect firms with poorer corporate governance to issue more debt if they have higher institutional equity ownership.

To measure corporate governance, we use two sets of variables. The first is corporate governance score, and the second is earnings management (a measure of management misbehavior). We obtain ESG management score and ESG shareholders score from Thomson Reuters, starting from

[76]Once again, the information could be hard or soft information. Examples of the latter could be individual interpretation of financial statistics, or information obtained from site visits.

Table A4: Institutional ownership and debt issuance with heterogeneous information asymmetry level

This table examines the information sharing mechanism by making use of firms' heterogeneity in information asymmetry. Panel (a) uses idiosyncratic volatility as proxy of uncertainty about firm value. Column 1 uses the idiosyncratic volatility estimated using CAPM, and columns 2-8 use Fama-French three factor. Columns 3, 5 and 7 restrict the sample to high macro uncertainty periods measured by EPU, macro equity market uncertainty and stock market market volatility respectively, while columns 4, 6 and 8 restrict the sample to low macro uncertainty periods. The interaction between $L.InstShare$ and total volatility, as well as the total volatility level is controlled throughout all columns. Panel (b) presents similar results using bid-ask spread to measure information asymmetry. Because bid-ask spread may also capture liquidity, we control for Amihud illiquidity measure in column 2. Columns 3 and 4 use cross-sectional uncertainty at the industry level, measured by SIC 3-digit industry level return volatility (excluding the firm itself). Macro conditions may affect liquidity for a wide range of investors, and cross-sectional variation from industries suffers less from these concerns as the variation does not come from time series. In columns 5-10, we restrict the samples to high and low macro uncertainty periods similar to panel (a). Panel (c) uses Altman Z score to measure firms' default probability (Altman, 1968; Bhardwaj, Gupta and Howell, 2025). Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

(a) Idiosyncratic volatility

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.InstShare	0.214***	0.222***	0.233***	0.300***	0.294***	0.252***	0.279***	0.209***
	(0.034)	(0.034)	(0.062)	(0.065)	(0.064)	(0.069)	(0.051)	(0.053)
L.idiovol	-0.345							
	(0.227)							
L.InstShare × L.idiovol	0.720***							
	(0.264)							
L.idio3factor		-0.403**	-0.097	-0.789*	-0.516*	-0.992	-0.463**	-0.413
		(0.177)	(0.270)	(0.470)	(0.270)	(0.722)	(0.226)	(0.397)
L.InstShare × L.idio3factor		0.598***	0.643*	-0.289	0.562*	1.194	0.664**	0.943
		(0.230)	(0.329)	(0.729)	(0.325)	(1.011)	(0.284)	(0.602)
	(0.030)	(0.030)	(0.062)	(0.064)	(0.082)	(0.047)	(0.059)	(0.040)
Firm/Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Periods			HiEPU	LoEPU	HiEU	LoEU	HiMktVol	LoMktVol
NObs	94941	94941	24565	31872	29094	30341	43786	48606

Table A4: Institutional ownership and debt issuance with heterogeneous information asymmetry level (continued)

(b) Bid-ask spread

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
L.InstShare	0.107***	0.110***	0.126*	0.099**	0.109*	0.150***	0.175***	0.069	0.158***	0.055
	(0.030)	(0.030)	(0.070)	(0.046)	(0.056)	(0.058)	(0.055)	(0.057)	(0.045)	(0.045)
L.BASGroup=2	-0.066***	-0.064***	-0.083**	-0.031	-0.067**	-0.082***	-0.083***	-0.083***	-0.066***	-0.082***
	(0.015)	(0.015)	(0.038)	(0.023)	(0.032)	(0.030)	(0.029)	(0.028)	(0.024)	(0.023)
L.BASGroup=3	-0.160***	-0.154***	-0.187***	-0.095***	-0.135***	-0.211***	-0.175***	-0.159***	-0.148***	-0.172***
	(0.018)	(0.018)	(0.042)	(0.029)	(0.037)	(0.035)	(0.034)	(0.034)	(0.027)	(0.028)
L.BASGroup=2 × L.InstShare	-0.002	-0.004	0.015	-0.044	0.022	-0.002	0.043	-0.002	0.004	0.004
	(0.025)	(0.025)	(0.058)	(0.038)	(0.048)	(0.047)	(0.046)	(0.046)	(0.038)	(0.036)
L.BASGroup=3 × L.InstShare	0.100***	0.099***	0.192***	-0.084	0.103	0.174**	0.143**	0.044	0.101**	0.084
	(0.035)	(0.036)	(0.072)	(0.063)	(0.066)	(0.073)	(0.062)	(0.071)	(0.051)	(0.053)
L.Amihud		-0.004								
		(0.005)								
L.InstShare × L.Amihud		-0.028								
		(0.024)								
Firm/YearFE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Periods	All	All	HiIndusVol	LoIndusVol	HiEPU	LoEPU	HiEU	LoEU	HiMktVol	LoMktVol
NObs	93811	92949	28012	30638	24192	31722	28938	29860	43404	47911

(c) Altman Z score

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.InstShare	0.156***	0.149***	0.138***	0.215***	0.247***	0.104**	0.202***	0.106**
	(0.028)	(0.030)	(0.049)	(0.054)	(0.051)	(0.052)	(0.041)	(0.042)
L.logZ	0.011	0.011	0.046**	0.032	0.038*	-0.022	0.029*	-0.006
	(0.011)	(0.011)	(0.022)	(0.020)	(0.021)	(0.022)	(0.016)	(0.017)
L.InstShare × L.logZ	-0.037**	-0.040**	-0.056*	-0.073**	-0.091***	0.006	-0.077***	-0.001
	(0.018)	(0.019)	(0.033)	(0.037)	(0.033)	(0.034)	(0.027)	(0.027)
FirmFE	Y	Y	Y	Y	Y	Y	Y	Y
YearFE	Y	Y	Y	Y	Y	Y	Y	Y
Periods	All	Survival	HiEPU	LoEPU	HiEU	LoEU	HiMktVol	LoMktVol
NObs	91790	81552	23724	30917	28150	29263	42374	46861

year 2002. The ESG management score is constructed based on two broad dimensions: (1) structure, which evaluates firms' independence, diversity, committees; (2) compensation, specifically the number of controversies published in the media linked to high executive or board compensation. The ESG shareholders score is based on two dimensions as well: (1) shareholder rights, specifically the number of controversies published in the media linked to shareholder rights infringements; (2) takeover defenses. A higher score means firms perform better in management (shareholding protection).

The second measure is accounting manipulation based on discretionary accruals normalized by total assets (Francis et al., 2005; Mi et al., 2024). The discretionary accruals are companies' accounting accruals that managers have discretion over and are easier to manipulate for specific outcomes. This measure is constructed based on regressions of total accruals on variables correlated with theoretical normal accruals. The empirical model below is estimated within each Fama-French 48 industry (with at least 20 firms) in year t.

$$\frac{tca_{it}}{at_{it-1}} = \alpha + \beta_1 \frac{1}{at} + \beta_2 \frac{cfo_{it-1}}{at_{it-1}} + \beta_3 \frac{cfo_{it}}{at_{it-1}} + \beta_4 \frac{cfo_{it+1}}{at_{it-1}} + \beta_5 \frac{\Delta rev_{it}}{at_{it-1}} + \beta_6 \frac{ppe_{it}}{at_{it-1}} + \epsilon_{it}. \quad (16)$$

The dependent variable $\frac{tca_{it}}{at_{it-1}}$ is total current accruals computed as

$$tca_{it} = \Delta ca_{it} - \Delta cl_{it} - \Delta cash_{it} + \Delta STdebt_{it}$$

where Δca_{it} is firm i's change in current assets from year $t-1$ to year t; Δcl_{it} is firm i's change in current liabilities between year $t-1$ and year t; $\Delta cash_{it}$ is firm i's change in cash from year $t-1$ to year t; $\Delta STdebt_{it}$ is firm i's change in debt from current liabilities between year $t-1$ and year t.

