JOURNAL OF FINANCIAL AND QUANTITATIVE ANALYSIS Vol. 61, No. 4, June 2026, pp. 2033–2072
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doi:10.1017/S0022109025102317

Do Shareholder Leverage Constraints Affect Debtholders?

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Abstract

We examine the relationship between shareholder leverage constraints and corporate risk-taking, focusing on its impact on debtholders. Our findings show that mutual fund leverage constraints are related to more risk-taking activities of portfolio companies, inducing higher credit risk and greater risk-shifting concerns for the firms' debtholders. In response, the debtholders raise borrowing costs and tighten lending conditions. These effects intensify for firms facing higher levels of conflict between debtholders and shareholders and when mutual funds exert greater influence over firms. Econometric analyses, including instrumental variable specifications and asset management company mergers, support a causal interpretation.

I. Introduction

Standard portfolio theory suggests that investors select portfolios with the highest expected excess return per unit of risk and adjust their leverage up or down based on their risk profile. However, in practice, investors face various leverage constraints, including borrowing limits, margin requirements, investment mandates, regulatory restrictions, and even an unwillingness to take on leverage. In the presence of such constraints, equity investors tend to overweight risky high-beta stocks in their portfolios rather than resorting to explicit leverage (Black (1972)). This phenomenon—named after the trading strategy designed to capture the risk-adjusted returns arising from it—is known as "betting against beta" (Frazzini and Pedersen (2014)). Its implications for asset managers and, more broadly, for asset pricing have been widely studied.[1]

In this article, we examine an important yet previously unexplored aspect of shareholder leverage constraints: their impact on the debtholders of firms in which

[1]See, for example, Brunnermeir and Pedersen (2009), He and Krishnamurthy (2013), Frazzini and Pedersen (2014), Christoffersen and Simutin (2017), He, Kelly, and Manela (2017), and Boguth and Simutin (2018). In recent studies, Jylhä (2018) shows that tighter leverage constraints in the market result in a flatter security market line. Lu and Qin (2021) document that the market-wide shadow cost of leverage constraints is directly linked to the returns of betting-against-beta strategies.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

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such shareholders invest. The fact that leverage constraints increase asset managers' incentives to favor risky stocks has direct consequences for debtholders. Companies may cater to the preferences of leverage-constrained shareholders by pursuing riskier activities, or such shareholders may pressure firm managers to take on more risk (Baker and Wurgler (2004), Baker, Coval, and Stein (2007)). In this case, investment by leverage-constrained shareholders will be associated with higher corporate risk-taking. Such heightened (or perceived) risk-taking may indicate a wealth transfer from debtholders to shareholders, exacerbating the potential for debtholder-shareholder conflict (Jensen and Meckling (1976), Smith and Warner (1979), and Becker and Strömberg (2012)). In response, debtholders will attempt to protect themselves by increasing borrowing costs and imposing additional restrictions, suggesting that shareholder leverage constraints can significantly influence the cost of borrowing and debt contract design.[2]

Specifically, we expect that asset managers' leverage constraints will be associated with higher corporate risk-taking, leading to increased credit risk and heightened concerns about risk-shifting and wealth transfer for debtholders. We hypothesize that debtholders will respond by imposing higher borrowing costs and more stringent borrowing conditions, such as collateral requirements and covenant restrictions. In other words, shareholder leverage constraints will make it more difficult and costly for firms to raise debt financing.

To test this hypothesis, we focus on a key set of equity investors: mutual funds. Mutual funds are the largest group of equity investors, collectively owning approximately a quarter of corporate America. Moreover, they are subject to various leverage constraints, as taking on leverage is generally discouraged by fund families and regulators. If an open-end mutual fund wishes to borrow, it must do so exclusively from banks and maintain at least 300% asset coverage for bank borrowings (Morley (2013)). Almazan et al. (2004) show that mutual fund managers operate under investment policy mandates that prevent them from borrowing to finance their portfolios, short-selling stocks, or taking positions in derivatives contracts.[3]

We construct a novel measure of mutual fund leverage constraints based on the "betting-against-beta" (BAB) factor returns developed by Frazzini and Pedersen (2014) and refined by Novy-Marx and Velikov (2022). The BAB factor is constructed as the *market-neutral* portfolio return generated by going long on leveraged low-beta stocks and short on high-beta stocks. We focus on the *value-weighted BAB*

[2]Constrained investors do not become risk-loving but are, instead, willing to accept a lower return-risk trade-off if compared to their unconstrained counterparts. This implies that leverage constrained investors will be pleased if the firm in which they invest increases their business exposure to priced risk (i.e., systematic risk). Importantly, extant studies have documented that firms with greater exposure to macroeconomic shocks are subject to higher cost of borrowing (Chen, Collin-Dufresne, and Goldstein (2009), Kuehn and Schmid (2014), and Bhojraj et al. (2021)). This suggests that the systematic risk profile of the underlying business is an important consideration for debtholders. Additionally, recent research has shown that exposure to the overall corporate bond market is a key factor in explaining cross-sectional bond returns (Dickerson, Mueller, and Robotti (2023)).

[3]Notably, the faction of derivatives using equity funds has not changed much during the past two decades (Koski and Pontiff (1999), Kaniel and Wang (2024)), which may be due to the complexity of derivatives contracts, investment mandates, collateral and margin requirements, or reputational concerns for using derivatives instruments that are unfamiliar to fund investors.

factor by Novy-Marx and Velikov (2022) to develop our fund leverage constraint measure.[4] The BAB factor delivers a positive return when a high-beta stock portfolio underperforms a leveraged low-beta stock portfolio with the same market risk. This situation arises when leverage-constrained investors are forced into high-beta stocks because they are constrained to lever up. From 1981 to 2016, the value-weighted BAB factor earned a significant excess return of 55 basis points per month (6.8% per year). The key intuition behind the factor's return and its persistence is that funds constrained from taking explicit leverage overweight high-beta stocks to achieve a better gross-of-risk performance, despite knowing that this leads to an inferior net-of-risk return. Therefore, the sensitivity of a fund's returns to the negative BAB factor captures the extent to which it sacrifices net-of-risk return to enhance gross-of-risk performance (as per CAPM)—effectively serving as a fund-specific proxy for its leverage constraints.

Specifically, we quantify fund leverage constraints as the regression loadings of fund returns on the negative BAB factor constructed by Novy-Marx and Velikov (2022).[5] A higher loading indicates that the fund is more constrained in its ability to take on leverage. Essentially, the loading on the negative BAB factor captures the degree of comovement between a fund's beta and the overall leverage constraint of the market, rather than reflecting the generic risk-taking incentives of mutual funds.[6] We then aggregate fund leverage constraints at the stock level, estimating both value-weighted and equally weighted fund leverage constraints among the funds holding a given stock. This defines our measure of "shareholder leverage constraints" for the specific company.

Next, we validate the leverage constraint measure at the fund level. We consider two potential sources of leverage constraints for mutual funds. The first is a fund's ability to engage in margin trading as part of its investment strategy. Using data from mutual funds' N-SAR filings to identify constraints on margin purchases, we find that our proxy for leverage constraints is significantly positively related to the presence of such constraints. The second explicit constraint we examine is a fund's accessibility to bank loans. It is well documented that proximity lending mitigates information asymmetry, such that borrowing costs increase and borrowing availability decreases with the distance between the borrower and the lender. Therefore, it is reasonable to expect that the presence of more banks nearby will alleviate the fund's leverage constraints. Using the initiation of new bank lending in the local area as an event, we show that greater bank debt availability

[4]We extend our gratitude to Mihail Velikov for generously providing us with the BAB data. Specifically, the BAB factor returns correspond to the dot-dashed line in Figure 2 of Novy-Marx and Velikov (2022).

[5]Even though by construction the negative BAB factor is market neutral, we always include the market factor in the regressions to ensure that the loading on the negative BAB factor is not contaminated by the generic risk-taking incentives of mutual funds (i.e., the fund beta as the loading of fund returns on the market factor).

[6]The fact that the negative BAB factor is market neutral implies that there should be no mechanical correlation between the loading on the negative BAB factor and the beta loading on the market factor. The univariate results show that fund leverage constraint has a correlation of 0.024 with fund beta, and the value-weighted leverage constraint has a correlation of 0.114 with the value-weighted fund beta at the stock level, suggesting that the fund leverage constraints are largely independent of the generic risk preferences of mutual funds.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

reduces a fund's exposure to the negative BAB factor (i.e., it lowers the fund's leverage constraint). Both validation tests support the validity of our fund leverage constraint proxy.

We then examine the impact of leverage constraints on firms' cost of debt, focusing on credit default swap (CDS) spreads and bond yield spreads. Our findings indicate that shareholder leverage constraints are strongly positively related to both CDS spreads and bond yield spreads. A 1-standard-deviation (SD) increase in value-weighted (equally weighted) leverage constraints is associated with a 14.4% (21.1%) rise in CDS spreads and a 10.6% (15.9%) increase in bond yield spreads relative to the sample average.[7] These results suggest that debtholders recognize the heightened credit risk and, in response, demand higher borrowing costs.

Moreover, do lenders design debt contracts to mitigate the increased debtholder–shareholder conflict? To address this question, we focus on bank loan contracts. We find that banks lending to borrowers owned by leverage-constrained funds charge higher loan spreads and impose stricter borrowing conditions, such as collateral requirements and more stringent covenant restrictions. A 1 SD increase in value-weighted (equally weighted) leverage constraints is associated with a 5.3% (5.8%) increase in loan spreads, a 10.1% (10.5%) higher likelihood of a collateral requirement, a 3.3% (3.8%) increase in the number of covenants, and a 6.0% (5.4%) reduction in maximum leverage covenant slack relative to the sample average.[8]

Next, we closely examine the risk-taking channel, whereby firms held by funds with more binding leverage constraints engage in greater risk-taking activities. A firm may take on additional operating risk through its business operations or by increasing financial risk by reaching higher leverage. To assess risk-taking in business operations, we first examine the volatility of operating cash flows. We find a positive relationship between shareholder leverage constraints and operating cash flow volatility. In addition, leverage constraints influence operating leverage—a measure reflecting a firm's exposure to systematic risk in its operations.[9] We find a significant positive relationship between shareholder leverage constraints and a firm's operating leverage.[10]

Does this imply that firms will also increase their financial leverage? While this may be appealing from a risk-taking perspective, it is directly hindered by rising borrowing costs and stricter borrowing conditions, such as tighter maximum leverage covenants. Moreover, firms may seek to balance operating and financial leverage. In other words, although the motivation to increase risk might drive firms

[7]It is worth noting that we always control the holdings weighted fund beta to ensure that the general risk-taking preferences of different funds do not drive our results.

[8]It is interesting to note that in the case of bank loans the effect on loan pricing is smaller than in the case of bonds. This is likely due to the fact that banks protect themselves with collateral requirements and covenant restrictions that are positively related to leverage-constrained funds.

[9]Firms with high operating leverage bear a larger proportion of fixed costs relative to variable costs, which magnifies the impact of sales fluctuations on operating income, thereby increasing sensitivity to business cycles (Aboody, Levi, and Weiss (2018)).

[10]Additionally, we examine the detailed risk-taking business activities. We consider three types of corporate actions: product diversification, geographic diversification, and engagement in diversification enhancing M&As. The results show that firms held by funds with more binding leverage constraints engage more in risk-taking activities.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

to pursue higher financial leverage, this tendency is counterbalanced by the increased agency costs of debt and the trade-off between operating and financial leverage (Chen, Harford, and Kamara (2019)). To explore this dynamic, we analyze how shareholder leverage constraints affect firms' capital structure. Our findings indicate that the net effect is a reduction in financial leverage, consistent with standard corporate finance theory, which suggests that the agency costs of debt associated with greater debtholder–shareholder conflict discourage the use of debt (Jensen and Meckling (1976)).

Furthermore, if shareholder leverage constraints are associated with heightened concerns about risk-shifting and wealth transfer impacting debtholders, we would expect our findings to be more pronounced in firms facing significant conflicts between debtholders and shareholders. Prior research indicates that the benefits for shareholders from wealth transfers are especially notable in financially distressed firms (Eisdorfer (2008), Gilje (2016)). Conversely, this impact tends to lessen in companies where shareholders also have considerable debt holdings (Jiang, Li, and Shao (2010), Chen, Zhang, and Zhu (2023)). Our analysis supports this expectation: the effects of shareholder leverage constraints are indeed more pronounced in financially distressed firms, while they are reduced in those where fund families maintain both substantial equity and debt stakes.

The next step is to determine whether the impact of shareholder leverage constraints on debtholders is causal. To evaluate causality, we conduct a comprehensive three-part analysis. First, we investigate whether our findings are more pronounced when funds exert greater influence over the company, using a range of proxies for fund influence, such as geographical proximity, investment horizon, fund ownership, and ownership concentration. Our analysis reveals that the effects of leverage-constrained funds are amplified when these funds have greater influence —such as being geographically closer, maintaining longer investment horizons, holding larger stakes, or exhibiting higher ownership concentration. Furthermore, we reconstruct leverage constraints based on the strength of fund influence, and document that the funds with the greatest influence drive the observed effects, while those with minimal influence do not exhibit explanatory power.

