Bridging Markets: Equity Investors' Dual Roles in Corporate Debt Financing

December 22, 2025

Abstract

I demonstrate that institutional equity investors influence corporate debt financing through their dual roles as informed traders and shareholders. These roles operate through two distinct channels: an information transmission channel that affects debt investors' capital supply, and an equity benchmarking channel that affects firms' demand for debt capital by altering shareholders' effective risk tolerance. Empirically, I provide evidence for both channels using a mutual fund disclosure reform and equity benchmarking intensity as an instrument, respectively. Theoretically, I develop a dynamic general equilibrium model that incorporates both channels and endogenizes firms' financing choices and investors' shareholdings. The calibrated model shows that the information channel accounts for over 20% of the observed relationship between institutional ownership and corporate debt issuance, with the associated information costs representing about 5% of equity value. Furthermore, an increase in benchmarking intensity 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, Passive ownership, Capital structure, Information, Uncertainty, Capital markets segmentation, Credit cycle.

1 Introduction

Institutional investors, who now hold roughly 60% of U.S. public equities, occupy a unique position in bridging equity and debt markets. First, as informed traders, they generate information about firms, shaping market beliefs about firm values. Second, as shareholders, their investment mandates, such as benchmarking to equity indexes,[1] influence the valuation of firms' cash flows.

In this paper, I examine how institutional equity investors affect firms' debt financing outcomes. Traditionally, debt and equity markets are viewed as fully integrated (Modigliani and Miller, 1958; Miller, 1977). In contrast, a growing body of work studies how investor characteristics in a given market impact financing outcomes in that same market (Baker and Wurgler, 2002; Coppola, 2025), implicitly assuming complete segmentation. These contrasting views highlight a gap in our understanding of interactions between debt and equity markets.

This paper fills this gap by showing that institutional equity ownership significantly influences corporate debt issuance. I document that a 1 percentage point increase in institutional ownership is associated with over 4% rise in debt issuance among U.S. non-financial firms. I demonstrate, both empirically and through a dynamic general equilibrium model, that two mechanisms are crucial for this cross-market relationship. First, institutional equity investors transmit information to debt investors, which reduces debt investors' uncertainty about firm values and reveals firms' quality. This channel raises the valuations debt investors assign to firms, especially those with high information asymmetry or good quality, and increases debt capital supply. Second, institutional equity investors' benchmarking practices create additional inelastic demand for constituent firms' shares. By inducing shareholders to hold these firms' equity regardless of cash-flow risk, benchmarking lowers the risk premium shareholders require without altering their underlying preferences. This reduced sensitivity to future cash flow volatility decreases firms' marginal costs of debt financing and thus encourages debt issuance.

I begin by providing empirical evidence for both mechanisms by leveraging two sources of

[1] Throughout this paper, benchmarking refers broadly to both the benchmarking practices of active funds and the strict indexing strategies of passive funds.

exogenous variation. First, I examine the information channel using a difference-in-differences design that exploits a 2004 regulatory change by the Securities and Exchange Commission (SEC). This reform mandated more frequent disclosure of mutual fund holdings, improving the transparency of institutional equity investors' activity. As investors' holdings reflect their private information and assessments of firm value, the new rule revealed more updated information to the market, including debt investors. This reduced uncertainty about firm value and revealed firm quality, lowering debt financing costs particularly for well-performing firms. The effects should be most pronounced for firms where investors' shareholdings were more likely to reveal new information and where new information carried the highest value. Consistent with these predictions, firms with higher ownership by treated funds issued more debt following the regulation change, with stronger effects among firms with lower price informativeness, higher profitability, and greater information asymmetry. Furthermore, firms with higher ownership by index funds, whose holdings are largely unrelated to private information, exhibited no significant increase in debt issuance. This isolates the effect to the revelation of information instead of just differences in institutional ownership.

Second, I examine the equity benchmarking channel using benchmarking intensity as an instrument following Pavlova and Sikorskaya (2023). This instrument measures firms' institutional ownership driven by indexing and benchmarking demand arising from the Russell 1000/2000 index reconstitution. Benchmarking portfolio performance to equity indexes is a pervasive practice among institutional equity investors. It introduces additional inelastic demand for constituent firms' shares, reducing shareholders' sensitivity to firms' cash flow risk without altering underlying preferences and thus lowering the risk premium. Because debt repayment obligations make firms' cash flows riskier, the reduction in required risk compensation lowers firms' marginal cost of debt financing, encouraging firms to use debt financing more. Consistent with this mechanism, institutional ownership induced by benchmarking leads to lower risk premiums and more equity and debt issuance. It also lengthens debt maturity, consistent with long-term debt being more sensitive to borrowing costs.

To further investigate the magnitude and implications of each mechanism for debt issuance, I develop a dynamic general equilibrium model with three key features based on the empirical findings: (i) endogenous institutional ownership and firms' financing decisions; (ii) debt issuance costs arising from debt investors' information frictions, which decrease in institutional equity ownership; (iii) benchmarking mandate embedded in institutional equity investors' budget constraint, which affects shareholders' stochastic discount factors (SDF) and thus the valuation of firm cash flows. In the model, the firm issues debt and equity to cover operational costs and repay previous debt. The level of optimal debt issuance is limited not only by a borrowing constraint, but also by debt issuance costs stemming from debt investors' uncertainty about firm values. Motivated by empirical findings, this uncertainty declines in institutional ownership, arising from debt investors' learning from institutional equity investors. On the investor side, institutional equity holders choose stock purchases by weighing the standard intertemporal consumption tradeoff against a benchmarking penalty for deviations from a target shareholding. This benchmarking incentive directly enters investors' SDF and thus alters the way they value the firm's cash flows.

To fit the real data, the model is calibrated to match several key empirical moments: debt-to-revenue ratio, net equity issuance-to-market value ratio, average and persistence of institutional ownership, and auxiliary regression coefficients that capture the debt-equity holdings relationship. Beyond these target moments, the model also reproduces untargeted moments related to external financing, fluctuations in firm values and the correlation between institutional ownership and corporate revenues reasonably well. As the model is over-identified, the overall fit indicates that it captures the main forces underlying the relationship between institutional ownership and debt issuance, the focus of this paper.

Using the calibrated model, I show that the information and equity benchmarking channels produce quantitatively different responses of debt issuance to fundamental shocks, and that the two channels interact with one another in generating equilibrium financing outcomes. To illustrate this, I compare the impulse responses of debt issuance and institutional shareholdings to revenue shocks in three models: (i) the baseline model; (ii) a model without information transmission; (iii) a model with higher benchmarking intensity. In all three cases, a positive revenue shock leads to increases in both institutional ownership and debt issuance. However, the increase in debt issuance is more muted in the last two. In the baseline model, a positive and persistent revenue shock reduces debt issuance costs because future repayment obligations can be met at lower costs using internal funds. The positive response of debt issuance is further amplified as higher institutional ownership generates and transmits more information to debt investors, reducing uncertainty about firm values and lowering debt financing costs. When information transmission is eliminated in model (ii), this amplification channel disappears, leading to a smaller increase in debt issuance. With stronger benchmarking intensity in model (iii), deviations from the target shareholding are penalized more severely, dampening the rise in institutional ownership and reducing the precision of information transmitted. Moreover, the rise in institutional ownership, closer to the target, attenuates the inelastic demand effect of benchmarking, effectively raising shareholders' risk aversion. These forces together further moderate the increase in debt issuance.

To quantify and further investigate the implications of each mechanism, I conduct a series of counterfactual analyses. First, eliminating information transmission reduces the debt-equity holdings relationship by about 20%. The information frictions associated with debt issuance are also economically significant, accounting for roughly 5% of equity value. Equity benchmarking likewise strengthens the positive debt-equity holdings relationship: a stricter benchmarking mandate, comparable to the institutional ownership increase from Russell 2000 additions, amplifies the relationship by 9%. Moreover, I also examine how this cross-market relationship varies with firms' cash flow characteristics. When operational costs are lowered, firms retain more internal funds and become less dependent on external financing, including debt issuance, to sustain operations. Because both information transmission and equity benchmarking operate by reducing the cost of debt issuance, their impact diminishes in an environment where firms already have sufficient internal resources, thereby weakening the effects of institutional equity investors on debt financing. A similar pattern emerges when equity issuance costs fall. In this case, firms gain greater flexibility to raise external finance through equity rather than debt, which reduces the importance of debt issuance costs and further attenuates the debt–equity holdings relationship.

The model also has implications for the dynamics of debt issuance. While prior research attributes credit contractions during recessions primarily to declines in collateral values, my results suggest that investors' behaviors also play an important role. Institutional investors' shareholdings tend to be lower when corporate profits fall, and this influences debt dynamics in two distinct ways. First, with inadequate internal funds, firms in low states rely more on external financing to cover operational costs and repay debts. Yet lower institutional ownership in these states means less information is produced and transmitted by equity investors. Debt investors, lacking precise information about firms, require more compensation for supplying debt, raising firms' debt financing costs. That is, institutional ownership is low exactly when more information is needed to relax debt financing constraints, thereby amplifying credit cycles. Second, reduced ownership in downturns strengthens investors' incentives to purchase shares to meet target allocations. This inelastic demand lowers shareholders' sensitivity to debt repayment risk, reducing firms' marginal cost of debt and encouraging issuance. Thus, the equity benchmarking channel mitigates credit cycles, counteracting the amplifying role of the information channel.

By combining empirical and structural approaches, this paper demonstrates that institutional equity investors affect debt financing through their dual roles: (i) as informed traders influencing debt investors' supply of capital; (ii) as shareholders whose benchmarking incentives shape firms' demand for capital. These mechanisms also generate distinct implications for the dynamics of debt issuance: the information channel amplifies credit cycles by strengthening the response of debt financing to changes in fundamentals, whereas benchmarking helps stabilize issuance by dampening firms' sensitivity to cash-flow fluctuations. Taken together, this paper underscores the importance of equity investors' behavior in understanding debt financing dynamics.

Literature Review. This paper closely relates to five strands of literature. The first is the growing literature on how investor characteristics affect corporate policies and asset prices (Baker, 2009). One line of research adopts reduced-form empirical strategies. For example, Baker and Wurgler (2002) show that firms exploit equity misvaluation to time the market. Some studies exploit plausibly exogenous variation, such as index inclusions, fund flows and intermediary balance-sheet shocks, to provide causal identification (Leary, 2009; Lou, 2012; Kashyap et al., 2023). For instance, using a shift-share instrument, Coppola (2025) shows that firms whose bonds are predominantly held by insurers sustain higher debt at lower cost in bond market turmoil. Another line of research adopts structural approaches, using demand-based asset pricing approach to estimate the shape of investor demand for equities and bonds (Koijen and Yogo, 2019; Chaudhary, Fu and Li, 2023; Choi et al., 2025). Yet, these studies often examine debt and equity markets in isolation, abstracting from cross-market interactions. This paper fills the gap by demonstrating that institutional equity investors affect both supply and demand of debt capital markets and thus corporate debt financing outcomes. I further contribute by developing a structural model that endogenizes both firms' financing decisions and investors' equity holdings.

A closely related work is Choi et al. (2025) that combines supply and demand of financial capital and studies how equity investor demand affects firm investment and equity issuance. This paper differs in two aspects. First, rather than adopting a reduced-form approximation of investor demand as in their framework, I fully characterize equity investors' portfolio choices. While neither approach is unambiguously superior, modeling salient investor characteristics provides a more transparent account of the underlying mechanisms: in particular, the way institutional investors' benchmarking mandates affect their SDF. Second, I emphasize cross-market interactions and the multifaceted role of institutional equity investors in simultaneously linking debt investors, equity investors, and firms, whereas Choi et al. (2025) focus exclusively on equity issuance.

Second, this paper contributes to the literature on asset market integration.[2] In traditional views, debt and equity markets are fully integrated (Miller, 1977; Modigliani and Miller, 1958). By contrast, recent studies document arbitrage opportunities exploited by both firm managers and investors (Ma, 2019; Yu, 2006), indicating that segmentation persists in practice. Complementary evidence from alternative measures of market integration (Schaefer and Strebulaev, 2008; Chen, Chen and Li, 2023; Sandulescu, 2019) also points to incomplete integration between debt and equity markets. Overall, the extent and nature of asset market integration remain open questions, yet they have important implications for asset pricing (Chen, Chen and Li, 2023), corporate policies (Ma, 2019), wealth distribution, and the transmission of local shocks, such as regulatory changes or monetary policy interventions, from

[2] I define full market integration as the existence of a single discount factor that prices assets in both equity and debt markets. By contrast, market segmentation implies that arbitrage opportunities across markets cannot be fully exploited, at least in the short run. Such segmentation may arise from frictions including short-sale constraints, liquidity or funding constraints, and investor inattention, among others (Duarte, Longstaff and Yu, 2007; Kapadia and Pu, 2012; Ma, 2019). Moreover, equity and debt markets differ markedly in their investor bases, with equity markets being substantially less institutionalized. As a result, debt and equity investors may hold distinct preferences and information sets (Koijen and Yogo, 2019; Chaudhary, Fu and Li, 2023).

individual markets to the broader economy (Greenwood, Hanson and Liao, 2018). This paper contributes by demonstrating that debt and equity markets are neither fully integrated nor fully segmented: informational discrepancies across asset classes preclude full integration, yet firms' simultaneous demand for capital from both markets links them together.

Third, this paper also adds to the literature on information frictions in financial markets, a longstanding topic in finance. Prior work on information asymmetry in corporate financing predominantly examines investors' informational disadvantages relative to firms (Akerlof, 1978; Holmstrom, 1982; Stiglitz and Weiss, 1981; Bernanke and Gertler, 1986; Yang, 2020). Research on heterogeneous information and information sharing among investors dates back to Grossman and Stiglitz (1980) and Kyle (1985), with recent extensions in Panageas et al. (2020) and Goldstein, Xiong and Yang (2025). However, this literature largely focuses on information flows among investors within a given asset market, rather than across different capital markets.

This paper advances the discussion by emphasizing the importance of informational heterogeneity between equity and debt investors, and how such cross-market information flows shape corporate financing outcomes. A small yet growing set of studies examines information flows across equity and debt markets (Augustin et al., 2020; Jiang, Li and Shao, 2010; Addoum and Murfin, 2020). Closely related, Auh and Bai (2020) document information sharing between bond and equity mutual funds within the same fund family. This paper differs in three respects. First, my results are not limited to *dual* ownership: information held by institutional equity investors can be transmitted not only through interpersonal communication but also via public disclosure of their holdings. Second, I show that such information sharing has real effects on firms' financing choices, whereas Auh and Bai (2020) focus on asset pricing. Third, I develop a structural model that characterizes the interactions among equity investors, debt investors and firms, which enables me to quantify the magnitude of the information channel.

Relatedly, this paper contributes to the literature on the role of financing costs in corporate financing and investment (Whited, 1992; Hennessy and Whited, 2005; Tserlukevich, 2008). Many studies capture these costs in reduced form (Whited, 1992; Hennessy and Whited, 2005), often using information frictions in debt and equity issuance as microfoundations (Hennessy and Whited, 2007). Others explicitly model financing costs, linking financing costs to agency conflicts between managers and shareholders (Bernanke and Gertler, 1986) or to intermediation frictions (Gertler and Kiyotaki, 2010; Gilchrist and Zakrajšek, 2012; Krishnamurthy and Muir, 2017). These often manifest as collateral or leverage constraints. This paper introduces two new mechanisms: misbeliefs of debt investors,[3] and equity investors' benchmarking behavior. In doing so, it also broadens our understanding of the credit cycle, which is typically linked to fluctuations in collateral values over the business cycle (Kiyotaki and Moore, 1997).[4]

Lastly, this paper adds to the growing literature on passive ownership. Passive ownership has surged over the past decades, exceeding 30% in 2021 (Chinco and Sammon, 2024). Prior studies have examined the role of passive demand in corporate governance, stock price informativeness, stock returns and investment (Appel, Gormley and Keim, 2016; Sammon, 2024; Kashyap et al., 2021; Haddad, Huebner and Loualiche, 2025). Unlike most existing work that focuses on equity markets, I extend the literature by analyzing how equity benchmarking affects debt valuation through the discount factors firms apply to cash flows. The key distinction is that for equity markets, shareholders' discount factors affect both the supply and demand, while for debt capital markets, they only affect the demand side because of the largely segmented nature of debt and equity markets.

The rest of the paper proceeds as follows. Section 2 describes the data and sample. Section 3 documents a strong positive association between debt issuance and institutional equity ownership as the baseline. Sections 4 and 5 provide causal evidence on the information transmission and equity benchmarking channels. Sections 6 and 7 present the theoretical framework and quantitative analyses. Section 8 concludes.

2 Data Description

This section outlines the data used in the baseline analysis in Section 3 where I examine the relationship between institutional ownership, debt issuance and other financing outcomes.

[3]This paper remains agnostic about the source of this misbelief, which may stem from debt investors' incomplete information, bounded rationality, etc.

[4]The information channel could also offer a complementary explanation for credit spread puzzle, which remains difficult to reconcile within rational frameworks (Gilchrist and Zakrajšek, 2012; Huang and Huang, 2012; Chen, 2010; Ai, Frank and Sanati, 2020).

Datasets specific to additional tests are introduced in relevant sections. The baseline sample covers fiscal years 1985–2018. The starting year reflects the availability of variables used in empirical tests, and the endpoint avoids distortions from the COVID-19 pandemic and accounts for changes in the definition of debt in financial statements.[5]

2.1 Data

Holdings of institutional investors. Data on institutional equity holdings come from the Thomson/Refinitiv Institutional (13F) Holdings–S34 database. Under SEC regulations, 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[6] with maximum 45-day delay to SEC. Only long positions are disclosed. Following the literature (Koijen and Yogo, 2019), institutional ownership of firm i in the end of quarter t is defined as the ratio of shares held by all 13F institutions to total shares outstanding

$$InstShare_{it} = \frac{\text{Shares held by 13F institutions}_{it}}{\text{Total shares outstanding}_{it}}.$$

Firm financials. Firm financial data is obtained from Compustat. I exclude firms with non-positive total assets, negative sales, negative long (short) term debt, negative dividend payment or stock sales. The sample is restricted to U.S. firms listed on AMEX, NASDAQ, or NYSE. To mitigate the influence of outliers, all variables are winsorized at the 1st and 99th percentiles within each fiscal year. Firms in the financial, utilities, and public administration sectors are excluded because they are either heavily regulated or follow distinct capital structure practices.[7] The baseline measure of debt issuance is the annual growth rate of debt. For firm i in fiscal year t, debt issuance is defined as

$$\Delta Debt_{it} = \frac{Debt_{it} - Debt_{it-1}}{0.5(Debt_{it} + Debt_{it-1})},$$

[5] See "Notes on Operating Lease Accounting Post 2019" on Yueran Ma's website.

[6] https://www.sec.gov/rules-regulations/staff-guidance/division-investment-management-frequently-asked-questions/frequently-asked-questions-about-form-13f

[7] 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 remaining missing observations, I use the header SIC code.

with $\Delta Debt_{it}$ set to 0 if $Debt_{it} = Debt_{it-1} = 0$ (Davis, Haltiwanger and Schuh, 1996; Eslava et al., 2010).[8] *Debt* is the total debt outstanding, defined as the sum of long-term debt (dltt) and short-term debt (dlc). Since debt is non-negative, the growth rate $\Delta Debt_{it}$ is bounded within [-2,2].

Bond issuance and credit spreads. Corporate bond issuance information (offering amount, maturity date, issuer identity, coupon rate, bond yield at issuance) is obtained from FISD. The sample begins in 1992 due to substantial missing information when matching to CRSP–Compustat. Following conventions in the literature (Ma, 2019), I exclude convertible bonds, asset-backed securities, Yankee bonds, Canadian bonds, puttable bonds, and bonds issued in foreign currencies so that the issuance and prices are more comparable. The analysis focuses on U.S.-issued bonds only. Secondary-market transaction prices and yields are constructed using TRACE, which has been available since July 2002. Bond-level credit spread is computed as the difference between the bond's yield and the contemporaneous yield on its nearest-maturity Treasury. Treasury yields (1-, 2-, 3-, 5-, 7-, 10-, 20-, and 30-year maturities) are obtained from FRED. Bonds with less than one year to maturity are excluded to avoid noisy spread calculations (Ma, 2019). I also remove those with more than 40 years to maturity to prevent inaccurate extrapolation.

2.2 Summary statistics

Table 1 reports the summary statistics of the baseline sample. The average debt issuance $\Delta Debt$ is 3%, which corresponds to an average of 24.06 (=802*0.03) million dollars of net debt issued per year measured in 2017 dollars. Debt issuance exhibits substantial heterogeneity across firms and over time, with an overall standard deviation of 75%. Firms in the bottom quartile in each year on average pay back debt ($\Delta Debt < 0$), while those in the top quartile expand debt by 22%, equivalent to 6.5% ($= \frac{802 \times 0.22}{2703.17}$) of total assets.

The average institutional equity ownership of U.S. public firms has tripled from about 20% in 1985 to 60% in 2018. Substantial cross-sectional variation also exists. In 2018, about 11%

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

of shares were held by institutions for bottom quartile firms, compared with roughly 68% for firms in the top quartile. These time-series and cross-sectional patterns are also demonstrated in Appendix Figure A1. To understand the composition of institutional ownership, I further classify institutions following Bushee (2001). Investment companies (including independent investment advisors) are the dominant group, holding nearly 30% of an average firm, followed by bank trusts (6.21%), insurance companies (2.02%) and pension funds (1.51%). The relatively small share attributed to pension funds contrasts with the Flow of Funds data, where pension funds appear as the second largest holder of corporate equity. This discrepancy arises because 13F filings capture only the shares directly managed by a reporting institution.

The pronounced variation in institutional ownership across firms, combined with the rising dominance of institutional investors in U.S. equity markets, indicates that institutional investors are likely to play a significant role in accounting for heterogeneity in corporate financing outcomes across firms and over time.

3 Institutional Equity Shareholdings and Debt Financing

Institutional equity investors are dominant players in U.S. equity markets and differ markedly from retail investors. With professional expertise, they tend to act more rationally and acquire valuable firm-specific information through activities such as on-site visits and extensive equity research. At the same time, they face mandates and constraints that can distort portfolio choices (see Appendix A for details).

In what follows, I first document a strong association between institutional equity ownership and corporate debt issuance. I then introduce two mechanisms, namely information transmission and equity benchmarking, that contribute to this relationship, before providing causal evidence.

3.1 Institutional equity shareholdings and debt financing

I first examine the association between debt financing and institutional ownership through the following ordinary least squares (OLS) regression:

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

where y_{it} denotes firm i's financing outcomes at the end of fiscal year t. C_{it} denotes a vector of controls to be discussed later. γ_t and θ_i represent the fiscal year and firm fixed effects respectively. ϵ_{it} denotes the error term. Time fixed effects control for aggregate economic conditions that could influence both average debt issuance and institutional ownership. Firm fixed effects account for time-invariant firm characteristics, such as average size, location, and sector, that could be correlated with both debt issuance and institutional ownership. The baseline specification includes *only* year and firm fixed effects and captures the overall relationship between debt issuance and institutional ownership for an average firm-year.

The baseline estimate, reported in column 1 of Table 2 panel (a), indicates that a 1 percentage-point (pp) increase in institutional ownership is associated with a 4.3% (=0.13*0.01/0.03) increase in debt issuance. This is economically sizable, corresponding to over one million dollars of additional debt issuance for an average firm in an average year (deflated to 2017 dollars). This coefficient estimate reflects not only the causal effects of institutional equity investors on debt financing, but also the fact that firms' cash flow characteristics influence both institutional ownership and debt issuance (i.e., endogeneity). I use this coefficient to calibrate several key parameters of the theoretical model (Sections 6 and 7), which is a stationary dynamic general equilibrium model that endogenizes both institutional ownership and debt issuance.