The earnings management is then measured by the standard deviation of firm i's residuals from year $t-4$ to t. Larger standard deviations of residuals indicate poorer accruals quality, as it indicates that firms frequently change or make large changes to accruals outside those predicted by corporate 'normal' operations.

Table A5 gives the results. We first look at whether institutional ownership indeed improves corporate governance. In columns 1-4 of panel (a) and column 1 of panel (b), we see that higher institutional ownership is positively related to ESG management score, negatively related to earnings management, but is not related to ESG shareholder score. Therefore, it is not safe for us to directly reject the corporate governance channel. However, what matters to us is whether higher debt issuance in response to higher institutional ownership is caused by better corporate governance. If so, we should observe that for firms with poorer corporate governance, the debt issuance-institutional ownership relation should be stronger. Nevertheless, throughout all specifications the interaction terms are either insignificant or even positively significant for shareholder protection score in column 8. This positive coefficient is actually consistent with the information sharing story. Firms that care more about shareholder interests take advantage of the debt issuance benefit brought by institutional ownership and thus issue more debt.

D.2 Creditor-shareholder conflict

When firms' debt and equity securities are held by the same investors, this aligns incentives of creditors and shareholders (Jiang, Li and Shao, 2010) and hence decreases debt financing costs stimulating debt issuance. However, this incentive alignment occurs only when firms are held by debt and equity investors from the same management company. We provide evidence on public information sharing in the previous section and this indicates that incentive alignment cannot be the single underlying mechanism. Furthermore, we have shown that the results are stronger for firms that are more difficult to value and held more by informed investors. Reduction in creditor-shareholder conflict does not necessarily imply these predictions.

D.3 Searching costs

Another explanation is that if firms are held more by institutional investors, these shareholders may help firms find lenders in the debt market. In other words, institutional ownership decreases searching costs to find debt investors. Note that the searching cost is related to informational frictions: once information asymmetry about a firm's value decreases, it is easier and less costly to find a counterparty to trade with. Some papers find that stock IPO could help firms gain access to debt investors due to public information disclosure (Almazan et al., 2023). However, part of the searching cost arises from the market structure of the capital markets, orthogonal to the information sharing mechanism. When the intermediation sector and credit supplier market are more

Table A5: Corporate governance as an alternative channel

This table tests for the corporate governance channel. In panel (a), corporate governance is measured using Governance scores from Thomson Reuters. Columns 1-4 test whether institutional ownership is related to better corporate governance. While it is positively related to management score, it is not the case for shareholder protection. Columns 1 and 3 use the continuous scores as the dependent variable, while columns 2 and 4 use a categorical variable that takes on three values. Columns 5-8 test whether firms with better corporate governance benefit less from institutional equity ownership by interaction institutional ownership with previous year's corporate governance score. In panel (b), corporate governance is measured using firms' earnings management to measure management misbehavior. The variable is constructed based on Equation 16. Column 1 tests whether institutional ownership is related to less earnings management. Columns 2 and 3 test whether firms with more ex-ante earnings manipulation benefit less from institutional equity ownership. Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

(a) Governance scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	MGscore	rateMG	SHscore	rateSH	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$
L.InstShare	0.048**	0.090**	-0.012	-0.047	0.087	0.130*	0.039	0.044
	(0.023)	(0.044)	(0.022)	(0.041)	(0.093)	(0.067)	(0.090)	(0.069)
L.InstShare × L.MGscore					0.038			
					(0.136)			
L.rateMG=2						0.055		
						(0.065)		
L.rateMG=3						0.062		
						(0.067)		
L.rateMG=2 × L.InstShare						-0.073		
						(0.081)		
L.rateMG=3 × L.InstShare						-0.015		
						(0.085)		
L.InstShare × L.SHscore							0.135	
							(0.140)	
L.rateSH=2								-0.083
								(0.061)
L.rateSH=3								-0.048
								(0.072)
L.rateSH=2 × L.InstShare								0.136*
								(0.079)
L.rateSH=3 × L.InstShare								0.105
								(0.095)
Firm/Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y
NObs	9818	9818	9818	9818	9818	9818	9818	9818

Table A5: Corporate governance as an alternative channel (continued)

(b) Earnings management

	(1)	(2)	(3)
	accCF	$\Delta Debt$	$\Delta Debt$
L.InstShare	-0.002**	0.221***	0.197***
	(0.001)	(0.036)	(0.035)
L.accCF	0.734***	-0.294	
	(0.004)	(0.222)	
L.InstShare $\times$ L.accCF		-0.288	
		(0.435)	
L.accCF=2			-0.023
			(0.016)
L.accCF=3			-0.043**
			(0.019)
L.accCF=2 $\times$ L.InstShare			0.018
			(0.025)
L.accCF=3 $\times$ L.InstShare			0.012
			(0.032)
Firm/Year FE	Y	Y	Y
Controls	Y	Y	Y
NObs	67777	68137	68137

concentrated, firms' may find it harder to find an appropriate buyer. Therefore, high institutional equity ownership might be an indicator of the high capital market concentration in the firm's sector, and hence is related to debt issuance.

If this is the case, we expect to see firms benefit more from higher institutional equity holding when the financial sector is dominated by few larger players and more concentrated. We first measure this using financial sector concentration. We compute the Herfindahl-Hirschman Index based on sale and total assets of firms in the Finance industry (SIC 6000-6999): $HHI_t = \sum_i s_{it}^2$, where s_{it} is firm i's market share[77]. Second, we use the total assets shares of top 1%, 10% or 500 firms in the finance sector, obtained from Kwon, Ma and Zimmermann (2024). Table A6 shows that the interaction term between institutional ownership and market concentration is insignificant across specifications, implying no support for the searching cost story.

D.4 Misvaluation

Previous studies have shown that firms time financial markets (Baker and Wurgler, 2002; Choi et al., 2025). If institutional equity investors overvalue a certain firm, i.e. they believe firm equity values more than the current price, they will purchase shares in the hope of making profits when the price returns to 'fair' value (Crawford, Gray and Kern, 2017)[78]. Faced with a temporarily higher demand for shares, (rational) firms would issue more equity financing either to make arbitrage profits or to raise funds for real investment (Ma, 2019), substituting for debt issuance. The same story applies to institutional equity shareholdings induced by fund flow shocks (Lou, 2012). However, this implies less debt issuance and more equity issuance, inconsistent with the signs of coefficients in Table 3.

[77] We have tried more granular industries, i.e. "Security and Commodity Brokers, Dealers, Exchanges, and Services" (SIC 6200-6299) and "Insurance Agents, Brokers and Service" (SIC 6400-6499). We obtain similar results.

[78] One may expect retail investors to be more irrational. Thus when institutional equity investors are overoptimistic, retail investors may be even more overoptimistic. So the percentage of shares held by institutional equity investors should decrease. Even if retail investors would like to purchase more, they are financially constrained. Gabaix et al. (2023) show that the overall retail order flows are insensitive to financial market fluctuations.