Second, we examine a dynamic specification that exploits time-series variations in fund leverage constraints resulting from mergers of asset management companies. Portfolio repositioning often occurs when two institutions merge, typically with the acquired fund adjusting its investment policies or strategies to align with those of the acquiring fund.[11] This process leads to time-series changes in shareholder leverage constraints for underlying stocks primarily held by the funds being acquired. As fund mergers are primarily driven by deregulation or consolidation within the financial services industry to achieve economies of scale, these time-series changes in fund leverage constraints are largely exogenous to other unobservable firm-specific characteristics. Focusing on fund family mergers among the largest mutual fund investors, we document a positive relationship between changes in fund leverage constraints and our key outcome variables: cost of borrowing, strictness of loan contracts, and corporate risk-taking.

[11]Independent Directors Council Task Force Report, 2006, available at https://www.idc.org/docserver/pdf%3Appr_idc_fund_mergers.pdf.

Third, we adopt an instrumental variable specification. Following Edmans, Goldstein, and Jiang (2012), we identify exogenous supply-driven shocks induced by the occurrence of extreme fund outflows.[12] To mitigate concerns that extreme outflows may be driven by deteriorating conditions in the underlying companies, we construct a "neighboring extreme fund outflows" indicator for each fund. This indicator identifies whether another fund located within 50 miles of the fund's headquarters is experiencing extreme outflows, as neighboring funds tend to share a similar investor base and be subject to similar supply-driven shocks. Therefore, we can reasonably expect that the extreme outflows of neighboring funds are largely exogenous to the underlying company. We then use the proportion of neighboring funds experiencing extreme outflows across a firm's mutual fund investors to instrument for aggregated shareholder leverage constraints.

We document that the proportion of funds with neighboring funds experiencing extreme outflows in the previous year is strongly positively related to investor leverage constraints in the first-stage regression. More importantly, the more leverage constrained the funds are, the more they induce risk-taking in portfolio companies, the higher the cost of borrowing, and the more debtholders protect themselves with additional lending restrictions. Taken together, these findings indicate a causal relationship between shareholder leverage constraints and corporate risk-taking, as well as the expected responses from debtholders.

Our article contributes to several strands of literature. First, we contribute to the growing body of research on the behavior of leverage-constrained investors. Existing studies primarily focus on the asset pricing implications of the "beta anomaly" and the BAB phenomenon (Brunnermeier and Pedersen (2009), He and Krishnamurthy (2013), Frazzini and Pedersen (2014), Christoffersen and Simutin (2017), He, Kelly, and Manela (2017), Boguth and Simutin (2018), Jylhä (2018), Lu and Qin (2021), and Novy-Marx and Velikov (2022)). This article extends this literature to corporate finance, highlighting the implications of shareholder leverage constraints for firms' risk-taking behavior and borrowing conditions.

Second, we contribute to the literature on the cost of borrowing, debt contract design, and optimal capital structure. Prior studies have identified debtholder–shareholder conflicts that may lead to wealth transfers through various corporate actions such as excessive dividend payouts, risk shifting, and asset substitution.[13] While the theoretical foundation for these conflicts is well established, empirical testing has lagged due to the fact that corporate actions resulting from shareholder–debtholder conflicts are equilibrium outcomes potentially influenced by managerial choices. For example, business risk and financial risk may be jointly determined (Chen, Harford, and Kamara (2019)). We contribute to this literature by focusing on the funding constraints of shareholders and examining how these constraints shape corporate financial decisions.

[12] We expect that large outflows will make the leverage constraints of the funds more binding. Indeed, Cai and Shin (2021) show that bank credit serves as an important liquidity source for mutual funds from which they draw down cash in times of excessive outflows.

[13] See Jensen and Meckling (1976), Smith and Warner (1979), Kalay (1982), Asquith, and Wizman (1990), Billett, King, and Mauer (2004), Jiang, Li, and Shao (2010), Acharya, Amihud, and Litov (2011), Becker and Strömberg (2012), Bodnaruk and Rossi (2016), Gilje (2016), Chava, Wang, and Zou (2018), and Chu (2021).

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

Third, our findings contribute to understanding the importance of shareholder influence on management in determining debt contract design. Existing studies show that loan spreads increase when shareholder activism exacerbates firms' asset substitution problems (Klein and Zur (2011)), while they decrease when shareholder activism addresses managerial entrenchment (Sunder, Sunder, and Wongsunwai (2014)). We identify shareholder leverage constraints as a critical determinant of firms' risk-taking incentives and show that they have important implications for debt contracts and capital structure. Our results further contribute to recent studies demonstrating that the characteristics of a firm's shareholder base can significantly affect financial and investment policies (Friberg, Goldstein, and Hankins (2024)).

II. Data and Main Variables

A. Sample Collection

Our sample consists of the universe of actively managed domestic equity mutual funds in the U.S. covered in the CRSP Mutual Fund database from 1982 to 2016. We obtain mutual fund holdings from the Thomson Reuters Mutual Fund Holdings (s12) database and merge the two data sets using the Mutual Fund Links (MFLINKS) obtained from Wharton Research Data Services (WRDS). Stock return and accounting information are sourced from CRSP and Compustat. We obtain business and geographic segment data from the Compustat Historical Segment database. Data on bank loan contracts come from the LPC's Dealscan database, while bond yield spreads and CDS spreads are obtained from the Bank of America-Merrill Lynch Corporate and High Yield Master Index Compositions database and the Markit CDS database. We collect data on mergers and acquisitions (M&As) from the Thomson Financial SDC Platinum M&A database.[14]

B. Fund Leverage Constraints

To quantify the degree of leverage constraints among mutual funds, we use the BAB factor in Novy-Marx and Velikov (2022), which is constructed as the value-weighted, market-neutral portfolio return from longing leveraged low-beta stocks and shorting high-beta stocks. For convenience, we use the negative BAB factor to construct our fund leverage constraint measure. When leverage-constrained investors are forced into high-beta stocks, the high-beta stock portfolio underperforms the leveraged low-beta stock portfolio. In such cases, the negative BAB factor generates a negative net-of-risk return (as per CAPM). Therefore, we estimate fund leverage constraints as the regression loadings of fund returns on the negative BAB factor (i.e., a higher loading on the negative BAB factor implies that the fund's leverage constraint is more binding). This measure quantifies the extent to which a

[14]Following Masulis, Wang, and Xie (2007), our final sample includes all completed M&A deals that meet the following criteria: the deal value disclosed in SDC is greater than one million dollars; the acquirer holds less than 50% of the target's shares before the announcement and 100% of the combined business after the completion of the transaction. We do not include partial acquisition events (e.g., purchases of assets such as plants, divisions, or subsidiaries from the targets) in our analyses.

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fund is constrained in taking on leverage by being compelled to overweight high-beta stocks to achieve its intended gross-of-risk performance.

Specifically, we perform rolling regressions at the fund level, detailed as follows: For each month t and each fund i, we estimate

$$(1) \qquad R_{i,\tau} - r_{f,\tau} = \alpha_{i,t} + \beta_{i,t}^{MKT}\left(R_{Mkt,\tau} - r_{f,\tau}\right) + \gamma_{i,t}(-BAB_{\tau}) + \varepsilon_{i,\tau}, \tau \in [t-23, t],$$

where $R_{i,\tau}$ is the monthly return of fund i in month τ, $R_{Mkt,\tau}$ and $r_{f,\tau}$ are the monthly market return and the risk-free rate in month τ. We require each fund to have nonmissing returns for at least 12 months within the 24-month estimation period. We obtain the loading $\gamma_{i,t}$ as our proxy for the tightness of fund leverage constraints.

Notably, the loading $\gamma_{i,t}$ is not driven by the general risk-taking incentives of mutual funds. This is because the negative BAB factor is, by construction, market-neutral, and we also include the market factor in the rolling regressions. In later analyses, we always control for fund beta $\beta_{i,t}^{MKT}$ to ensure that our results are not influenced by the general risk preferences of mutual funds.[15] We then aggregate fund leverage constraints at the stock level. Fich, Harford, and Tran (2015) show that both the fraction of a stock held by a fund and the fraction of the fund's portfolio represented by that stock matter for the fund's incentive to actively influence the firm. Therefore, we consider both an equally weighted measure (*EW leverage constraint*) and a value-weighted measure (*VW leverage constraint*), where the weight is the fund's stake in the firm.

C. Variable Definitions

To examine the effects of aggregated fund leverage constraints on the cost of borrowing, corporate risk-taking, and firm capital structure, we consider two sets of variables.

The first set of variables pertains to the cost of borrowing, loan contract features, and firm capital structure. We consider two market-based measures of the cost of debt: the CDS spread and the bond yield spread. The *CDS spread* is the U.S. dollar-denominated spread of 5-year CDS contracts with the modified restructuring clause. For CDS contracts, we control for the *recovery rate* in the event of default. *Yield spread* is estimated as the issue amount-weighted bond yield spread aggregated at the issuer level. The bond yield spread is measured by the number of percentage points by which the fair value of the Treasury spot curve is shifted to match the present value of discounted cash flows to the bond's price.[16] For bond characteristics, we control for *bond maturity*, defined as the issue amount-weighted

[15]To completely rule out the concern that fund leverage constraints may be "mechanically" correlated with the generic risk preferences of the mutual funds, we also use an alternative measure which by construction is orthogonal to fund beta. For each year quarter at the fund level, we regress fund leverage constraints (i.e., fund loading on the negative BAB factor) on fund beta (i.e., fund loading on the market factor) and use the regression residual as the alternative measure of fund leverage constraints. We also consider Fama–French–Carhart four factors and Fama–French five factors for robustness checks.

[16]For bonds with embedded options, such as callability, a log-normal short-term interest rate model is used to evaluate the present value of the bond's potential cash flows. In this case, the option adjusted spread is equal to the number of percentage points by which the short-term interest rate must be shifted to match the expected discounted cash flows to the bond's price.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

bond maturity at the issuer-year level, and the *issue amount outstanding*, defined as the logarithm of the total bond face value aggregated at the issuer level.

In terms of the characteristics of bank loan contracts, the *loan spread* is the all-in-drawn spread that the borrower pays over LIBOR for the drawn portion of the loan. The *collateral requirement* is an indicator variable that equals 1 if the loan is secured by collateral, and 0 otherwise. The *number of covenants* is the total number of covenants included in a loan agreement. The *maximum leverage slack* is defined as the maximum leverage ratio set by the bank minus the most recent book leverage ratio. We control for *loan maturity*, defined as the maturity of a bank loan expressed in years, and *loan size*, defined as the logarithm of the loan amount outstanding. To measure a firm's capital structure, we calculate *book leverage* as the ratio of long-term debt to total book assets.

The second set of variables are related to corporate risk-taking in business operations. We consider business risk-taking measures including *operating cash flow volatility* and *operating leverage.* For each firm-year, we calculate *operating cash flow volatility* as the standard deviation of quarterly operating cash flow in the next 3 years, including the current year. Operating cash flows are defined as the difference between income before extraordinary items and total accruals using the Compustat quarterly data (IB – ΔACT + ΔCHE + ΔLCT – ΔDLC + DP). Operating leverage arises from the proportion of fixed costs in a firm's cost structure. We follow Aboody, Levi, and Weiss (2018) to estimate a time-series regression for each firm i and quarter t with a rolling window of next 12 quarters: $OC_{\mathrm{i,k}} = \alpha + \beta_{i,t} REV_{\mathrm{i,k}} + \varepsilon_{i,k}$, $k = t + 1, \ldots, t + 12$, where OC is the logarithm of operating costs (XOPRQ), and REV is the logarithm of sales revenue (REVTQ). If the costs are primarily fixed, then the estimated $1 - \beta_{i,t}$ is high, indicating a high ratio of fixed to variable costs, which results in a high operating leverage.

We also consider several risk-taking business activities, including the number of business and geographic segments, as well as the likelihood of pursuing industry- and geography-diversifying M&As. The *number of business segments* is the number of segments reported by a company as industry or product line breakouts. The *number of geographic segments* is the number of segments reported as country-by-country breakouts. An *industry-diversifying merger* is an indicator that equals 1 if the acquirer and target operate in different industries, as identified by their 2-digit SIC codes, and 0 otherwise. A *geography-diversifying merger* is an indicator that equals 1 if the acquirer and target are located in different states, and 0 otherwise. For M&A deals, we control for the *relative size* of the bidder and target, as well as *deal value.*[17]

D. Summary Statistics

Table 1 presents summary statistics for the main variables. For each variable, we report the sample size, mean, median, standard deviation, 5th percentile, and

[17]We control for a series of firm characteristics. The *weighted fund beta* is the *ownership*-weighted average of fund beta among mutual funds aggregated at the stock level. *Fund ownership* is the percentage of outstanding shares held by mutual funds. In terms of the firm's financial conditions, we control for *firm size, profitability, tangibility, book-to-market, free cash flow, and Amihud illiquidity.* The detailed definitions are in the Appendix.

TABLE 1

Summary Statistics

Table 1 presents summary statistics for the main variables used in the subsequent analyses. For each variable, we report the sample size, mean, median, standard deviation, 5th percentile, and 95th percentile. Detailed variable descriptions are provided in the Appendix.