This paper focuses on two mechanisms underlying this cross-market relationship: information transmission, and equity benchmarking. To show that the baseline relationship identified above is not simply driven by other factors discussed in the literature, I include additional controls known to affect debt issuance as descriptive evidence for the robustness of the debt-equity holdings relationship. These controls, denoted by C_{it}, include lagged cash holdings, logarithm of total assets, 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 the lagged dependent variable y_{it-1} to deal with potential serial correlation of dependent variables (see Appendix Table A1 for variable definitions). Cash holdings and profitability (ROA) proxy for external financing needs. Size is related to both financing costs and institutional ownership. Asset growth captures the expansion tendency which affects firms' financing needs. Industry leverage and distance to target leverage ratio are important determinants for debt issuance. Finally, investor horizon, share turnover and blockholder ownership control for the monitoring channel of long-term institutional investors.

Columns 2 and 3 show that the debt-equity holdings relationship is robust to including controls for variables known to affect debt financing decisions. The coefficients differ from the baseline estimate in column 1, which is expected because firm characteristics such as size and profitability are important forces driving both institutional ownership and debt issuance. Columns 4 and 5 examine alternative debt issuance measures, and similar results are obtained.[9] Column 6 shows that the relationship also holds for bond issuance. Finally, columns 7 and 8 extend the analysis to the extensive margin. These results show that the positive association between institutional ownership and debt issuance is robust across all specifications.

Panel (b) examines the results for equity issuance and leverage. Column 1 shows a negative association between institutional ownership and equity issuance. This negative relation is likely driven by endogeneity: institutional investors tend to hold large firms that rely less on equity financing, given their greater internal cash flows and easier access to cheaper external financing such as bank loans or bonds. Once baseline controls, especially firm size, are included in column 2, the relation turns positive. Although not the focus of this paper, this positive relation could come from firms taking advantage of market overvaluation and timing the equity market: when controlling for Tobin's Q, the coefficient becomes insignificant, as shown in column 3. Columns 4 and 5 indicate that institutional equity shareholdings negatively predict equity issuance in the extensive margin. Taken together, these findings suggest that institutional ownership tends to favor debt issuance over equity issuance. Consistent with this, columns 6 and 7 show that higher institutional ownership is associated with faster leverage

[9]This paper uses $\Delta Debt$ as the primary measure mainly for two reasons. First, it mitigates the influence of outliers, as discussed before. Second, it maps directly to variables in the theoretical model, enabling a more accurate calibration of model parameters.

growth. These estimates capture the relative growth of debt and equity values, which provide additional empirical moments that can be used to discipline the theoretical model in Sections 6 and 7.

A rise in debt issuance may be driven by both greater firm demand and increased investor supply, and changes in debt costs provide information on which side dominates. Table 3 reports results on costs of debt, measured by bond credit spreads and interest payments.[10] The dependent variables in columns 1 and 2 are firm-level credit spreads[11], calculated as the par value–weighted average credit spread of all bonds outstanding for a firm in a given fiscal year. BondYRtm denotes the par value-weighted years to maturity of bonds outstanding, and BondDur is the par value-weighted duration of bonds. Columns 3 and 4 examine interest payments, measured as $xint/debt$. Across all specifications, higher institutional ownership is consistently associated with lower debt financing costs. These lower costs (credit spreads and interest expenses) suggest that the capital supply side plays an important role.

Although not the focus of this paper, Appendix C discusses firms' use of the funds raised through debt issuance. Firms issue debt primarily for two reasons (not mutually exclusive): to exploit market overvaluation of debt securities, and to finance real investment or operations. The results indicate that debt issuance relaxes firms' financing constraints and is associated with more capital investment, employment, share repurchases, and precautionary saving, suggesting the presence of both motives.

3.2 Mechanisms

What drives the cross-market relationship between debt issuance and institutional equity ownership? This paper focuses on two mechanisms: information transmission from institutional equity investors to debt investors, and equity benchmarking.[12] These two channels are of

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

[11]Even with year fixed effects, firm-level bond yields do not generate the same regression coefficients as those of credit spreads because bonds have different time to maturity. I focus on credit spreads because this paper focuses on the firm-specific costs of debt, while bond yields also capture firms' heterogeneous exposure to treasury rates largely driven by macroeconomic conditions.

[12]As descriptive evidence, Appendix D.1 shows that the association between institutional equity ownership and debt issuance is stronger for firms with higher information asymmetry and whose debt values are more

particular interest because they are prevalent and have direct implications for the integration of equity and debt markets. Furthermore, they operate on different sides of the debt capital market, generating distinct consequences for debt financing dynamics.

The first mechanism concerns information. Information is fundamental: nearly all economic decisions are made based on beliefs formed from available information, making it central to corporate and broader economic outcomes. For example, Van Nieuwerburgh and Veldkamp (2006) show that information acquisition contributes to the sharp downturn and gradual recovery in business cycles. In financial markets, information frictions are particularly prevalent and often serve as microfoundations for financing costs in theoretical models (Hennessy and Whited, 2007; Bernanke and Gertler, 1986). The pivotal role of information in equity and debt issuance is well-established in corporate finance (Akerlof, 1978; Meckling and Jensen, 1976). In the context of equity issuance, Myers and Majluf (1984) highlight the importance of information asymmetry between managers and shareholders, while for debt issuance, Townsend (1979) and Gale and Hellwig (1985) underscore the role of incentive and monitoring costs.

The second mechanism relates to benchmarking. Passive ownership has expanded rapidly in recent decades. Index funds held 16% of the US stock market in 2021 compared to 3% in 2000, with the overall passive ownership share exceeding 30% (Chinco and Sammon, 2024). Moreover, over three quarters of (compensation-based) active funds benchmark their portfolios against equity indexes (Ma, Tang and Gomez, 2019). Given the rapid growth and prevalence of benchmarking (including indexing), it is important to understand how this feature of institutional investors influences firms' policies including financing outcomes.

In addition, both mechanisms are grounded in prior research. Equity benchmarking affects the discount factors shareholders apply to firms' cash flows, including those associated with debt financing. While recent studies show that equity benchmarking and indexing influence stock returns and investment (Pavlova and Sikorskaya, 2023; Kashyap et al., 2021), their implications for debt issuance have yet to be examined. On the information transmission side, previous work demonstrates that information discrepancies between different asset markets are widespread and play an important role in explaining segmentation across asset

sensitive to information. In untabulated results, ownership of index equity fund is also positively associated with debt issuance.

markets, though most of this literature emphasizes asset prices rather than financing outcomes (Shiller and Pound, 1989; Goldstein, Xiong and Yang, 2025; Hilscher, Pollet and Wilson, 2015; Addoum and Murfin, 2020; Auh and Bai, 2020).

Lastly, these two channels operate on different sides of the debt market. First, information transmission affects the *supply* of debt capital by shaping debt investors' beliefs about firm values, while equity benchmarking influences firms' *demand* for debt capital by altering the effective risk aversion of shareholders through general equilibrium effects. Second, as will be discussed in Section 7.4, these two mechanisms generate different implications for firms' responses to fundamental shocks and the effects of institutional ownership on the dynamics of debt issuance.

Intuition. How do these two channels drive the effect of institutional equity investors on debt issuance? For the information channel, debt investors update their beliefs about firm value based on signals embedded in institutional investors' disclosed holdings as well as information transmitted through private communication. This belief updating influences the valuation of debt securities and hence the supply of debt capital. Institutional ownership therefore proxies for the amount and quality of information flowing from equity to debt markets. Without institutional shareholders, such information transmission would be far more costly or even infeasible. At the intensive margin, higher institutional ownership reflects either the entry of new informed investors which adds new information sources, or existing investors increasing their stake which strengthens their incentives to produce higher-quality information. Higher institutional ownership also reveals firm value, benefiting high-quality firms if institutions are more sophisticated than retail investors.

Meanwhile, the pervasive practice of benchmarking among institutional equity investors introduces additional inelastic demand for firm shares, effectively increasing shareholders' risk tolerance. Because debt financing increases the riskiness of firm cash flows due to repayment obligations, higher shareholder risk tolerance, without altering underlying preferences, reduces the marginal cost of debt, boosting firms' demand for debt capital.

Apart from these two mechanisms, the debt-equity holdings association (column 1 of Table 2 panel (a)) could also stem from the endogeneity of institutional equity ownership and debt issuance, both of which are affected by firm fundamentals. To account for this, in the theoretical model in Section 6, both debt issuance and institutional ownership are endogenously determined by factors including firms' cash flow characteristics. Appendix Section B discusses several alternative mechanisms, including corporate governance, search costs, creditor-shareholder conflict and equity misvaluation. These are interesting extensions, but a full exploration of these mechanisms is beyond the scope of this paper.

The remainder of this paper proceeds in two steps. First, I establish empirical foundations for the theoretical model by providing causal evidence for the information transmission and equity benchmarking channels. Second, I use the calibrated model to quantify the magnitude of each mechanism and analyze its implications for the dynamics of debt financing.

4 Information Transmission from Equity to Debt Investors

This section provides empirical evidence that information transmission from institutional equity investors to debt investors helps explain the positive association between institutional ownership and debt issuance.[13] Before turning to the results, I first describe how information can be transmitted from equity to debt markets.

First, debt investors can learn about firm values from information publicly disclosed by institutional equity investors. For example, institutional equity investors are required to disclose their positions to the SEC via Form 13F which is also made publicly available. When information acquisition is costly, stock prices do not fully reveal firm value, thus the disclosed positions of informed shareholders provide incremental information about firm value (Drechsler, Moreira and Savov, 2020). By observing institutional equity investors' holdings and other publicly available information such as analyst reports, debt investors can infer those investors'

[13] One may ask why firms do not simply disclose more information if lower asymmetry reduces financing costs. First, both producing and disclosing information are costly. Information production requires monetary and non-pecuniary resources such as labor, and disclosure may reduce firm value by leaking information to competitors. Second, firms may lack credibility in disclosing certain information, as managers may have incentives to misreport or selectively withhold information for personal gain (Terry, Whited and Zakolyukina, 2023).

private information about the firm.

Information can also be shared in private ways, such as inter-personal communications.[14] This does not necessarily imply insider trading: privately shared information may be overlooked public news[15] or individual interpretations of common signals.[16] To examine this, I follow the tests in Auh and Bai (2020). Given the similar setup, I report results in Appendix D.3, which support private information sharing between institutional equity and debt investors. The focus of this paper is not to distinguish between private and public information transmission; rather, both serve as evidence of the information transmission mechanism.[17]

4.1 Disclosure of institutional equity investors' holdings

This section examines the information transmission channel using a regulation change in public disclosure of mutual fund holdings. Under the efficient market hypothesis, prices should aggregate all information about firm value. In practice, however, frictions such as irrational trading and informational heterogeneity, etc., also affect prices. Thus, shareholdings of informed equity investors reveal valuable information about the firm. For example, when an investor sees that a highly sophisticated investor, say, Warren Buffett, has taken a significant position in a company, she may infer that the firm has strong expected cash flows.

Following this idea, I exploit a regulatory change in May 2004 that mandates more frequent disclosure of mutual fund holdings as a shock that releases more information from informed equity investors to the public. While the amount of information produced may not have

[14]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. For example, anecdotal evidence suggests that PIMCO organizes regular nationwide meetings where equity and bond funds managers exchange views on 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). In addition, a corporate bond fund manager confirmed to the author that she discusses investment strategies with colleagues on the equity side.

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

[16]I do not take a stand on the causes of the different interpretations of public signals. It could be due to inattention to public information or individual bias about the credibility of a new piece of information (Cheng and Hsiaw, 2022).

[17]Equity investors may also learn from debt investors. Although this is beyond the scope of the paper, Appendix D.4 briefly reviews debt investors' information advantage and its implications for the findings.

changed, the regulatory change made it easier for outsiders, including debt investors, to observe informed investors' positions and infer firm values.

4.1.1 Institutional background

Before May 10, 2004, mutual funds were required to disclose their holdings only semiannually; thereafter, disclosure has been mandated on a quarterly basis. The discussion about increasing the frequency of disclosure started in 2000s, when the SEC received several rulemaking petitions on that.[18] The regulation rule was first proposed in January 2003, and finally released in February 2004.[19] This regulatory change represents an information shock: after May 2004, more timely and detailed data on institutional investors' holdings became available to the public.[20] As the SEC emphasized, these rules were "intended to provide better information to investors about fund costs, investments, and performance".

4.1.2 Data

Equity fund holdings are obtained from Thomson/Refinitiv Mutual Fund Holdings (S12) database. Some funds voluntarily disclosed their holdings quarterly before the 2004 regulation and are therefore classified as non-treated funds. I will discuss differences between treated and non-treated funds later, and below I describe how treated funds are identified.

Treated funds are identified by comparing their actual disclosure frequency with the number of calendar quarters in a given period. Actual disclosure frequency is measured as the number of holdings reported by a fund, as recorded in the S12 files, which primarily document

[18] The petitions were motivated by several considerations: (i) enabling investors to make more informed portfolio decisions; (ii) providing greater transparency about how funds adhere to their stated investment objectives; and (iii) preventing potential portfolio manipulation practices, such as "window dressing". All of these were aimed at enhancing investors' access to information and improving their ability to make informed decisions.

[19] See 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 many investors pay attention to such disclosures, including 13F, N-CSR, and N-Q (now N-PORT) filings. An example is the close attention media and analysts devote to Warren Buffett's holdings (https://www.wsj.com/finance/investing/warren-buffett-berkshire-hathaway-letter-2025-9c4530f8?st=1UyVYQ).

public filings with the SEC. Because S12 database may not capture all holdings disclosure due to input errors or because funds disclose positions through alternative channels (e.g., fund websites), I calculate reporting frequency over several years to reduce measurement error. A fund is classified as treated if it meets two conditions: (1) $\frac{\#\ reporting}{\#\ quarter} \in [0.4, 0.5]$ between January 2001 and May 2004, consistent with semiannual disclosure; (2) $\frac{\#\ reporting}{\#\ quarter} \geq 0.9$ between May 2004 and December 2006, consistent with quarterly disclosure after the rule change and serving to filter out data errors. To focus on domestic equity funds, I exclude those with investment objective codes 1 (international funds), 5 (municipal bond funds), 6 (bond and preferred funds), or 7 (balanced funds). I also drop index funds, since their holdings convey little information about firm value given that many index compositions are public.[21] After identifying treated funds, I construct the percentage of firms' shares held by these funds, denoted by MFExposure. I also compute ownership by non-treated funds (MFShareNonTreat) and by index funds (MFShareIdx) for placebo tests.

Discussion on differences between compliers and always takers. Managers face multiple tradeoffs when deciding disclosure frequency (Wermers, 2001). On the one hand, disclosure can lead to free-riding, as outside investors replicate the fund's strategies and move prices against the fund, eroding returns. This is potentially costly for actively managed funds that profit from market misvaluation, but less so for funds pursuing diversification or long-term horizons. Disclosure also entails paperwork and labor costs, which are mostly fixed costs and weigh more heavily on smaller funds. On the other hand, voluntary disclosure can build investor trust and attract capital.

Consistent with these tradeoffs, compliers tend to have smaller assets under management and hold fewer stocks, as shown in Table 4. In 2004Q1, the largest unaffected fund, measured by AUM, was 'Dodge & Cox Stock Fund' which 'seeks long-term growth of principal and income' and primarily 'target(s) a diversified portfolio of U.S. equity securities'. In contrast, the largest treated fund was 'Vanguard Health Care Fund' which invests 'solely within the

[21] For example, one can find S&P 500 firms easily from Wikipedia. Index funds are identified based on fund names in S12 files following Appel, Gormley and Keim (2016). Specifically, funds are classified as index (or 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". I exclude WILSHIRE from the classification in Appel, Gormley and Keim (2016) because Wilshire also operated non-passive funds during the sample period. Results are unchanged if index funds are retained.

health care sector'. About 40% of funds are compliers, i.e., treated funds. Importantly, these funds are more likely to possess private information about firm value. Thus, the mandatory disclosure reform in 2004 likely released valuable information to the public, including debt investors.

Overall, smaller and less diversified funds are less willing to disclose in order to protect strategies that are more informative about firm value. The underlying mechanism could be either fixed paperwork costs or a desire to avoid information leakage. The latter directly affects information production, in which case the empirical estimates reflect effects of more informed holdings – likely larger than the average effect. I want to emphasize that this does not alter the qualitative interpretation, despite resulting in a coefficient with a larger magnitude than the disclosure of an average investor.

4.1.3 Dynamic effects estimated using difference-in-differences

In this section, I examine the dynamic treatment effects of increased public disclosure of mutual fund holdings using the following specification, estimated at the semiannual frequency:[22]

$$y_{it} = \overline{MFExposure}_{i,2001Q1-2004Q1} \times \sum_{\tau=2001S1,\tau\neq 2004S1}^{\tau=2007S2} \beta_\tau \times \mathbf{1}\{t=\tau\} + \gamma_t + \theta_i + C'_{it}\eta + \epsilon_{it}, \quad (2)$$

where treatment intensity $\overline{MFExposure}_i$ is firm i's average pre-treatment exposure to treated mutual funds, measured as the average percentage of shares held by treated mutual funds from 2001Q1 (first quarter of year 2001) to 2004Q1 (first quarter of year 2004). γ_t denotes time fixed effects, and θ_i firm fixed effects. The term C'_{it} denotes the vector of control variables to be discussed below.

As discussed above, treated funds differ from funds voluntarily disclosing positions before the rule change. Firms more exposed to treated funds also differ systematically: such firms tend to be larger, more profitable, with fewer cash holdings, larger asset growth rate, smaller distance to target leverage and shorter investor horizon. It is therefore necessary to control for firm characteristics correlated with both treatment and outcomes. C'_{it} denotes the vector

[22] 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.

of control variables[23], which includes the same controls as in Equation (1). I also control for illiquidity and market leverage. More frequent disclosure may affect debt issuance by improving the liquidity of firms' securities or by lowering leverage (mechanically) through increases in market value (Agarwal et al., 2015), rather than through debt investors' learning. Illiquidity is measured by Amihud (2002) illiquidity ratio based on price impact of trading flows. Finally, to address concerns that the results are driven by changes in overall institutional ownership, which is likely correlated with treated fund holdings, I also include total institutional ownership as a control.

Consider two otherwise similar firms, A and B, with firm A held by affected funds and B by control funds. The regulatory change increases the frequency with which informed investors' holdings in A are revealed, improving transparency and disseminating information from informed investors. This enhances debt investors' ability to infer A's fundamentals.[24] The reform does not necessarily induce institutional investors to produce more information,[25] yet it lowers the cost for debt investors to learn from holdings of informed equity investors. Even if the total amount of information is unchanged, easier and timelier access enables more learning. This learning reduces investors' uncertainty about firm values, lowering their required return on debt. It also reveals the firm's quality,[26] assuming that institutional shareholders are informed. Conceptually, this operates through a shift in beliefs about the distribution of firm values: firms of good type are now assigned a higher probability of being good. This differs from a pure reduction in dispersion that leaves the mean of the distribution unchanged.

Figure 1 reports the dynamics coefficients estimated from Equation (2), using 2004S1 as the baseline period (the first half of the year 2004). The estimates in Figure 1 might understate the

[23]I also implemented propensity score matching within each one-digit SIC industries, 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, and the remaining firms serve as controls. Using one-to-one nearest-neighbor matching without replacement, I pair treatment and control firms based on logit propensity scores while enforcing common support. Caliper width is chosen to ensure covariates are balanced at 5% significance level. I obtain similar results, but with larger confidence intervals due to smaller sample size.

[24]I also used the number of treated funds as an alternative treatment measure and find a significant rise in debt issuance about one and half years after treatment. Ownership intensity is the preferred measure because it provides more variation and better reflects funds' information production incentives due to skin in the game.

[25]Disclosure may even discourage information production due to free-riding (Agarwal et al., 2015).

[26]The fact that a firm's shares are held by active, informed investors rather than passive or retail holders can itself signal higher firm quality. Moreover, more disclosure of institutional shareholders' activities enables debt investors to better infer firm value over time, gradually revealing the firm's quality.

counterfactual effect of more information disclosure, as fund managers can engage in window dressing around reporting dates, diminishing the informativeness of disclosed holdings.

Panel (a) demonstrates the effects on corporate debt issuance $\Delta Debt$. Estimates are insignificant for $\tau = \{-6, -5, ..., -1\}$, indicating no evidence of differential pre-trends between more and less exposed firms. The coefficients begin to rise in the second half year after the treatment at $\tau = 2$, and become significant at $\tau = 3$, suggesting that more affected firms increase debt issuance about half a year after the regulatory change compared to firms with lower treatment intensity. This delay is expected because additional debt issuance takes time. In practice, firms make their financing decisions ahead of time. For example, at the start of a fiscal year, they decide how much capital to raise and the allocation between debt and equity based on their production plans, market conditions, etc. Adjustments to these financing and production plans require both planning and logistical effort. This also implies that changes in debt issuance tend to lag behind price changes, consistent with the pattern in panel (b). In addition, the coefficients in panel (a) do not rise monotonically. This is because firms that have issued more debt in one period face lower immediate financing needs in subsequent periods.

Panel (b) reports results for the costs of debt. I focus on bond credit spreads, which are more frequently marked to market compared to loan rates that are much less timely. After the treatment, credit spreads decline, with the effect appearing about half a year before debt issuance. This supports the capital supply-driven mechanism: reduced uncertainty about firm value makes debt investors willing to pay more for a given amount of bonds, lowering firms' borrowing costs. As firms start to issue debt at $\tau = 2$, costs of debt rise but remain negative. More importantly, the effect on debt costs persists in subsequent periods. This persistence reflects the cumulative nature of information in equity holdings disclosures: current reports do not render past disclosures obsolete, and firms' debt issuance is not necessarily driven by short-run market timing to exploit temporary misvaluations.[27]

[27] Each disclosure of mutual fund holdings releases *noisy* signals about firm values, and observing multiple disclosures amounts to accumulating signals. Noise arises because (i) equity fund managers themselves lack precise knowledge of firms' fair values; (ii) mutual funds follow distinct strategies and vary in informativeness, differences that are not fully observable to outsiders, including debt investors. As a result, learning and belief updating occur gradually. The effects on debt costs and issuance amounts are therefore long-lasting and are not confined to quarters when treated funds had not disclosed holdings prior to the treatment.

In Figure 2, I conduct two sets of falsification tests. First, I replace the ownership of treated active mutual funds with the ownership of index funds (panel (a)) and non-treated active funds (panel (b)). The estimates are much less significant and do not exhibit an increasing pattern post-treatment. In panel (a), the estimate is (marginally) negative in the second period, suggesting that debt investors may substitute towards firms held more by treated funds. Consistent with this, when total institutional ownership replaces $MFExposure$ in Equation (2), the coefficients are insignificant, implying that substitution occurs among firms held by different investor types rather than from an overall increase in debt capital supply or institutional ownership.

Second, I examine whether the results simply reflect random time trends in the ownership of affected funds. Panels (c) and (d) use placebo treatment periods: 1997S1 and 2011S1 instead of 2004S1. In both cases, there is no significant or persistent increase in debt issuance, reinforcing that the baseline effects are driven by the 2004 disclosure change.

Examine mechanisms driving the effects. Figure 1 shows that more frequent disclosure of fund holdings increases debt issuance. Falsification tests in Figure 2 reinforce the causal interpretation and point toward underlying mechanisms (panel (a)). I next examine whether these effects are driven by information transmission by exploiting firm-level heterogeneity.

First, if the efficient market hypothesis holds, stock prices would fully reveal all information. For fund holdings to provide incremental signals, public information, e.g. stock prices, must not capture everything equity investors know. The prediction, therefore, is that effects should be stronger for firms with less informative prices. Figure 3 tests this by grouping firms by price informativeness, measured based on abnormal returns around earnings announcements (Sammon, 2024). Consistent with the hypothesis, the positive effects are concentrated among firms with lower price informativeness (top panels).