Table A6: Searching costs as an alternative channel

This table tests for searching costs as an alternative channel. Columns 1 and 2 use HHI index calculated using sale (log(HHISale)) and total assets (log(HHI)) of firms in the financial sector in Compustat. Columns 3-5 use the market shares (based on total assets) held by top 1%, 10% and 500 firms in the finance sector taken from Kwon, Ma and Zimmermann (2024). Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
L.InstShare	0.423**	0.342***	0.254***	0.248***	0.206
	(0.196)	(0.119)	(0.045)	(0.040)	(0.180)
L.InstShare $\times$ L.log(HHISale)	0.059				
	(0.054)				
L.InstShare $\times$ L.log(HHI)		0.041			
		(0.037)			
L.InstShare $\times$ L.log(share1pct)			0.543		
			(0.640)		
L.InstShare $\times$ L.log(share10pct)				4.757	
				(5.535)	
L.InstShare $\times$ L.log(shareTop500all)					-0.038
					(0.362)
Firm/Year FE	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y
NObs					
N	94941	94941	86078	86078	86078

E Informativeness of equity investors

To measure the amount of relevant information associated with institutional equity ownership, I take two approaches: (1) decompose total institutional equity ownership into different components; (2) measure investor informativeness more directly. Using the classification data provided by Brian Bushee[79], I categorize the total institutional ownership into six categories: independent investment advisor and investment company, bank trust, public and private pension fund, insurance company, endowments and all others. Pension funds and insurance companies are buy-and-hold investors with infrequent trading and face more regulations (Coppola, 2025), while mutual funds and bank trusts take on risks and do more active research to pick stocks. Moreover, the latter two types of investors are also crucial participants in corporate bond and loan markets. I would expect to see more significant results for these categories.

I also utilize the comprehensive data on mutual fund return to measure investor informativeness directly. I use two sets of variables to measure the informativeness of institutional equity holdings. I focus on mutual funds because I have detailed monthly returns. The 13F filings only include quarterly positions and are collected at the management firm level, whereas I can obtain returns and expense ratios of individual mutual funds. I remain agnostic about the source of manager informativeness. It could be due to personal connections to firms, geographic proximity or stronger educational background of managers (Cohen, Frazzini and Malloy, 2008; Coval and Moskowitz, 2001).

The first set of measures is based on the idea that managers with superior information can generate larger α implied by factor models (Fama and French, 2010; Agarwal et al., 2015) measured as below

$$R_{it} - R_{ft} = \alpha_i^T + F_t'\beta_i + \epsilon_{it},\ t \in [T-35, T] \tag{17}$$

where F_t is a vector of factors. I use both Carhart (1997) four-factor model and a five-factor model which adds the liquidity factor (Pástor and Stambaugh, 2003). I include the momentum factor because trend following strategy is common among mutual funds (Grinblatt et al., 2020). R_{ft} is one-month Treasury bill rate. R_{it} is gross return of mutual funds which equals net returns plus

[79] https://accounting-faculty.wharton.upenn.edu/bushee/

expense ratio (monthly), both of which are directly obtained from CRSP Mutual Fund database. I have also tried net returns, which is the return investors actually earn. The caveat is that net return is also influenced by market competition faced by mutual funds, which affects the management fees they can collect. At each month T (e.g. January 2015), α_i^T is estimated based on returns in the past 36 months. Then I aggregate α_i^T to firm level, calculated as the fund-level α_i^T weighted by the share of firm j's stock held by each fund i

$$\alpha_{ij}^T = \sum_{k \in K} \frac{ME_{iT}^j}{\sum_{k \in K} ME_{kT}^j} \alpha_i^T.$$

It is worth noting that I do not take a stand on the true asset pricing model (Fama and French, 2010), instead the factor model is used to approximate the alternative investment opportunities managers with similar risk appetites can easily seize. In other words, it represents a benchmark portfolio that fund manager can construct without acquiring much firm-specific information. The implicit assumption is that manager ability to generate α is closely associated with managers' informativeness about firm (Coval and Moskowitz, 2001). Moreover, I also use the net return of Vanguard S&P 500 Index fund (VFINX) as a benchmark. The Vanguard S&P 500 Index fund is a passive fund that tracks S&P 500. It can easily be accessed by other mutual fund managers and is also arguably well-known considering that VFINX dates back to 1976. Thus it is a natural alternative mutual fund managers and investors can get. I construct α using this benchmark as $\alpha_{it} = R_{it} - R_t^b$, where R_t^b is the net return of VFINX at month t.

The second measure is based on the *amount* of value added created by mutual fund managers (Berk and Van Binsbergen, 2015). The right measure for manager skills depends on what fund managers' objective is: managers who make outcomes closer to the objective given their constraints are presumably more skilled and informative. Berk and Van Binsbergen (2015) argue that managers maximize the value created relative to their benchmark portfolio. Based on this argument, the second measure I use is constructed as "gross excess returns over its benchmark multiplied by asset under management". The gross excess return over its benchmark is constructed as $\alpha_{it} = R_{it} - R_t^b$ as above. Firm j's investor informativeness based on value added is thus

$$VA_{ij}^T = \sum_{k \in K} \frac{ME_{iT}^j}{\sum_{k \in K} ME_{kT}^j} VA_i^T.$$

The value added measure is driven by both gross excess return and fund size. Although fund size is relatively stable (Berk and Van Binsbergen, 2015), I do not want to capture the trending part of it. To make sure the variable is comparable over time, each year I divide firms equally into three groups based on VA^T_{ij}, and create a categorical variable accordingly.

I examine whether the relationship between institutional equity ownership and debt issuance is stronger when institutional investors produce more useful information about the firm. This is confirmed in Table A7. In column 1, total institutional ownership is decomposed into six categories, and the control group is retail investor ownership[80]. I can see that the ownership of investment companies and independent advisors, and bank trusts are the most significant. In columns 2 to 8, I directly measure manager informativeness. Across different specifications, the link between institutional equity ownership and debt issuance tends to be stronger when investors are more informative.

Discussion on information revealed by prices. In an economy with homogeneous investors and rational beliefs, prices fully reflects equity value[81]. If this were true, information produced by institutional investors would be useless, considering that equity price can be accessed with low costs. However, the rationality assumption does not seem to always hold as suggested by the behavioral finance literature (Bordalo et al., 2021). Moreover, investors have heterogeneous beliefs. The price will ultimately be the weighted average of different investors' valuations (Panageas et al., 2020). Investors could also have preference for liquidity and other factors orthogonal to payoffs. This is the logic for rational expectations equilibrium models to introduce noisy traders (Grossman and Stiglitz, 1980). Informed traders also act strategically to avoid information leakage (Kyle, 1985).

Overall, institutional shareholdings are not an inferior measure of firm value: quantities and prices are like the two sides of the same coin. It might even be more valuable becomes it gives the exact positions of arguably more informed investors.

[80]Because 13 filings are only required for management firms with AUM over $100 million, so these tiny firms are also counted as retail investors under the definition used here.

[81]Investor homogeneity and complete information are not necessary conditions for this statement. For example, in a static economy with no noise traders and informed traders receiving signals about asset payoffs, price is fully revealing.