	Sample Size	Mean	Median	Std. Dev.	5th Percentile	95th Perecentile
Value-weighted leverage constraint	103,347	0.085	0.098	0.203	−0.287	0.395
Equal-weighted leverage constraint	103,347	0.076	0.091	0.187	−0.290	0.344
Ownership-weighted fund beta	103,347	1.065	1.061	0.184	0.772	1.378
Book leverage	103,347	0.163	0.113	0.172	0.000	0.499
Tangibility	103,347	0.265	0.180	0.249	0.007	0.789
Firm size	103,347	6.171	6.007	2.173	2.961	9.998
Profitability	103,347	0.069	0.103	0.232	−0.283	0.274
Fund ownership	103,347	0.143	0.105	0.220	0.002	0.575
Free cash flow	103,347	−0.040	0.008	0.196	−0.412	0.128
Book-to-market	103,347	0.709	0.546	0.643	0.117	1.824
Amihud illiquidity	103,347	0.399	0.127	0.723	0.012	1.761
Number of business segments	101,077	4.784	2.000	5.799	1.000	16.000
Number of geographic segments	101,077	4.220	2.000	4.669	1.000	14.000
Operating cash flow volatility	87,481	0.051	0.035	0.051	0.010	0.150
Operating leverage	88,640	0.199	0.128	0.353	−0.220	0.886
Yield spread (%)	9,509	2.713	1.942	2.230	0.655	7.200
Bond maturity (years)	9,509	5.641	5.388	2.274	2.245	9.894
Issue amount outstanding	9,509	6.891	6.716	1.275	5.017	9.159
CDS spread (%)	5,909	1.492	0.872	1.692	0.212	5.047
CDS recovery rate	5,909	0.397	0.400	0.028	0.363	0.429
Loan spread (%)	20,928	1.667	1.500	1.241	0.250	3.850
Collateral requirement	20,928	0.432	0.000	0.495	0.000	1.000
Loan maturity (years)	20,928	3.622	3.750	2.121	1.000	6.917
Loan size	20,928	18.663	18.826	1.640	15.751	21.129
Number of covenants	11,469	2.202	2.000	0.932	1.000	4.000
Maximum leverage slack	2,116	0.318	0.313	0.133	0.107	0.535
Industry-diversifying merger	19,113	0.525	1.000	0.499	0.000	1.000
Geography-diversifying merger	19,113	0.680	1.000	0.466	0.000	1.000
Relative size	19,113	0.097	0.030	0.265	0.001	0.395
Deal value	19,113	3.955	3.784	1.769	1.335	7.148

95th percentile. The complete sample comprises 103,347 firm-year observations with nonmissing information on aggregated fund leverage constraints and major firm characteristics. The average value-weighted (equally weighted) fund leverage constraint is 0.085 (0.076), with a standard deviation of 0.203 (0.187). The average fund ownership is 14.3% of total shares outstanding, and the average ownership-weighted fund beta is 1.065. Tangible assets and free cash flow account for 26.5% and −4.0% of total assets, respectively. The sample firms have an average book-to-market ratio of 0.709 and an average profitability (return on assets) of 0.069.

On average, the sample firms have 4.784 business segments and 4.220 geographic segments. Among the M&A deals, 52.5% are industry-diversifying mergers, and 68.0% are geography-diversifying mergers. The sample firms have an average bond yield spread of 2.713% and an average CDS spread of 1.492% for bond issuers. Among bank borrowers, the average loan spread is 1.667%, 43.2% of bank loan contracts have a collateral requirement, and the average number of covenants per contract is 2.202.

E. Validating the Measure of Fund Leverage Constraint

The theoretical link between mutual funds' leverage constraints and their exposure to the negative BAB factor was introduced earlier. We now provide empirical validation of the leverage constraint measure at the fund level.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

We first examine an explicit leverage constraint: a fund's ability to engage in margin trading as part of its investment practices. We expect funds with margin purchase constraints in their investment policies to exhibit higher exposure to the negative BAB factor. We rely on the SEC requirement for registered investment companies to disclose whether their investment policies permit margin purchases. We obtain data from mutual funds' N-SAR filings from 2006 to 2017, including both N-SAR A (semi-annual reports) and N-SAR B (annual reports), to identify constraints on margin purchases.[18] Specifically, we extract information from Item 70.G ("Margin purchases: permitted by investment policies? Y/N") to determine whether a fund's investment policy imposes margin purchase constraints. We then test whether funds with such constraints have higher exposure to the negative BAB factor. We report our findings in Table 2, specifications 1 and 2, where the dependent variable is the fund-level leverage constraint measure, and the independent variable is an indicator for the presence of margin purchase constraints. Given the mean fund leverage constraint of 0.061 at the fund-year level, we find that funds with margin purchase constraints in their investment policy are associated with a 24.0% higher exposure to the negative BAB factor.[19]

The second constraint we consider is access to bank loans, as the ability to borrow from banks is a typical leverage constraint. Fund regulations stipulate that mutual funds can only borrow externally from banks.[20] A large body of banking literature has documented that proximity lending alleviates information asymmetry, such that the cost of borrowing increases and the availability of borrowing decreases with greater distance between the borrower and the lender.[21] It is reasonable to expect that a higher number of nearby banks increases access to bank credit for local funds. To examine this, we analyze changes in mutual fund behavior when a new bank begins lending in the local area. We define an indicator variable, *new neighboring bank*, which equals 1 when a new bank starts lending within 50 miles of the fund's headquarters, and 0 otherwise. We identify a bank's starting year using the first facility start date recorded in the LPC's DealScan database. Table 2, specifications 3 and 4, presents the results. In specification 4, which includes all

[18]Using the ticker information from the "CLASS-CONTRACT-TICKER-SYMBOL" item (available after 2006) extracted from the N-SAR filings, we can accurately match it with fund tickers from the CRSP Mutual Fund database.

[19]This result is based on specification 2 of Table 2 with all the fund-level controls, as well as fund and year fixed effects. We control for fund return, expense ratio, fund total net assets (TNA), and fund turnover in the previous year. Fund return is the buy-and-hold portfolio returns of a mutual fund. Expense ratio is calculated by dividing a fund's operating expenses by its net assets. Fund TNA is the logarithm of fund total net assets. Fund turnover is measured as the lesser of total fund purchases or sales over the 12 months, divided by the fund's average monthly net assets.

[20]Open-end funds that borrow are confined to bank loans only. They are not permitted to issue bonds or other forms of debt, or any preferred stock. Moreover, funds should not borrow more than one third of its total net asset value (Morley (2013), Warburton and Simkovic (2019)). An open-end fund must always maintain an asset coverage ratio above 300%. The asset coverage is defined as (A – L + B)/B, where A is the total asset, L is the total liability, and B is aggregate bank borrowing. If the ratio falls below 300%, an open-end fund must pay down its borrowings (within 3 days) so that the 300% asset coverage ratio is satisfied.

[21]See, for example, Petersen and Rajan (2002), Degryse and Ongena (2005), Mian (2006), DeYoung, Glennon, and Nigro (2008), Agarwal and Hauswald (2010), Knyazeva and Knyazeva (2012), and Hollander and Verriest (2016).

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 2

Validation of Fund Leverage Constraints

In Table 2, we present evidence to validate our measure of fund leverage constraints. The dependent variable is the regression-based leverage constraint measure at the fund level, identified as the regression loading of fund returns on the negative betting-against-beta factor. We consider two leverage constraints for mutual funds. The first constraint is the fund's ability to pursue margin purchases in its investment practices. We obtain data from mutual funds' N-SAR filings to identify constraints in margin purchases, specifically from Item 70.G ("Margin purchases: permitted by investment policies? Y/N"). The second constraint is the accessibility of bank loans. We examine how mutual fund behavior changes when a new bank starts lending in the neighborhood, hypothesizing that more nearby banks will reduce the accessibility of bank loans. In specifications 1 and 2, the independent variable is an indicator for the existence of a margin purchase constraint. In specifications 3 and 4, the independent variable is an indicator that equals 1 if a new bank starts lending within 50 miles of a mutual fund's headquarters, and 0 otherwise. In specifications 2 and 4, we control for fund return, expense ratio, total net assets, and fund turnover, with all independent variables lagged by 1 year. Year and fund fixed effects are included in all the tests, and standard errors are clustered at the fund level. The *t*-statistics are reported in parentheses below coefficient estimates, with statistical significance indicated at the 1%, 5%, and 10% levels by ***, **, and *, respectively.

	Dependent Variable: Fund Leverage Constraint			
	Evidence: Margin Purchase		Evidence: Bank Lending	
	1	2	3	4
Margin purchase constraint indicator	0.016***	0.015**		
	(2.74)	(2.48)		
New neighboring bank indicator			−0.004*	−0.004**
			(−1.89)	(−2.07)
Controls				
Fund return		−0.213		−0.646***
		(−1.55)		(−7.01)
Expense ratio		−4.144***		0.641
		(−3.23)		(0.71)
Fund TNA		−0.014***		0.010***
		(−6.01)		(5.46)
Fund turnover		−0.007*		0.001
		(−1.82)		(0.26)
Year FE	Yes	Yes	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes
No. of obs.	13,511	13,511	33,864	33,864
R^2	0.624	0.626	0.515	0.518

fund-level controls as well as fund and year fixed effects, we find that the event of a new neighboring bank starting to lend reduces the fund leverage constraint by 6.5% relative to the sample average.

Taken together, these results suggest that a fund's exposure to the negative BAB factor serves as a valid empirical proxy for overall fund leverage constraints.

III. Shareholder Leverage Constraints and Debt Contracts

A. Credit Spread

We start by examining how fund leverage constraints are perceived by debtholders and test whether they exacerbate the cost of borrowing and the agency cost of debt. If leverage-constrained funds are associated with high risk-taking by firms, this should be particularly concerning for debtholders, who may impose a higher cost of borrowing.

To assess whether this is the case, we focus on two widely used market-based proxies for the cost of borrowing: CDS spreads and bond yield spreads. We report the results in Table 3. In Panel A, we examine CDS spreads, focusing on the most commonly observed CDS contracts (i.e., those with a 5-year maturity and a modified restructuring clause). We find a strong positive relationship between

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https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 3

Shareholder Leverage Constraints and Credit Spread

Table 3 presents the results of regression analyses for the credit spread. We examine the credit default swap (CDS) spread in Panel A and the bond yield spread in Panel B. In Panel A, the dependent variable is the CDS spread. We focus on the most commonly observed CDS contracts, specifically those with a 5-year maturity and a modified restructuring clause. The CDS recovery rate is included as an additional control. In Panel B, the dependent variable is the issue amount-weighted bond yield spread, aggregated at the issuer-year level. The bond yield spread is the number of percentage points that the fair value of the treasury spot curve is shifted to match the present value of the discounted cash flows to the bond's price. For bonds with embedded options, a log-normal short interest rate model is used to evaluate the present value of the securities' potential cash flows. The data are obtained from the Bank of America Merrill Lynch Bond Index database. Bond issue amount and maturity are included as additional controls.

For both Panels A and B, in specifications 1 through 3, the independent variable is the ownership-weighted fund loading on the negative betting-against-beta factor (VW leverage constraint) for all domestic equity mutual funds aggregated at the firm level. In specifications 4 through 6, the independent variable is the equal-weighted fund loading on the negative betting-against-beta factor (EW leverage constraint) for all domestic equity mutual funds aggregated at the firm level. Specifications 3 and 6 include firm fixed effects. All the independent variables are lagged by 1 year. Year fixed effects are included in all tests, and standard errors are clustered at the firm level. We report *t*-statistics in parentheses below coefficient estimates, with statistical significance indicated at the 1%, 5%, and 10% levels by ***, **, and *, respectively.