Second, public disclosure of equity holdings affects debt investors' beliefs by revealing firm quality and reducing uncertainty about firm values. Information embedded in funds' holdings helps investors better gauge firms' true values, benefiting well-performing firms. Reduced uncertainty also raises debt values by reducing downside risk. Panels (a) and (b) of Figure 4 show stronger effects for firms with higher profitability, measured by return on assets, consistent with the quality-revealing channel.[28] Panels (c) and (d) illustrate that the effects are stronger for firms wither high idiosyncratic volatility,[29] consistent with the uncertainty-reduction mechanism.[30]

Debt values are typically viewed as insensitive to information because of the concavity of their payoffs. Consequently, firms distant from default are typically thought to be less affected by information shocks. However, this view overlooks the effects of information on debt investors' required risk premium, which accounts for a significant portion of credit spreads (Huang and Huang, 2012). Thus, even for firms relatively far from default, reductions in investor uncertainty can meaningfully raise debt values through both cash-flow and risk-premium channels. Moreover, firms closer to default do not necessarily benefit more from reduced uncertainty: (i) their debt investors already have strong incentives to acquire private information, making additional signals from equity investors less valuable; (ii) when default probabilities are high, reducing uncertainty can even lower debt values as it confirms that the firm has high default likelihood; (iii) firms with greater distance to default could benefit more from the quality-revealing aspect of learning. In Appendix Figure A2, I split firms by default probability, measured using Altman Z score (Altman, 1968) and distance-to-default (Ottonello and Winberry, 2020). Post-treatment trends are similar across subsamples, though the effects do appear slightly stronger effects for firms with lower Altman Z score (more likely to default).

In Appendix Section D.6, I estimate the overall treatment effect using a standard difference-in-differences specification. Based on the patterns in Figure 1, I use annual frequency and compare one year before and after the event. Consistent with the results above, firms with higher treatment intensity issued more debt. Using Compustat data, I also separate loans and bonds, which are available at the annual frequency. Loans, issued primarily through banks,

[28] Appendix Figure A3 provides further supporting evidence by showing that the effects are more positive for firms that experienced increase in treated funds' shareholdings immediately after the regulation change.

[29] For each firm-fiscal year, I run the regression below based on CAPM using daily stock returns

$$R^e_{it} = \alpha_i + \beta_i R^e_{mkt,t} + \epsilon_{it}, \tag{3}$$

where R^e_{it} is excess stock return, $R^e_{mkt,t}$ is excess 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.

[30] In Appendix D.5, I discuss the implications of bond fund disclosure for the results.

involve lenders who already have substantial private information about borrowers. Hence, the marginal value of equity investors' information is limited for loans, but more relevant for public bonds. Appendix Table A8 shows that the effect is indeed stronger for non-loan debt (primarily bonds).

5 Equity Benchmarking

Section 4 shows that institutional equity investors affect debt capital supply due to information transmission. In this section, I provide empirical support that they also influence firms' demand for debt capital through their equity benchmarking practice. Benchmarking is widely adopted by institutional investors to evaluate managers. Among mutual funds compensating managers based on their performance, over three quarters rely on a benchmark (Ma, Tang and Gomez, 2019). Prior studies have shown that equity index inclusion lowers future stock returns,[31] but how it affects debt issuance remains unclear. The literature suggests that index inclusion increases investor demand for firms' shares (Pavlova and Sikorskaya, 2023), boosting equity issuance in equilibrium. Substitution between debt and equity financing would then imply lower debt issuance.

This reasoning overlooks that equity investors are also shareholders whose discount factor prices the firm's projects, including financing decisions. Debt repayment is particularly costly when firms are hit by negative shocks and internal funds are scarce, making debt cash flows risky in the presence of debt and equity issuance costs. Index inclusion creates extra demand for the firm's shares, so shareholders value each unit of cash flow more, regardless of the risk. That is, shareholders are less sensitive to the volatility of firms' cash flows. This lowers the risk premium shareholders require. For a given debt price, the firm is thus more willing to issue debt, shifting the debt supply curve outward and raising equilibrium issuance.[32]

In short, equity index inclusion could have significant yet opposite implications across asset

[31] The standard view is that the passive demand should be arbitraged away, leaving no effects on firm value. This relies on two assumptions: (i) index inclusion does not affect corporate cash flows, and (ii) there is no limit to arbitrage and firm stocks are perfectly substitutable. However, neither necessarily holds (Collin-Dufresne and Fos, 2015; Koijen and Yogo, 2019).

[32] See Appendix F.2.2 for a formal discussion based on the model in Section 6.

markets: equity issuance rises due to higher share demand (capital supply-driven), while debt issuance also rises as lower shareholder risk premia reduce the effective cost of debt (capital demand-driven). In what follows, I examine the effects of institutional equity shareholdings on debt issuance by estimating the local average treatment effects (LATE) using benchmarking intensity (Pavlova and Sikorskaya, 2023) as the instrument.

5.1 Benchmarking intensity

Institutional equity shareholdings are equilibrium outcomes shaped by both firm and investor characteristics. To empirically examine equity index benchmarking as a mechanism through which institutional ownership affects debt issuance, we need exogenous variation in institutional ownership driven by index inclusion. Prior studies have used the Russell 1000/2000 cutoff as an instrument for passive ownership (Appel, Gormley and Keim, 2016, 2019). However, this instrument has low power in the first stage when the endogenous variable is overall institutional ownership (Appel, Gormley and Keim, 2020).

To address this, I borrow the benchmarking intensity (BMI) measure from Pavlova and Sikorskaya (2023). Unlike the binary index inclusion dummy, which offers limited variation, BMI aggregates demand from all equity mutual funds and ETFs that track equity indexes. This provides richer cross-sectional variation, making it a stronger instrument for overall institutional ownership. The formal definition is given in Equation (4).

$$BMI_{it} = \frac{\sum_{j=1}^{J} \lambda_{jt} w_{ijt}}{MV_{it}} \tag{4}$$

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 share of a firm's market value attributable to indexing and benchmarking demand.[33] Reorganizing Equation (4) yields

$$BMI_{it} = \sum_{j=1}^{J} \frac{\lambda_{jt} 1_{ijt}}{IndexMV_{jt}} \tag{5}$$

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 index j at time t. The terms λ_{jt} and $IndexMV_{jt}$ are plausibly exogenous to characteristics of individual firm i, especially after excluding mega firms such as the 'magnificent seven' in 2020s.[34] Hence, the only component linked to firm-specific characteristics is 1_{ijt}. To address its endogeneity, I restrict the sample to firms in the neighborhood of 400 ranks around the Russell 1000/2000 cutoffs and control for factors that determine index inclusion following prior studies (Pavlova and Sikorskaya, 2023; Appel, Gormley and Keim, 2016; Ben-David, Franzoni and Moussawi, 2019; Sammon, 2020). As the construction of the sample and the choice of controls closely follow existing literature, I leave the details to Appendix Section E.

5.2 Results

In this section, I use BMI as an instrument to estimate local average treatment effects of institutional ownership on firms' financing choices, driven by equity benchmarking incentive. 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

$$\Delta Debt_{it} = \beta \widehat{InstShare}_{it-1} + \xi C'_{it-1} + \gamma_t + \theta_i + \nu_{it}.$$

Table 5 reports the results. Columns 1-4 in panel (a) show that higher institutional equity

[33] Active and passive benchmarked shares are treated equally.

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

shareholdings lead to more debt and equity issuance, especially on the intensive margin. Equity benchmarking influences the stock market by increasing equity capital supply, while in debt markets it raises firms' demand for debt capital. This predicts a lower expected stock return but higher costs of debt in response to being included in Russell 2000. Consistent with this, column 5 shows a decline in future excess stock returns. The average increase in institutional ownership due to Russell 2000 inclusion is 1.526%, so the estimate in column 5 implies a 2.77% (=1.526% $\times$ 1.816) annual return decline, closely matching the estimate of 2.8% in Pavlova and Sikorskaya (2023). Column 6 examines bond credit spreads. The coefficient is positive as expected, although it is insignificant with t-stat of 1.35, likely due to a smaller sample size.[35]

Why do firms simultaneously issue more equity and more debt? The increase in equity supply due to equity benchmarking lowers equity issuance costs, encouraging more equity issuance. Cheaper equity could crowd out debt issuance, or equivalently reduce firms' demand for debt capital, if this were the end of the story. However, with equity benchmarking, shareholders become less averse to risks associated with higher leverage, which reduces firms' marginal costs of debt issuance and thus encourages more debt financing. Ultimately, whether firms issue more debt depends on the relative strength of these opposing forces.

If equity benchmarking affects debt issuance through reduced risk premium, debt with longer maturity should benefit disproportionately.[36] Columns 7 and 8 investigate debt maturity. Column 7 uses the logarithm of the ratio between long-term debt (maturity $>$ 1 year) and total debt as the dependent variable, and column 8 uses the logarithm of the ratio between longer-term debt (maturity $>$ 3 years) and total debt. The results support this prediction: greater institutional equity ownership shifts the debt structure toward longer maturities.

Panel (b) examines alternative mechanisms using the same instrument (BMI). Columns 1-3 test the information channel by interacting institutional shareholdings with proxies for information asymmetry. None of the interaction terms is significant, indicating that information

[35]The associated first stage F-stat is smaller than other results, and it does not pass the Anderson-Rubin weak instrument test. In addition, the credit spread captures only part of debt financing costs: it does not include, for example, issuance expenses and the costs of complying with covenant requirements.

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

transmission from passive investors is unlikely to drive the results. Prior studies have shown that index inclusion affects liquidity and volatility, which could in turn influence debt issuance outside the risk-premium channel. To address this, columns 4 and 5 control for contemporaneous liquidity (Amihud illiquidity measure Amihud (2002)) and total volatility, respectively. The coefficients remain virtually unchanged.[37]

The empirical evidence documented in Sections 3–5 serves two purposes. First, it provides empirical evidence that institutional equity investors influence debt issuance through two channels: (i) information transmission to debt markets and (ii) equity benchmarking that alters shareholders' effective risk aversion. These findings establish the microfoundations for which characteristics of institutional investors matter and motivate their inclusion in the model.

Second, the baseline empirical relationships (Table 2) serve as key moments to discipline parameters governing information transmission and equity benchmarking. The model is not intended to replicate the specific disclosure regulation change or index inclusion process. Rather, these empirical shocks demonstrate the *existence and significance* of the two mechanisms. While the regressions capture local deviations in debt issuance around exogenous shocks, the structural model—calibrated to the full sample—captures both local and overall relationships between institutional ownership and debt issuance.

6 Model

The economy consists of an infinitely-lived representative firm, a continuum of heterogeneous equity investors and a continuum of identical debt investors. Equity and debt markets are segmented (Greenwood, Hanson and Liao, 2018): equity investors hold only stock shares,

[37] A further concern is that the Russell 1000 and 2000 indexes represent only one component of BMI measure – index transitions of Russell 1000/2000 indexes could capture transitions in other benchmarks. Several factors mitigate this issue. 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. I have also included control variables from the baseline specification to further address potential confounding concerns. More importantly, the objective is not to estimate the causal effect of Russell 2000 inclusion per se, but to exploit Russell 1000/2000 reconstitutions as an exogenous source of variation in passive ownership within the restricted sample.

while debt investors hold only corporate bonds. If the two markets were fully integrated, all investors would share the same information and no learning would occur, which contradicts the empirical evidence discussed earlier. In practice, equity and debt investors in U.S. public markets constitute distinct groups. 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).[38] The prevalence of debt-equity market segmentation is also reflected in the imperfect linkages between debt and equity prices of the same firm and the predictive power of one asset price for another (Ma, 2019; van Binsbergen, Brandt and Koijen, 2012; Greenwood, Hanson and Liao, 2018; Sandulescu, 2019; Chen, Chen and Li, 2023).

The economy features two key frictions that capture information transmission and equity benchmarking channels respectively. First, debt investors do not have full information rational expectations about the firm's future value at a given state. Instead, they update their prior beliefs about firm value after observing signals generated by institutional equity investors. This gives rise to the debt capital supply curve, i.e. demand schedule for debt securities, which directly affects the firm's debt financing costs. Second, equity benchmarking enters institutional investors' budget constraint, altering their discount factors due to incentives to match target shareholdings (Kashyap et al., 2021). Importantly, in the model both equity ownership and debt issuance decisions are endogenously determined by institutional equity investors' portfolio choices and the firm's optimization problem.

In what follows, I first describe equity investors' behavior, then the firm's optimization problem. Debt investors' choices are introduced in the discussion of the firm's debt financing costs, because their portfolio choices are summarized by their capital supply curve which directly affects the firm's debt issuance costs.

[38] Why does market segmentation arise 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.

6.1 Equity investors

The economy has two types of equity investors with a total measure of 1: institutional investors of measure μ and retail traders of measure $1-\mu$. 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).[39] As the economy only has two types of equity investors, the distribution of investors in the equity market is fully characterized by s_t^I, the institutional shareholdings. Exogenous states are denoted by $\Theta_t \equiv \{z_t, f_t\}$, where z_t denotes the firm's revenue and f_t represents operational costs (to be discussed later in Section 6.2).

Institutional investors choose consumption, c_t, and shareholdings, s_{t+1}^I, to maximize lifetime utility $V_t(s_t^I; \Theta_t, b_t)$, taking stock prices as given

$$
\begin{aligned}
V_t(s_t^I; \Theta_t, b_t) = \max_{s_{t+1}^I, c_t} \; & log(c_t) + \beta E[V_{t+1}^i(s_{t+1}^I; \Theta_{t+1}, b_{t+1})], \\
s.t.\; & c_t + s_{t+1}^I(P_t - e_t) + \phi_s(s_{t+1}^I - \bar{s})^2 = I(z_t) + s_t^I P_t - cb_t\tau, \\
& I(z_t) = e^{\gamma_I[log(z_t) - log(\mu_z)]},
\end{aligned} \tag{6}
$$

where P_t denotes cum-dividend stock price, e_t represents the dividend payment, b_t denotes the firm's existing debt in period t, and $cb_t\tau$ represents lump-sum taxes financing the tax benefit of debt for the firm (Jermann and Quadrini, 2012). These variables are from the firm's optimization problem to be discussed in Section 6.2. $I(z_t)$ represents investors' non-financial income, such as labor income. Equity benchmarking is modeled by the term $\phi_s(s_{t+1}^I - \bar{s})^2$. As the economy only has one firm, $\bar{s}$ represents the share required by the market index portfolio, with symmetric penalties for deviations. Allowing asymmetric penalties will add an additional parameter without providing further economic insight for the purpose of this paper: $\phi_s(s_{t+1}^I - \bar{s})^2$ is simply intended to capture inelastic demand from the benchmarking

[39] To clarify, retail investors are not modeled as noise traders in the sense of Kyle (1985). Although retail trading is uninformative, similar to noise traders in Kyle (1985), their demand is infinitely elastic rather than inelastic. As a result, their discount factor does not effectively affect firm value. This assumption reflects the fragmented and inactive nature of retail trading, and retail investors' limited voting power. While the law of one price requires all SDFs to price equity, dispersed retail activity makes institutional investors the marginal investors on average.

mandate. The current specification follows Pavlova and Sikorskaya (2023) and Kashyap et al. (2021).[40]

Effects of benchmarking on debt financing. As presented above, the benchmarking mandate enters shareholders' budget constraints. Therefore, it directly affects their stochastic discount factor and hence the valuation of corporate cash flows. Proposition 6.1 gives the SDF of institutional equity investors (see Appendix for the proof).

Proposition 6.1. *The SDF of institutional equity investors is* $M_{t,t+1} = \beta\frac{c_t}{c_{t+1}}\frac{1}{1+\frac{\phi_s(s^I_{t+1}-\bar{s})}{P_t-e_t}}$. *The term* $\phi_s(s^I_{t+1}-\bar{s})$ *captures the effects of benchmarking mandate on shareholders' SDF.*

The benchmarking mandate impacts costs and benefits of debt issuance (equivalently, net present value of debt issuance) in two ways. First, the term $\phi_s(s^I_{t+1}-\bar{s})$ raises the discount factor when institutional holdings fall short of the target $s^I_{t+1} < \bar{s}$. As a result, the present value of negative cash flows from debt financing (future repayments and any associated equity issuance costs) rises, predicting a negative relation between debt issuance and benchmarking in this region. In contrast, benchmarking also introduces an extra inelastic demand that reduces the covariance between the SDF and cash flows from debt issuance, thereby lowering the present value of repayment costs. These repayment costs consist of (i) the debt repayments, (ii) and equity issuance (negative dividend) costs incurred to finance those repayments. The SDF, $M_{t,t+1}$, constitutes two components: a traditional consumption growth element $\beta\frac{c_t}{c_{t+1}}$, and a new element brought by the benchmarking mandate $\frac{1}{1+\frac{\phi_s(s^I_{t+1}-\bar{s})}{P_t-e_t}}$. Compared to consumption c_{t+1} which closely relies on the firm's output in period $t+1$ and thus the debt repayment costs, the term $\phi_s(s^I_{t+1}-\bar{s})$ introduced by benchmarking has a weaker correlation with repayment costs of debt. Appendix Section F.2.2 provides formal derivations of these effects.

The net effect depends on the relative strength of changes in the SDF's level versus its covariance with cash flows. When cash flows are risky and equity issuance costs are sizable, the covariance channel dominates. Consistent with this, the empirical evidence, using benchmarking intensity as an instrument, shows that greater benchmarking intensity indeed leads to more debt issuance and lower equity risk premium.

[40] For example, Pavlova and Sikorskaya (2023) implies that investors have the incentive hold more of the firm's share if the benchmarking weight $\bar{s}$ is high, and less if $\bar{s}$ is low.

6.2 Firm

In this section, I introduce the firm's optimization problem (capital demand side). In addition, because debt investors' capital supply curve directly affects the firm's debt financing costs in each period, I also describe debt investors' portfolio choices that are affected by the informational linkage between debt and institutional equity investors.

The economy has a representative firm[41] with the profit function

$$F(z_t, f_t) = z_t - f_t,$$

where z_t denotes revenues and f_t operating costs.[42] Operating costs f_t evolve according to a three-state Markov process. For parsimony, the transition matrix is obtained by discretizing the AR(1) process $logf_{t+1} = (1-\rho_f)f + \rho_f logf_t + \sigma_f \epsilon_{f,t}$. Firm revenues z_t also follow an AR(1) process in logs

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

Apart from (after-tax) internal funds from operations $(1-\tau)F(z_t, f_t)$,[43] the firm can also raise external funds through debt and equity issuance. In this economy, the firm issues one-period debts with a coupon rate of c (Cooley and Quadrini, 2001), meaning that debt repayments are made in the subsequent period upon solvency.

[41] The implication is that the benchmarking mandate associated with this single firm has non-negligible effects on shareholders' SDF. This is motivated and supported by the empirical evidence showing significant effects of equity benchmarking on asset returns and debt issuance. In contrast, in models with a continuum of firms (e.g., Bordalo et al. (2021)), one firm's stock has negligible impacts on the discount factor, contrary to empirical evidence in previous studies (Pavlova and Sikorskaya, 2023). In untabulated simulation exercises, I extend the economy to include 30 or 60 additional firms, with investor exposures specified as $e^{-\gamma_j \Delta z_j}$ following the production-based asset pricing literature (Zhang, 2005). In these simulations, the firm issues more debt. As information transmission decreases per unit debt financing costs, this implies the information channel has larger quantitative effects. The benchmarking channel weakens since a single firm has less influence on the stochastic discount factor. Overall, the effects of adding heterogeneous firms are quantitative, and the main insights remain unchanged.

[42] 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 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 $\max_{k_t} p_t y_t - p_{kt} k_t - \tilde{f}_t$. Solving this gives a profit function of the form $F(z_t, f_t) = z_t - f_t$, where $f_t = p_{kt} k_t + \tilde{f}_t$

[43] The expression applies to both positive and negative profits. In the case of losses, it reflects the accounting convention that losses may be carried back for two years and carried forward for up to twenty years (Hennessy and Whited, 2005).

Debt financing constraints. Debt issuance involves distress costs C_t^b below

$$C_t^b = e^{-\nu(\eta \frac{z_t}{b_{t+1}} - 1)},$$

where ν and η are positive constants. The parameter η captures the cash-flow based constraints faced by firms. The parameter ν is set to be large to discourage the firm from borrowing more than the cash flow constraint. Following Croce et al. (2012), this formulation is obtained by convexifying the enforcement constraint below[44]

$$b_{t+1} \leq \eta z_t, \tag{7}$$

requiring that shareholders do not borrow more than a multiple of the firm's revenue so that the firm never defaults. Modeling C_t^b as a continuous and differentiable function avoids the kinks introduced by the occasionally-binding inequality (7) which complicates the numerical solution.[45]

Firm's periodic cash flows. The firm pays out dividends to shareholders if it has positive cash flows after debt issuance and repayment, otherwise it has to issue equity to meet operational needs given non-default. I do not explicitly model share issuance as 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

[44] This constraint is motivated by cash-flow based covenants, which cover over 80% of debt among U.S. non-financial firms (Lian and Ma, 2021; Drechsel, 2023). The most common form is based on the debt-to-EBITDA ratio. This model does not have a direct mapping to EBITDA, so the debt-to-revenue ratio is used, with parameter calibration adjusted accordingly in Section 7. The distinction between asset-based and cash-flow covenants is not the focus here; the key assumption is that the firm pledges its earnings stream to secure repayment.

[45] This treatment is close to how inequality constraints are sometimes incorporated into numerical solutions in the literature.

payout d_t minus equity financing costs Ψ_t^d

$$e_t = \underbrace{d_t}_{\text{Net payout}} - \underbrace{\Psi_t^d}_{\text{Equity issuance costs}}, \tag{8}$$

$$\textit{where } d_t = \underbrace{(1-\tau)(z_t - f_t)}_{\text{Profits}} - \underbrace{(1+c)b_t}_{\text{Debt repayment}} + \underbrace{q_t(b_{t+1})b_{t+1}}_{\text{Debt issuance proceeds}} + \underbrace{cb_t\tau}_{\text{Tax benefits}} - \underbrace{C_t^b}_{\text{Distress costs}},$$

where c represents the coupon rate on corporate bonds. Debt investors' inverse demand function, denoted by $q_t(b_{t+1})$, is derived from debt investors' portfolio choices discussed below.

Debt financing costs due to information frictions. Motivated and supported by the empirical evidence on debt investors' learning from institutional equity investors, it is assumed that debt investors, as outsiders, do not have full information rational expectation about the firm's behavior and thus payoffs of debt. Consequently, they assign a larger probability of default to the firm,[46] reflecting their uncertainty about the firm's value (Drechsel, 2023). This information friction affects bond demand schedule $q_t(b_{t+1})$ and introduces additional debt financing costs associated with informational frictions. In what follows, I outline debt investors' choices and leave details to Appendix Section F.1.

The economy has a continuum of identical debt investors with mean–variance preferences, who live for two periods in an overlapping-generations framework (Greenwood and Vayanos, 2014).[47] In each period, there are two investor cohorts. The first generation is newly born, endowed with wealth, and allocates between a risk-free asset and corporate debt to maximize expected terminal utility. The second generation, born in the previous period, receives debt payouts, consumes, and exits. The measure of each generation is normalized to one.

Given this structure, a central object of interest is the perceived return of debt, which depends on debt investors' beliefs about the firm's future value. Because of informational frictions, they do not know the true future value of the firm for given states. Instead, in each period they receive signals produced by institutional equity investors and update their prior beliefs accordingly. Higher institutional ownership indicates more information produced and shared with debt markets, which makes the signals more precise. Therefore, debt investors'

[46] In the model, the firm does not default due to debt financing constraint, so this means debt investors assign a positive probability of default.