Table A7: Informativeness of institutional investors

This table examines the information sharing mechanism by exploring the heterogeneity in investor informativeness. In column 1, I decompose total institutional ownership into six components using the classification code from Brian Bushee's webpage. Columns 2-8 examine whether the link between institutional ownership and debt issuance is stronger when investors are more informative, measured by net α (columns 2-3), gross α (columns 4-5), gross excess return relative to the net return of Vanguard S&P 500 fund (columns 6-7), and total value added of mutual funds (column 8). The sample used in columns 2-8 starts from the fiscal year 2009 because CRSP Mutual Fund database contains noticeable missing values before 2008 (Schwarz and Potter, 2016). Standard errors are clustered at the firm level. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.InstShare		0.171***	0.176***	0.158***	0.162***	0.162***	0.136**	0.113**
		(0.052)	(0.052)	(0.052)	(0.052)	(0.052)	(0.053)	(0.057)
L.InvstCompShare	0.002***							
	(0.000)							
L.bankShare	0.004***							
	(0.001)							
L.pensionShare	0.003*							
	(0.002)							
L.insurShare	0.002							
	(0.001)							
L.endowShare	0.005							
	(0.007)							
L.otherShare	0.004**							
	(0.002)							
L.Net α 4factor $\times$ L.InstShare		20.746**						
		(9.614)						
L.Net α 5factor $\times$ L.InstShare			23.319**					
			(10.509)					
L.Gross α 4factor $\times$ L.InstShare				19.741**				
				(9.409)				
L.Gross α 5factor $\times$ L.InstShare					22.169**			
					(10.322)			
L.α_{SP500} $\times$ L.InstShare						0.247		
						(0.843)		
$Dummy\alpha_{SP500}$ $\times$ L.InstShare							0.063*	
							(0.033)	
$VA = 2$ $\times$ L.InstShare								0.066
								(0.044)
$VA = 3$ $\times$ L.InstShare								0.083**
								(0.041)
L.Net α 4factor		-9.215						
		(6.483)						
L.Net α 5factor			-10.748					
			(7.150)					
L.Gross α 4factor				-8.510				
				(6.350)				
L.Gross α 5factor					-9.782			
					(7.040)			
L.α_{SP500}						-0.991*		
						(0.602)		
$Dummy\alpha_{SP500}$							-0.049**	
							(0.025)	
$VA = 2$								-0.041
								(0.033)
$VA = 3$								-0.063**
								(0.030)
Firm/Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y
NObs	94941	22026	21899	22025	21895	22182	22182	22182

F Debt investors' problem

Proof for Proposition 6.4.

Proof. Using Assumption 6.1, 6.2 and Proposition 6.3

$$\pi_{lt+1} = \Phi\left(-\frac{\varrho_t^e P_{t+1}^e + \varrho_t^b \tilde{\eta}_t}{\sqrt{(\rho_{et} + (\mu_I s_t^I)^{\tilde{\zeta}})^{-1}}}\right) = \Phi\left(-(\varrho_t^e P_{t+1}^e + \varrho_t^b \tilde{\eta}_t)\sqrt{\rho_{et} + (\mu_I s_t^I)^{\tilde{\zeta}}}\right), \tag{18}$$

$$= \int_{-\infty}^{-(\varrho_t^e P_{t+1}^e + \varrho_t^b \tilde{\eta}_t)\sqrt{\rho_{et} + (\mu_I s_t^I)^{\tilde{\zeta}}}} \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx \tag{19}$$

Taylor expand the default probability around the average institutional equity shareholdings $\tilde{s}$ gives

$$\pi_{lt+1} = \Phi(\tilde{s}) + \frac{1}{\sqrt{2\pi}} e^{-\tilde{s}^2/2}(-(\varrho_r^e P_{t+1}^e + \varrho_t^b \tilde{\eta}_t)) \frac{1}{2\sqrt{\rho_{et} + \tilde{s}}}((\mu_I s_t^I)^{\tilde{\zeta}} - \tilde{s}) + O((\mu_I s_t^I)^{2\tilde{\zeta}})$$
$$\approx \delta_{0t} - \delta_{1t}(\mu_I s_t^I)^{\tilde{\zeta}},$$

where $\delta_{0t} = \Phi(\tilde{s}) + \frac{1}{\sqrt{2\pi}} e^{-\tilde{s}^2/2}(\varrho_r^e P_{t+1}^e + \varrho_t^b \tilde{\eta}_t)\frac{1}{2\sqrt{\rho_{et}+\tilde{s}}}\tilde{s}$ and $\delta_{1t} = -\frac{1}{\sqrt{2\pi}} e^{-\tilde{s}^2/2}(\varrho_r^e P_{t+1}^e + \varrho_t^b \tilde{\eta}_t)\frac{1}{2\sqrt{\rho_{et}+\tilde{s}}}$. □

Proof for Proposition 6.5.

Proof. Recall from debt investors' problem, their inverse demand function is

$$q_t = -\gamma_{0t} b_{t+1}^d + \gamma_{1t},$$

where $\gamma_{0t} \equiv \frac{\alpha Var_t}{r} = \frac{1+c}{r}\alpha\tilde{\pi}_{lt}(1-\tilde{\pi}_{lt})(1+c)(1-\xi)^2$, $\gamma_{1t} \equiv \frac{E_t}{r} = \frac{1+c}{r}(1-\tilde{\pi}_{lt}(1-\xi))$, $\tilde{\pi}_{lt} = \sum_{S_{t+1}} \Pi_{ij}\pi(S_{t+1})$.

Because the true firm value is always positive in the model, π_{lt+1} is small and hence $\tilde{\pi}_{lt}$ is also small. Therefore γ_{1t} can be approximated by

$$\gamma_{1t} \approx \frac{1+c}{r_t}.$$

Using Equation 13, we have the approximation below

$$\gamma_{0t} \approx \frac{\alpha(1+c)}{r_t}(1+c)(1-\xi)^2\tilde{\pi}_{lt} \tag{20}$$

$$\approx \frac{\alpha(1+c)}{r_t}(1+c)(1-\xi)^2(\delta_{0t} - \delta_{1t}(\mu_I s_t^I)^{\tilde{\xi}}) \tag{21}$$

$$\equiv \Phi_{0t} - \frac{\Phi_{1t}}{2}(\mu_I s_t^I)^{\tilde{\zeta}}. \tag{22}$$

Φ_{0t} and Φ_{1t} are related to recovery rate, risk aversion of debt investors, coupon payment, actual firm value and equity investors' misvaluation. These factors introduce many more parameters and additional state variable η_t^e which makes the model less tractable. In addition, the distributional assumptions are important. If the distribution of future firm value is uniform or logistic instead of normal, we still have an approximation similar to Equation 22, but the exact functional form of Φ_{0t}, Φ_{1t} differ. The key takeaway from $\Phi_{0t} - \frac{\Phi_{1t}}{2}(\mu_I s_t^I)^{\tilde{\zeta}}$ is that the sensitivity of debt price to debt issuance takes a nonlinear form and is decreasing in s_t^I. I capture this term in a parsimonious way

$$\frac{\Psi_b}{2}(\mu^I s_t^I)^{-\zeta}.$$

□

G Definition of recursive equilibrium

The definition of recursive equilibrium is given below.