	1	2	3	4	5	6
Panel A. CDS Spread						
VW leverage constraint	2.817***	1.821***	1.056***			
	(12.00)	(7.29)	(4.87)			
EW leverage constraint				3.916***	2.585***	1.687***
				(12.40)	(7.57)	(5.48)
Controls						
Weighted fund beta		2.660***	0.211		2.718***	0.194
		(7.88)	(0.78)		(7.96)	(0.72)
Fund ownership	−0.459***	−0.425***	−0.877***	−0.488***	−0.444***	−0.892***
	(−5.77)	(−5.44)	(−8.32)	(−6.10)	(−5.67)	(−8.44)
Firm size	0.036	0.069**	0.022	0.057**	0.086***	0.044
	(1.30)	(2.53)	(0.38)	(2.06)	(3.14)	(0.74)
Profitability	−1.806***	−1.564***	−1.759***	−1.792***	−1.539***	−1.697***
	(−4.31)	(−3.82)	(−3.83)	(−4.29)	(−3.78)	(−3.73)
Free cash flow	−0.813*	−0.862**	−0.572	−0.844*	−0.887**	−0.610*
	(−1.83)	(−1.98)	(−1.57)	(−1.90)	(−2.04)	(−1.67)
Tangibility	−0.386***	−0.365***	−0.509	−0.374***	−0.357***	−0.487
	(−2.86)	(−2.73)	(−1.38)	(−2.76)	(−2.66)	(−1.32)
Book-to-market	0.821***	0.793***	0.717***	0.807***	0.782***	0.711***
	(10.62)	(10.21)	(9.13)	(10.45)	(10.09)	(9.05)
Book leverage	3.642***	3.501***	1.728***	3.616***	3.480***	1.733***
	(21.16)	(21.17)	(7.48)	(21.02)	(21.03)	(7.48)
Amihud illiquidity	12.946***	11.849***	18.285***	12.731***	11.686***	18.451***
	(5.91)	(5.64)	(6.97)	(5.86)	(5.62)	(7.04)
CDS recovery rate	−11.320***	−11.066***	−8.528***	−11.254***	−11.012***	−8.477***
	(−8.59)	(−8.46)	(−8.01)	(−8.55)	(−8.44)	(−7.99)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	Yes	Yes	No
Firm FE	No	No	Yes	No	No	Yes
No. of obs.	5,909	5,909	5,909	5,909	5,909	5,909
R^2	0.554	0.563	0.793	0.554	0.563	0.794
Panel B. Bond Yield Spread						
VW leverage constraint	2.206***	1.896***	1.415***			
	(12.06)	(9.52)	(7.55)			
EW leverage constraint				3.042***	2.691***	2.130***
				(13.13)	(10.83)	(9.31)
Controls						
Weighted fund beta		1.315***	−0.664***		1.324***	−0.668***
		(5.13)	(−2.80)		(5.25)	(−2.88)
Fund ownership	0.082***	0.073***	−0.195***	0.081***	0.072***	−0.184***
	(3.44)	(3.05)	(−5.56)	(3.41)	(3.01)	(−5.28)
Firm size	−0.390***	−0.355***	−0.219***	−0.379***	−0.344***	−0.225***
	(−14.04)	(−12.31)	(−4.32)	(−13.53)	(−11.88)	(−4.43)
Profitability	−2.134***	−1.988***	−1.606***	−2.181***	−2.024***	−1.627***
	(−5.66)	(−5.33)	(−3.87)	(−5.86)	(−5.49)	(−3.96)

(continued on next page)

TABLE 3 (continued)
Shareholder Leverage Constraints and Credit Spread

Panel B. Bond Yield Spread (continued)

Free cash flow	−2.734***	−2.742***	−1.748***	−2.701***	−2.712***	−1.726***
	(−7.92)	(−8.00)	(−4.84)	(−7.84)	(−7.93)	(−4.79)
Tangibility	−0.226*	−0.222*	0.111	−0.224*	−0.222*	0.111
	(−1.81)	(−1.78)	(0.41)	(−1.78)	(−1.77)	(0.41)
Book-to-market	1.568***	1.552***	1.506***	1.560***	1.544***	1.504***
	(25.31)	(24.88)	(19.58)	(25.24)	(24.82)	(19.60)
Book leverage	3.834***	3.775***	3.222***	3.821***	3.760***	3.255***
	(22.28)	(21.92)	(12.84)	(22.24)	(21.89)	(13.01)
Amihud illiquidity	2.517***	2.701***	1.158**	2.606***	2.790***	1.208**
	(5.39)	(5.52)	(2.02)	(5.46)	(5.60)	(2.08)
Issue amount outstanding	−0.058***	−0.058***	−0.220***	−0.057**	−0.056**	−0.217***
	(−2.60)	(−2.60)	(−7.46)	(−2.54)	(−2.51)	(−7.44)
Bond maturity	−0.081***	−0.079***	−0.007	−0.079***	−0.077***	−0.006
	(−13.43)	(−13.13)	(−0.90)	(−13.18)	(−12.86)	(−0.82)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	Yes	Yes	No
Firm FE	No	No	Yes	No	No	Yes
No. of obs.	9,509	9,509	9,509	9,509	9,509	9,509
R^2	0.674	0.676	0.829	0.675	0.677	0.830

shareholder leverage constraints and CDS spreads, a result that holds across all specifications. Notably, this finding is robust to the inclusion of ownership-weighted fund beta as an additional control, demonstrating that the generic risk preferences of mutual funds do not drive the result. In the fully specified model, a 1-standard–deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 14.4% (21.1%) higher CDS spread relative to the sample average.

In Panel B of Table 3, the dependent variable is the issue amount-weighted bond yield spread, aggregated at the bond issuer level. We include total issue amount and issue amount-weighted bond maturity as additional controls. Again, we find a strong positive relationship between shareholder leverage constraints and bond yield spreads across specifications. In the fully specified model, a 1-standard-deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 10.6% (15.9%) higher yield spread relative to the sample average.

B. Loan Contracts

The preceding results suggest that debtholders perceive the presence of leverage-constrained investors as increasing credit risk and aggravating concerns about risk-shifting and wealth transfer. Do lenders also design debt contracts in response to such heightened concerns about debtholder–shareholder conflicts? To address this question, we examine the features of *bank loan* contracts. We expect banks to respond by increasing loan spreads and imposing more stringent borrowing conditions, such as collateral requirements and covenant restrictions.

We begin by analyzing loan spreads and collateral requirements, with results reported in Panel A of Table 4. We estimate contract-level specifications with

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 4

Shareholder Leverage Constraints and Bank Loan Contracts

Table 4 presents the results of regression analyses for loan contract characteristics. We obtained data on syndicated bank loans from Thomson-Reuters LPC Dealscan database and examined loan spread, collateral requirement, the number of covenants, and the slack of the maximum leverage covenant, respectively. The analyses are performed at the loan package level. In Panel A, we focus on loan spread and the likelihood of collateral requirement in a loan contract. In specifications 1 and 2, the dependent variable is loan spread, measured as the all-in-drawn spread the borrower pays over LIBOR for the drawn portion of the loan. Specifications 3 and 4 present estimates of Probit regressions of the likelihood of collateral requirement, where the dependent variable is an indicator that equals 1 if the loan is secured by collateral, and 0 otherwise. In Panel B, we focus on the covenant restrictions contained in the loan contracts. In specifications 1 and 2, the dependent variable is the total number of financial covenants included in a loan package. In specifications 3 and 4, the dependent variable is the maximum leverage covenant slack, measured as the maximum leverage ratio set by the bank minus the most recent book leverage ratio.

For both panels, in specifications 1 and 2, the independent variable is the ownership-weighted fund loading on the negative betting-against-beta factor (VW leverage constraint) for all domestic equity mutual funds aggregated at the firm level. In specifications 3 and 4, the independent variable is the equal-weighted fund loading on the negative betting-against-beta factor (EW leverage constraint) for all domestic equity mutual funds aggregated at the firm level. Year, industry, and credit rating fixed effects are included in all regressions. All the independent variables are lagged by 1 year. Standard errors are clustered at the firm level. We report *t*-statistics below coefficient estimates, and statistical significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively.

Panel A. Loan Spread and Collateral Requirement

	Loan Spread		Collateral Requirement	
	1	2	3	4
VW leverage constraint	0.434***		0.734***	
	(5.81)		(7.42)	
EW leverage constraint		0.513***		0.828***
		(5.90)		(7.23)
Controls				
Weighted fund beta	0.428***	0.445***	0.716***	0.750***
	(7.20)	(7.46)	(8.62)	(8.99)
Fund ownership	0.025	0.035	−0.222**	−0.204*
	(0.36)	(0.51)	(−1.96)	(−1.79)
Firm size	−0.121***	−0.121***	−0.285***	−0.284***
	(−8.32)	(−8.31)	(−2.92)	(−2.90)
Profitability	−1.810***	−1.816***	−0.246***	−0.246***
	(−13.73)	(−13.78)	(−12.15)	(−12.18)
Free cash flow	−0.093	−0.094	−1.654***	−1.667***
	(−0.93)	(−0.95)	(−8.28)	(−8.33)
Tangibility	−0.261***	−0.261***	0.010	0.010
	(−4.03)	(−4.03)	(0.08)	(0.08)
Book-to-market	0.232***	0.233***	0.248***	0.250***
	(9.42)	(9.47)	(7.92)	(7.97)
Book leverage	1.546***	1.545***	1.483***	1.480***
	(21.77)	(21.75)	(15.31)	(15.28)
Amihud illiquidity	0.202***	0.203***	0.094**	0.096**
	(7.08)	(7.10)	(2.51)	(2.55)
Loan maturity	0.039**	0.039**	0.308***	0.308***
	(2.50)	(2.54)	(13.19)	(13.22)
Loan size	−0.222***	−0.222***	−0.123***	−0.123***
	(−17.67)	(−17.60)	(−6.91)	(−6.90)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Credit rating FE	Yes	Yes	Yes	Yes
No. of obs.	20,928	20,928	20,928	20,928
R^2	0.421	0.421	0.248	0.248

Panel B. Number of Covenants and Covenant Slack

	Number of Covenants		Maximum Leverage Slack	
	1	2	3	4
VW leverage constraint	0.353***		−0.094***	
	(3.85)		(−3.08)	
EW leverage constraint		0.411***		−0.092**
		(3.66)		(−2.53)

(continued on next page)

TABLE 4 (continued)
Shareholder Leverage Constraints and Bank Loan Contracts

Panel B. Number of Covenants and Covenant Slack (continued)

	Number of Covenants		Maximum Leverage Slack	
	1	2	3	4
Controls				
Weighted fund beta	0.293***	0.310***	−0.018	−0.030
	(4.09)	(4.36)	(−0.62)	(−1.04)
Fund ownership	−0.181**	−0.173**	0.051**	0.049**
	(−2.51)	(−2.39)	(2.17)	(2.08)
Firm size	−0.132***	−0.131***	−0.014***	−0.014***
	(−9.55)	(−9.44)	(−2.59)	(−2.62)
Profitability	0.053	0.050	0.136*	0.135*
	(0.41)	(0.38)	(1.85)	(1.82)
Free cash flow	0.491***	0.489***	−0.106*	−0.108*
	(5.20)	(5.20)	(−1.75)	(−1.78)
Tangibility	−0.134*	−0.132*	−0.036	−0.038
	(−1.81)	(−1.78)	(−1.47)	(−1.55)
Book-to-market	0.129***	0.129***	−0.019*	−0.019*
	(5.27)	(5.29)	(−1.94)	(−1.94)
Book leverage	0.844***	0.841***	−0.370***	−0.367***
	(11.22)	(11.19)	(−11.28)	(−11.08)
Amihud illiquidity	−0.117***	−0.117***	−0.029**	−0.029**
	(−4.47)	(−4.45)	(−2.22)	(−2.24)
Loan maturity	0.248***	0.249***	0.003	0.002
	(13.48)	(13.51)	(0.51)	(0.49)
Loan size	−0.007	−0.007	0.011**	0.011**
	(−0.49)	(−0.54)	(2.37)	(2.38)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Credit rating FE	Yes	Yes	Yes	Yes
No. of obs.	11,469	11,469	2,116	2,116
R^2	0.207	0.206	0.281	0.280

industry, credit rating, and year fixed effects, clustering standard errors at the borrower level. In specifications 1 and 2, we document a strong positive relationship between shareholder leverage constraints and loan spreads. In the fully specified model, a 1-standard-deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 5.3% (5.8%) higher loan spread relative to the sample average.

In specifications 3 and 4, we conduct Probit regressions in which the dependent variable is an indicator equal to 1 if the loan facility is secured by collateral, and 0 otherwise. The results show that a 1-standard-deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 10.1% (10.5%) higher probability of requiring collateral.

Next, we examine covenant restrictions. As a proxy for covenant tightness, we consider the number of financial covenants in a loan package. We also focus on covenants specifically designed to limit a borrower's ability to raise additional debt (i.e., the maximum leverage covenant (Robert and Sufi (2009))). We calculate maximum leverage slack as the maximum leverage ratio set by the bank minus the most recent book leverage ratio. A higher covenant slack represents a lower degree of covenant strictness. We expect shareholder leverage constraints to be associated with stricter covenants and, consequently, lower covenant slack.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

Panel B of Table 4 reports the results. A 1-standard-deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 3.3% (3.8%) increase in the number of financial covenants and a 6.0% (5.4%) decrease in maximum leverage slack relative to the sample average.

Overall, these results suggest that debtholders perceive the presence of leverage-constrained funds as potentially detrimental and respond by increasing the cost of borrowing and imposing tighter borrowing conditions on underlying firms.

IV. Shareholder Leverage Constraints and Corporate Risk-Taking

We now turn to the economic channels through which fund leverage constraints increase the cost of borrowing. We previously hypothesized a risk-taking channel in which firms held by funds with more binding leverage constraints engage in greater risk-taking activities. Such risk-taking can occur through either increased business risk or increased financial risk via higher leverage. To examine this channel, we relate different measures of corporate risk-taking to the degree of leverage constraints of the funds holding the firm.

A. Operating Cash Flow Volatility and Operating Leverage

We begin by analyzing the overall riskiness of firms' business operations, measured by the volatility of operating cash flow. We use operating cash flow rather than operating income, as cash flow analysis is more critical in lenders' credit-related decisions (Bhojraj and Swaminathan (2009)). In addition, we consider operating leverage as a proxy for the flexibility of a firm's cost structure. A less elastic cost structure (i.e., one characterized by a higher proportion of fixed costs and a lower proportion of variable costs) amplifies a firm's exposure to business cycle fluctuations. Accordingly, operating leverage is considered a real-asset risk-taking component that drives the systematic risk of common stocks (Gahlon and Gentry (1982), Mandelker and Rhee (1984), and Aboody, Levi, and Weiss (2018)).