[47] The two-period investor horizon reflects the shorter maturity of corporate debt relative to equity.

uncertainty about firm value decreases as institutional shareholdings rise. Conditional on no default, this lowers debt investors' perceived default risk and raises debt supply at a given price. The inverse demand function takes the form below

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

where γ_{0t} and γ_{1t} are both positive. The exact formulas of γ_{0t} and γ_{1t} as well as derivations are provided in Appendix F.1.1. Intuitively, γ_{0t} captures the disutility from variance, while γ_{1t} reflects the utility from receiving expected return on debt.

Firm's optimization problem. The firm chooses debt issuance and net payout to maximize shareholder value, defined as the present value of all future dividends. Using the bond demand schedule derived above and appropriate approximations, the firm's optimization problem is stated in Proposition 6.2, with the proof provided in Appendix F.1.1.[48]

Proposition 6.2. *Using Proposition F.3 and approximations in Appendix F.1.1, the firm's optimization problem is*

$$\begin{aligned} P_t(b_t; \Theta_t, s_t^I) = \max_{b_{t+1}, d_t} & \; d_t - \Psi_t^d + E_t[M_{t,t+1} P_{t+1}(b_{t+1}; \Theta_{t+1}, s_{t+1}^I)], \\ s.t. \; d_t &= (1-\tau)(z_t - f_t) - (1+c)b_t + q_{ft} b_{t+1} - \Psi_t^b b_{t+1}^2 + c b_t \tau - C_t^b, \\ \Psi^d(d_t) &= \psi_d |d_t| 1_{\{d_t < 0\}}, \\ C_t^b &= e^{-\nu(\eta \frac{z_t}{b_{t+1}} - 1)}, \end{aligned} \tag{9}$$

where $q_{ft} = E_t[M_{tt+1}(1+c)]$ and $\Psi_t^b = \frac{\psi_b}{2}(\mu s_t^I)^{-\zeta}$. $P_t(b_t; \Theta_t, s_t^I)$ is the cum-dividend value of the firm's equity. $M_{t,t+1}$ is institutional equity investors' SDF.

Intuitively, if debt investors believe that the firm will never default, the firm can raise q_{ft} from each unit of debt issuance, which is the price of risk-free debt with a coupon payment of c. 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 ownership is higher, more precise information is produced, reducing the uncertainty about firm value and lowering

[48] After plugging debt investors' bond demand schedule, costs of debt due to informational frictions are captured by cash flow costs $\Psi_t^b b_{t+1}^2$.

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 6.2, see Appendix F.1. The definition of the recursive equilibrium is given in Appendix F.3.

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 of Equation 9 (assuming interior solution):

$$(1 - \frac{\partial \Psi_t^d}{\partial d_t}) \left(q_{ft} - \psi_b (\mu s_t^I)^{-\zeta} b_{t+1} - \frac{\partial C_t^b}{\partial b_{t+1}} \right) = E_t \left(M_{t,t+1} [(1 + c - c\tau)(1 - \frac{\partial \Psi_{t+1}^d}{\partial d_{t+1}})] \right). \quad (10)$$

The firm benefits from debt issuance through debt proceeds that (i) raise current dividends and (ii) reduce current equity issuance costs. On the other hand, issuing more debt tightens debt financing constraints and also creates obligations to repay principal and interest in the next period, which (i) lowers future dividends and (ii) may trigger additional equity issuance costs.

7 Quantitative Results

In this section, I calibrate the model using the baseline sample of US non-financial firms constructed in Section 3. I then use the calibrated model as a laboratory to quantify and investigate the implications of each mechanism for the debt-equity holdings relationship and debt issuance dynamics.

7.1 Calibration

Table 6 presents the calibrated parameter values. A subset of parameters is taken from existing studies or directly matched to empirical moments in the data (see panel (a) of Table 6 for details). The remaining five parameters—including operating costs (f), benchmarking mandates ($\bar{s}, \phi_s$), and those governing debt financing costs (ψ_b) and the relationship between debt financing costs and institutional ownership (ζ) —are over-identified by the following six moments: the net equity issuance-to-market value ratio, the debt-to-revenue ratio, average institutional ownership, the persistence of institutional ownership, and coefficients from auxiliary regressions below

$$\Delta Debt_{it} = \beta^{B} InstShare_{it} + \gamma_t + \theta_i + e_{it}, \tag{11}$$

$$\Delta MLev_{it} = \beta^{\Delta MLev} InstShare_{it} + \gamma_t' + \theta_i' + \xi_{it}., \tag{12}$$

The coefficient β^B measures the sensitivity of debt issuance to institutional equity ownership, and $\beta^{\Delta MLev}$ measures the sensitivity of the *change* of market leverage to institutional holdings.[49] Both parameters have direct empirical correspondence in the baseline regressions in Table 2, i.e. the coefficients in column 1 panel (a) and column 6 panel (b) respectively.

The strength of information transmission in the model is governed by ψ_b and ζ. While all six moments are influenced by all five parameters to be calibrated due to interactions among different agents, these two are mainly identified by the debt-to-revenue ratio and β^B. Importantly, changes in ζ result in larger changes in β^B than debt-to-revenue ratio. That is, ζ captures mostly the *sensitivity* of information costs in debt financing to institutional ownership.

Parameters related to equity benchmarking, $\bar{s}$ and ϕ_s, are identified by average institutional ownership, the persistence of institutional ownership, β^B and $\beta^{\Delta MLev}$. A higher $\bar{s}$ raises the target share, leading to higher average institutional ownership. The parameter ϕ_s governs the intensity of benchmarking. In the extreme case where $\phi_s \to \infty$, institutional ownership converges to the target s_t^I with no variation, implying an AR(1) coefficient of 1. In addition, a larger ϕ_s strengthens inelastic demand for the firm's shares, affecting the valuation of both debt and equity. Consequently, both β^B and $\beta^{\Delta MLev}$ change accordingly. The change in β^B reflects the relative impact of ϕ_s on the level of SDF versus its covariance with debt financing costs, as discussed in Appendix F.2.2 and Section 7.2 below. In addition, as ϕ_s directly enters

[49]Compared to the leverage level, $\Delta MLev$ depends on the relative *speed* of changes in debt and equity value as institutional ownership varies. Both can capture how debt and equity values vary with changes in institutional ownership. I choose to match $\beta^{\Delta MLev}$ instead of the regression coefficient of $MLev$ on institutional ownership for two reasons: (i) the leverage level is known to be difficult to match the empirical value using traditional models (Strebulaev and Yang, 2013); (ii) the level of leverage and institutional ownership are both significantly affected by other parameters to be calibrated, making the coefficient calibrated in this way less sensitive to ϕ_s, the parameter I want to pin down.

the SDF, changes in ϕ_s affect both debt issuance and equity values, generating significant shifts in leverage and thus $\beta^{\Delta MLev}$.

The critical distinction between equity benchmarking and the information mechanism lies in 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 debt 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.[50]

Lastly, higher operating costs f reduce corporate internal funds, leading to greater reliance on equity issuance as an external financing source. It is mainly identified by the net equity issuance-to-market value ratio. The model matches both target and untargeted moments reasonably well, as reported in Table 7.[51]

7.2 Discussion of mechanisms

The model incorporates both information transmission and equity benchmarking channels, and allows institutional ownership and debt issuance to be endogenously determined by characteristics of firms' cash flows. Below, I first outline the main mechanisms linking institutional ownership and debt issuance that arise from these features. I then discuss the interactions between the information and benchmarking channels.

7.2.1 Main mechanisms

The first mechanism is information transmission. Higher institutional holdings s_t^I decrease debt financing costs due to decreased uncertainty about firm value, captured by the Ψ_t^b term. This channel implies that higher institutional equity ownership leads to more debt issuance.

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

[51]Admittedly, this model underestimates the risk premium quantitatively (shown in Table 8) due to the dampening effect of general equilibrium models and the introduction of investor benchmarking.

The second mechanism is equity benchmarking. When institutional shareholdings fall below the target $\bar{s}$, benchmarking incentive generates additional inelastic demand for the firm's shares that effectively reduces shareholders' risk aversion due to weaker covariance between SDF and cash flows related to debt repayment, without altering their underlying preferences. Because debt financing increases the riskiness of the firm's cash flows,[52] lower risk aversion leads to lower marginal costs of debt financing. This encourages firms to use debt financing more, resulting in more debt issuance in equilibrium.[53]

Third, in the absence of the frictions above, variations in institutional ownership and debt issuance both depend on variations in fundamental shocks. Higher profits lead to more debt issuance and higher institutional ownership. The former is because debt financing is less costly in good states when the firm can repay debt without incurring large costs. The latter is because better fundamentals help firms attract active investors. This leads to a spurious relationship, a source of endogeneity in OLS regressions.[54]

A countervailing effect is that institutional ownership can reduce debt issuance via an SDF channel, in the *absence* of equity benchmarking. With log utility, shareholders' SDF takes the form of $\beta\frac{c_t}{c_{t+1}}$ in the absence of benchmarking mandate. Institutional shareholdings s_t^I affect both current and future consumption, and thus the SDF. For current consumption, equity investors with more shares s_t^I are wealthier, enabling higher current-period consumption and raising the SDF.[55] A higher SDF increases the present value of debt repayment costs, implying a negative relationship between institutional ownership s_t^I and debt issuance. For future consumption, in equilibrium higher institutional ownership is associated with higher

[52]When the firm experiences a positive revenue shock, it can repay debt using internal funds without incurring equity issuance costs. In contrast, when profits are low, firms have to raise more equity, incurring higher equity financing costs, to repay debt.

[53]In the simulated data, institutional equity ownership can exceed the target share $\bar{s}$, but the dominant effect arises when ownership is below target. This is because institutional equity ownership is usually lower than the target in low states, when debt repayment is especially costly: this is because shocks are persistent, and future profit is 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 currently in low states. The changes in discount rate matter more when debt financing is more costly, i.e. in low states.

[54]The impulse responses in Figure 5 show that a positive profit shock raises both debt issuance and institutional shareholdings on impact. Subsequent changes would be a mix of all forces mentioned above. This captures the 'endogeneity'.

[55]With log utility, the SDF is $\beta\frac{c_t}{c_{t+1}}$ which increases in current consumption. Intuitively, when today's consumption is already high, its marginal utility is low. Investors are therefore more willing to give up one unit of consumption today to obtain one more unit tomorrow, meaning they value future cash flows more.

stock prices, both driven by strong corporate fundamentals. This makes investors wealthier but also raises the cost of acquiring additional shares. The resulting income effect encourages more share purchases, while the substitution effect discourages them. If the substitution effect dominates,[56] next-period consumption falls, further raising SDF and making debt even more costly. Taken together, these imply a negative relationship between institutional ownership and debt issuance through the SDF mechanism (via lower consumption growth).

Overall, the equilibrium relationship between institutional equity shareholdings and debt issuance is driven by the relative magnitude of information transmission, equity benchmarking, and other general equilibrium forces, some of which generate a negative debt-equity holdings relationship.

7.2.2 Interactions between information and equity benchmarking channels

In the model, the information and equity benchmarking mechanisms interact to drive debt financing dynamics. On the one hand, benchmarking incentives affect institutional shareholdings, which in turn influence information production and transmission through equity ownership.[57] On the other hand, information transmission alters firms' debt financing costs and thus their valuations, feeding back into investors' shareholdings and the strength of their benchmarking motives. A caveat is that the intensities of these two channels are not endogenously linked in the current theoretical framework. Specifically, the parameters driving benchmarking intensity (ϕ_s) and those driving information transmission (ζ and ψ_b) do not depend on each other.[58] Therefore, the magnitudes of each mechanism estimated from the model represent average effects, pooling variation over time and across different types of institutional

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

[57] The microfoundation is that institutional ownership affects the incentives and costs of acquiring and transmitting information, and also signals the firm's value.

[58] A reasonable hypothesis is that stronger benchmarking motives reduce information production and transmission to debt markets. This appears to hold for publicly disclosed equity holdings: as shown in Figure 2, disclosures of index fund positions do not seem to convey useful information to debt investors. However, even under extreme benchmarking ($\phi_s \to \infty$), i.e., pure indexing, private information transmission may still occur. Index fund managers interact with corporate management (Appel, Gormley and Keim, 2016; Hshieh, Li and Tang, 2021), and are therefore likely to acquire private information about firm value that can be shared with debt market participants. Theoretically, whether the growth of index funds leads to more or less learning depends on economic conditions and investors' risk attitudes (Sammon, 2020).

equity investors.

7.3 Quantitative analysis

In this section, I use the calibrated model to further examine and quantify the information transmission and equity benchmarking channels that connect debt and equity markets.

Impulse response analyses. To inspect how institutional ownership contributes to debt issuance, I conduct impulse response analyses for both the baseline model and several alternative specifications.[59] In the first alternative model, I eliminate the information transmission channel by setting $\zeta = 0$. In the second, I impose stricter equity benchmarking by increasing ϕ_s. In particular, Pavlova and Sikorskaya (2023) document that the addition to Russell 2000 results in a roughly 27 bps rise in active funds' ownership.[60] To match this effect, I increase ϕ_s from 0.2 to 0.4, which generates the 27 bps rise in institutional ownership.

Figure 5 plots the change of debt issuance and institutional shareholdings relative to the pre-shock values. Each panel plots the impulse responses of debt issuance b' and institutional ownership s' under three specifications: the baseline model (green solid line), the model without information transmission ($\zeta = 0$, blue dash-dot line), and the model with stricter benchmarking (higher ϕ_s, red dashed line).

Positive revenue shock. Panel (a) considers a positive revenue shock to the economy. Consistent with the empirical evidence on the procyclicality of debt issuance, at least in the aggregate (Jermann and Quadrini, 2012), firms issue more debt following such a shock across all specifications. The mechanism is that, when revenue shocks are positive and persistent, firms can take on additional debt without incurring large future repayment burdens, particularly given the presence of equity issuance costs.

Institutional shareholdings also increase across all specifications. This occurs because institutional equity investors are wealthier in good states, benefiting from both higher share

[59] To generate impulse responses, I run 6 simulations, each with 10,000 firms and spanning 515 periods. In period 501, I introduce a one-time shock by increasing (decreasing) all firms' revenue to the highest (lowest) level and then allow the model to evolve as before.

[60] The value of 27 bps is estimated based on active funds that benchmark the Russell 2000, so it is likely a lower bound.

values and greater non-financial income. While the substitution effect of higher stock prices predicts lower shareholdings, the wealth effect dominates, leading to an overall increase in institutional ownership. The adjustment unfolds gradually, reflecting both the time required to accumulate wealth and the persistence of the revenue shock.

The magnitude of responses, however, differs across the three models. When information transmission is shut down, the increase in debt issuance is smaller than the baseline, as shown in the left figure of panel (a). In the baseline model, the positive shock raises institutional ownership. This lowers debt financing costs due to more precise information produced and transmitted, which further amplifies debt issuance. When information transmission is eliminated, this amplification channel disappears, which results in a smaller increase in debt issuance.[61]

The red dashed lines illustrate the impulse responses in the economy with higher benchmarking intensity. In this case, the responses of both policies (b' and s') are more moderate than the other two models. With stricter benchmarking mandates, institutional investors are more reluctant to increase their shareholdings far above the target, as deviations are penalized more. The moderate rise in s' further implies that institutional investors exert less effort to generate and transmit information, either actively or passively, to debt markets. Consequently, the increase in debt issuance is also more moderate.

Overall, the impulse responses to positive revenue shocks demonstrate (i) the positive effects of information transmission on debt issuance via reducing debt issuance costs, (ii) the mitigation effect of equity benchmarking on debt issuance due to shareholders' reluctance to purchase more shares (in good states), which operates through the information channel.

Negative revenue shock. Panel (b) of Figure 5 considers a negative revenue shock to the economy. Across all three specifications, debt issuance drops on impact. Yet the decline continues beyond the first period, which differs from the positive shock in panel (a) where the largest change occurs immediately on impact. The gradual adjustment to a negative

[61] In addition, institutional ownership rises slightly more in the model without information transmission, as shown in the right figure of panel (a). In the baseline, stronger information transmission reduces financing costs and raises stock prices: following the literature, total stock supply in the model is fixed and normalized to 1, so a rise in stock price is equivalent to a rise in equity value. This discourages equity investors from purchasing more shares through the substitution effect, partly offsetting the wealth effect. When the information channel is eliminated, this substitution effect is weaker, so investor shareholdings respond more strongly.

shock arises because when a firm is hit by an extreme drop in cash flow, it cannot cut debt issuance too sharply: relying entirely on equity issuance—the alternative external financing source—would be prohibitively costly. Thus, following a severe negative shock, debt financing does not fall to its lowest level. Instead, debt issuance reaches its minimum when the shock is more moderate (in the second period when the shock begins reverting to its mean). In this sense, the flexibility of choosing between different financing sources provides a cushion against adverse shocks. Consequently, while debt financing remains generally procyclical, its dynamics do not fully coincide with output cycles, especially when firms face limited access to alternative financing sources.

The pattern of institutional shareholdings is not simply the mirror image of the positive shock case either, as shown in the right figure of panel (b). Following a negative revenue shock, institutional investors initially increase their holdings before reducing them. This is because under an extreme negative shock, the stock price falls so sharply that active investors find it optimal to purchase additional shares despite lower wealth—in other words, the substitution effect of lower stock price dominates the wealth effect. Prior studies document contrarian trading behavior among retail investors, often attributed to behavioral biases (e.g., misbeliefs in contrarianism) or passive liquidity provision (Kaniel, Saar and Titman, 2008). The results here suggest that even informed and rational investors may exhibit contrarian behavior when the firm is hit by an extremely large negative shock. In such cases, "buying low and selling high" is entirely rational when the substitution effect outweighs the wealth effect.

The magnitude of responses again differs across the three specifications. Because debt issuance depends on changes in institutional ownership, it is useful to begin with the right figure of panel (b). In later periods when institutional ownership falls below its pre-shock level, the pattern mirrors the positive revenue shock case: the economy with a stricter benchmarking mandate exhibits the smallest decline in s', while the economy without information transmission shows the largest drop. However, prior to the decline, the economy with a higher ϕ_s experiences a larger initial increase in s'. This occurs because benchmarking reduces investors' effective risk aversion. As a result, they are more willing to take on risk in low states when stock prices are extremely low.

The left figure of panel (b) shows that the decline in debt issuance is the smallest in the baseline model. This is because of the rise in institutional ownership on impact. First, compared to the economy without information transmission ($\zeta = 0$), the baseline economy benefits from higher institutional ownership that lowers cash flow costs of debt financing and thus experiences a smaller decline in debt issuance. Second, for the economy with stricter benchmarking ($\phi_s = 0.4$), the initial rise in institutional ownership reduces shareholders' incentive to hold firm shares, increasing their effective risk aversion and thereby raising the cost of debt financing. This results in a larger drop in debt issuance compared to the baseline model. The on-impact responses of alternative models (blue and red lines) appear similar in the figure because two opposing forces are at work: higher institutional ownership simultaneously lowers informational frictions in debt financing (absent in $\zeta = 0$ economy), while increasing effective risk aversion (weaker in $\zeta = 0$ economy).

Overall, the impulse responses across different policies and shocks indicate that both the information transmission and equity benchmarking channels significantly affect the dynamics of debt financing. Furthermore, the two mechanism play distinct roles in shaping firms' debt issuance responses, yet they also interact to jointly determine equilibrium debt financing outcomes.

Quantification of mechanisms. By varying relevant parameters, I further quantify and investigate the contribution of each mechanism to the debt–equity holdings relationship. Results are reported in Table 8.

Information transmission. To quantify the magnitude of the information channel, I eliminate this channel in panel (c) by setting $\zeta = 0$. In the simulated data, the regression coefficient of debt issuance on institutional equity ownership decreases from 0.128 to 0.102. This represents a 20.3% (=(0.128-0.102)/0.128) drop in the relation between institutional ownership and debt financing costs, which is sizable.

Reduction in effective risk aversion due to equity benchmarking. Prior studies suggest that index benchmarking reduces stock returns by introducing additional inelastic demand (Pavlova and Sikorskaya, 2023; Kashyap et al., 2021). As institutional equity investors are also shareholders, debt financing is likewise affected: the inelastic demand from benchmarking makes investors less sensitive to risks of firms' cash flows and hence lowers shareholders' effective risk aversion. This reduces the marginal cost of debt issuance that entails repayment obligations, and therefore encourages debt issuance.

This mechanism is examined in panels (d) and (e) in Table 8. In panel (d), I increase the benchmarking intensity ϕ_s from 0.2 to 0.4 so that the model-implied change in institutional ownership in the simulated data matches the empirical magnitude for Russell 2000 index inclusion in the real data (27 bps). As a result, the debt-equity holdings relationship rises by 9.4% (=(0.140-0.128)/0.128). Moreover, consistent with the proposed mechanism, the risk premium falls by 5.3% (=(0.57-0.54)/0.57). To further test whether equity benchmarking reduces risk aversion as predicted, panel (e) assumes that institutional investors are risk neutral by setting $\gamma = 0$. In this case, the risk premium turns negative (-0.8%) rather than converging to zero as in the standard model without investment frictions. This occurs because the benchmarking incentive induces active equity investors to purchase more shares, particularly when their current holdings are below target, creating additional inelastic demand for firm shares.[62]

Characteristics of firm cash flows. The impulse response analyses using different shocks suggest that the strength of each channel depends critically on firms' cash-flow characteristics. In what follows, I examine more closely how the effects of institutional ownership vary with these characteristics quantitatively.

Panel (f) examines how lower external financing needs affect the debt–equity holdings relationship, firms' policies, and valuations. In this experiment, the mean of log fixed costs is reduced to 0.5. As a result, the debt-equity holdings relationship approaches zero (and becomes negative), indicating that both the information and equity benchmarking channels lose importance. The reasons are as follows. First, debt issuance becomes less frequent (column 3) as the firm requires less external financing to cover operational costs that are now smaller. This reduces the relevance of the information channel, which operates by lowering debt financing costs. Second, with lower fixed costs, debt repayment is less likely to involve substantial equity issuance costs in the next period, even when fundamental shocks are adverse. Debt repayment-related cash flows therefore become less procyclical, making changes

[62] The association between debt issuance and institutional ownership, β^B, becomes stronger because the countervailing effect from the SDF channel (in the absence of benchmarking) is eliminated.

in shareholders' effective risk aversion less relevant and weakening the benchmarking channel. Consistent with this, stock return volatility and the risk premium both decline (columns 4 and 6 in panel (f)), suggesting reduced overall risk of the firm's cash flows. Taken together, lower operational costs make institutional ownership much less important for debt issuance through both channels.

Panel (g) presents the results when equity issuance costs decrease. The effect is similar to that of reduced operational costs: in both cases, lower future debt repayment costs weaken the role of institutional ownership in reducing debt financing costs. Consistent with this, β^B falls markedly from 0.128 to 0.081. Debt issuance frequency also declines as expected, but the magnitude is modest because of two offsetting forces. On the one hand, cheaper equity financing reduces reliance on debt due to substitution between these two funding sources. On the other hand, lower equity financing costs make debt issuance less risky as future repayments are less likely to trigger large cash flow burdens, which encourages debt issuance.

Panels (f) and (g) illustrate that the impact of institutional shareholdings varies with firms' financing needs, although the model does not explicitly incorporate firm heterogeneity. Smaller firms typically face higher equity financing costs and relatively larger operating costs, suggesting they could benefit more from institutional ownership. In practice, however, institutional holdings are much lower for smaller firms: among Compustat firms, average institutional ownership is roughly 12% for the lowest size quartile, compared to 62% for the largest quartile. Because institutional investors lower debt issuance costs by generating and transmitting information, smaller firms could, by themselves, increase disclosure to potential lenders. Moreover, because larger firms tend to receive higher indexation weights, smaller firms face an additional disadvantage in raising debt, reinforcing these size-based disparities.