Definition G.1. *A stationary recursive equilibrium for this economy is given by value function of institutional equity investor $V_{t+1}^I(b_t;\Theta_t,s_t^I)$; consumption and stockholding policy functions for each type of equity investors, $c^i(b_t;\Theta_t,s_t^I)$, $s_{t+1}^i(b_t;\Theta_t,s_t^I)$; firm equity value $P_t(b_t;\Theta_t,s_t^I)$; net distribution, debt issuance decisions $e_t(b_t;\Theta_t,s_t^I)$, $b_{t+1}(b_t;\Theta_t,s_t^I)$; pricing functions $M_{t,t+1},\bar{q}_t$ such that the following statements hold:*

1. *Given beliefs on the discount factor $M_{t,t+1}$, debt price with no default $\bar{q}_t$ and stockholding policy $s_{t+1}^I(b_t;\Theta_t,s_t^I)$, the price function and decisions rules of the firm owner solves her optimization problem*

2. *Given beliefs on share value $P_t(b_t;\Theta_t, s_t^I)$, net distribution $e_t(b_t;\Theta_t, s_t^I)$ and debt policy, the value function and decisions rule of each equity investor solve that investor's optimization problem.*

3. *All markets clear: (1) $\mu_I s_t^I + (1-\mu_I)s_t^R = 1$ (stock market), (2) $\mu_I c_t^I + (1-\mu_I)c_t^R = z_t$ (goods market), (3) $b_{t+1} = b_{t+1}^d$ (debt market), where b_{t+1}^d is debt investors' demand and b_{t+1} is firm's debt supply.*

4. *The beliefs of firm owner and equity investors are consistent with the equilibrium functions in the ergodic set.*

5. *There exists a probability measure defined over the ergodic set of equilibrium distributions that is invariant.*

This model is solved numerically using value function iteration. Details on the algorithm are given in Appendix H.

H Algorithm for numerical solution

The solution involves one outer loop and an inner loop.

1. Outer loop: First, guess equity investors' policy function $s_{t+1}^I(b_t;\Theta_t, s_t^I)$ and the mapping rule of stochastic discount factor $M_{t,t+1}$, Λ, as a linear function of $(logz_t, (logz_t)^2, log(x_t), log(b_t), log(s_t^I))$[82] for each $\theta \in \Theta$.

2. Inner loop (firm): With the guesses for policy functions and $M_{t,t+1}$, solve for the firm's optimization problem using value function iteration. The optimization step is done by grid search. Howard iteration is used to speed up the algorithm.

3. Inner loop (equity investor): Having solved the firm's problem, now use the resulting value and policy functions as the beliefs of equity investors. With these beliefs, solve the institutional equity investor's optimization problem using value function iteration.

[82]Because there is only one representative firm in the economy, the kinks in policy functions cannot be smoothed out through aggregation. Therefore, I include higher order terms of some variables in predicting the discount factor.

4. Outer loop – Update beliefs and check for convergence: Updated policy functions are obtained from steps above, and are used as new beliefs of the firm and institutional equity investors. Beliefs on $M_{t,t+1}$ are updated by estimating an OLS model on simulated data following Krusell and Smith (1998). Specifically, I estimate the OLS model below on the simulated time series for each (z_{t+1}, f_{t+1}) separately

$$log(M_{t,t+1}(z_{t+1}, f_{t+1})) = \alpha + \beta_1 log z_t + \beta_2 (log z_t)^2 + \beta_3 log(f_t) + \beta_3 log(B_t) + \beta_4 log(s_t^I) + \epsilon_{t+1}.$$

I evaluate the internal accuracy of the forecast mapping Λ using maximum Den Haan statistics (Den Haan, 2010): DH_k^{max}, the maximum absolute log difference between actually simulated $M_{t,t+1}$ and the forecasted belief $M_{t,t+1}$ estimated from the mapping rule. The forecasting rule converges when the Den-Haan statistics is small enough

$$max\{|DH_k^{max}|\} < \epsilon,$$

where $\epsilon = 1\%$. For other beliefs $P_t, s_{t+1}^I, b_{t+1}, e_{t+1}$, I simulate the path for each of these variables and calculate the absolute value of percentage change (time by time) of the simulated path of the current iteration relative to the last one. The belief converges if the maximum absolute change is smaller than ϵ. Because the model requires many beliefs to converge, I adopt a relatively weaker convergence requirement: rather than requiring all policies and value functions to converge at all states, I only require these beliefs to converge in the ergodic set. I also check the same statistics for all states, the largest absolute errors are always smaller than 0.1.

5. Iterate steps 2 to 4 until convergence.

I Debt versus Equity: A simple exercise

In this section, I show that debt might benefit more from reduction in uncertainty using a textbook static setup without bankruptcy costs: equity holders effectively hold a call option of firm value, equivalently hold firm asset and write a put option of underlying firm value.

Hypothesis 1. *Equity of firms with at least some debt holding benefits more from reduction in uncertainty.*

Hypothesis 2. *When expected firm value is larger than debt obligations, debt value increases more from a mean-preserving contraction of perceived firm value (reduction in uncertainty holding first moment unchanged) relative to equity.*

Proof. Consider a static setting. Debt investors' payoff from debt securities is the same as buying a put option of underlying firm value, firm value (debt value + equity value) is just linear in underlying firm value.

If the expected firm value is unchanged EV, further assume the distribution of firm value is symmetric. Then a decrease in uncertainty increases debt value as long as firm value on average is larger than debt obligations. Since expected firm value does not change, equity value decreases.

Let's give a proof under a simplest static setting. Suppose total firm value is $V \sim N(\bar{V}, \sigma^2)$ and the debt obligation is $\bar{D}$, then the prices of equity and debt (the expected value of future payoff) are

$$D = \bar{D} \times \pi(V \geq \bar{D}) + E[V \times 1(V < \bar{D})]. \tag{23}$$

$$E = E[(V - \bar{D}) \times 1(V \geq \bar{D})] + 0\pi(V < \bar{D}) = E[V \times 1(V \geq \bar{D})] - \bar{D} \times \pi(V \geq \bar{D}). \tag{24}$$

First notice that $D + E = E[V]$. Second, let's check out what happens if σ^2 increases.

$$\begin{aligned} D &= \bar{D} \int_{\bar{D}}^{\infty} f(V)dV + \int_0^{\bar{D}} Vf(V)dV, \\ &= EV - \int_{\bar{D}}^{\infty} (V - \bar{D})f(V)dV, \\ &= EV - E[(V - \bar{D}) \times 1(V \geq \bar{D})] \\ &= EV - \sigma E[\frac{V - \bar{D}}{\sigma} \times 1(\frac{V - \bar{D}}{\sigma} \geq 0)] \end{aligned}$$

$\frac{V-\bar{D}}{\sigma} \sim N(\frac{\bar{V}-\bar{D}}{\sigma}, 1)$. The second term of the last equation is the expectation of a truncated normal distribution and equals

$$\sigma \times (\frac{\bar{V} - \bar{D}}{\sigma} + \frac{\phi(\alpha)}{1 - \Phi(\alpha)}) = \bar{V} - \bar{D} + \sigma \frac{\phi(\alpha)}{1 - \Phi(\alpha)}.$$

where $\alpha = -\frac{\bar{V}-\bar{D}}{\sigma}$. If $\bar{V} \geq \bar{D}$, α is increasing in σ, hence $\frac{1}{1-\Phi(\alpha)}$ is increasing in σ. As $\alpha < 0$, $\phi(\alpha)$ increases in σ as well.