Table 5 presents the results of the regression analysis for corporate risk-taking. In specifications 1 and 2, we use operating cash flow volatility as a proxy for corporate risk-taking. In specifications 3 and 4, we use operating leverage as an alternative proxy. We find that shareholder leverage constraints are positively related to firms' degree of risk-taking. In the fully specified model, which includes all control variables as well as firm and year fixed effects, a 1-standard–deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 5.6% (4.0%) increase in operating cash flow volatility and a 5.1% (3.6%) increase in operating leverage relative to the sample average. These results support the hypothesized risk-taking channel, suggesting that leverage-constrained funds increase the cost of debt due to higher corporate risk-taking in business activities.

B. Business Activities

Next, we identify the specific activities through which firms may increase the riskiness of their operating cash flow. We consider three types of corporate actions: product diversification, geographic diversification, and engagement in

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 5

Channel Test: Shareholder Leverage Constraints and Corporate Risk-taking

Table 5 presents the results of regression analyses for corporate risk-taking activities. In specifications 1 and 2, we use operating cash flow volatility to proxy for corporate risk-taking. For each firm-year, we calculate operating cash flow volatility as the standard deviation of quarterly operating cash flows in the next 3 years including the current year. Operating cash flow is defined as the difference between income before extraordinary items and total accruals (IB – ΔACT + ΔCHE + ΔLCT – ΔDLC + DP) based on Compustat quarterly data. In specifications 3 and 4, we use operating leverage to proxy for corporate risk-taking. We follow Aboody, Levi and Weiss (2018) to estimate a time-series regression for each firm i and quarter t with a rolling window of next 12 quarters: $OC_{i,k} = \alpha + \beta_{i,t} REV_{i,k} + \varepsilon_{i,k}$, $k = t + 1, \ldots, t + 12$, where OC is the logarithm of operating costs (XOPRQ), and REV is the logarithm of sales revenue (REVTQ). If costs are primarily fixed, then the estimated $1 - \beta_{i,t}$ is high, indicating a high ratio of fixed to variable costs, which results in a high operating leverage. We average $1 - \beta_{i,t}$ at the firm-year level to proxy for operating leverage. In specifications 1 and 3, the independent variable is the ownership-weighted fund loading on the negative betting-against-beta factor (*VW leverage constraint*) for all domestic equity mutual funds aggregated at the firm level. In specifications 2 and 4, the independent variable is the equal-weighted fund loading on the negative betting-against-beta factor (*EW leverage constraint*) for all domestic equity mutual funds aggregated at the firm level. All the independent variables are lagged by 1 year. Firm and year fixed effects are included in all tests, and standard errors are clustered at the firm level. We report *t*-statistics in the parentheses below coefficient estimates, and statistical significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively.

	Operating Cash Flow Volatility		Operating Leverage	
	1	2	3	4
VW leverage constraint	0.014***		0.050***	
	(2.78)		(3.98)	
EW leverage constraint		0.011***		0.038**
		(2.78)		(2.44)
Controls				
Weighted fund beta	0.005*	0.005*	0.008	0.011
	(1.78)	(1.77)	(0.86)	(1.10)
Fund ownership	−0.003***	−0.003***	−0.079***	−0.078***
	(−3.54)	(−3.59)	(−3.01)	(−2.96)
Firm size	−0.009***	−0.009***	−0.022***	−0.022***
	(−8.37)	(−8.37)	(−9.24)	(−9.35)
Profitability	0.054***	0.054***	−0.225***	−0.225***
	(39.55)	(39.53)	(−8.47)	(−8.47)
Free cash flow	−0.081***	−0.081***	−0.004	−0.004
	(−5.59)	(−5.59)	(−0.23)	(−0.23)
Tangibility	−0.041***	−0.041***	0.071***	0.070***
	(−8.07)	(−8.09)	(4.06)	(4.02)
Book-to-market	0.012***	0.012***	0.027***	0.027***
	(5.48)	(5.50)	(5.31)	(5.28)
Book leverage	−0.006*	−0.006*	−0.052***	−0.052***
	(−1.85)	(−1.85)	(−3.71)	(−3.72)
Amihud illiquidity	0.001	0.001	−0.016***	−0.016***
	(1.41)	(1.42)	(−5.76)	(−5.72)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
No. of obs.	87,481	87,481	88,640	88,640
R^2	0.710	0.710	0.382	0.382

diversification enhancing M&As. The underlying intuition is that firms can reduce the riskiness of their operating cash flow by achieving greater internal diversification across business and geographic segments, as well as by engaging in diversifying M&As. We therefore examine the relationship between shareholder leverage constraints and these policies.

We report the results in Table 6. Panel A focuses on the degree of internal diversification in business and geographic segments, while Panel B examines firms' engagement in M&As. In Panel A, the dependent variable in specifications 1 and 2 is the number of business segments, reported as industry or product line segment breakouts. The dependent variable in specifications 3 and 4 is the number of geographic segments, reported as country-by-country segment breakouts. We

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 6

Channel Test: Shareholder Leverage Constraints and Business Activities

Table 6 presents the results of regression analyses for business activities associated with internal corporate diversification. Panel A examines the degree of internal diversification in business segments and in geographic segments. We obtain the segment data from the Compustat Historical Segments database. In specifications 1 and 2, the dependent variable is the number of business segments. Business segments are reported as industry or product line segments breakouts. In specifications 3 and 4, the dependent variable is the number of geographic segments. Geographic segments are reported as country-by-country segment breakouts. All the independent variables are lagged by 1 year. All the specifications include firm and year fixed effects, and standard errors are clustered at the firm level.

Panel B presents the results of Probit regression analysis for the likelihood of diversifying mergers. We obtain merger and acquisition events of U.S. public firms from the SDC platinum M&A database. We examine both industry-diversifying mergers and geography-diversifying mergers. In specifications 1 and 2, the dependent variable is an indicator for industry-diversifying merger, which equals 1 if the acquirer and target are in different industries, and 0 otherwise, where the industry is identified by the 2-digit SIC code. In specifications 3 to 4, the dependent variable is an indicator for geography-diversifying merger, which equals 1 if the acquirer and target are in different states, and 0 otherwise. All independent variables are lagged by 1 year. Industry and year fixed effects are included in all tests, and standard errors are clustered at the acquirer level.

For both Panels A and B, in specifications 1 and 3, the independent variable is the ownership-weighted fund loading on the negative betting-against-beta factor (*VW leverage constraint*) for all domestic equity mutual funds aggregated at the firm level. In specifications 2 and 4, the independent variable is the equal-weighted fund loading on the negative betting-against-beta factor (*EW leverage constraint*) for all domestic equity mutual funds aggregated at the firm level. We report *t*-statistics in the parentheses below coefficient estimates, and statistical significance at the 1%, 5%, and 10% levels is indicated by ***, ** and *, respectively.

Panel A. Number of Business Segments and Geographic Segments

	Number of Business Segments		Number of Geographic Segments	
	1	2	3	4
VW leverage constraint	−1.359***		−0.565***	
	(−4.72)		(−3.29)	
EW leverage constraint		−1.826***		−0.852***
		(−4.64)		(−3.50)
Controls				
Weighted fund beta	−0.558***	−0.586***	−0.376***	−0.494***
	(−3.43)	(−3.59)	(−4.43)	(−4.93)
Fund ownership	−2.384***	−2.402***	−0.259	−0.271
	(−6.54)	(−6.52)	(−1.03)	(−1.07)
Firm size	1.175***	1.169***	0.578***	0.572***
	(14.08)	(14.01)	(12.63)	(12.49)
Profitability	−0.005*	−0.005**	−0.007***	−0.007***
	(−1.92)	(−2.09)	(−5.29)	(−5.39)
Free cash flow	−0.031***	−0.029***	−0.047	−0.044
	(−3.91)	(−3.92)	(−1.27)	(−1.17)
Tangibility	−1.676***	−1.683***	−0.918***	−0.929***
	(−9.94)	(−10.02)	(−9.08)	(−9.18)
Book-to-market	−0.455***	−0.463***	−0.406***	−0.413***
	(−6.58)	(−6.64)	(−6.43)	(−6.53)
Book leverage	0.828***	0.824***	−0.423**	−0.424**
	(6.81)	(6.77)	(−2.36)	(−2.37)
Amihud illiquidity	0.205***	0.204***	0.095***	0.091***
	(4.98)	(4.96)	(4.03)	(3.87)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
No. of obs.	101,077	101,077	101,077	101,077
R^2	0.761	0.761	0.746	0.746

Panel B. Likelihood of Industry-Diversifying Merger and Geography-Diversifying Merger

	Indicator of Industry-Diversifying Merger		Indicator of Geography-Diversifying Merger	
	1	2	3	4
VW leverage constraint	−0.465***		−0.358***	
	(−4.33)		(−3.36)	
EW leverage constraint		−0.567***		−0.456***
		(−4.31)		(−3.55)
Controls				
Weighted fund beta	−0.199**	−0.224***	−0.094	−0.111
	(−2.35)	(−2.67)	(−1.04)	(−1.24)
Fund ownership	0.043	0.042	−0.075**	−0.076**
	(1.37)	(1.35)	(−2.02)	(−2.05)

(continued on next page)

TABLE 6 (continued)
Channel Test: Shareholder Leverage Constraints and Business Activities

Panel B. Likelihood of Industry-Diversifying Merger and Geography-Diversifying Merger (continued)

	Indicator of Industry-Diversifying Merger		Indicator of Geography-Diversifying Merger	
	1	2	3	4
Firm size	0.047***	0.045***	0.066***	0.064***
	(3.19)	(3.02)	(4.41)	(4.28)
Profitability	0.186	0.192	0.504***	0.510***
	(1.31)	(1.35)	(3.71)	(3.76)
Free cash flow	−0.029	−0.031	−0.008	−0.011
	(−0.27)	(−0.30)	(−0.09)	(−0.11)
Tangibility	−0.327***	−0.331***	−0.388***	−0.392***
	(−2.93)	(−2.97)	(−3.77)	(−3.81)
Book-to-market	0.003	0.001	−0.023	−0.024
	(0.09)	(0.03)	(−0.70)	(−0.75)
Book leverage	−0.073	−0.067	0.368***	0.371***
	(−0.72)	(−0.66)	(3.57)	(3.60)
Amihud illiquidity	0.037	0.034	−0.013	−0.015
	(1.05)	(0.98)	(−0.38)	(−0.44)
Relative size	−0.012	−0.012	−0.023	−0.023
	(−0.25)	(−0.25)	(−0.50)	(−0.49)
Deal value	−0.070***	−0.070***	−0.034***	−0.035***
	(−8.44)	(−8.45)	(−3.64)	(−3.67)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
No. of obs.	19,113	19,113	19,113	19,113
R^2	0.094	0.094	0.065	0.065

find a robust negative relationship between shareholder leverage constraints and various measures of internal diversification. In the fully specified model, a 1-standard-deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 5.8% (7.7%) decrease in product diversification and a 2.7% (3.8%) decrease in geographic diversification.

Next, in Panel B, we analyze firms' decisions to engage in diversification enhancing mergers, considering both industry-diversified and geography-diversified mergers. In specifications 1 and 2, the dependent variable is an indicator equal to 1 if the acquirer and target operate in different industries (as identified by the 2-digit SIC code), and 0 otherwise. In specifications 3 and 4, the dependent variable is an indicator equal to 1 if the acquirer and target are located in different, nonadjacent states, and 0 otherwise. We find a strong negative relationship between shareholder leverage constraints and the likelihood of engaging in diversifying M&As. In the fully specified model, a 1-standard-deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 6.5% (7.2%) lower probability of industry-diversifying M&As and a 2.8% (3.6%) lower probability of geography-diversifying M&As. Taken together, these results support the risk-taking channel, indicating that firms held by funds with more binding leverage constraints engage in riskier business activities.

C. Financial Leverage

A natural question is whether firms also take on additional financial risk by increasing leverage. While increasing leverage may be appealing from a risk-taking

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TABLE 7

Shareholder Leverage Constraints and Capital Structure

Table 7 presents the results of regression analyses for firm leverage. The dependent variable is book leverage. In specifications 1–2, the independent variable is the ownership-weighted fund loading on the negative betting-against-beta factor (*VW leverage constraint*) for all domestic equity mutual funds aggregated at the firm level. In specifications 3–4, the independent variable is the equal-weighted fund loading on the negative betting-against-beta factor (*EW leverage constraint*) for all domestic equity mutual funds aggregated at the firm level. All the independent variables are lagged by 1 year. Firm fixed effects and year fixed effects are included in all tests, and standard errors are clustered at the firm level. We report *t*-statistics in the parentheses below coefficient estimates, and statistical significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *, respectively.