The persistence of revenues is another key factor. In Panel (h), I raise revenue persistence ρ_z to 0.76, matching the persistence of real GDP. This has two opposing effects. First, it makes future performance more predictable, reducing the scope for financing "mistakes". In the extreme, if current shocks perfectly predict all future shocks, there is no uncertainty and shareholders always choose the ex-post optimal amount of debt issuance. With only moderate persistence as in the baseline, however, shareholders may over-issue in good states or under-issue in bad states, as reversals are more likely *ex post*. In this case, institutional ownership is especially valuable: by lowering financing frictions and enhancing financing flexibility, it mitigates the costs of such mistakes. As revenues become more predictable, these mistakes diminish, and the role of institutional ownership in reducing debt costs declines. Second, persistence also makes revenue shocks last longer, amplifying cash-flow volatility and raising shareholders' effective risk aversion, which could strengthen the equity benchmarking channel. The results in panel (h) show that the first effect dominates: the decline of β^B to 0.065 indicates that the predictability channel outweighs the modest increases in σ_R and risk premium.

To summarize, both information transmission and equity benchmarking play important roles in generating the positive cross-market effects of institutional equity investors on debt issuance, consistent with the empirical evidence. Furthermore, the magnitude and relative importance of these mechanisms depend on firms' cash flow characteristics such as their financing flexibility and the persistence of fundamental shocks.

7.4 Economic implications

We have seen that cross-market information transmission and equity benchmarking both have significant effects on debt financing. The former influences the capital supply side (debt investors), and the latter affects the capital demand side (firm). I now turn to the broader implications of these channels for welfare and credit cycle dynamics.

Magnitude of information frictions. Information frictions are pervasive yet difficult to measure. Unlike physical inputs such as raw materials, information is intangible and rarely directly observable. Except in cases where it is explicitly traded (e.g., datasets), its value must be inferred indirectly from observable outcomes or through structural models estimated on the data. In the model, information frictions associated with debt financing are captured by the term $\frac{\psi_b}{2}(\mu s_t^I)^{-\zeta} b_{t+1}^2$.

To calculate the magnitude of information frictions, I first calculate the average value of this term using simulated data. Discounting this average value either by the average R_{ft} or R_t—treating information costs as a perpetuity with constant cash flow and discount rate—yields information costs equal to 0.7% and 0.6% of equity value, respectively. Although these numbers may appear small, they are comparable to the costs of managerial short-termism estimated by Terry (2023). As an alternative approach, starting from the first period in the simulated data, I discount all periodic information costs back to the first period using each period's actual discount factor. Using this measure, information costs amount to 5% of equity value, comparable to the costs of earnings misreporting estimated by Terry, Whited and Zakolyukina (2023). Which number to use depends on the perspective. From shareholders' perspective, the cumulative 5% figure is appropriate, while from the standpoint of a risk-neutral investor, the 0.7% value is more reasonable.

The periodic information costs are also countercyclical, with their value (as a percentage of equity value) in the low state higher than in the high state, making them particularly costly during downturns. Policies that promote greater information disclosure in bad times could therefore yield substantial welfare gains. An important question, then, is whether institutional ownership helps mitigate the countercyclicality of information frictions, and more broadly, debt financing costs. In what follows, I examine how institutional ownership affects the dynamics of debt issuance.

Dynamics of institutional equity ownership and debt issuance. Institutional ownership is procyclical: in the simulated economy, its correlation with revenues is significantly positive at 0.108, close to the detrended correlation of 0.120 in the data.

To examine how the procyclicality of institutional ownership affects dynamics of debt issuance, I run the following regressions in the simulated data, where profit is measured by $z - f$[63]

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

Under baseline parameters, $\beta_2 = -0.03$ (significant at 1% significance level),[64] indicating that the marginal effect of institutional ownership on debt issuance is more positive in low states. In other words, the effect of institutional ownership on debt issuance tends to be *countercyclical*. Estimating the same model using OLS regressions in the data also gives a negative coefficient $\beta_2 = -0.021$. The negative β_2 together with procyclical institutional ownership indicates

[63] Because profits can be negative, $log(profit)$ represents $log(prfit + |min\{profit\}| + 1)$, where $|min\{profit\}|$ denotes the absolute value of the minimum profit in the sample.

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

that institutional ownership is low exactly when it is most needed to reduce debt financing costs. This implies that institutional ownership is likely to amplify debt dynamics, which is procyclical both in this model and in the aggregate data (Jermann and Quadrini, 2012).

The coefficient β_2 is driven by several forces, including information transmission, equity benchmarking, SDF effects (in the absence of benchmarking) and endogeneity. In what follows, I examine the contribution of information and equity benchmarking channels using counterfactual analyses.

Information transmission. Similar to panel (c) of Table 8, I eliminate the information transmission by setting $\zeta = 0$. In this case, β_2 switches from negative to a positive value of 0.06, indicating that the information channel drives the countercyclical effects of institutional ownership on debt issuance. This is because in low states, the firm is more financially constrained due to low profits, thus it really needs institutional equity investors to produce and transmit more information to reduce debt financing costs. However, because institutional ownership is procyclical, it is lower in downturns. Therefore, the information channel amplifies the procyclicality of debt issuance.

Equity benchmarking. Similar to panel (d) of Table 8, I increase benchmarking intensity from 0.2 to 0.4. In this case, β_2 rises from -0.03 to -0.01, indicating that equity benchmarking contributes to the procyclical effects of institutional ownership on debt issuance. This is because in low states, shareholders are more averse to risks because of lower wealth. To encourage debt issuance, lower institutional ownership would be helpful because it incentivizes shareholders to hold more shares, reducing their effective risk aversion and thereby lowering debt financing costs. The procyclicality of institutional ownership therefore mitigates credit cycles through the equity benchmarking channel.

These results suggest an alternative explanation for the cyclical variation in debt financing costs based on investors' behavior, in contrast to the traditional narrative centered on collateral or leverage constraints (Kiyotaki and Moore, 1997).[65] On the one hand, in downturns, informed investors devote less attention (effort) to producing and disclosing information about firm value, exactly when such information is most valuable in reducing debt financing costs.

[65] Because the current model does not accurately match the levels of security returns, it is not suitable for quantifying the effects of institutional ownership on credit spreads.

On the other hand, benchmarking (passive ownership) has surged in the past few decades, which potentially mitigates credit cycles via lowering the sensitivity of investors' capital supply to economic conditions.

8 Conclusion

Interactions between equity and debt markets have important implications for asset prices, corporate policies, government interventions targeted at either market, as well as social welfare given that debt and equity are held by different investor groups (Ma, 2019; Chen, Chen and Li, 2023).

This paper finds that institutional equity investors influence both the supply side (debt investors) and the demand side (firm) of debt capital markets through information transmission and equity benchmarking respectively. While information is fundamental to the decisions of investors and firms, its measurement challenges have led much of the corporate finance literature to assume full information rational expectations (FIRE) as a simplifying benchmark. Evidence on information transmission underscores that departures from the FIRE benchmark are crucial to understanding debt dynamics. Moreover, the result that equity benchmarking alters firms' valuation of debt issuance reveals that equity investors' mandates influence not only equity markets but also spill over into debt markets. Together, these results highlight the need to study corporate financing decisions in an integrated framework that spans across markets and accounts for investor frictions.

Overall, capital markets, much like goods and services markets, operate through the interaction of demand and supply across related segments. Isolating a single market, or focusing solely on one side of a given market, risks yielding an incomplete view of equilibrium outcomes.

Table 1: Summary Statistics and Correlations

This table reports summary statistics for the main variables and the correlation between institutional shareholdings and firm characteristics. Panel (a) presents summary statistics of variables constructed from Compustat–CRSP, with all values deflated to 2017 dollars using the GDP deflator from FRED. Institutional shareholdings are expressed as percentages. Panel (b) reports the correlations between institutional shareholdings and firm characteristics. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

(a) Summary Statistics

	mean	median	sd	p25	p75	NObs
$\Delta Debt$	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

(b) Correlation Matrix

	InstShare
logAT	0.691^{***}
ROA	0.301^{***}
DtoLev	-0.065^{***}
SIC3 Book leverage	-0.011^{***}
Asset growth	0.125^{***}

Table 2: Debt and Equity Issuance and Institutional Equity Ownership

This table reports the relationship between institutional equity ownership and firms' financing outcomes estimated from Equation (1). Panel (a) presents the results for debt issuance. Column 1 includes firm and fiscal year fixed effects. Column 2 adds the full set of 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 the lagged dependent variable. Column 3 further includes SIC three-digit industry-year fixed effects to account for time-varying industry characteristics. Columns 4 and 5 employ alternative measures for debt issuance. Column 6 examines growth in bond issuance. Columns 7 and 8 use indicator variables for net debt issuance and bond issuance, respectively. The number of observations is smaller in these specifications because firms that never issue debt (or bonds) or issue them every year during the sample period are dropped. For columns 6 and 8, the sample starts in 1992 due to missing observations when matching FISD to Compustat. Panel (b) reports results for equity issuance and changes in leverage ratios. Pseudo R^2 is reported for specifications with binary dependent variables. 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)
	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$	$\frac{Debt-L.Debt}{L.AT}$	$\frac{DebtCashFlow}{L.AT}$	$\Delta Bond$	$1\{NetDebtIss\}$	$1\{BondIss\}$
L.InstShare	0.130***	0.201***	0.211***	0.098***	0.083***	0.070***	0.439***	0.266**
	(0.017)	(0.028)	(0.030)	(0.008)	(0.011)	(0.019)	(0.048)	(0.121)
Firm/Year FE	Y	Y	Y	Y	Y	Y	Y	Y
SIC3Year	N	N	Y	N	N	N	N	N
Controls	N	Y	Y	Y	Y	Y	Y	Y
NObs	111423	94941	94143	94941	89221	73879	89479	20549
Adj.R2	-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	-1.021***	-0.448***	0.082***	0.027***
	(0.014)	(0.018)	(0.016)	(0.059)	(0.085)	(0.005)	(0.004)
L.Q			0.176***				
			(0.007)				
Firm/Year FE	Y	Y	Y	Y	Y	Y	Y
Controls	N	Y	Y	N	Y	Y	Y
NObs	87557	87557	87557	65540	65540	94864	94864
Adj.R2	0.240	0.297	0.330	0.154	0.165	0.122	0.037

Table 3: Costs of Debt and Institutional Equity Ownership

This table reports the relationship between institutional equity ownership and costs of debt estimated from Equation (1). Columns 1 and 2 use par value-weighted credit spread as the dependent variable. Columns 3 and 4 use the logarithm of interest payments over total debt, $\frac{int}{debt}$, as the dependent variable (in the sample, the value of interest payments over total debt is strictly positive for firms with non-zero debt after winsorization). Using the level of $\frac{int}{debt}$ is problematic because debt also enters the control variables *Dtolev* and $sic3blev$, and the resulting high correlation between the dependent and control variables may absorb the variation in $\frac{int}{debt}$. ***,**,* indicate significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Credit spread	Credit spread	$\log(\frac{int}{debt})$	$\log(\frac{int}{debt})$
L.InstShare	-0.022***	-0.021***	-0.266***	-0.297***
	(0.008)	(0.007)	(0.024)	(0.031)
Firm/Year FE	Y	Y	Y	Y
Controls	N	Y	N	Y
NObs	8022	8022	73310	73310
Adj.R2	0.450	0.538	0.359	0.369

Table 4: Characteristics of Always-takers and Compliers under the May 2004 Regulatory Change

This table compares the characteristics of mutual funds that reported voluntarily prior to the regulatory change (always-takers) with those whose reporting frequency increased as a result of the change (compliers). Assets under management (AUM) are reported in millions of dollars. 'AUM (mean)' is the the assets under management averaged across fund-quarter observations for compliers (treated funds) and always-takers (non-treated funds) separately, and 'AUM (median)' is the median value. 'Number of stocks (mean)' is the average number of stocks held by funds across fund-quarter observations, and 'Number of stock (median)' is the median. 'Number of funds' is the total number of funds classified as compliers or always-takers. 'Reporting quarters (Pre)' shows the pre-treatment share of quarters in which a fund reported its holdings, separately for compliers and always-takers.

	(1)	(2)
	Always-takers	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 5: Equity Benchmarking and Corporate Financing

This table reports 2SLS results using BMI as the instrument for institutional ownership $InstShare$. The sample is restricted to firms whose market capitalization falls within the 400 bandwidth around the cutoff on the ranking date in May, over the period 1998-2018. Panel (a) presents effects on debt and equity issuance. Columns 1 and 2 examine the intensive and extensive margins of debt issuance, respectively. Columns 3 and 4 use equity issuance and an equity issuance dummy as dependent variables. Columns 5 and 6 report results for excess stock returns and value-weighted credit spreads. Stock return is defined as the cumulative daily returns within a fiscal year, and excess stock return as the difference between the annual stock return and the five-year Treasury rate. Column 7 uses the logarithm of the ratio of long-term debt (maturity >1 year) to total debt as the dependent variable, while column 8 uses the logarithm of the ratio of debt with maturity longer than three years to total debt. Panel (b) tests for alternative mechanisms. Whenever the interaction term $x \times InstShare$ is included, the level variable x is also included but omitted from the table for the sake of space. Columns 1 to 3 test whether coefficients on interaction terms between $InstShare$ and three proxies for information asymmetry are significant. Columns 4 and 5 examine 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) Debt and equity financing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\Delta Debt$	$1\{NetDebtIss\}$	$\Delta Equity$	$1\{EquityIss\}$	ExRet	CreditSpread	Maturity	Maturity
L.InstShare	1.816**	1.185*	0.409**	0.338	-1.801***	0.080	0.668	11.617**
	(0.778)	(0.622)	(0.189)	(0.322)	(0.682)	(0.060)	(0.586)	(5.473)
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	1592	5484	4221
First stage F-stat	30.98	30.67	30.72	30.66	31.65	15.61	27.59	25.23

(b) Alternative mechanisms

	(1)	(2)	(3)	(4)	(5)
	Info	Info	Info	Liquidity	Volatility
L.InstShare	3.859*	4.274	1.889**	1.874**	1.681**
	(2.289)	(2.723)	(0.842)	(0.801)	(0.727)
L.InstShare × L.idioVol	73.014				
	(45.473)				
L.InstShare × L.TotVol	-66.632	-66.706			
	(41.136)	(44.720)			
L.InstShare × L.idio3factor		74.635			
		(50.573)			
BASGroup=2× L.InstShare			-0.085		
			(0.229)		
BASGroup=3× L.InstShare			-0.117		
			(0.332)		
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 6: Parameter Calibration

This table reports the calibrated parameters. The model is solved at an annual frequency. Panel (a) presents parameter values directly taken from prior research or with direct empirical match, and panel (b) presents parameter values calibrated using empirical moments. The parameter ρ_z denotes the AR(1) coefficient of revenues, calibrated using non-financial corporate revenue and real GDP. Both series are obtained from FRED: non-financial corporate revenue (BOGZ1FU106030005A, deflated by the GDP deflator) and real GDP (GDPCA). The AR(1) coefficients of these two detrended variables are 0.617 and 0.755, respectively. The value of η is calibrated using the median EBITDA-to-revenue ratio of 0.1 among Compustat firms and the median debt-to-EBITDA ratio of 3.75 reported in Drechsel (2023). The parameter ρ_f denotes the AR(1) coefficient of operating costs, calibrated from the difference between non-financial corporate revenue (BOGZ1FU106030005A) and profits (A464RC1A027NBEA) from FRED, both deflated by the GDP deflator.

Parameter	**Value**	**Source**
(a) Parameters taken from prior research or with direct empirical match		
β	0.976	five year real Treasury bond rate
γ	1	log utility (relative risk aversion coefficient=1)
ρ_z	0.7	AR(1) coef of (real) nonfinancial corporate revenue and real GDP
σ	0.03	conditional volatility of nonfinancial corporate revenue
coupon rate	0.039	average coupont rate in FISD
τ	0.2	Gomes and Schmid (2010)
ρ_f	0.63	AR(1) coefficient of (revenue-profits)
σ_f	0.18	conditional volatility of (revenue-profits)
ψ_d	0.051	Altinkilic and Hansen (2000)
η	2.67	Median EBITDA-revenue ratio of Compustat firms
		and median debt-EBITDA ratio in debt covenants (Drechsel, 2023)
ν	2000	Croce et al. (2012)
γ_I	0.1	wage income from Survey of Consumer Finance (SCF)
μ	0.54	proportion of equity investors who hold stocks through institutions (SCF)
(b) Parameters calibrated to match moments		
$\bar{s}$	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	operating costs
ϕ_s	0.2	equity benchmarking intensity

Table 7: Comparison of Data and Simulated Moments in the Baseline Model

This table compares moments estimated from real data with those generated from simulated data. To compute the simulated moments, I simulate six artificial panels, each with 10,000 firms and 340 periods, with a burn-in period of 1,000. The reported moments are the averages across these six panels. The three columns on the left present the target moments. The first two are regression coefficients estimated from Equation (11) and Equation (12) respectively. The third moment is net equity issuance scaled by equity value, where negative values indicate dividend payouts in excess of equity issuance. The fourth moment is the debt-to-revenue ratio. The fifth moment is average institutional ownership, computed as the average fraction of shares held by institutional investors multiplied by $\mu = 0.54$ which is the measure of institutional equity investors. The last moment is the AR(1) coefficient of institutional holdings.

The three columns on the right report the untargeted moments. The first is the (gross) dividend-to-equity value ratio. The second moment is the frequency of debt issuance: for each firm, I calculate the fraction of periods with positive net debt issuance and then average across firms. These two moments capture key features of firms' financing choices, the focus of this paper. The third moment is the correlation between institutional ownership and firm revenue, calculated after removing firm fixed effects. The fourth moment is stock return volatility, where returns in the simulated data are calculated as $\frac{P_{t+1}}{P_t - d_t}$ with P_t denoting the cum-dividend stock price (firm equity value) at time t and d_t the dividend payment at time t. The fifth moment is the volatility of the risk free rate. In the simulated data, the risk free rate is calculated as $\frac{1}{E_t M_{t,t+1}}$. The last moment is the average risk free rate.

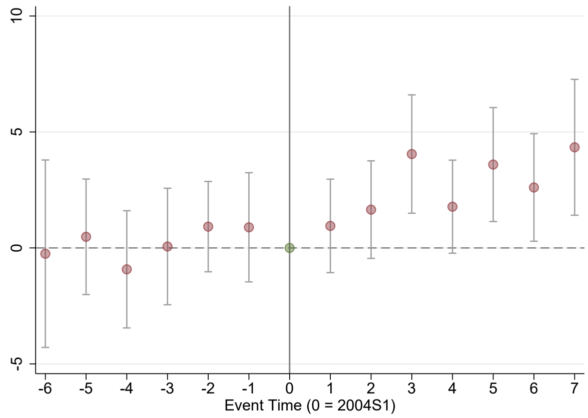
Target moments	**Data**	**Model**	**Untargeted moments**	**Data**	**Model**
Regression coef of debt growth on s^I	0.130	0.128	$\frac{Dividend}{\text{Equity value}}$	0.036	0.034
Regression coef of $D.MLev$ on s^I	0.081	0.086	Frequency of debt issuance	0.530	0.565
$\frac{\text{Net equity issuance}}{\text{Equity value}}$	-0.022	-0.017	$\rho_{s^I,z}$	0.108	0.120
$\frac{Debt}{Revenue}$	0.510	0.516	σ_R	0.177	0.144
Average institutional ownership	0.406	0.414	σ_{rf}	0.021	0.038
AR1 of s^I	0.936	0.969	r_f	2.50%	2.18%

Table 8: Counterfactual Analysis

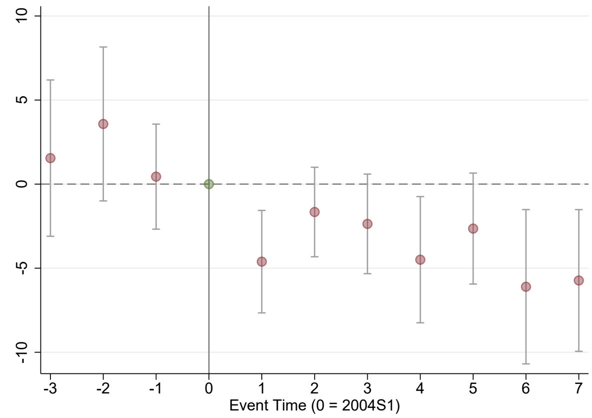
This table reports the counterfactual analysis of the model. The specifications considered are: (a) data, (b) baseline calibration, (c) no information transmission, (d) higher benchmarking intensity, (e) risk-neutral equity investors, (f) lower fixed costs, (g) lower equity issuance costs, and (h) more persistent (and more volatile) revenues. For each counterfactual experiment (panels (c)–(h)), one parameter is altered while all others remain fixed, and the model is re-solved. Moments are computed in the same way as in Table 7. Specifically, I simulate six artificial panels, each with 10,000 firms and 340 periods, with a burn-in period of 1,000. The reported moments are the averages across these six panels.

β^B	$\beta^{\Delta MLev}$	Debt Issuance Freq	σ_R	r_f	$r - r_f$
(a) Data					
0.130	0.081	0.530	0.177	2.50%	7.64%
(b) Baseline model					
0.128	0.086	0.565	0.144	2.18%	0.57%
(c) No information transmission ($\zeta = 0$)					
0.102	0.075	0.497	0.141	2.19%	0.53%
(d) Higher benchmarking intensity ($\phi_s = 0.4$)					
0.140	0.150	0.524	0.143	2.17%	0.54%
(e) Risk neutral equity investors ($\gamma = 0$)					
1.027	-0.014	0.521	0.066	2.50%	-0.80%
(f) Lower fixed costs ($f = 0.5$)					
-0.012	-0.017	0.492	0.096	2.24%	0.40%
(g) Lower equity issuance costs ($\psi_d = 0.03$)					
0.081	0.085	0.550	0.143	2.18%	0.59%
(h) Higher persistence of revenue ($\rho_z = 0.76$)					
0.065	0.079	0.390	0.145	2.15%	0.63%

Figure 1: Dynamic Effects of Frequent Mutual Fund Holdings Disclosure



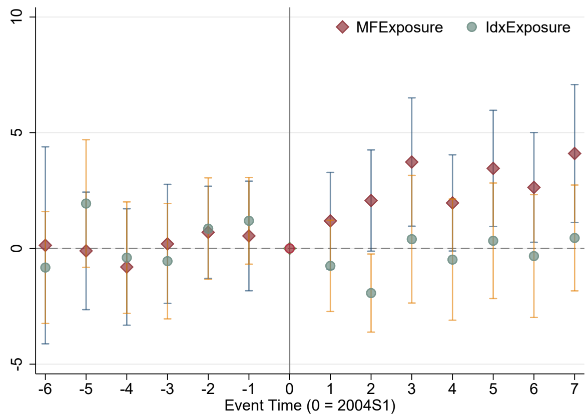
(a) $\Delta Debt$



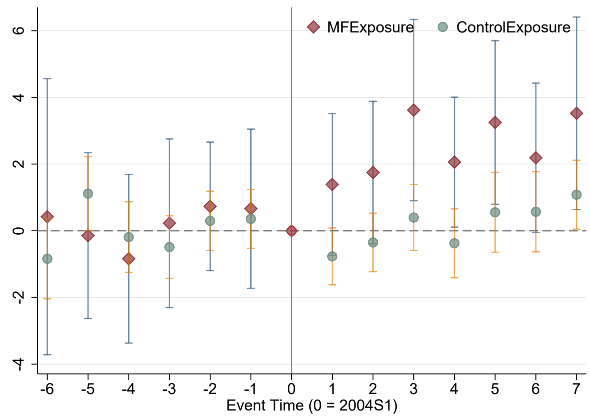
(b) Bond credit spread

This figure plots the dynamic coefficients estimated from Equation (2) at the semi-annual frequency from 2001S1 (the first half of year 2001) to 2007S2 (the second half of year 2007). The gray solid lines represent the 90% confidence intervals. Panel (a) presents the estimates when debt issuance, $\Delta Debt$, is the dependent variable. Panel (b) reports estimates using credit spread, defined as the par value–weighted average credit spread of all bonds outstanding for a given firm in a given half year, as the dependent variable. Because TRACE data is only available from July 2002 onward, the sample for this panel begins in 2002S2.