For given EV, if $\bar{V} \geq \bar{D}$, i.e. on average the firm is able to fulfill its debt obligations, an decrease in σ will decrease the second term (the value owing to equity holders) $\int_{\bar{D}}^{\infty}(V-\bar{D})f(V)dV$, and hence debt value increases. However, if firm is on average going to default, $\bar{V} < \bar{D}$, $\frac{1}{1-\Phi(\alpha)}$ increase when σ rises while $\phi(\alpha)$ decreases, so the ultimate effect is ambiguous.[83]

Intuitively, when uncertainty about firm value is high, equity investor can benefit from the extreme high value while being protected from the low value due to limited liability. For a fixed expected firm value, debt value decreases. Similarly, when uncertainty about firm value decreases, debt value increases relative to equity value due to higher downside risk and concavity of payoff function. □

J Equity index inclusion

From the firm's problem, we can obtain the marginal benefit and marginal cost from the first order condition (interior solution)

$$(1-\frac{\partial \Psi_t^d}{\partial d_t})\,(q_t - \Psi_b b_{t+1}) = E_t\left(M_{t,t+1}[(1+c-c\tau)(1-\frac{\partial \Psi_{t+1}^d}{\partial d_{t+1}})]\right).$$

Therefore, the demand for debt capital is

$$b_{t+1} = q_t - \frac{E_t\left(M_{t,t+1}[(1+c-c\tau)(1-\frac{\partial \Psi_{t+1}^d}{\partial d_{t+1}})]\right)}{\Psi_b(1-\frac{\partial \Psi_t^d}{\partial d_t})},$$
$$\frac{\partial \Psi_t^d}{\partial d_t} = 1 + \psi_d \cdot 1\{d_t < 0\}.$$

[83]To make this easier to understand, let's do a quick numerical exercise. Equity value can be 0, 0 and 1 with probability 0.25,0.5 and 0.25 respectively. The first two values occur when the firm defaults. Correspondingly, debt value is 0,1 and 1 with probability 0.25,0.5 and 0.25 respectively. The expected equity value is 0.25, while 0.75 for debt. Now suppose the probability distribution becomes (0,1,0). Then expected equity value becomes 0, while 1 for debt.

Further reorganization gives

$$b_{t+1} = q_t - \frac{E_t\left(M_{t,t+1}[(1+c-c\tau)(1+\psi_d \cdot 1\{d_{t+1} < 0\})]\right)}{\Psi_b(1+\psi_d \cdot 1\{d_t < 0\})}$$

$$E_t\left(M_{t,t+1}[(1+c-c\tau)(1+\psi_d \cdot 1\{d_{t+1} < 0\})]\right)$$
$$= E_t(M_{t,t+1})E_t((1+c-c\tau)(1+\psi_d \cdot 1\{d_{t+1} < 0\})) + cov(M_{t,t+1}, (1+c-c\tau)(1+\psi_d \cdot 1\{d_{t+1} < 0\}))$$

With index inclusion, $M_{t,t+1}$ becomes less sensitive to risky cash flows. Hence covariance term decreases[84]. When the decrease in covariance dominates the change in the level of discount factor $E_t(M_{t,t+1})$, equity index inclusion increases debt demand for given price q_t. That is, the demand curve for debt capital shifts upward and firms issue more debt in equilibrium.

Both quantitative analysis and empirical evidence support the positive effects of index inclusion on debt issuance.

[84]The level of discount factor is also affected. However, the counterfactual analysis shows that risk premium channel is quantitatively important and increasing ψ indeed leads to stronger relationship between debt issuance and institutional equity shareholdings.

References

Addoum, Jawad M, and Justin R Murfin. 2020. "Equity price discovery with informed private debt." *The Review of Financial Studies*, 33(8): 3766–3803.

Agarwal, Vikas, Kevin A Mullally, Yuehua Tang, and Baozhong Yang. 2015. "Mandatory portfolio disclosure, stock liquidity, and mutual fund performance." *The Journal of Finance*, 70(6): 2733–2776.

Ai, Hengjie, Murray Z Frank, and Ali Sanati. 2020. "The trade-off theory of corporate capital structure."

Akerlof, George A. 1978. "The market for "lemons": Quality uncertainty and the market mechanism." In *Uncertainty in economics*. 235–251. Elsevier.

Alfaro, Ivan, Nicholas Bloom, and Xiaoji Lin. 2024. "The finance uncertainty multiplier." *Journal of Political Economy*, 132(2): 577–615.

Almazan, Andres, Nathan Swem, Sheridan Titman, and Gregory Weitzner. 2023. "Access to Capital and the IPO Decision: An Analysis of US Private Firms."

Altman, Edward I. 1968. "Financial ratios, discriminant analysis and the prediction of corporate bankruptcy." *The journal of finance*, 23(4): 589–609.

Amihud, Yakov. 2002. "Illiquidity and stock returns: cross-section and time-series effects." *Journal of financial markets*, 5(1): 31–56.

Anderson, Anne-Marie, and Edward A Dyl. 2005. "Market structure and trading volume." *Journal of Financial Research*, 28(1): 115–131.

Appel, Ian R, Todd A Gormley, and Donald B Keim. 2016. "Passive investors, not passive owners." *Journal of Financial Economics*, 121(1): 111–141.

Appel, Ian R, Todd A Gormley, and Donald B Keim. 2019. "Standing on the shoulders of giants: The effect of passive investors on activism." *The Review of Financial Studies*, 32(7): 2720–2774.

Appel, Ian, Todd A Gormley, and Donald B Keim. 2020. "Identification using Russell 1000/2000 index assignments: A discussion of methodologies." *Critical Finance Review, Forthcoming*.

Auh, Jun Kyung, and Jennie Bai. 2020. "Cross-asset information synergy in mutual fund families." National Bureau of Economic Research.

Baker, Malcolm. 2009. "Capital market-driven corporate finance." *Annu. Rev. Financ. Econ.*, 1(1): 181–205.

Baker, Malcolm, and Jeffrey Wurgler. 2002. "Market timing and capital structure." *The journal of finance*, 57(1): 1–32.

Baker, Scott Baker, Nicholas Bloom, Steven J Davis, and Kyle Kost. 2019. "Policy news and equity market volatility." *NBER working paper*, 25720.

Baker, Scott R, Nicholas Bloom, and Steven J Davis. 2016. "Measuring economic policy uncertainty." *The quarterly journal of economics*, 131(4): 1593–1636.

Begenau, Juliane, and Juliana Salomao. 2019. "Firm financing over the business cycle." *The Review of Financial Studies*, 32(4): 1235–1274.

Begenau, Juliane, Maryam Farboodi, and Laura Veldkamp. 2018. "Big data in finance and the growth of large firms." *Journal of Monetary Economics*, 97: 71–87.

Ben-David, Itzhak, Francesco Franzoni, and Rabih Moussawi. 2019. "An improved method to predict assignment of stocks into Russell indexes." National Bureau of Economic Research.

Berk, Jonathan B, and Jules H Van Binsbergen. 2015. "Measuring skill in the mutual fund industry." *Journal of financial economics*, 118(1): 1–20.

Bernanke, Ben S, and Mark Gertler. 1986. "Agency costs, collateral, and business fluctuations."

Bhardwaj, Abhishek, Abhinav Gupta, and Sabrina T Howell. 2025. "Capital Structure & Firm Outcomes: Evidence from Dividend Recapitalizations in Private Equity."

Bloom, Nicholas. 2009. "The impact of uncertainty shocks." *econometrica*, 77(3): 623–685.