	1	2	3	4
VW leverage constraint	−0.029***	−0.029***		
	(−9.47)	(−9.37)		
EW leverage constraint			−0.035***	−0.035***
			(−9.72)	(−9.64)
Controls				
Weighted fund beta		−0.001		−0.002
		(−0.38)		(−0.69)
Fund ownership	−0.028***	−0.028***	−0.028***	−0.028***
	(−10.26)	(−10.27)	(−10.36)	(−10.38)
Firm size	0.037***	0.037***	0.037***	0.036***
	(41.72)	(41.53)	(41.65)	(41.44)
Profitability	−0.033***	−0.033***	−0.033***	−0.033***
	(−8.05)	(−8.04)	(−8.05)	(−8.03)
Free cash flow	−0.002*	−0.002*	−0.002*	−0.002*
	(−1.70)	(−1.70)	(−1.70)	(−1.69)
Tangibility	0.088***	0.087***	0.087***	0.087***
	(15.37)	(15.35)	(15.33)	(15.31)
Book-to-market	−0.007***	−0.007***	−0.007***	−0.007***
	(−7.47)	(−7.48)	(−7.56)	(−7.58)
Amihud illiquidity	0.011***	0.011***	0.011***	0.011***
	(12.53)	(12.45)	(12.51)	(12.39)
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
No. of obs.	103,347	103,347	103,347	103,347
R^2	0.738	0.738	0.738	0.738

perspective, it is directly constrained by rising borrowing costs and stricter borrowing conditions, such as tighter maximum leverage covenants. Moreover, firms may seek to balance operating and financial leverage. As noted by Chen, Harford, and Kamara (2019), higher operating leverage can reduce a firm's ability to meet debt obligations, prompting firms to adopt lower financial leverage. To investigate this issue, we analyze firms' capital structure decisions.

We report the results in Table 7, where the dependent variable is book leverage. We find a robust negative relationship between shareholder leverage constraints and book leverage. Specifically, in the fully specified model, a 1-standard-deviation increase in value-weighted (equally weighted) fund leverage constraints is associated with a 3.6% (4.0%) decrease in book leverage relative to the sample average. This suggests that, although firms might be incentivized to increase risk through higher financial leverage, this tendency is offset by higher agency costs of debt and the trade-off between operating and financial leverage.

D. Moderation Tests

Moreover, if shareholder leverage constraints are associated with heightened concerns about risk-shifting and wealth transfer impacting debtholders, we would

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

expect our findings to be more pronounced in firms facing significant conflicts between debtholders and shareholders. Prior research indicates that the benefits for shareholders from wealth transfers are especially notable in financially distressed firms (Eisdorfer (2008), Gilje (2016)). Conversely, the shareholder–debtholder conflict tends to be mitigated in companies where shareholders also have considerable debt holdings (Jiang, Li, and Shao (2010), Chen, Zhang, and Zhu (2023)). Consequently, we perform moderation tests to explore how shareholder leverage constraints interact with the level of financial distress and the dual holdings of mutual fund families.

We first examine the moderation effects of dual holdings of mutual fund families. For the specific features of loan contracts, such as loan spread, we follow Jiang, Li, and Shao (2010) and construct a loan-based dual-holder indicator variable. Specifically, we match lender names from the LPC's DealScan database with those of mutual fund management companies in the Thomson Reuters Mutual Fund Holdings database. We manually verify the matching results to ensure their accuracy. The dual-holder indicator is equal to 1 if one of the lenders in the syndicated loan package is part of the same financial institution as the mutual fund families that possess the largest mutual fund stake in the firm, and 0 otherwise. For bond-specific features, such as the bond yield spread, we adopt the approach of Chen, Zhang, and Zhu (2023) to define a dual-holder indicator based on bond holdings of institutional investors. Specifically, we gather data on institutional bond holdings from the Thomson Reuters eMAXX (formerly Lipper eMAXX) database and match bondholder names with those of mutual fund management companies in the Thomson Reuters Mutual Fund Holdings database. We manually verify these matches to ensure their accuracy. The dual-holder indicator is set to 1 if the same financial institution owns at least 1% of the firm's outstanding shares and at least 1% of one of its outstanding bonds. For other firm-level dependent variables, such as operating leverage, we calculate a weighted average of the dual-holder indicator, using the loan amount and the face value of outstanding bonds as weights.

We present the results in Panel A of Table 8. The dependent variable in specifications 1–9 includes the CDS spread, bond yield spread, loan spread, collateral requirement, number of covenants, maximum leverage slack, operating cash flow volatility, operating leverage, and book leverage, respectively. Our focus is on the interaction term between shareholder leverage constraints and the dual-holder indicator. As expected, we find that the effects of shareholder leverage constraints are generally mitigated when the severity of debtholder–shareholder conflict is weaker, particularly when fund families hold significant debt stakes in the company.

Next, we examine the moderation effects of financial distress. We expect that the effects of shareholder leverage constraints should be stronger for more financially distressed companies. This is because shareholders of levered firms have incentives to take on higher levels of operating risk as they approach distress, reaping the upside rewards in good states of the world and transferring losses to debtholders in bad states (Jensen and Meckling (1976), Eisdorfer (2008), and Gilje (2016)). To capture the degree of financial distress, we use Bharath and Shumway (2008) measure of expected default frequency (EDF), which is estimated based on a simplified version of Merton (1974) structural distance-to-default model. Firms

TABLE 8

Moderation Tests

Table 8 presents the estimates of moderation tests by interacting shareholder leverage constraints with cross-sectional proxies for the potential of debtholder–shareholder conflicts. Panel A examines the moderation effects of dual holdings of mutual fund families. For the specific features of loan contracts, such as loan spread, we follow Jiang, Li, and Shao (2010) and construct a loan-based dual-holder indicator variable. Specifically, we match lender names from the LPC's DealScan database with those of mutual fund management companies in the Thomson Reuters Mutual Fund Holdings database. The dual-holder indicator is equal to 1 if one of the lenders in the syndicated loan package is part of the same financial institution as the mutual fund families that possess the largest mutual fund stake in the firm, and 0 otherwise. For bond-specific features, such as the bond yield spread, we adopt the approach of Chen, Zhang, and Zhu (2023) to define a dual-holder indicator based on bond holdings of institutional investors. Specifically, we gather data on institutional bond holdings from the Thomson Reuters eMAXX (formerly Lipper eMAXX) database and match bondholder names with those of mutual fund management companies in the Thomson Reuters Mutual Fund Holdings database. The dual-holder indicator is set to 1 if the same financial institution owns at least 1% of the firm's outstanding shares and at least 1% of one of its outstanding bonds. For other firm-level dependent variables, such as operating leverage, we calculate a weighted average of the dual-holder indicator, using the loan amount and the face value of outstanding bonds as weights. Panel B examines the moderation effects of financial distress. To capture the degree of financial distress, we use the Bharath and Shumway (2008) measure of expected default frequency (EDF), which is estimated based on a simplified version of Merton (1974) structural distance-to-default model. Firms with a higher EDF are considered more financially distressed than those with a lower EDF. The dependent variable in specifications 1–9 includes the CDS spread, bond yield spread, loan spread, collateral requirement, number of covenants, maximum leverage slack, operating cash flow volatility, operating leverage, and book leverage, respectively. For brevity, we only report the coefficient of the interested variables. All independent variables are lagged 1 year. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	CDS Spread	Yield Spread	Loan Spread	Collateral Requirement	Number of Covenants	Max. Lev. Slack	Operating Volatility	Operating Leverage	Book Leverage
	1	2	3	4	5	6	7	8	9
Panel A. Interaction with Dual-Holding Indicator									
VW leverage constraint	2.186***	1.648***	0.439***	0.882***	0.373***	−0.065	0.095*	0.007	−0.064***
	(5.21)	(7.15)	(5.96)	(7.92)	(4.06)	(−0.95)	(1.81)	(1.54)	(−4.28)
VW leverage constraint × Dual-Holding Indicator	−1.153**	−0.584**	−0.258**	−0.306	−0.329*	−0.049	−0.188***	−0.003	0.031*
	(−2.28)	(−2.31)	(−1.98)	(−1.40)	(−1.96)	(−0.62)	(−3.15)	(−0.68)	(1.75)
Dual-Holding Indicator	0.012	0.018	−0.044*	0.031	0.011	−0.037***	0.007	0.000	0.013***
	(0.24)	(0.49)	(−1.81)	(0.75)	(0.35)	(−2.66)	(0.62)	(0.61)	(4.27)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2
Panel B. Interaction with Expected Default Frequency									
VW leverage constraint	0.642***	0.522**	0.464***	1.581***	0.605***	−0.056	0.009	0.052***	−0.012***
	(3.21)	(2.18)	(4.66)	(9.43)	(5.08)	(−1.21)	(1.61)	(3.37)	(−2.49)
VW leverage constraint × EDF	25.973**	61.877***	2.107*	−0.990	−0.234	−0.536*	0.034**	0.139*	−0.034*
	(2.56)	(7.17)	(1.69)	(−1.33)	(−0.40)	(−1.66)	(2.38)	(1.66)	(−1.65)
EDF	3.109***	0.864**	0.809***	0.361**	0.000	0.034	0.001	0.030	0.062***
	(4.26)	(2.35)	(6.28)	(2.47)	(0.00)	(0.41)	(0.25)	(1.32)	(10.95)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2

with a higher EDF are considered more financially distressed than those with a lower EDF.

We present the results in Panel B of Table 8. The dependent variable in specifications 1–9 includes the CDS spread, bond yield spread, loan spread, collateral requirement, number of covenants, maximum leverage slack, operating cash flow volatility, operating leverage, and book leverage, respectively. Our focus is on the interaction term between shareholder leverage constraints and the EDF measure. Consistent with our expectation, the results show that the effects of shareholder leverage constraints are more pronounced for more financially distressed companies.

E. Robustness Checks

Next, we investigate the robustness of our results using alternative measures of fund leverage constraints. In the preceding analyses, we identified fund leverage constraints based on rolling regressions of fund returns on the market factor and the negative BAB factor. To fully rule out the concern that fund leverage constraints may be mechanically correlated with the generic risk preferences of mutual funds,

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we construct a residual leverage constraint measure that is orthogonal to fund beta. Specifically, for each year quarter at the fund level, we regress fund leverage constraints (i.e., fund loading on the negative BAB factor) on fund beta (i.e., fund loading on the market factor) and use the regression residual as our measure of leverage constraints. We then compute ownership-weighted residual fund leverage constraints at the stock level and re-estimate our tests using this alternative measure.

In addition, we consider a multifactor model, incorporating the Fama–French–Carhart 4-factor model, which include market (MKT), value (HML), size (SMB), and momentum (UMD) factors. We estimate:

$$R_{i\tau} = \alpha_{it} + \beta^{MKT}{}_{it} R_{MKT,\tau} + \beta^{HML}{}_{it} R_{HML,\tau} + \beta^{SMB}{}_{it} R_{SMB,\tau} + \beta^{UMD}{}_{it} R_{UMD,\tau} + (-BAB_{\tau}) + \varepsilon_{i\tau}. \quad \tau[t-23, t]. \tag{2}$$

We then use $\gamma_{i,t}$ as leverage constraint at the fund level and calculate the ownership-weighted leverage constraint at the stock level. For the Fama–French 4-factor model, the factors are market (MKT), value (HML), size (SMB), profitability (RMW), and investment (CMA). We estimate:

$$R_{i\tau} = \alpha_{it} + \beta^{MKT}{}_{it} R_{MKT,\tau} + \beta^{HML}{}_{it} R_{HML,\tau} + \beta^{SMB}{}_{it} R_{SMB,\tau} + \beta^{RMW}{}_{i,t} R_{RMW,\tau} + \beta^{CMA}{}_{i,t} R_{CMA\tau} + (-BAB_{\tau}) + \varepsilon_{i\tau}, \quad \tau[t-23, t]. \tag{3}$$

We then use $\gamma_{i,t}$ as leverage constraint at the fund level and calculate the ownership-weighted leverage constraint at the stock level.

The results based on these alternative measures are consistent with our main findings, alleviating concerns that when leverage constraints compel funds to take on more systematic risk in their portfolios, they may load more heavily on other dimensions of priced risk rather than market risk.[22]

V. Assessing Causality

A critical step is to assess whether the relationship between shareholder leverage constraints and their effect on debtholders is *causal.* To properly evaluate causality, we conduct a threefold analysis.

A. Degree of Fund Influence

First, we examine whether the impact is stronger when funds exert greater influence on the company. We consider several measures of fund influence: geographical distance, investment horizon, fund ownership, and ownership concentration. Geographically closer shareholders are more likely to communicate directly with management and have their views heard (Ayers, Ramalingegowda, and Yeung (2011)). Moreover, proximity facilitates information collection and reduces the

[22] We report these results in the Supplementary Material (Table IA-1).