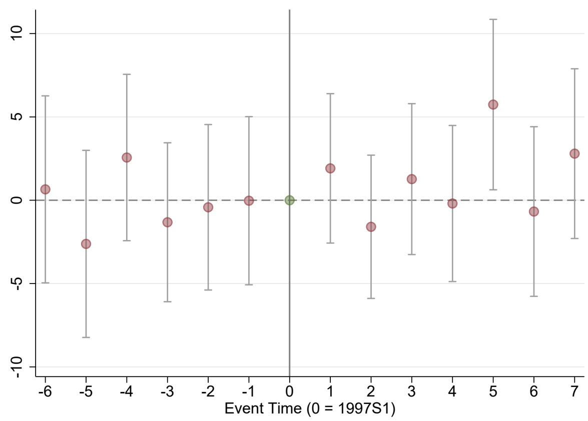
Figure 2: Falsification Tests: Alternative Funds and Placebo Treatment Periods



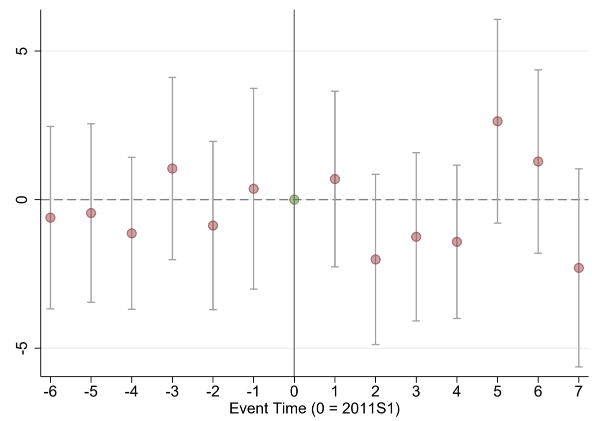
(a) $\Delta Debt$ (Index funds)



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



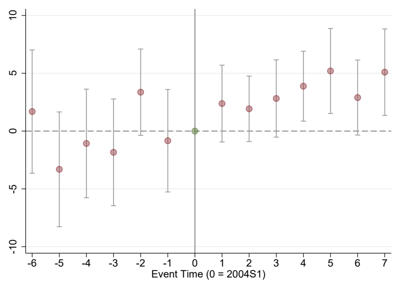
(c) 1997



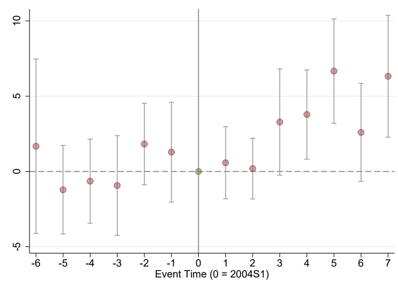
(d) 2011

This figure presents dynamic coefficients estimated from Equation (2) at the semi-annual frequency from 2001S1 (the first half of year 2001) to 2007S2 (the second half of year 2007). Gray solid lines represent the 90% confidence intervals. In panels (a) and (b), the regressions include additional interaction terms between time dummies and the percentage of shares held by index funds and non-treated active mutual funds, respectively. In panel (a) ((b)), green dots and orange bars show the coefficients on the interaction terms with index fund shares (other active fund shares), while red dots and blue bars correspond to the coefficients on the interaction terms with treated fund shares. Panels (c) and (d) report estimates for 1994S1–2000S2 and 2008S1–2014S2, respectively, with 1997S1 and 2011S1 assigned as placebo treatment periods.

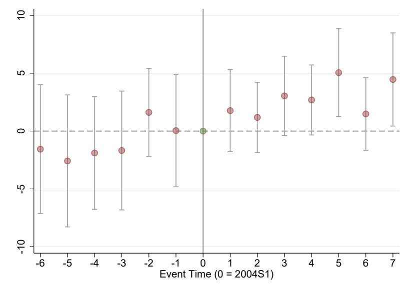
Figure 3: Dynamic Effects of Frequent Mutual Fund Holdings Disclosure: Heterogeneity in Price Informativeness



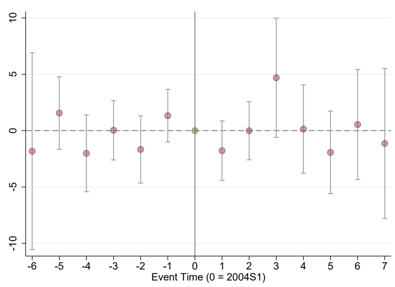
(a) High price jump



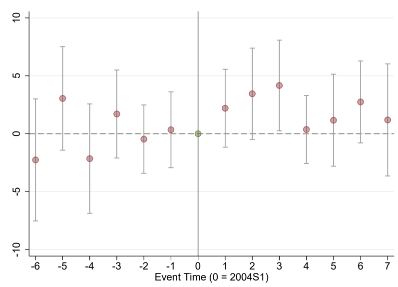
(b) High abnormal return



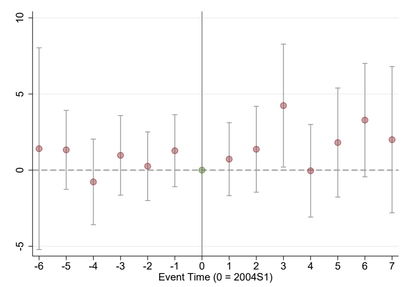
(c) High adjusted abnormal return



(d) Low price jump



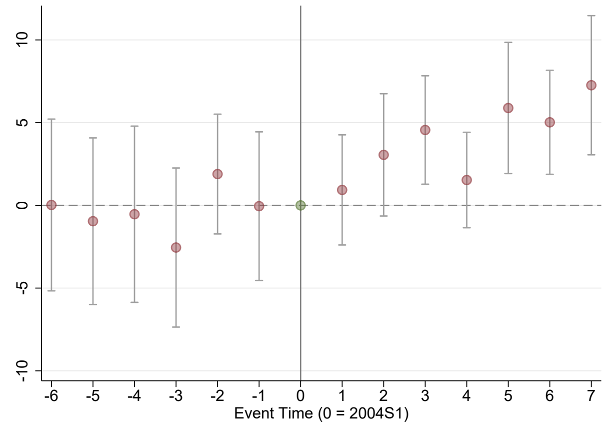
(e) Low abnormal return



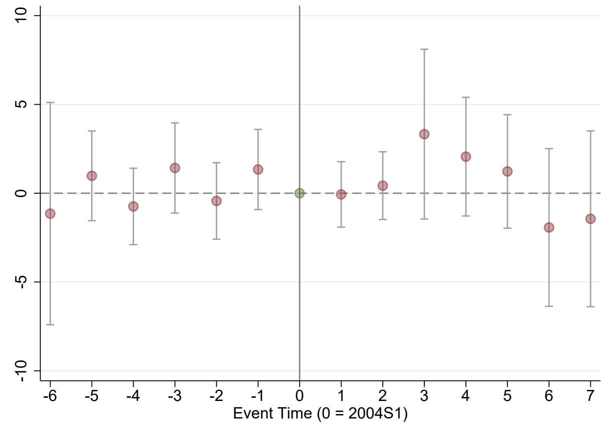
(f) Low adjusted abnormal return

This figure presents dynamic coefficients estimated from Equation (2) at the semi-annual frequency from 2001S1 (the first half of year 2001) to 2007S2 (the second half of year 2007) for subsamples divided based on price informativeness. Gray solid lines represent 90% confidence intervals. Panels (a)-(c) use the 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 measures are based on abnormal returns around corporate earnings announcements following Sammon (2024).

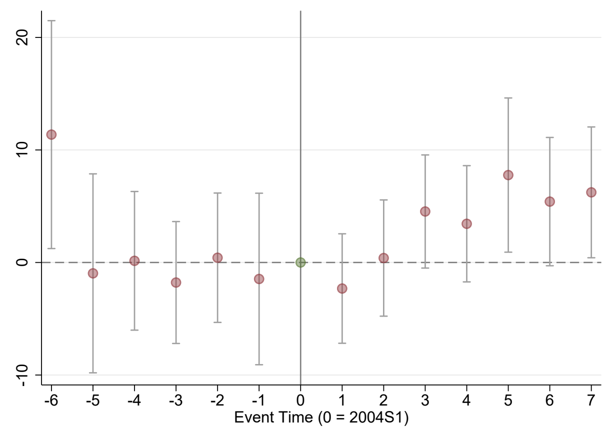
Figure 4: Dynamic Effects of Frequent Mutual Fund Holdings Disclosure: Heterogeneity in Profitability and Information Asymmetry



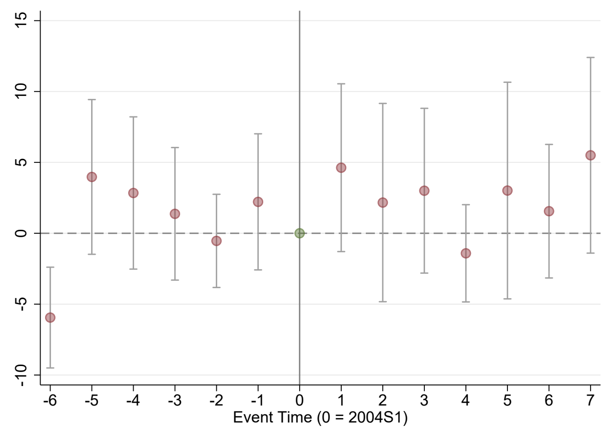
(a) High ROA



(b) Low ROA



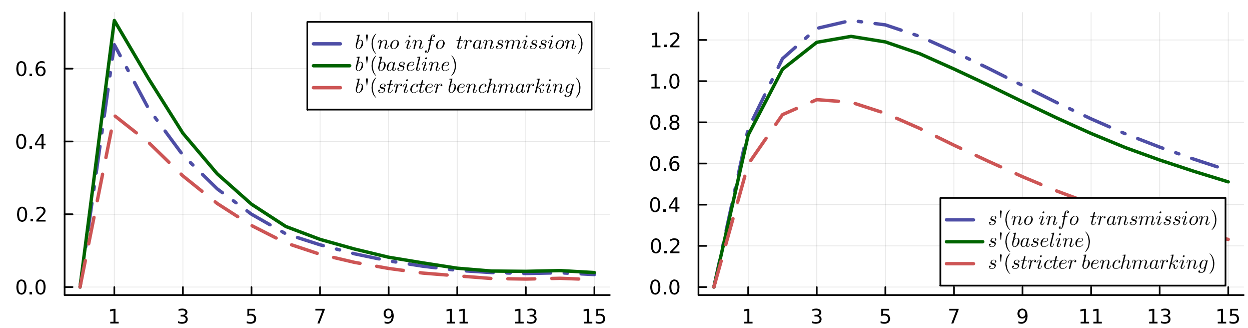
(c) High idiosyncratic volatility (conditional)



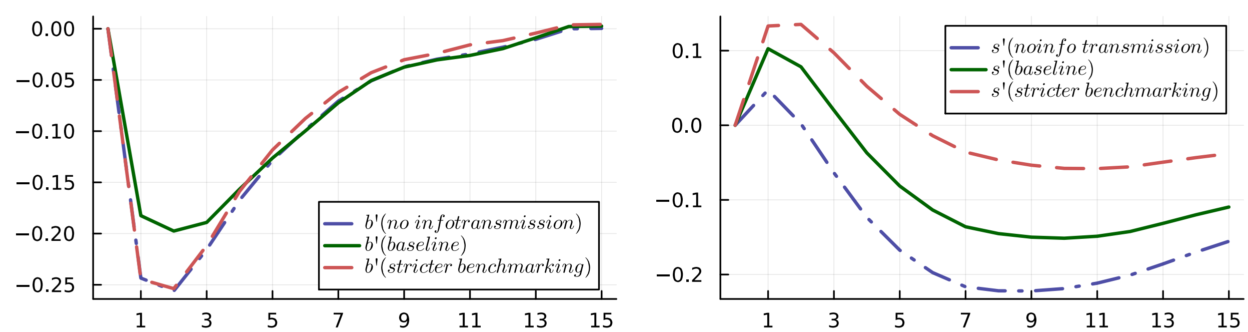
(d) Low idiosyncratic volatility (conditional)

This figure presents dynamic coefficients estimated from Equation (2) at the semi-annual frequency from 2001S1 (the first half of year 2001) to 2007S2 (the second half of year 2007) for subsamples divided by proxies for firm fundamentals and information asymmetry. Gray solid lines represent 90% confidence intervals. Panels (a) and (b) split firms into two equally sized groups based on return on assets (ROA), measured one year prior to treatment. Firms with ROA larger than the median value are classified as the High group, and those below as the Low group. Panel (a) reports estimates for the High group, and panel (b) for the Low group. Panels (c) and (d) split firms by idiosyncratic volatility, calculated as the volatility of CAPM residuals. To address the strong negative correlation between ROA and idiosyncratic volatility (correlation coefficient is -0.38), I first divide firms into terciles based on ROA and keep the top two terciles only. These remaining firms are then classified as the High group (top two quintiles) or the Low group (bottom two quintiles) based on their idiosyncratic volatility. The high-ROA group in panel (a) is not directly used in the first step because further partitioning a small sample would yield noisier estimates.

Figure 5: Impulse Response to Revenue Shocks



(a) Positive revenue shock



(b) Negative revenue shock

This figure plots impulse responses to one-period revenue shocks. Panel (a) shows the percentage deviations of policies from their quarter-0 values under three model specifications following a positive shock to revenue z. Panel (b) reports the corresponding deviations after a negative shock to z. To generate the impulse responses, I run six simulations of 10,000 firms over 515 periods. In period 501, I introduce a one-time shock by setting all firms' revenue to its highest (lowest) level and then allow the model to evolve as before.

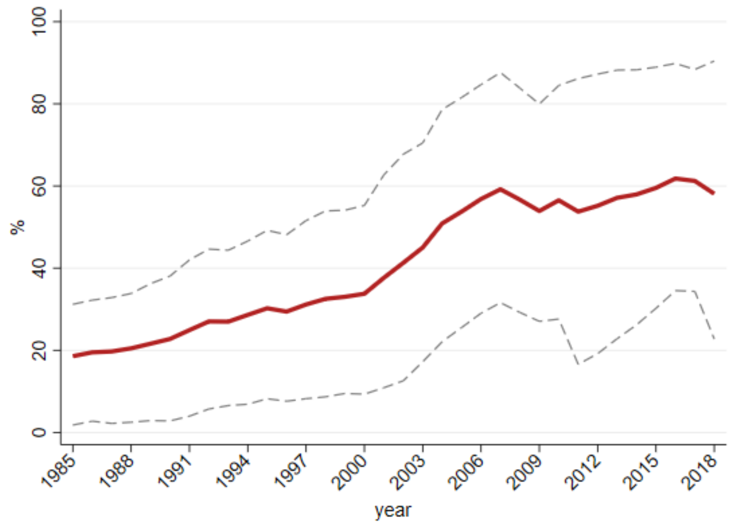
Appendix

Table A1: Variable Definition

This table provides the definitions and measurement of the variables.

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 refer to institutional investors with ownership >5%)
Share turnover	Trading volume divided by shares outstanding, adjusted for double-counting (Anderson and Dyl, 2005)
CumRet	Annual cumulative return from daily stock returns
ExRet	CumRet minus five-year Treasury rate
CreditSpread	Par value–weighted average credit spread of all bonds outstanding for a firm in a given period, where credit spread is the difference between bond yield and the yield on the nearest-maturity Treasury
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 (3), annualized by multiplying $\sqrt{252}$ (at least 200 observations)
idio3factor	Standard deviation of ϵ estimated using Equation (3) 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: Evolution of Institutional Equity Ownership



This figure plots the evolution of institutional equity ownership of U.S. non-financial public firms from 1985 to 2018. The red solid line shows the average institutional equity shareholdings in each fiscal year, and the gray lines represent the 25th and 75th percentiles.

A Characteristics of Institutional Equity Investors

Institutional equity investors are a diverse group, including mutual funds, pension funds, etc., and each of these investor types may employ distinct investment strategies. For example, some may engage in speculative trading, others in passive, indexed investing, and some may pursue long-term growth strategies. Despite the heterogeneity, they share several key common characteristics.

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 4.1 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[66].

[66] $79.04\% \times 77.9\% = 61.6\%$

B Alternative Mechanisms

This paper focuses on two (causal) mechanisms: information sharing from informed equity investors to debt investors, and equity benchmarking. In this section, I discuss alternative explanations that may lead to a positive correlation between institutional equity ownership and debt issuance.

B.1 Corporate governance

Previous studies show that the ownership 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.[67] However, the effects on debt financing are ambiguous. On the one hand, this could decrease capital financing costs in general, although this does not necessarily imply more debt financing. On the other hand, 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, I use two sets of variables. The first is corporate governance score, and the second is earnings management (a measure of management misbehavior). I obtain ESG management score and ESG shareholders score from Thomson Reuters, starting from 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

[67] This effect arises from the resolution of agency conflicts between shareholders and managers, rather than from frictions impeding the integration of different asset markets, which is the focus of this paper.

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.

$$\frac{tca_{it}}{at_{it-1}} = \alpha + \beta_1 \frac{1}{at} + \beta_2 \frac{cfo_{it-1}}{at_{it-1}} + \beta_3 \frac{cfo_{it}}{at_{it-1}} + \beta_4 \frac{cfo_{it+1}}{at_{it-1}} + \beta_5 \frac{\Delta rev_{it}}{at_{it-1}} + \beta_6 \frac{ppe_{it}}{at_{it-1}} + \epsilon_{it}. \tag{13}$$

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 A2 gives the results. I first look at whether institutional ownership indeed improves corporate governance. Columns 1-4 of panel (a) and column 1 of panel (b) show that higher institutional ownership is positively related to ESG management score, negatively related to earnings management, but is not related to ESG shareholder score. These results do not rule out the possibility that institutional ownership improves corporate governance. However, what really matters 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-equity holdings relation should be stronger. Nevertheless, throughout all specifications the interaction terms are either insignificant or even positively significant for the shareholder protection score in column 8. This positive coefficient is actually consistent with the information sharing channel: institutional ownership helps reveal firms of higher quality that are attentive to shareholder interests, which enables these firms to issue more debt at lower costs.

B.2 Creditor-shareholder conflict

When firms' debt and equity securities are held by the same investors, incentives of creditors and shareholders are aligned (Jiang, Li and Shao, 2010). This could decrease debt financing costs, stimulating debt issuance. In the main text (Section 4), I provided evidence on public information sharing which indicates that incentive alignment cannot be the single underlying mechanism. Moreover, the incentive alignment relies on *dual* ownership, when firms are held by debt and equity investors from the same management company, instead of institutional ownership per se.

B.3 Search costs

When firms are more heavily held by institutional investors, these shareholders may facilitate firms' access to lenders in the debt market. In other words, institutional ownership can reduce the search costs associated with finding debt investors. Note that the searching cost story is not mutually exclusive with the information channel: when information asymmetry about a firm's value decreases, it is easier and less costly to find a counterparty to trade with. Some studies 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 transmission mechanism. When the intermediation sector and credit supplier market are more concentrated, firms may find it harder to find ideal buyers for their debt.

If this is the case, we expect to see firms benefit more from higher institutional ownership when the financial sector is dominated by a few large players and is more concentrated. To measure the financial sector concentration, I compute the Herfindahl-Hirschman Index based on sale and total assets of firms in the Finance industry (SIC 6000-6999): $HHI_t = \sum_i s_{it}^2$,

Table A2: 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 (13). 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 A2: 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.InstShare × L.accCF		-0.288	
		(0.435)	
L.accCF=2			-0.023
			(0.016)
L.accCF=3			-0.043**
			(0.019)
L.accCF=2 × L.InstShare			0.018
			(0.025)
L.accCF=3 × L.InstShare			0.012
			(0.032)
Firm/Year FE	Y	Y	Y
Controls	Y	Y	Y
NObs	67777	68137	68137

where s_{it} is firm i's market share[68]. Second, I use the total assets shares of top 1%, 10% or 500 firms in the finance sector, obtained from Kwon, Ma and Zimmermann (2024). Table A3 shows that the interaction term between institutional ownership and market concentration is insignificant across specifications, providing no support for the search costs story.

B.4 Misvaluation

Prior research documents that firms time financial market misvaluations (Baker and Wurgler, 2002; Choi et al., 2025). If institutional equity investors believe a firm's 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)[69]. Facing a temporarily higher

[68]Using more granular industry definitions, i.e. "Security and Commodity Brokers, Dealers, Exchanges, and Services" (SIC 6200-6299) and "Insurance Agents, Brokers and Service" (SIC 6400-6499), yields similar results.

[69]One may argue that retail investors tend to be more irrational, so when institutional equity investors are overoptimistic, retail investors may be even more overoptimistic and purchase more, resulting in more shares held by retail investors. However, 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

Table A3: Search Costs as an Alternative Channel

This table tests for search 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 × L.log(HHISale)	0.059				
	(0.054)				
L.InstShare × L.log(HHI)		0.041			
		(0.037)			
L.InstShare × L.log(share1pct)			0.543		
			(0.640)		
L.InstShare × L.log(share10pct)				4.757	
				(5.535)	
L.InstShare × 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

demand for shares, (rational) firms would issue more equity either to make arbitrage profits or to raise funds for real investment (Ma, 2019), substituting for debt issuance. The same story applies to higher institutional shareholdings induced by fund flow shocks (Lou, 2012). Therefore, equity misvaluation should lead to less debt issuance and lower leverage growth (due to more equity issuance), which is not the case as shown in Table 2. This indicates that equity misvaluation does not seem to be the major driving force underlying the debt-equity holdings relationship, although it could exist (as suggested in column 3 of panel (b) Table 2). More importantly, the objective of this paper is to understand the connections between equity and debt markets, so misvaluation within a single asset market is not the focus.

C Use of Funds

Firms issue debt for two primary reasons. First, debt provides financing for real investment—such as acquiring capital equipment or developing new products—particularly when internal funds are insufficient and equity issuance is costly. Second, firms may issue debt to exploit favorable financing conditions. This motive can stem from arbitrage opportunities related to misvaluation or from low borrowing costs more generally. In the case of misvaluation, when corporate debt is overpriced, firms can raise debt and return capital to shareholders (Ma, 2019). Equity mispricing can also spill over to debt markets because debt investors, who learn from equity investors' holdings, may adopt equity investors' misperceptions. In the absence of misvaluation, debt may still be attractive if the firm lacks profitable investment opportunities, in which case borrowed funds are returned to shareholders and saved (Begenau and Salomao, 2019). Although disentangling these motives is beyond the scope of this paper, clarifying them helps illustrate what is going on behind firms' financing choices.

If the first motive explains what we observe in Table 2, the results should be stronger for firms more financially constrained, e.g. firms that want to invest but do not have enough funds to do so. Table A4 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

fluctuations.

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).

Finally, consistent with the second motive—taking advantage of low debt costs—firms also repurchase more shares and accumulate more cash (columns 4 and 6). Importantly, both the information transmission and equity benchmarking channels are consistent with either motive. A natural extension, left for future work, would be to disentangle the relative contribution of each channel to each motive.