Bordalo, Pedro, Nicola Gennaioli, Andrei Shleifer, and Stephen J Terry. 2021. "Real credit cycles." National Bureau of Economic Research.

Bushee, Brian J. 2001. "Do institutional investors prefer near-term earnings over long-run value?" *Contemporary accounting research*, 18(2): 207–246.

Carhart, Mark M. 1997. "On persistence in mutual fund performance." *The Journal of finance*, 52(1): 57–82.

Cella, Cristina, Andrew Ellul, and Mariassunta Giannetti. 2013. "Investors' horizons and the amplification of market shocks." *The Review of Financial Studies*, 26(7): 1607–1648.

Cetorelli, Nicola, Gabriele La Spada, and João AC Santos. 2022. "Monetary Policy, Investor Flows, and Loan Fund Fragility." *FRB of New York Staff Report*, , (1008).

Chaudhary, Manav, Zhiyu Fu, and Jian Li. 2023. "Corporate bond multipliers: Substitutes matter." *Available at SSRN*.

Cheng, Haw, and Alice Hsiaw. 2022. "Distrust in experts and the origins of disagreement." *Journal of economic theory*, 200: 105401.

Chen, Hui. 2010. "Macroeconomic conditions and the puzzles of credit spreads and capital structure." *The Journal of Finance*, 65(6): 2171–2212.

Chen, Hui, Zhiyao Chen, and Jun Li. 2023. "The debt-equity spread." *Available at SSRN 3944082*.

Chen, Qi, Itay Goldstein, and Wei Jiang. 2006. "Price Informativeness and Investment Sensitivity to Stock Price." *The Review of Financial Studies*, 20(3): 619–650.

Chinco, Alex, and Marco Sammon. 2024. "The passive ownership share is double what you think it is." *Journal of Financial Economics*, 157: 103860.

Choi, Jaewon, Xu Tian, Yufeng Wu, and Mahyar Kargar. 2025. "Investor demand, firm investment, and capital misallocation." *Journal of Financial Economics*, 168: 104039.

Chung, Kee H, and Hao Zhang. 2014. "A simple approximation of intraday spreads using daily data." *Journal of Financial Markets*, 17: 94–120.

Cohen, Lauren, Andrea Frazzini, and Christopher Malloy. 2008. "The small world of investing: Board connections and mutual fund returns." *Journal of Political Economy*, 116(5): 951–979.

Collin-Dufresne, Pierre, and Vyacheslav Fos. 2015. "Shareholder activism, informed trading, and stock prices." *Swiss Finance Institute Research Paper*, , (13-70).

Cooley, Thomas F, and Vincenzo Quadrini. 2001. "Financial markets and firm dynamics." *American economic review*, 91(5): 1286–1310.

Coppola, Antonio. 2025. "In safe hands: The financial and real impact of investor composition over the credit cycle."

Coval, Joshua D, and Tobias J Moskowitz. 2001. "The geography of investment: Informed trading and asset prices." *Journal of political Economy*, 109(4): 811–841.

Crawford, Steven S, Wesley R Gray, and Andrew E Kern. 2017. "Why do fund managers identify and share profitable ideas?" *Journal of Financial and Quantitative Analysis*, 52(5): 1903–1926.

Crouzet, Nicolas. 2021. "Credit disintermediation and monetary policy." *IMF Economic Review*, 69(1): 23–89.

Davis, Steven J, John Haltiwanger, and Scott Schuh. 1996. "Small business and job creation: Dissecting the myth and reassessing the facts." *Small business economics*, 8: 297–315.

DeAngelo, Harry, Linda DeAngelo, and Toni M Whited. 2011. "Capital structure dynamics and transitory debt." *Journal of financial economics*, 99(2): 235–261.

Den Haan, Wouter J. 2010. "Comparison of solutions to the incomplete markets model with aggregate uncertainty." *Journal of Economic Dynamics and Control*, 34(1): 4–27.

Drechsler, Itamar, Alan Moreira, and Alexi Savov. 2020. "Liquidity and volatility." National Bureau of Economic Research.

Duarte, Jefferson, Francis A Longstaff, and Fan Yu. 2007. “Risk and return in fixed-income arbitrage: Nickels in front of a steamroller?” *The Review of Financial Studies*, 20(3): 769–811.

Eslava, Marcela, John Haltiwanger, Adriana Kugler, and Maurice Kugler. 2010. “Factor adjustments after deregulation: panel evidence from Colombian plants.” *The Review of Economics and Statistics*, 92(2): 378–391.

Fama, Eugene F, and Kenneth R French. 2002. “Testing trade-off and pecking order predictions about dividends and debt.” *Review of financial studies*, 1–33.

Fama, Eugene F, and Kenneth R French. 2010. “Luck versus skill in the cross-section of mutual fund returns.” *The journal of finance*, 65(5): 1915–1947.

Francis, Jennifer, Ryan LaFond, Per Olsson, and Katherine Schipper. 2005. “The market pricing of accruals quality.” *Journal of accounting and economics*, 39(2): 295–327.

Gabaix, Xavier, Ralph S.J. Koijen, Federico Mainardi, Sangmin S. Oh, and Motohiro Yogo. 2023. “Asset Demand of U.S. Households.” Working paper.

Gertler, Mark, and Nobuhiro Kiyotaki. 2010. “Financial intermediation and credit policy in business cycle analysis.” In *Handbook of monetary economics*. Vol. 3, 547–599. Elsevier.

Gilchrist, Simon, and Egon Zakrajšek. 2012. “Credit spreads and business cycle fluctuations.” *American economic review*, 102(4): 1692–1720.

Goldstein, Itay, Yan Xiong, and Liyan Yang. 2025. “Information sharing in financial markets.” *Journal of Financial Economics*, 163: 103967.

Greenwood, Robin, and Dimitri Vayanos. 2014. “Bond supply and excess bond returns.” *The Review of Financial Studies*, 27(3): 663–713.

Greenwood, Robin, Samuel G Hanson, and Gordon Y Liao. 2018. “Asset price dynamics in partially segmented markets.” *The Review of Financial Studies*, 31(9): 3307–3343.

Grinblatt, Mark, Gergana Jostova, Lubomir Petrasek, and Alexander Philipov. 2020. “Style and skill: Hedge funds, mutual funds, and momentum.” *Management Science*, 66(12): 5505–5531.

Grossman, Sanford J, and Joseph E Stiglitz. 1980. "On the impossibility of informationally efficient markets." *The American economic review*, 70(3): 393–408.

Hadlock, Charles J, and Joshua R Pierce. 2010. "New evidence on measuring financial constraints: Moving beyond the KZ index." *The review of financial studies*, 23(5): 1909–1940.

Harford, Jarrad, Ambrus Kecskés, and Sattar Mansi. 2018. "Do long-term investors improve corporate decision making?" *Journal of Corporate Finance*, 50: 424–452.

Harris, Lawrence E, and Michael S Piwowar. 2006. "Secondary trading costs in the municipal bond market." *The Journal of Finance*, 61(3): 1361–1397.

Hennessy, Christopher A, and Toni M Whited. 2005. "Debt dynamics." *The journal of finance*, 60(3): 1129–1165.

He, Zhiguo, and Konstantin Milbradt. 2014. "Endogenous liquidity and defaultable bonds." *Econometrica*, 82(4): 1443–1508.