D Additional Discussion of Information Transmission Channel

D.1 Heterogeneity in information asymmetry

In this section, I provide descriptive evidence supporting the information transmission mechanism by demonstrating that: (i) the debt-equity holdings relationship is stronger for firms with greater information asymmetry; (ii) 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

Table A4: Tests for Debt Financing Motives

This table examines firms' use of funds. Panel (a) examines whether the debt-equity holdings relationship is stronger for firms that are more financially constrained, measured using the Whited and Wu index (Whited and Wu, 2006), the Size-Age index (Hadlock and Pierce, 2010), and the S&P rating. For each fiscal year, $SADummy_{it} = 1$ if firm i's Size-Age index is larger than the median value, $WWDummy_{it} = 1$ if firm i's Whited and Wu index is larger than the median value, $Rating_{it} = 1$ if firm i does not have a S&P credit rating. Panel (b) examines the relationship between institutional ownership and real investment, R&D, employment growth, share repurchases, dividend payment and cash growth. 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

valuable to investors. I proxy macroeconomic uncertainty using three measures: (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 the annual standard deviation of daily stock market returns. The second measure is the U.S. equity market volatility index constructed by Baker et al. (2019), a newspaper-based proxy for equity market uncertainty. Each month, authors count the number of newspaper articles in major US newspapers 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). The resulting counts are standardized to ensure comparability over time.[70]. Because macroeconomic conditions are most relevant for firms' financing choices, I further restrict the sample to articles that reference "macroeconomic news and outlook". The third measure captures policy-related economic uncertainty, which is also text-based by counting words related to economic, policy and uncertainty in newspapers[71]. Each of these measures captures different aspects of economic uncertainty.

I also control for R^2 obtained from estimating Equation (3) to account for firms' heterogeneous exposure to the market.[72] The average R^2 from the CAPM regressions is about 10%, suggesting idiosyncratic volatility and total volatility are highly correlated (correlation coefficient 0.99). Accordingly, when idiosyncratic volatility is used as a proxy for information asymmetry, I also control for the interaction between institutional equity ownership and total volatility.

As shown in columns 1 and 6 of Table A5, the coefficients on the interaction terms are positive and statistically significant. This finding is consistent with the hypothesis that institutional equity ownership reduces the information asymmetry faced by debt investors, thereby facilitating debt issuance. I further divide the sample by periods of high versus low macroeconomic uncertainty. The interaction coefficient is more significant during high-uncertainty

[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 value of equity rather than returns (price changes) to measure sensitivity to market conditions does not affect the results. Specifically, instead of Equation (3), I estimate

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

where ME_{it} is firm i's market equity from CRSP.

periods, consistent with the idea that firm-specific information becomes more valuable when aggregate uncertainty is elevated. Similar results are obtained when bid–ask spreads are used as an alternative measure of the difficulty in valuing the firm.[73]

In addition, because debt values are more sensitive to information when firms are closer to default,[74] information sharing from institutional equity investors should have stronger effects for firms closer to bankruptcy. Panel (c) of Table A5 provides evidence consistent with this prediction. Default risk is measured using the Altman Z-score, where higher values indicate greater distance from bankruptcy. In column 1, the interaction term is negative, consistent with the hypothesis that as firms move further from bankruptcy, the effect of institutional ownership weakens because information becomes less important for debt valuation. This finding does not support the alternative explanation that higher institutional shareholdings and greater debt issuance are both simply driven by stronger firm performance. Lastly, lower uncertainty can actually harm firms with very high default probabilities: for these firms, reduced uncertainty simply confirms to investors that default is imminent. This effect offsets the positive role of information sharing for normal firms. In column 2, I exclude firms that exit the sample in the subsequent period. The interaction term becomes even slightly more significant despite the reduced sample size, consistent with the prediction.

D.2 Informativeness of equity investors

The implicit assumption behind the information transmission channel is that professional equity investors produce (or acquire) information about firms that is useful to debt investors. If investors do not produce valuable information,[75] their holdings would be less useful signals

[73] I also examine dispersion and forecast errors in analysts' one-year-ahead EPS forecasts from IBES. Results are similar: during periods of high macro uncertainty, the interaction coefficient is positive and significant. In the full sample the coefficient is positive but statistically insignificant. This could be due to a smaller sample size (more than 40% lower than when idiosyncratic volatility is used as the proxy) and larger measurement error in belief dispersion measure with only a few reported analyst forecasts. Using implied volatility from Alfaro, Bloom and Lin (2024) yields similar evidence: the interaction coefficient is again positive and statistically significant.

[74] This result holds conditional on default probabilities remaining below 50% and arises from the concavity of the debt payoff function.

[75] The information could be either hard or soft. Hard information refers to objective data such as financial statements and other quantitative measures. Examples of soft information include individual interpretation of financial statistics, information obtained from site visits, etc.

Table A5: Institutional Ownership and Debt Issuance: Heterogeneity in Information Asymmetry

This table examines the information sharing mechanism by exploring firm heterogeneity in information asymmetry. Panel (a) uses idiosyncratic volatility as proxy of uncertainty about firm value. Column 1 uses the idiosyncratic volatility estimated from CAPM, and columns 2-8 use Fama-French three factor model. 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. Across all specifications, I control for both the interaction between *L.InstShare* and total volatility, as well as the level of total volatility itself. Panel (b) presents analogous results using bid-ask spread as a measure of information asymmetry. Because bid-ask spread may also capture liquidity, column 2 includes the Amihud illiquidity measure as an additional control. Columns 3 and 4 employ a measure of cross-sectional uncertainty at the industry level, calculated as return volatility at the SIC three-digit industry level (excluding the firm itself). Unlike macro conditions, which may affect liquidity broadly, industry-level variation is less likely to be driven by time-series liquidity fluctuations. Columns 5–10 further restrict the sample to periods of high and low macroeconomic uncertainty, analogous 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 A5: Institutional Ownership and Debt Issuance: Heterogeneity in Information Asymmetry (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

for debt investors. In this section, I show that the relationship between institutional equity shareholdings and debt issuance is stronger for firms held by more informed institutional investors.

To measure the amount of relevant information associated with institutional equity ownership, I adopt two approaches: (i) decomposing total institutional equity ownership into different investor categories; (ii) measuring investor informativeness more directly. Using the classification data provided by Brian Bushee[76], I partition institutional ownership into six groups: 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 typically buy-and-hold investors with infrequent trading activity and greater regulation constraints (Coppola, 2025), while mutual funds and bank trusts actively take on risk and engage in more intensive research when selecting stocks. Moreover, the latter two types of investors are also crucial participants in corporate bond and loan markets. If information transmission matters, I expect to see more significant results for these two groups.

Second, I use information embedded in mutual fund returns to measure investor informativeness more directly. Specifically, I construct two sets of variables capturing the informativeness of institutional equity holdings, focusing on mutual funds for which detailed monthly return data are available. The 13F filings provide only quarterly positions and are reported at the management-company level, whereas mutual fund data allow me to observe returns and expense ratios at the individual fund level. I remain agnostic regarding the precise source of manager informativeness, which may arise from personal connections to firms, geographic proximity, or managers' educational backgrounds (Cohen, Frazzini and Malloy, 2008; Coval and Moskowitz, 2001).

The first set of measures builds on the idea that managers with superior information generate larger αs implied by factor models (Fama and French, 2010; Agarwal et al., 2015). Formally, I estimate

$$R_{it} - R_{ft} = \alpha_i^T + F_t'\beta_i + \epsilon_{it},\ t \in [T-35, T] \tag{14}$$

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

where F_t is a vector of factors. I use both Carhart (1997) four-factor model and a five-factor model that adds the liquidity factor (Pástor and Stambaugh, 2003). The momentum factor is included given the prevalence of trend-following strategies among mutual funds (Grinblatt et al., 2020). R_{ft} is one-month Treasury bill rate. R_{it} denotes mutual funds' gross return, defined as net returns plus expense ratio (monthly), both obtained from CRSP Mutual Fund database. I also consider net returns, which is the return investors actually earn. The caveat is that net returns are affected by market competition through their influence on management fees. At each month T (e.g. January 2015), α_i^T is estimated using the prior 36 months of returns. 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

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

Importantly, I do not take a stand on the true asset pricing model (Fama and French, 2010). Rather, the factor models serve as approximations of the alternative investment opportunities that managers with similar risk appetites can easily seize. In other words, it represents a benchmark portfolio that fund managers can construct without acquiring much firm-specific information. The assumption is that managers' ability to generate α reflects their informativeness about firms they hold (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 has been available since 1976, and is widely known and accessible to other fund managers. Therefore, it provides a natural alternative investment opportunity readily accessible to mutual fund managers and investors. In this specification, I define alpha as $\alpha_{it} = R_{it} - R_t^b$, where R_t^b is the net return of VFINX in month t.

The second measure focuses on the *amount* of value added created by mutual fund managers (Berk and Van Binsbergen, 2015). The appropriate measure of manager skills depends on fund managers' objective: more skilled and informative managers are those who deliver outcomes closer to the objective, given their constraints. Berk and Van Binsbergen (2015) argue that managers seek to maximize the value created relative to their benchmark portfolio.Following this logic, the second measure is constructed as a fund's gross excess return over its benchmark, multiplied by asset under management. Gross excess return over its benchmark is defined as $\alpha_{it} = R_{it} - R_t^b$, same as before. 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 reflects both gross excess return and fund size. Although fund size tends to be relatively stable over time (Berk and Van Binsbergen, 2015), I want to further avoid capturing its long-run trending components. To ensure comparability across time, I re-scale the variable each year by sorting firms into terciles based on VA_{ij}^T and constructing a corresponding categorical variable.

With these measures, I now examine whether the relationship between institutional equity ownership and debt issuance is stronger when institutional investors are more skilled and informative. Table A6 reports the results. In column 1, total institutional ownership is decomposed into six categories, with retail investor ownership as the control group.[77] The results indicate that ownership of investment companies and independent advisors, as well as bank trusts, is most strongly associated with debt issuance. In columns 2 to 8, I turn to direct measures of manager informativeness. Across these specifications, the relationship between institutional equity ownership and debt issuance is consistently stronger when investors are more informed.

Discussion on information revealed by prices. In an economy with homogeneous investors and rational beliefs, prices fully reflect equity value[78]. If this were the case, information produced by institutional investors would be redundant, since equity prices are publicly observable at very low costs. However, the rationality assumption does not 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). Prices may also embed preferences for liquidity or other

[77] Because 13 filings are only required for management firms with AUM over \$100 million, very small institutions are also classified as retail investors under the definition used here.

[78] 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 A6: Institutional Ownership and Debt Issuance: Heterogeneity in Informativeness of Institutional Investors

This table examines the information sharing mechanism by exploring the heterogeneity in investor informativeness. Column 1 decomposes 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). Whenever the interaction term $x \times InstShare$ is included, the level variable x is also included but omitted from the table for the sake of space. The sample used in columns 2-8 starts from the fiscal year 2009 because the 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)
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

factors orthogonal to payoffs. This motivates the introduction of noise traders in rational expectations models (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 relative to prices. Rather, quantities and prices should be viewed as two sides of the same coin. Indeed, shareholdings may even be more informative, as they reveal the exact positions of investors who are plausibly better informed.

D.3 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. I 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 paper.

The statistical model is as follows:

$$\Delta H^B_{fit} = \alpha + \sum_{k=0}^{1} \beta_k \Delta H^S_{fit-k} + C'_{ft}\eta + \theta_f + \theta_i + \theta_{it} + \theta_t + \epsilon_{fit}, \tag{15}$$

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.[79] 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 interpersonal 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 interpersonal communications, and the exact independent variable is chosen to better capture the mechanism.

Since each observation is at mutual fund-firm-quarter level, I have enough freedom to control for firm-quarter fixed effects and thus eliminate the concern that firm characteristics (time variant and invariant) drive both bond and equity holdings. I 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 A7. 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

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

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 1 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[80]. Moreover, the holding changes in Table A7 capture transactions both in the secondary market and primary market where new bonds are issued[81]. 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, I 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 7. Given that total bond supply is typically stable in 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 8. Instead of examining how a particular fund family's stock holdings are related to bond holdings of all other fund families, I 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

[80] The reason I 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.

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

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.

D.4 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 unknown 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,

Table A7: Comovements in Stock and Corporate Bond Holdings of Mutual Funds

This table reports 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} × log(AT)						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

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 (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 4.1.3.

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 although such reverse information flows may exist, they are unlikely to drive the association between institutional ownership and debt issuance.

D.5 Discussion on corporate bond holdings disclosure

A potential concern is that the regulatory change applied to the entire mutual fund industry, including not just equity funds, but also for example fixed-income funds.[82] Although this study focuses on domestic equity funds, the observed effects might reflect correlated disclosures by corporate bond funds. Firms with greater equity ownership by affected equity funds may 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.

This explanation is unlikely to drive the results for three reasons. First, equity holdings are more informative about firm valuation than bond holdings. The secondary market of stocks are far more liquid than corporate bonds, implying limited information discovery simply by observing bond holdings. Most bonds (56%) traded only 11-50 times during the whole period from November 1999 to October 2000 (Harris and Piwowar, 2006). Second, bond allocations in primary markets often reflect factors unrelated to firm values, such as other investors' liquidity needs or underwriter relationships (Coppola, 2025). Third, additional analysis shows that the interaction between treatment exposure and a pre-treatment S&P credit rating indicator is insignificant. Since only rated firms can issue public bonds and have outstanding bonds, unrated firms are unaffected by bond fund disclosures. If bond fund disclosure were driving the results, this interaction would be significantly positive—but it is not.

D.6 Information disclosure effects: DID estimates

In this subsection, I estimate the overall effect of the treatment on debt issuance. Based on the patterns in Figure 1, I move to annual frequency and focus on one year before and after the event. The specification is

$$\Delta Debt_i^{post} - \Delta Debt_i^{pre} = \alpha + \beta \overline{MFExposure}_{i,2001Q1-2004Q1} + C_i'\eta + \epsilon_i, \tag{16}$$

where C_i denotes the vector of controls as in Equation (2), measured as averages over the three years prior to treatment (2001Q1–2004Q1). Equation (16) is a weaker version of DID:

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

firm fixed effects are not included, and thus firm-specific time-invariant factors are not fully differenced out. This choice is deliberate: the average exposure to treated funds is only 1% with a standard deviation of 1%,[83] so including firm fixed effects would eliminate too much variation needed to identify information effects. Results are reported in Table A8.

Column 1 implies that a 5 pp increase in $MFExposure$ leads to a 15.2 pp (=0.05*3.065) rise in debt issuance. This is larger than baseline results in Table 2. However, these two magnitudes are not comparable because first, they are estimated using different samples; second, β estimated from Equation (1) captures more than disclosure-driven effects. In untabulated results, replacing $MFExposure$ with the total institutional ownership $InstShare$ in column 1 yields a coefficient of 0.175, only marginally significant (t-stat = 1.56). This suggests that the overall supply of capital remains relatively stable. In other words, after the regulation change, capital is reallocated from non-treated firms to treated firms, and the combined effect is not salient. Overall, despite reflecting only the local impact of the regulation change, Table 2 indicates that information transmission via public disclosure is economically meaningful.

Treatment intensity may not be fully exogenous even though the regulation itself is. Mutual fund ownership could correlate with omitted firm characteristics that also influence debt issuance. To address this concern, columns 2 and 3 replace treated shares with shares held by non-treated mutual funds and by index funds (as in panels (a) and (b) in Figure 2). The coefficients are insignificant. Column (4) includes all three types of ownership simultaneously, leaving non–mutual fund institutions and individual investors as the residual. The coefficient on treated shares remains significant, while the other two are not.

Columns (5) and (6) explore heterogeneity by debt type. Corporate loans, issued primarily through banks, involve lenders who themselves have substantial private information about borrowers. Hence, the marginal value of equity investors' information is limited for loans, but more relevant for public bonds. 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.[84] Outstanding bonds are approximated using the remaining debt. Comparing

[83]In a similar setting, Agarwal et al. (2015) reports 6.6% which is also small. We differ because of different data sources and criteria used to filter affected funds.

[84]These two items are not available at the quarterly frequency. *np* includes bank acceptances, bank overdrafts, and loans payable. *dlto* covers revolving credit agreements, and construction and equipment loans. It

columns (5) and (6) in Table A8, the effect is indeed stronger for non-loan debt (primarily bonds).

Table A8: Debt Issuance Before and After the May 2004 Disclosure Regulation Change

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 2. $\Delta Debt^{post} - \Delta Debt^{pre}$ is the dependent variable in columns 1 to 4, where *post* and *pre* refer to the year 2005 and 2003 respectively. Column 1 presents the results estimated based on Equation (16). 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.

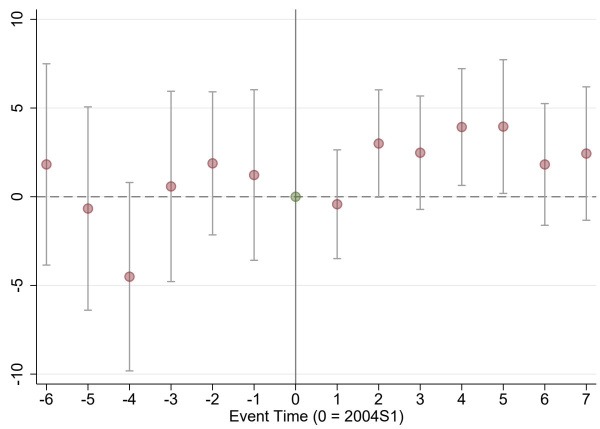
	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$	$\Delta Debt$	$\Delta NonLoan$	$\Delta Loan$
MFExposure	3.065**			3.066**	2.508*	3.225
	(1.387)			(1.400)	(1.314)	(3.720)
MFShareNoTreat		0.247		0.191		
		(0.631)		(0.629)		
MFShareIdx			0.209	-0.160		
			(1.692)	(1.730)		
InstShare	0.001	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

excludes senior nonconvertible bonds, convertible or subordinate bonds. Both *np* and *dlto* include commercial paper outstanding.

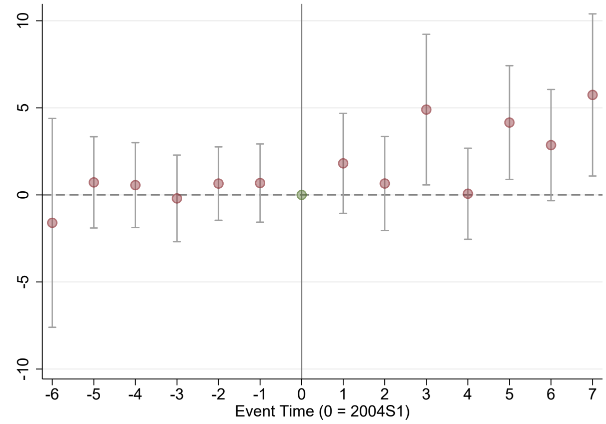
D.7 Information disclosure effects: Explore firm heterogeneity

D.7.1 Firm default probability

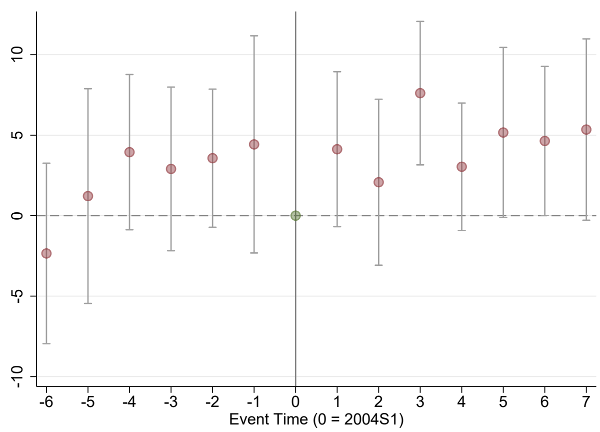
Figure A2: Dynamic Effects of Frequent Mutual Fund Holdings Disclosure: Heterogeneity in Default Probability



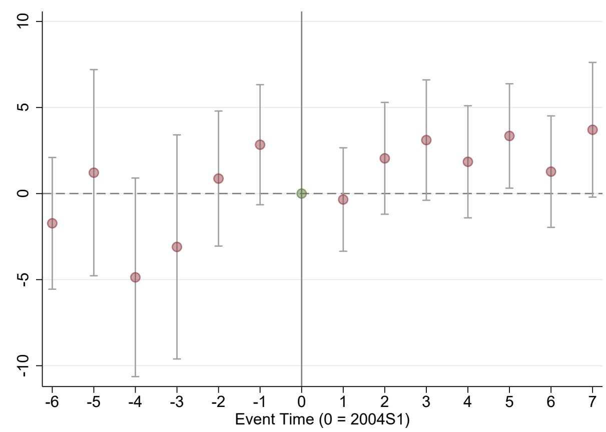
(a) High Altman Z score



(b) Low Altman Z score



(c) High distance-to-default

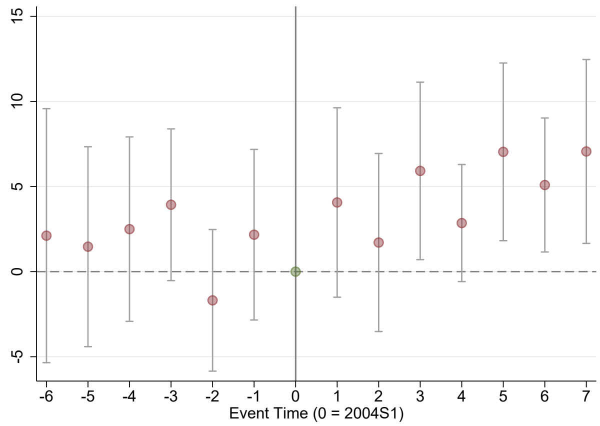


(d) Low distance-to-default

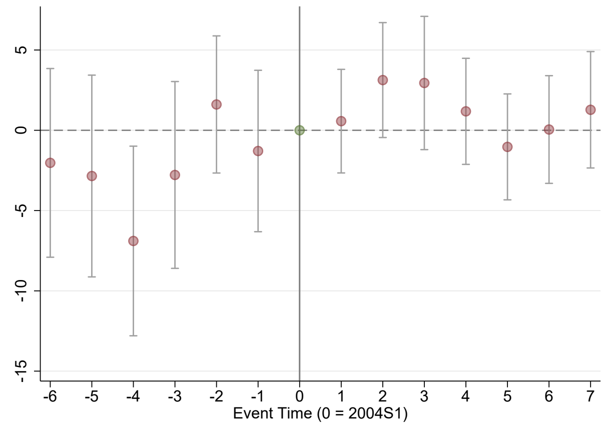
This figure presents dynamic coefficients estimated from Equation (2) at the semi-annual frequency from 2001S1 (the first half of year 2001) to 2007S2 (the second half of year 2007) for subsamples divided by proxies for firms' default probability. Gray solid lines represent 90% confidence intervals. Panels (a) and (b) split firms into two equally sized groups based on the Altman Z score, measured one year prior to treatment. Firms with Altman Z score larger than the median value are classified as the High group, and those below as the Low group. Panel (a) reports estimates for the High group, and panel (b) for the Low group. Panels (c) and (d) split firms into two equally sized groups based on firms' distance to default (Ottonello and Winberry, 2020), measured one year prior to treatment. Firms with distance-to-default larger than the median value are classified as the High group, and those below as the Low group. Panel (c) reports estimates for the High group, and panel (d) for the Low group.

D.7.2 Increase versus decrease in treated funds' ownership post reform

Figure A3: Dynamic Effects of Frequent Mutual Fund Holdings Disclosure: Heterogeneous Changes in Holdings Post Reform



(a) High changes (increase) in holdings



(b) Low changes (decrease) in holdings

This figure presents dynamic coefficients estimated from Equation (2) at the semi-annual frequency from 2001S1 (the first half of year 2001) to 2007S2 (the second half of year 2007) for subsamples divided by changes in treated funds' ownership post-reform (2004S2). Gray solid lines represent 90% confidence intervals. Panels (a) and (b) split firms into three equally sized groups based on changes in the ownership of treated funds, measured half a year after the treatment. Firms in the top tercile are classified as the High group, where all firms experienced increases in treated-fund ownership. Firms in the bottom tercile form the Low group, where all firms experienced decreases in treated-fund ownership. I group firms into terciles based on changes in treated-fund ownership rather than simply separating them into positive versus non-positive changes. This approach yields more balanced group sizes and ensures a comparable number of observations across groups. Panel (a) reports estimates for the High group, and panel (b) for the Low group.

E Russell Index Reconstitution

The Russell indexes are reconstituted every June. On a designated day in May, all eligible stocks are ranked by their market capitalization.[85] The top 1000 stocks are assigned to the Russell 1000 in June, and stocks ranking 1001-3000 are assigned to the Russell 2000.[86] This is where the exogenous variation arises. Because index assignment depends solely on market capitalization measured on a single day, even small idiosyncratic shocks or noise can move a firm across the cutoff. This introduces plausibly random variation around the threshold. For instance, firms ranked 999th and 1001st are otherwise very similar, yet they receive vastly different levels of passive demand due to being placed in different indexes. As shown in Equation (5), BMI is determined by two components: (i) a stock's index membership, and (ii) the ratio of AUM to index market value (IndexMV). Focusing on the Russell 1000 and 2000, the key driver of differences in BMI for firms just to the left versus just to the right of the cutoff is the disparity in these AUM-to-market-cap ratios across the two indexes. Russell 1000 constitutes a much larger market cap than Russell 2000, accounting for about 94% of the Russell 3000 index as of April 2023.[87] Overall, BMI is substantially smaller for firms just inside the Russell 1000 relative to those just inside the Russell 2000, as documented by Pavlova and Sikorskaya (2023). This validates the relevance condition for the instrument.

To identify firms around the Russell 1000/2000 cutoff, I follow Pavlova and Sikorskaya (2023) and rank firms by market capitalization in May.[88] The estimation focuses on observations near the cutoff (using a rectangular kernel). Given data availability for the BMI measure, the sample period covers 1998–2018. Ideally, we want to compare firms within a very small bandwidth around the cutoff to maximize comparability. However, overly small bandwidths

[85] The specific date varies across years, but the key feature is that the ranking is based on a single day rather than a multi-day window.

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

[87] The number is taken from https://www.lseg.com/en/ftse-russell/indices/russell-us/russell-1000.

[88] The market capitalization that Russell uses to rank stocks in May is not publicly available. This variable could differ from CRSP market values, computed as the product of publicly held shares and CRSP stock price, because Russell combines different issues of the same firm and includes nonpublicly traded shares when computing firms' market value. I follow Ben-David, Franzoni and Moussawi (2019) to adjust CRSP market values to approximate Russell's methodology.

substantially reduce sample size and weaken statistical power. As a compromise, I adopt a default bandwidth of 400 firms around the cutoff, consistent with Ben-David, Franzoni and Moussawi (2019).

To further address endogeneity in index inclusion, I control for determinants of Russell membership, following prior studies that use Russell 2000 index assignment 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 include dummies for being in the band, being in the Russell 2000, and their interaction in May of the previous year. I also incorporate the baseline controls in Section 3, along with 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 driven by differences in fund and index sizes.

F Model Details

F.1 Debt investors' problem

F.1.1 Setup

Learning process of debt investors. There is a continuum of identical debt investors in the debt market. They do not know the firm's true value for a given state in the future. This could be because they are irrational (or bounded rational) or do not have full information about future firm value. I remain agnostic about the source of the deviation from full information rational expectations.

Debt investors begin each period with priors about the firm's future value, which capture their baseline beliefs before new information is revealed. Institutional equity investors generate informative signals about firm value, while retail investors are uninformed traders whose transactions are scattered (no price impact) and contain no information. After observing these signals, debt investors update their beliefs using Bayes' rule. Assumption F.1 assumes that debt investors' prior beliefs equal the true equity value, P_{t+1}, plus an error term e_t.[89] This error term captures debt investors' uncertainty about firm values. I use $\tilde{P}_{t+1}$ to denote equity values from debt investors' perspective, which differ from the true values represented by P_{t+1}. Note that the equity firm value for any *given state* Θ_{t+1}, $P_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1})$, is a constant.

Assumption F.1. *Debt investors update their beliefs about future firm value using Bayes' rule. Their prior is* $\tilde{P}_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) = P_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) + e_t$*, where the error term* $e_t \sim \mathcal{N}(0, \rho_{et}^{-1})$*. They then receive a signal about the firm value from institutional equity investors, denoted by* $\eta(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) = \tilde{P}_{t+1}(\Theta_{t+1}|\Theta_t, s^I_{t+1}, b_{t+1}) + \tilde{e}_t \sim \mathcal{N}(\tilde{P}_{t+1}, \rho_{bt}^{-1})$*, with* ρ_{bt} *to be discussed below.*

Signal production. Institutional equity investors produce information about firm value and

[89] The exact distribution of prior beliefs need not be normal. In fact, the firm's value does not follow a well-behaved distribution, which can be shown using the simulated data. Therefore, this assumption implicitly assumes that debt investors do not have correct beliefs about the distribution of firm values. However, this does not affect the final approximation in Proposition 6.2: using alternative distributions such as the uniform distribution yields similar approximations.

transmit a signal η_t to debt investors. A higher ownership stake enhances both their capacity and incentives to generate precise information (Collin-Dufresne and Fos, 2015). Consistent with this idea, I assume that the precision of η_t is determined by a CES-type information production technology.

$$\rho_{bt}(s_t^I) = (\int_0^{\mu} (s_{it}^I)^{\rho} di)^{\frac{\zeta}{\rho}},$$

where ζ represents the return to scale, $\frac{1}{1-\rho}$ represents elasticity of substitution. ρ is set to 1 so that s_i^I's are perfect substitutes. Since all institutional equity investors are identical, we have $s_{it}^I = s_t^I$. This gives Proposition F.2, which states that the precision of information about future firm value is increasing in institutional equity ownership.

Proposition F.2. *The precision of the signal produced from the CES production function is* $\rho_{b,t} = (\mu s_t^I)^{\zeta}$.

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

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

Therefore, the payoff of each unit of debt perceived by debt investors is[90]

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

where ξ denotes the recovery rate of debt repayment in default, and c represents the coupon rate. Thus, debt investors' perceived default probability can be approximated by Equation (17) in Proposition F.3.

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

Proposition F.3. *Based on Assumptions F.1 and Proposition F.2, the perceived default probability can be approximated by*

$$\pi_{lt+1} \approx \delta_{0t} - \delta_{1t}(\mu s_t^I)^{\zeta}. \tag{17}$$

The exact form of δ_{0t} and δ_{1t}, together with the proof, can be found in the Appendix F.1.2. Intuitively, δ_{1t} measures how sensitive the perceived default probability is to changes in the precision of the signal from institutional investors.

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 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:

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

where y_{t+1} represents the payoff of each unit of debt in period $t+1$. Under full information rational expectations, the firm does not default due to the borrowing constraint, and thus $y_{t+1} = 1 + c$. The gross risk free rate R_{ft} equals $\frac{1}{E_t[M_{t,t+1}]}$, priced at firm shareholders' pricing kernels.

This gives us the inverse demand function

$$q_t = -\gamma_{0t} b_{t+1} + \gamma_{1t}, \tag{18}$$

where $\gamma_{0t} = \frac{1+c}{R_{ft}} \alpha \tilde{\pi}_{lt}(1 - \tilde{\pi}_{lt})(1 + c)(1 - \xi)^2$, $\gamma_{1t} = \frac{1+c}{R_{ft}}(1 - \tilde{\pi}_{lt}(1 - \xi))$. The term $\tilde{\pi}_{lt} = \sum_{\Theta_{t+1}} \Pi_{\Theta_{t+1}|\Theta_t} \pi_{lt+1}(\Theta_{t+1}|s_t^I, b_t, \Theta_t)$ represents the firm's future default probability, aggregated across possible states and weighted by corresponding transition probabilities: $\Pi_{\Theta_{t+1}|\Theta_t}$ denotes the transition probability from current state Θ_t to future state Θ_{t+1}, and $\pi(\Theta_{t+1})$ denotes the default probability at state Θ_{t+1} perceived by debt investors. The term γ_{0t} captures the disutility from variance. For a given quantity of debt purchased, greater variance makes investors less willing to pay a high price q_t, leading them to require a higher yield. γ_{1t} captures the utility gain from a higher expected payoff. For a given level of debt purchased, a higher expected payoff encourages investors to pay a higher price q_t and require a lower yield.

Equilibrium outcome in the debt market. Within each period, the firm and (the first generation) debt investors play a sequential game. At the very beginning of each period, investors submit a demand schedule,[91] i.e. $q_t(b_{t+1})$. Knowing this demand schedule, the firm decides 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. In practice, this market power can arise from the illiquidity and high transaction costs characterizing the secondary market for corporate debt (Coppola, 2025).[92] Debt investors then purchase securities at the market clearing price. In the subsequent period, debt investors collect the payoffs.

[91] 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), where firms are not price takers in security issuance. In practice, corporate bond markets are relatively illiquid, especially for the secondary market, making firms the dominant suppliers of bonds (He and Milbradt, 2014)and implying that their issuance decisions have price impact. In terms of the microstructure of bond issuance, when firms issue bonds in the primary market, investors submit their preliminary orders in the form of indications of interest (IOIs) to underwriters who then assist firms in setting the final (uniform) price and determining allocations (Nikolova, Wang and Wu, 2020). I also want to clarify that elasticity and market power are different. An infinitely elastic demand schedule (high market power on the demand side) does not mean suppliers take prices as given when issuing debt. It depends on the market structure, such as the size of each supplier relative to the size of the whole market.

[92] The assumption that the firm is not a price taker does not mean its debt issuance has a large impact on the market-clearing price, which also depends on the elasticity of debt investors' demand.

F.1.2 Proofs of propositions

Proof for Proposition F.3.

Proof. Using Assumption F.1 and Proposition F.2, debt investors perceived default probabilty is

$$\begin{aligned}\pi_{lt+1} =& \Phi(-\frac{\varrho_t^e P_{t+1} + \varrho_t^b \eta_t}{\sqrt{(\rho_{et} + (\mu s_t^I)^\zeta)^{-1}}}) = \Phi\left(-(\varrho_t^e P_{t+1} + \varrho_t^b \eta_t)\sqrt{\rho_{et} + (\mu s_t^I)^\zeta}\right), \\ =& \int_{-\infty}^{-(\varrho_t^e P_{t+1} + \varrho_t^b \eta_t)\sqrt{\rho_{et} + (\mu s_t^I)^\zeta}} \frac{1}{\sqrt{2\pi}} e^{-x^2/2} dx\end{aligned}$$

Taylor expansion of the default probability around $(\mu\tilde{s})^\zeta$ gives ($\tilde{s}$ denote the average institutional ownership)

$$\begin{aligned}\pi_{lt+1} =& \Phi(\tilde{s}) + \frac{1}{\sqrt{2\pi}} e^{-[(\varrho_t^e P_{t+1} + \varrho_t^b \eta_t)\sqrt{\rho_{et} + (\mu\tilde{s})^\zeta}]^2/2} (-(\varrho_t^e P_{t+1} + \varrho_t^b \eta_t)) \frac{1}{2\sqrt{\rho_{et} + (\mu\tilde{s})^\zeta}} ((\mu s_t^I)^\zeta - (\mu\tilde{s})^\zeta) \\ &+ O((\mu s_t^I)^{2\zeta}) \qquad (19) \\ &\approx \delta_{0t} - \delta_{1t}(\mu s_t^I)^\zeta,\end{aligned}$$

where $\delta_{0t} = \Phi(\tilde{s}) + \frac{1}{\sqrt{2\pi}} e^{-[(\varrho_t^e P_{t+1} + \varrho_t^b \eta_t)\sqrt{\rho_{et} + (\mu\tilde{s})^\zeta}]^2/2} (\varrho_t^e P_{t+1} + \varrho_t^b \eta_t) \frac{1}{2\sqrt{\rho_{et} + (\mu^I\tilde{s})^\zeta}} (\mu\tilde{s})^\zeta$ and $\delta_{1t} = -\frac{1}{\sqrt{2\pi}} e^{-[(\varrho_t^e P_{t+1} + \varrho_t^b \eta_t)\sqrt{\rho_{et} + (\mu\tilde{s})^\zeta}]^2/2} (\varrho_t^e P_{t+1} + \varrho_t^b \eta_t) \frac{1}{2\sqrt{\rho_{et} + (\mu^I\tilde{s})^\zeta}}$.[93] □

Proof for Proposition 6.2.

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

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

where $\gamma_{0t} \equiv \frac{\alpha Var_t}{R_{ft}} = \frac{1+c}{R_{ft}} \alpha \tilde{\pi}_{lt}(1 - \tilde{\pi}_{lt})(1+c)(1-\xi)^2$, $\gamma_{1t} \equiv \frac{E_t}{R_{ft}} = \frac{1+c}{R_{ft}}(1 - \tilde{\pi}_{lt}(1-\xi))$, $\tilde{\pi}_{lt} = \sum_{\Theta_{t+1}} \Pi_{\Theta_{t+1}|\Theta_t} \pi_{lt+1}(\Theta_{t+1}|s_t^I, b_t, \Theta_t)$.

Because the true equity value is always positive in the model, the default probability perceived by debt investors, $\pi(\Theta_{t+1}|s_t^I, b_t, \Theta_t)$, is small for a reasonable level of uncertainty,

[93] Note that P_{t+1} is a function on s_{t+1}^I and other variables, not directly on s_t^I. Here I omit the derivative of P_{t+1} with respect to s_t^I without loss of generality.

which in turn implies a small $\tilde{\pi}_{lt}$. Therefore, γ_{1t} can be approximated by

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

Based on Equation (17), γ_{0t} can be approximated by

$$\begin{aligned} \gamma_{0t} &\approx \frac{\alpha(1+c)}{R_{ft}}(1+c)(1-\xi)^2\tilde{\pi}_{lt} && (20) \\ &\equiv \Phi_{0t} - \frac{\Phi_{1t}}{2}(\mu s_t^I)^{\zeta}. && (21) \end{aligned}$$

Φ_{0t} and Φ_{1t} are complicated expressions consisting of debt recovery rate, risk aversion of debt investors, coupon payment, actual firm value, etc. These factors introduce many additional parameters and an extra state variable η_t that makes the model less tractable. In addition, if the distribution of future firm value is uniform or logistic instead of normal, the exact functional forms of Φ_{0t}, Φ_{1t} will change, although we still have an approximation similar to Equation (21). Therefore, I focus on the key takeaway that the sensitivity of debt price to debt issuance takes a nonlinear form and is decreasing in s_t^I. To capture this idea in a parsimonious way, I replace $\Phi_{0t} - \frac{\Phi_{1t}}{2}(\mu s_t^I)^{\zeta}$ with a parsimonious term

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

□

F.2 Equity benchmarking

F.2.1 Equity benchmarking and SDF

Below gives the proof for Proposition 6.1, which demonstrates how benchmarking mandate in institutional investors' budget constraints affects their SDF.

Proof of Proposition 6.1.

Proof. Institutional investors' trade-offs are summarized by the first-order and envelope conditions below

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

Combining these two equations gives

$$1 = E_t\left[\beta\frac{c_t}{c_{t+1}}\frac{1}{1+\frac{\phi_s(s^I_{t+1}-\bar{s})}{P_t-e_t}}R^s_{t+1}\right]. \tag{22}$$

Therefore, the SDF of institutional equity investors is $\beta\frac{c_t}{c_{t+1}}\frac{1}{1+\frac{\phi_s(s^I_{t+1}-\bar{s})}{P_t-e_t}}$. □

F.2.2 Effects of equity benchmarking on debt issuance

In what follows, I discuss how equity benchmarking affects shareholders' valuation of debt issuance via its effects on SDF.

Firms' (shareholders') marginal benefit and marginal cost of debt issuance are given by first order conditions below (assuming interior solution)

$$(1-\frac{\partial\Psi^d_t}{\partial d_t})\left(q_{ft} - \psi_b(\mu s^I_t)^{-\zeta}b_{t+1} - \frac{\partial C^b_t}{\partial b_{t+1}}\right) = E_t\left(M_{t,t+1}[(1+c-c\tau)(1-\frac{\partial\Psi^d_{t+1}}{\partial d_{t+1}})]\right),$$
$$where\ C^b_t = e^{-\nu(\eta\frac{z_t}{b_{t+1}}-1)}.$$

The term C^b_t represents the convexified debt financing constraint following Croce et al. (2012). The penalty term $\nu > 0$ is calibrated to a large number ($\nu = 2000$). Under this parametrization, the marginal effect $\frac{\partial C^b_t}{\partial b_{t+1}}$ is negligible, and I omit it for simplification without loss of generality.

Therefore, the firm's demand for debt capital is

$$b_{t+1} = \frac{1}{\psi_b(\mu s^I_t)^{-\zeta}}[q_{ft} - \frac{E_t\left(M_{t,t+1}[(1+c-c\tau)(1-\frac{\partial\Psi^d_{t+1}}{\partial d_{t+1}})]\right)}{1-\frac{\partial\Psi^d_t}{\partial d_t}}],\ where\ \frac{\partial\Psi^d_t}{\partial d_t} = -\psi_d\cdot 1\{d_t<0\}.$$

Combining equations above gives

$$b_{t+1} = \frac{1}{\psi_b(\mu s_t^I)^{-\zeta}}[q_{ft} - \frac{E_t\left(M_{t,t+1}[(1+c-c\tau)(1+\psi_d \cdot 1\{d_{t+1}<0\})]\right)}{1+\psi_d \cdot 1\{d_t<0\}}], \tag{23}$$

where the numerator of the second term inside the brackets can be rewritten as

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

As discussed before, with benchmarking captured by $\phi_s(s_{t+1}-\bar{s})$ in $M_{t,t+1}$, shareholders' SDF becomes less sensitive to risky cash flows, reducing the covariance terms. An opposing effect is that the level of SDF increases when institutional holdings fall short of the target value $s_{t+1} < \bar{s}$. Counterfactual analyses show that the risk premium channel dominates: increasing ϕ_s strengthens the positive association between debt issuance and institutional equity shareholdings. Holding other variables constant, when the reduction in covariance outweighs the increase in the level of discount factor $E_t(M_{t,t+1})$, equity benchmarking (index inclusion) increases debt demand, as shown in the right hand side of Equation (23). In equilibrium, the debt demand curve shifts upward, and firms issue more debt. Both the quantitative analysis and the empirical evidence confirm these positive effects of benchmarking (index inclusion) on debt issuance.

Another way to think about this question is by comparing the net present value of debt issuance with and without the benchmarking mandate ($\phi_S = 0$). We can obtain similar conclusions following this logic.

F.3 Definition of recursive equilibrium

The definition of recursive equilibrium is given below.

Definition 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 equity holding policies of 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 $e_t(b_t;\Theta_t,s_t^I)$, $b_{t+1}(b_t;\Theta_t,s_t^I)$; stochastic discount factor $M_{t,t+1}$ such that the following statements hold:

1. Given beliefs on the discount factor $M_{t,t+1}$ and equity holding policy $s_{t+1}^I(b_t;\Theta_t,s_t^I)$, the decision rules of the firm owner solve her optimization problem

2. Given beliefs on share price $P_t(b_t;\Theta_t,s_t^I)$, net distribution $e_t(b_t;\Theta_t,s_t^I)$ and debt policy, the value function and decision rule of equity investors solve their optimization problem.

3. All markets clear: (1) $\mu s_t^I + (1-\mu)s_t^R = 1$ (stock market), (2) $\mu c_t^I + (1-\mu)c_t^R = z_t$ (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 the firm and investors are consistent with equilibrium policies and value functions in the ergodic set.

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

Note that under Proposition 6.2, the debt market is cleared by setting $q_{ft} = E_t[M_{t,t+1}(1+c)]$. The model is solved numerically using value function iteration. Details on the algorithm are given in Appendix G.

G Numerical Algorithm

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 $(logz_t, (logz_t)^2, log(x_t), log(b_t), log(s_t^I)$ for each $\theta \in \Theta$.

[94] 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.

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.

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.

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.”

Altinkilic, Oya, and Robert S Hansen. 2000. “Are there economies of scale in underwriting fees? Evidence of rising external financing costs.” *The Review of Financial Studies*, 13(1): 191–218.

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.*

Augustin, Patrick, Feng Jiao, Sergei Sarkissian, and Michael J Schill. 2020. "Cross-listings and the dynamics between credit and equity returns." *The Review of Financial Studies*, 33(1): 112–154.

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."

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.*

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.

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.

Croce, M Max, Howard Kung, Thien T Nguyen, and Lukas Schmid. 2012. "Fiscal policies and asset prices." *The Review of Financial Studies*, 25(9): 2635–2672.

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.

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.

Drechsel, Thomas. 2023. "Earnings-based borrowing constraints and macroeconomic fluctuations." *American Economic Journal: Macroeconomics*, 15(2): 1–34.

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.

Gale, Douglas, and Martin Hellwig. 1985. "Incentive-compatible debt contracts: The one-period problem." *The Review of Economic Studies*, 52(4): 647–663.

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.

Gomes, Joao F, and Lukas Schmid. 2010. "Levered returns." *The journal of finance*, 65(2): 467–494.

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.

Haddad, Valentin, Paul Huebner, and Erik Loualiche. 2025. "How competitive is the stock market? Theory, evidence from portfolios, and implications for the rise of passive investing." *American Economic Review*, 115(3): 975–1018.

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.

Hennessy, Christopher A, and Toni M Whited. 2007. "How costly is external financing? Evidence from a structural estimation." *The Journal of Finance*, 62(4): 1705–1745.

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

Hilscher, Jens, Joshua M Pollet, and Mungo Wilson. 2015. "Are credit default swaps a sideshow? Evidence that information flows from equity to CDS markets." *Journal of Financial and Quantitative Analysis*, 50(3): 543–567.

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

Hshieh, Shenje, Jiasun Li, and Yingcong Tang. 2021. "How do passive funds act as active owners? Evidence from mutual fund voting records." *Journal of Corporate Finance*, 66: 101692.

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.

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.

Kaniel, Ron, Gideon Saar, and Sheridan Titman. 2008. "Individual investor trading and stock returns." *The Journal of finance*, 63(1): 273–310.

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.

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.

Lian, Chen, and Yueran Ma. 2021. "Anatomy of corporate borrowing constraints." *The Quarterly Journal of Economics*, 136(1): 229–291.

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.

Meckling, William H, and Michael C Jensen. 1976. "Theory of the Firm." *Managerial Behavior, Agency Costs and Ownership Structure.*

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

Miller, Merton H. 1977. "Debt and taxes." *the Journal of Finance*, 32(2): 261–275.

Modigliani, Franco, and Merton H Miller. 1958. "The cost of capital, corporation finance and the theory of investment." *The American economic review*, 48(3): 261–297.

Myers, SC, and Nicholas Majluf. 1984. "Corporate Financing and Investment Decisions When Firms have Information that Investors do not have." *JFE*.

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*.

Sammon, Marco. 2020. "ETFs, Learning, and Information in Stock Prices." *Available at SSRN 3571409*.

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.

Townsend, Robert M. 1979. "Optimal contracts and competitive markets with costly state verification." *Journal of Economic theory*, 21(2): 265–293.

Tserlukevich, Yuri. 2008. "Can real options explain financing behavior?" *Journal of Financial Economics*, 89(2): 232–252.

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.

Van Nieuwerburgh, Stijn, and Laura Veldkamp. 2006. "Learning asymmetries in real business cycles." *Journal of monetary Economics*, 53(4): 753–772.

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.