Holmstrom, Bengt. 1982. "Moral hazard in teams." *The Bell journal of economics*, 324–340.

Huang, Jing-Zhi, and Ming Huang. 2012. "How much of the corporate-treasury yield spread is due to credit risk?" *The Review of Asset Pricing Studies*, 2(2): 153–202.

Ivashina, Victoria, and Zheng Sun. 2011. "Institutional demand pressure and the cost of corporate loans." *Journal of Financial Economics*, 99(3): 500–522.

Jermann, Urban, and Vincenzo Quadrini. 2012. "Macroeconomic effects of financial shocks." *American Economic Review*, 102(1): 238–271.

Jiang, Wei, Kai Li, and Pei Shao. 2010. "When shareholders are creditors: Effects of the simultaneous holding of equity and debt by non-commercial banking institutions." *The Review of Financial Studies*, 23(10): 3595–3637.

Johnston, Rick, Stanimir Markov, and Sundaresh Ramnath. 2009. "Sell-side debt analysts." *Journal of Accounting and Economics*, 47(1-2): 91–107.

Kapadia, Nikunj, and Xiaoling Pu. 2012. "Limited arbitrage between equity and credit markets." *Journal of Financial Economics*, 105(3): 542–564.

Kashyap, Anil K, Natalia Kovrijnykh, Jian Li, and Anna Pavlova. 2021. "The benchmark inclusion subsidy." *Journal of Financial Economics*, 142(2): 756–774.

Kashyap, Anil K., et al. 2023. "Is there too much benchmarking in asset management?" *American Economic Review*, 113(4): 1112–1141.

Kiyotaki, Nobuhiro, and John Moore. 1997. "Credit cycles." *Journal of political economy*, 105(2): 211–248.

Koijen, Ralph SJ, and Motohiro Yogo. 2019. "A demand system approach to asset pricing." *Journal of Political Economy*, 127(4): 1475–1515.

Krishnamurthy, Arvind, and Tyler Muir. 2017. "How credit cycles across a financial crisis." National Bureau of Economic Research.

Kroen, Thomas, Ernest Liu, Atif R Mian, and Amir Sufi. 2021. "Falling rates and rising superstars." National Bureau of Economic Research.

Krusell, Per, and Anthony A Smith, Jr. 1998. "Income and wealth heterogeneity in the macroeconomy." *Journal of political Economy*, 106(5): 867–896.

Kwon, Spencer Y, Yueran Ma, and Kaspar Zimmermann. 2024. "100 years of rising corporate concentration." *American Economic Review*, 114(7): 2111–2140.

Kyle, Albert S. 1985. "Continuous auctions and insider trading." *Econometrica: Journal of the Econometric Society*, 1315–1335.

Laarits, Toomas, and Marco Sammon. 2024. "The retail habitat." *Available at SSRN 4262861*.

Leary, Mark T. 2009. "Bank loan supply, lender choice, and corporate capital structure." *The Journal of Finance*, 64(3): 1143–1185.

Lou, Dong. 2012. "A flow-based explanation for return predictability." *The Review of Financial Studies*, 25(12): 3457–3489.

Ma, Linlin, Yuehua Tang, and Juan-Pedro Gomez. 2019. "Portfolio manager compensation in the US mutual fund industry." *The Journal of Finance*, 74(2): 587–638.

Ma, Yueran. 2019. "Nonfinancial firms as cross-market arbitrageurs." *The Journal of Finance*, 74(6): 3041–3087.

Merton, Robert C. 1974. "On the pricing of corporate debt: The risk structure of interest rates." *The Journal of finance*, 29(2): 449–470.

Mi, Biao, Luqiao Zhang, Liang Han, and Yun Shen. 2024. "Bank market power and financial reporting quality." *Journal of Corporate Finance*, 84: 102530.

Nikolova, Stanislava, Liying Wang, and Juan Julie Wu. 2020. "Institutional allocations in the primary market for corporate bonds." *Journal of Financial Economics*, 137(2): 470–490.

Ofek, Eli, and Matthew Richardson. 2003. "Dotcom mania: The rise and fall of internet stock prices." *the Journal of Finance*, 58(3): 1113–1137.

Ottonello, Pablo, and Thomas Winberry. 2020. "Financial heterogeneity and the investment channel of monetary policy." *Econometrica*, 88(6): 2473–2502.

Panageas, Stavros, et al. 2020. "The implications of heterogeneity and inequality for asset pricing." *Foundations and Trends® in Finance*, 12(3): 199–275.

Parker, Jonathan A, Antoinette Schoar, and Yang Sun. 2023. "Retail financial innovation and stock market dynamics: The case of target date funds." *The Journal of Finance*, 78(5): 2673–2723.

Pástor, L'uboš, and Robert F Stambaugh. 2003. "Liquidity risk and expected stock returns." *Journal of Political economy*, 111(3): 642–685.

Pavlova, Anna, and Taisiya Sikorskaya. 2023. "Benchmarking intensity." *The Review of Financial Studies*, 36(3): 859–903.

Sammon, M. 2024. "Passive ownership and price informativeness." *Management Science*.

Sandulescu, Mirela. 2019. "How integrated are corporate bond and stock markets?" *Ross School of Business Paper Forthcoming, Swiss Finance Institute Research Paper*, , (20-09).

Schaefer, Stephen M, and Ilya A Strebulaev. 2008. "Structural models of credit risk are useful: Evidence from hedge ratios on corporate bonds." *Journal of Financial Economics*, 90(1): 1–19.

Schwarz, Christopher G, and Mark E Potter. 2016. "Revisiting mutual fund portfolio disclosure." *The Review of Financial Studies*, 29(12): 3519–3544.

Shiller, Robert J, and John Pound. 1989. "Survey evidence on diffusion of interest and information among investors." *Journal of Economic Behavior & Organization*, 12(1): 47–66.

Stiglitz, Joseph E, and Andrew Weiss. 1981. "Credit rationing in markets with imperfect information." *The American economic review*, 71(3): 393–410.

Strebulaev, Ilya A, and Baozhong Yang. 2013. "The mystery of zero-leverage firms." *Journal of Financial Economics*, 109(1): 1–23.

Terry, Stephen J. 2023. "The macro impact of short-termism." *Econometrica*, 91(5): 1881–1912.

Terry, Stephen J, Toni M Whited, and Anastasia A Zakolyukina. 2023. "Information versus investment." *The Review of Financial Studies*, 36(3): 1148–1191.

van Binsbergen, Jules H, Michael W Brandt, and Ralph SJ Koijen. 2012. "Decentralized decision making in investment management." In *The Oxford handbook of quantitative asset management*. 157–76. Citeseer.

Wermers, Russ. 2001. "The potential effects of more frequent portfolio disclosure on mutual fund performance." *Perspective*, 7(3): 1–11.

Whited, Toni M. 1992. "Debt, liquidity constraints, and corporate investment: Evidence from panel data." *The journal of finance*, 47(4): 1425–1460.

Whited, Toni M, and Guojun Wu. 2006. "Financial constraints risk." *The review of financial studies*, 19(2): 531–559.

Yang, Ming. 2020. "Optimality of debt under flexible information acquisition." *The Review of Economic Studies*, 87(1): 487–536.

Yu, Fan. 2006. "How profitable is capital structure arbitrage?" *Financial Analysts Journal*, 62(5): 47–62.

Zhang, Lu. 2005. "The value premium." *The Journal of Finance*, 60(1): 67–103.