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

travel costs associated with attending meetings or serving on the board (Chhaochharia, Kumar, and Niessen-Ruenzi (2012)). In addition, the literature documents that long-term shareholders are more likely to influence management through direct engagement (Chen, Harford, and Li (2007)), whereas short-term investors prioritize information acquisition for trading (Yan and Zhang (2009)) and have lower incentives to exert influence on corporate policies. Furthermore, survey evidence suggests that large institutional investors frequently influence management through private, behind-the-scenes engagement (McCahery, Sautner, and Starks (2016)). For each stock, we reconstruct shareholder leverage constraints based on the largest fund, large funds (top five funds), and small funds (bottom five funds). The larger a fund's stake, the stronger its incentives to monitor the firm and influence management. We expect our previously documented results to be driven by funds that are geographically closer, have long-term investment horizons, hold larger stakes, and exhibit higher ownership concentration.[23]

We report the results in Table 9. Panels A–D present regressions in which the ownership-weighted fund leverage constraints are interacted with weighted fund distance, weighted fund turnover, fund ownership, and ownership concentration, respectively. As before, we repeat all prior analyses using the fully specified models and, for brevity, only report the coefficients of the key variables. As expected, we find that the previously documented results are primarily driven by the leverage constraints of funds with long-term horizons, located nearby, holding larger stakes, and exhibiting higher ownership concentration.

We also reaggregate fund leverage constraints based solely on the largest fund (Panel E), large funds (top five funds, Panel F), and small funds (bottom five funds, Panel G). In most specifications of Panels E and F, the coefficients of fund leverage constraints are larger in absolute terms, suggesting that leverage constraints become more influential when funds hold larger ownership stakes in the company. In contrast, in Panel G, where we examine funds with the bottom five ownership stakes, the insignificance of the fund leverage constraint coefficients across all regressions suggests that funds with minimal influence do not explain our findings.

B. Merger of Asset Management Companies

Second, we explore a dynamic specification that leverages time-series variation in shareholder leverage constraints resulting from mergers of asset management companies. Portfolio repositioning often occurs following a merger between two institutions, typically with the acquired fund adjusting its investment policies or strategies to align with those of the acquiring fund. This process leads to time-series changes in fund leverage constraints for stocks primarily held by the acquired funds. As fund mergers are largely driven by deregulation, industry consolidation, or mutual funds' pursuit of economies of scale (Jayaraman, Khorana, and Nelling (2002), He and Huang (2017)), these time-series changes in fund leverage constraints are relatively exogenous to other unobservable firm-specific characteristics.

[23]We define *weighted fund distance* as the ownership-weighted fund-firm distance aggregated at the stock level, *weighted fund turnover* as the ownership-weighted fund turnover aggregated at the stock level, *fund ownership* as the total mutual fund ownership relative to shares outstanding, and *ownership concentration* as the Herfindahl index of fund ownership aggregated at the stock level.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 9

Interaction with Fund Influence

In Table 9, we examine the role played by the strength of fund influence. Panels A–D present cross-sectional tests regarding the influence of mutual funds. We proxy for mutual fund influences along four dimensions, that is, fund distance, fund turnover, fund ownership, and ownership concentration. *Weighted fund distance* is the ownership-weighted fund-firm distance aggregated at the stock level. *Weighted fund turnover* is the ownership-weighted fund turnover aggregated at the stock level. *Fund ownership* is the total mutual fund ownership relative to shares outstanding. *Ownership concentration* is the Herfindahl–Hirschman (HHI) index of the mutual fund holding in the firm relative to the fund's total holdings. In Panels A–D, we interact the ownership-weighted fund leverage constraints with the weighted fund distance, weighted fund turnover, fund ownership, and ownership concentration, respectively. In Panels E–G, we reconstruct *VW leverage constraint* based on the fund with the largest holding in the firm (Panel E), the top five mutual fund investors holding the firm (Panel F), as well based on the bottom five funds holding the firm (Panel G). For brevity, we only report the coefficient of the interested variables. All independent variables are lagged 1 year. ***, ** and * indicate significance at the 1%, 5%, and 10% levels, respectively

	CDS Spread	Yield Spread	Loan Spread	Collateral Requirement	Number of Covenants	Max. Lev. Slack	Operating Volatility	Operating Leverage	Book Leverage
	1	2	3	4	5	6	7	8	9
Panel A. Interaction with Weighted Fund Distance									
VW leverage constraint	5.237**	2.897***	2.649***	3.747***	1.085*	−0.436	0.032***	0.435**	−0.069***
	(2.10)	(2.87)	(2.58)	(3.23)	(1.82)	(−1.17)	(3.38)	(2.09)	(−4.40)
VW leverage constraint × Weighted fund distance	−0.648*	−0.282*	−0.312**	−0.365**	−0.066	0.055	−0.004***	−0.050*	0.005*
	(−1.84)	(−1.85)	(−2.13)	(−2.20)	(−0.96)	(1.04)	(−3.05)	(−1.68)	(1.85)
Weighted fund distance	−0.040	−0.097**	0.097***	0.087	0.048*	−0.016	−0.000	0.013	−0.000
	(−0.45)	(−2.15)	(2.76)	(1.54)	(1.70)	(−1.13)	(−0.21)	(1.27)	(−0.17)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2
Panel B. Interaction with Weighted Fund Turnover									
VW leverage constraint	1.537***	2.798***	0.518***	0.792***	0.805***	−0.098	0.013***	0.052***	−0.024***
	(3.84)	(5.73)	(5.12)	(5.79)	(4.20)	(−1.54)	(3.14)	(3.78)	(−4.50)
VW leverage constraint × Weighted fund turnover	−10.485***	−12.642***	−1.461**	−1.788**	−3.860**	0.069	−0.056**	−0.156*	0.085*
	(−3.17)	(−3.02)	(−2.31)	(−2.12)	(−2.29)	(0.11)	(−1.99)	(−1.69)	(1.73)
Weighted fund turnover	1.764***	0.351	0.860***	1.952***	1.331***	−0.135	−0.018***	−0.083***	−0.082***
	(4.00)	(0.57)	(4.98)	(6.43)	(4.84)	(−1.36)	(−2.87)	(−3.44)	(−8.23)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2
Panel C. Interaction with Fund Ownership									
VW leverage constraint	0.195	0.710***	0.401***	0.568***	0.312***	−0.081*	0.003**	0.025*	−0.010***
	(0.54)	(3.34)	(5.60)	(5.54)	(2.64)	(−1.89)	(2.30)	(1.92)	(−2.62)
VW leverage constraint × Fund ownership	1.144**	0.136	0.719**	2.201***	1.472***	−0.059	0.013*	0.612***	−0.146***
	(2.23)	(0.48)	(2.36)	(4.32)	(3.91)	(−0.49)	(1.87)	(4.71)	(−6.74)
Fund ownership	−0.799***	−0.498***	0.040	−0.341***	−0.131	0.017	−0.003	0.009	−0.012***
	(−6.65)	(−8.43)	(0.59)	(−2.97)	(−1.59)	(0.15)	(−1.54)	(0.90)	(−4.40)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2
Panel D. Interaction with Ownership Concentration									
VW leverage constraint	−0.328	0.968***	0.310***	0.519***	−0.036	0.057	0.001	0.020*	−0.016***
	(−0.70)	(2.76)	(3.16)	(3.96)	(−0.24)	(1.25)	(0.41)	(1.71)	(−3.30)
VW leverage constraint × Ownership concentration	1.128***	0.538*	0.238**	0.359**	0.726***	−0.157***	0.006**	0.010	−0.013**
	(2.91)	(1.74)	(2.28)	(2.54)	(4.30)	(−5.21)	(2.37)	(0.76)	(−2.40)
Ownership concentration	−0.353***	0.064	−0.038**	−0.053**	−0.066**	0.011	−0.001	−0.015***	−0.001**
	(−2.96)	(0.83)	(−2.14)	(−2.55)	(−2.29)	(1.09)	(−1.01)	(−4.39)	(−2.53)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2
Panel E. Analysis Using Mutual Fund with the Largest Holding									
VW leverage constraint (Top 1 Fund)	1.107***	1.659***	0.523***	0.834***	0.350***	−0.102***	0.012***	0.049***	−0.030***
	(6.98)	(7.18)	(7.60)	(8.09)	(4.20)	(−3.57)	(3.20)	(4.27)	(−7.77)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2
Panel F. Analysis Using Top Five Mutual Funds									
VW leverage constraint (Top 5 Funds)	1.340***	0.904***	0.490***	1.463***	0.467***	−0.121***	0.013***	0.075***	−0.038***
	(7.71)	(5.68)	(4.44)	(7.36)	(3.69)	(−2.73)	(2.84)	(3.26)	(−6.31)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2

(continued on next page)

TABLE 9 (continued)
Interaction with Fund Influence

	CDS Spread	Yield Spread	Loan Spread	Collateral Requirement	Number of Covenants	Max. Lev. Slack	Operating Volatility	Operating Leverage	Book Leverage
	1	2	3	4	5	6	7	8	9
Panel G. Analysis Using Bottom Five Mutual Funds									
VW leverage constraint (Bottom 5 Funds)	0.604	0.463	−0.022	0.450	−0.073	−0.051	0.003	0.007	−0.005
	(1.59)	(1.59)	(−0.13)	(1.53)	(−0.45)	(−0.92)	(0.99)	(0.24)	(−0.32)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2

This allows us to analyze firms' responses in terms of corporate risk-taking and borrowing costs.

We obtain data on financial company mergers from the SDC Mergers and Acquisitions database during our sample period. We manually match the names of acquirers and targets with the management company names from the CRSP Mutual Fund database to ensure that the mergers were completed. The initial sample consists of 347 investment company mergers. We then integrate this sample with the Thomson Reuters Mutual Fund Database to obtain information on mutual fund holdings.

Our analysis focuses on fund family mergers involving the largest mutual fund investors in our sample firms, as these influential investors are most likely to significantly impact shareholder leverage constraints before and after the merger. This approach yields 5692 firm-year observations in which the largest mutual fund investors experienced merger events among asset management institutions. For each firm year, we define the event year as year t, when the firm's largest mutual fund investor is acquired by another asset management company. We then calculate the change in leverage constraint Δ *Fund leverage constraint* for the firm's largest mutual fund holder between year $t + 1$ and year t.[24] Next, we regress the changes in our primary focus variables between year $t + 1$ and year t—specifically, changes in CDS spread, bond yield spread, loan spread, likelihood of collateral requirements, covenant slack, number of covenants, operating volatility, operating leverage, and book leverage—on the change in fund leverage constraints. For nonpanel variables such as loan spread, collateral requirements, maximum leverage covenant slack, and the number of covenants, we compute yearly averages and then take the differences.[25]

We present the results in Table 10. Our analysis reveals a positive relationship between changes in fund leverage constraints and our key dependent variables: the cost of borrowing, the strictness of loan contracts, and corporate risk-taking. In addition, we continue to observe a negative relationship between changes in fund leverage constraints and changes in book leverage. Most regression analyses indicate that these effects are statistically significant at least at the 10% level. These results, derived from time-series changes in shareholder leverage constraints

[24]For example, Managers Funds LLC was the largest mutual fund shareholder of Sequa Corporation in 1999, and it was acquired by AMG Funds LLC that same year. As a result of the merger, the difference in fund leverage constraint (i.e., Δ *Fund leverage constraint*) increases by 0.487 for Sequa Corporation from 1999 to 2000.

[25]The results remain consistent if we use the differences between year $t + 1$ and year $t - 1$.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 10

Mutual Fund Family Merger Analysis

In Table 10, we focus on time-series variations in fund leverage constraints resulting from the mergers of asset management companies. We obtain completed merger events involving asset management companies from the SDC Mergers and Acquisitions database. Specifically, we focus our analysis of fund family mergers on the largest mutual fund investors of the sample firms. For each firm-year, we identify the event year as year *t*, when the firm's largest mutual fund investor is acquired by another asset management company. Then, we regress the changes in our primary focus variables on the change in fund leverage constraint between year $t+1$ and year *t*. We always control for the change of other independent variables. Standard errors are clustered at the stock level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively

	Δ CDS Spread	Δ Yield Spread	Δ Loan Spread	Δ Collateral Requirement	Δ Number of Covenants	Δ Max. Lev Slack	Δ Operating Volatility	Δ Operating Leverage	Δ Book Leverage
	1	2	3	4	5	6	7	8	9
Δ *Fund leverage constraint*	0.457**	1.696***	0.420**	0.124*	0.055	−0.003	0.007**	0.070**	−0.013*
	(2.05)	(3.30)	(2.01)	(1.66)	(0.20)	(−0.04)	(2.06)	(2.42)	(−1.83)
Controls									
Δ Weighted fund beta	0.310	−3.098***	0.357*	0.122*	0.002	−0.073	−0.006	0.005	−0.011
	(0.61)	(−3.62)	(1.69)	(1.68)	(0.01)	(−1.04)	(−1.55)	(0.20)	(−1.46)
Δ Fund ownership	−0.201	0.214	0.249	0.088	−0.400	0.019	−0.003	−0.073	−0.009
	(−0.91)	(0.98)	(1.11)	(0.70)	(−0.98)	(0.35)	(−0.47)	(−0.98)	(−0.90)
Δ Firm size	−0.311	−0.287	0.155	−0.106**	−0.143	−0.021	0.015***	0.011	0.005
	(−1.36)	(−0.86)	(1.08)	(−2.40)	(−1.05)	(−0.42)	(3.74)	(0.24)	(1.29)
Δ Profitability	−0.410	−0.330	−3.064***	−0.159	−1.471	−0.061	−0.025	−0.185	0.003
	(−0.58)	(−0.24)	(−3.22)	(−0.77)	(−1.52)	(−0.20)	(−0.84)	(−1.45)	(0.29)
Δ Free cash flow	−0.024	−2.378*	0.321	0.021	0.443	−0.262	−0.011	−0.040	−0.005
	(−0.05)	(−1.84)	(0.53)	(0.16)	(1.05)	(−1.11)	(−0.49)	(−0.63)	(−0.95)
Δ Tangibility	−0.386	3.706*	0.393	−0.055	1.004	−0.283	0.032	−0.149	0.045*
	(−0.45)	(1.70)	(0.61)	(−0.28)	(1.12)	(−1.36)	(1.59)	(−1.04)	(1.66)
Δ Book-to-market	0.202	0.932***	0.070	0.019	0.187*	0.000	0.006*	0.018	0.003
	(0.94)	(2.78)	(0.46)	(0.48)	(1.83)	(0.01)	(1.79)	(1.44)	(1.40)
Δ Book leverage	0.785*	2.272*	0.729**	0.132	−0.298	−0.448**	0.007	0.037	
	(1.76)	(1.93)	(2.19)	(1.14)	(−0.68)	(−2.15)	(0.97)	(0.81)	
Δ Amihud illiquidity	10.003***	0.749	1.964***	0.073	0.217	−0.077	−0.002	0.002	−0.009
	(3.40)	(0.58)	(3.45)	(0.43)	(0.33)	(−0.63)	(−1.08)	(0.07)	(−1.15)
Δ Other relevant controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specification	Table 3 Panel A Column 3	Table 3 Panel B Column 3	Table 4 Panel A Column 1	Table 4 Panel A Column 3	Table 4 Panel B Column 1	Table 4 Panel B Column 3	Table 5 Column 1	Table 5 Column 3	Table 7 Column 2
No. of obs.	341	681	797	797	320	50	5,062	5,220	5,792
R^2	0.091	0.171	0.121	0.027	0.066	0.227	0.063	0.009	0.030

following mergers of asset management companies, reinforce the causal relationships identified in our main findings.[26]

C. Instrumental Variables Regression

Third, we provide a direct test of causality using an instrumental variable specification. The instrument is based on Edmans, Goldstein, and Jiang (2012), which identifies an exogenous supply-driven shock using the occurrence of extreme fund outflows. Such outflows affect a fund's need to borrow. The Investment

[26]In an unreported analysis, to further explore the time-series variation in fund leverage constraints, we identify the top three largest mutual fund investors for each firm and conduct regression analyses at the fund-firm pair level. Here, after controlling for time fixed effects and fund-firm fixed effects, the variation in fund leverage constraints is likely driven by high-frequency turnover among large mutual fund investors or time-series changes in their fund leverage constraints. In this context, we consistently find that fund leverage constraints are positively associated with corporate risk-taking and the borrowing restrictions imposed by debtholders.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

Company Act allows mutual funds, subject to formal regulations and reporting requirements, to "borrow for liquidity" in order to meet redemption requests. By borrowing to meet large redemptions, a fund avoids the immediate sale of portfolio assets. As stated by the SEC, "it is relatively common for funds to establish lines of credit to manage liquidity risk" (https://www.federalregister.gov/documents/2015/10/15/2015-24507/open-end-fund-liquidity-risk-management-programs-swing-pricing-re-opening-of-comment-period-for).

Using a new data set—specifically, recent N-CEN filings reported by open-end mutual funds after 2019—on credit line (and other types of loan) extensions by bank holding companies,[27] Cai and Shin (2021) show that bank credit, particularly in the form of credit lines, has provided open-end funds with an important liquidity source from which they can draw cash in times of excessive fund outflows. These findings suggest that leverage constraints become more binding for funds facing extreme outflows. Therefore, we expect that during surges in redemptions caused by extreme fund outflows, mutual funds will be subject to tighter leverage constraints. We define a fund as facing an "extreme outflow" if it experiences redemptions of at least 5% of total fund assets. We expect that large outflows will exacerbate the binding nature of fund leverage constraints.[28]

Moreover, to mitigate the concern that extreme outflows may be driven by deteriorating firm conditions in the underlying portfolio companies, we identify, for each fund, a *neighboring extreme fund outflow* indicator. This indicator reflects whether another fund headquartered within 50 miles experiences extreme outflows. The intuition behind this approach is that neighboring funds tend to share a similar investor base and are subject to similar supply-driven shocks.

To further address the concern that investors with correlated liquidity shocks may invest in funds with correlated holdings, we construct firm-specific measures that proxy for the degree of correlation in liquidity shocks and fund holdings across funds holding a given stock. For correlated liquidity shocks, we follow Gong, Lin, and Zwinkels (2017) to construct a measure of flow-driven skewness, which

[27]The SEC has adopted new rules and forms as well as amendments to its rules and forms to modernize the reporting and disclosure of information by registered investment companies. Specifically, starting from 2019, open-end funds are required to file Form N-CEN to report certain census-type information to the SEC in a structured data format, which includes disclosure of information on their liquidity management activities.

[28]When facing extreme outflow shocks, mutual funds may also sell stocks with higher liquidity to meet redemption needs. Indeed, Cai and Shin (2021) find that mutual funds that hold more illiquid assets are more reliant on bank credit during the periods of excess fund outflows. It may be the case that low-beta stocks generally tend to be more liquid than high-beta stocks, which mechanically leads to a positive relationship between extreme fund outflow and the measure of fund leverage constraint. However, in an unreported analysis, we find that the Amihud illiquidity measure is significantly negatively related to stock beta in various regression specifications, suggesting that high-beta stocks tend to be more liquid than low-beta stocks. This relationship may be due to the fact that high-beta stocks tend to be probusiness cycle and subject to less firm-specific information asymmetry for equity investors, thereby leading to a lower price impact of trading. This evidence helps us address the concern of a liquidity explanation of the link between the instrument and fund leverage constraints.

captures the correlation of liquidity-driven trading among mutual funds.[29] This measure sums the skewness in the flows of a stock's mutual fund investors and the co-skewness between their flows. A higher value indicates that the flows of a stock's mutual fund investors are more negatively skewed and display greater co-movement. To proxy for the degree of correlated holdings among a firm's mutual fund investors, we construct, for each stock quarter, the portfolio correlation across mutual funds.[30] By controlling for these two measures, we mitigate the concern that the effect of the instrument is driven by correlated liquidity shocks.

We report the results of the instrumental variables analysis in Table 11. We find that the proportion of funds with neighboring funds experiencing extreme outflows in the previous year is strongly positively related to investor leverage constraints in the first-stage regression. The second-stage regression results confirm our previous findings: the more constrained mutual funds are in terms of leverage, the more they induce firm risk-taking in business activities. In addition, debtholders respond by charging a higher cost of borrowing, imposing tighter covenants, and leading to a reduction in firm leverage. A 1-standard-deviation increase in investor leverage constraints is associated with an 11.4% higher CDS spread, a 9.5% higher bond yield spread, a 3.2% higher loan spread, an 11.2% higher likelihood of collateral requirements, a 2.8% increase in operating cash flow volatility, a 4.8% increase in

[29]For each stock quarter, the covariance–variance matrix Ω_t and coskewness–skewness matrix M_t are calculated on a rolling window basis, of which the window size T is 5 years, or equivalently 20 quarterly observations. For mutual fund k at quarter t, we calculate the percentage change of fund flow as $f^{\%}_{k,t} = \frac{TNA_{k,t} - TNA_{k,t-1}(1+R_{k,t})}{TNA_{k,t-1}}$, where $TNA_{k,t}$ is the total net asset and $R_{k,t}$ is the mutual fund return. Then, Ω_t is calculated as:

$$\Omega_t = \tfrac{1}{t-1} diag(TNA_t) * \left(F^{\%}_t - \overline{F^{\%}_t}\right)' * \left(F^{\%}_t - \overline{F^{\%}_t}\right) * diag(TNA_t),$$

where TNA_t is a vector which collects the $TNAs$ of mutual funds which hold the stock at quarter t, and $diag(TNA_t)$ is the $K \times K$ diagonal matrix whose kth term is $TNA_{k,t}$. $F^{\%}_t$ is a $T \times N$ matrix that collects the percentage fund flows of N mutual funds that hold the stock at quarter t, whereby the kth column of $F^{\%}_t$ is the percentage flow of mutual fund k, and $\overline{F^{\%}_t}$ is the mean percentage flow during the rolling window T. Next, for N mutual funds that hold the stock at quarter t, the skewness–coskewness matrix M_t is identified as : $[M_{1,t} M_{2,t} M_{3,t} \ldots M_{k,t} \ldots M_{N,t}]$. $M_{k,t}$ is calculated as:

$$M_{k,t} = \frac{1}{t-1} diag(TNA_t) * \left(F^{\%}_t - \overline{F^{\%}_t}\right)' * \left(TNA_{k,t} * diag\left(f^{\%}_{k,t} - \overline{f^{\%}_{k,t}}\right)\right) * \left(F^{\%}_t - \overline{F^{\%}_t}\right) * diag(TNA_t),$$

where $f^{\%}_{k,t}$ is the vector of percentage flow of mutual fund k during the rolling window T. To ensure calculation capacity, we restrict a firm's holding institutions to the top 20 mutual fund investors. Then, each stock-quarter (i,t), the correlation of liquidity shocks facing its mutual fund investors is calculated as:

$$Correlated\ Liquidity\ Shocks = -W_{it}' M_t (W_{it} \otimes W_{it}) / (W_{it}' \Omega_t W_{it})^{3/2},$$

where W_{it} is the vector of holding weights of stock i at quarter t, and $\otimes$ represents the Kronecker product.

[30]The measure is defined as $Correlated\ Fund\ Holdings = \left[\sum_{p \in S} \omega_{p,t} \left(\sum_{q \in S} \omega_{q,t} Corr_{p,q,t}\right)\right]$, where S is the set of mutual funds in the stock at quarter t, $\omega_{p,t}$ ($\omega_{q,t}$) is the weight of fund $p(q)$'s holding in the stock in the total holding of fund $p(q)$ at quarter t, and $Corr_{p,\ q,\ t}$ is the correlation coefficient of the portfolio weight allocated to the overlapping holdings between funds p and q at quarter t.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 11

Instrumental Variables Regression

Table 11 presents the results of two-stage least squares (2SLS) regressions. The sample size differs across regressions depending on data availability. The instrument is *Neighboring extreme fund outflows*, defined as the percentage of mutual funds (out of total number of funds holding the stock) with neighboring funds which experienced extreme fund outflows in the previous year. We identify extreme fund outflows if a fund experiences outflows of at least 5% of its total assets. For each fund, we identify its neighboring funds as those located within 50 miles of the fund in the same city. Specification 1 reports results from the first-stage regressions where the dependent variable is *VW leverage constraint*. Specifications 2–10 report results from the second-stage regressions. All the independent variables are lagged 1 year. Standard errors are clustered at the stock level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively

	First-Stage Regression	Second-Stage Regressions								
	VW Leverage Constraint	CDS Spread	Yield Spread	Loan Spread	Collateral Requirement	Number of Covenants	Max. Lev. Slack	Operating Volatility	Operating Leverage	Book Leverage
	1	2	3	4	5	6	7	8	9	10
VW leverage constraint		1.068*	1.653**	0.695*	0.795***	1.072**	−0.187	0.005	0.299*	−0.056*
		(1.77)	(2.51)	(1.65)	(3.76)	(2.15)	(−0.91)	(0.63)	(1.77)	(−1.77)
Neighboring extreme fund outflows	0.069***									
	(11.67)									
Controls										
Weighted fund beta	0.228***	−0.305	−1.196***	0.234*	0.205***	0.101	0.066	0.001	−0.042	0.017**
	(20.35)	(−1.27)	(−4.59)	(1.96)	(3.10)	(0.67)	(1.02)	(0.70)	(−0.99)	(2.11)
Fund ownership	−0.010	−0.725***	−0.194***	−0.042	−0.107***	−0.141***	0.018	−0.007***	−0.032***	−0.050***
	(−0.78)	(−9.60)	(−6.74)	(−0.85)	(−5.15)	(−2.88)	(0.95)	(−6.32)	(−4.04)	(−10.68)
Firm size	−0.023***	−0.053	−0.061	−0.115***	−0.051***	−0.111***	0.081	−0.006***	−0.018**	0.036***
	(−8.32)	(−0.98)	(−1.31)	(−7.95)	(−8.39)	(−6.51)	(1.01)	(−12.55)	(−2.20)	(17.60)
Profitability	0.005	−1.365***	−1.357***	−2.923***	−0.464***	0.274**	0.072	−0.015***	−0.000	−0.002
	(0.38)	(−4.09)	(−5.41)	(−18.06)	(−8.76)	(2.34)	(1.11)	(−2.60)	(−0.52)	(−0.20)
Free cash flow	0.002	−0.280	−0.768***	−0.413***	−0.058	0.368***	0.028	−0.036***	−0.082***	−0.018***
	(0.61)	(−0.96)	(−3.41)	(−4.92)	(−1.52)	(4.72)	(1.02)	(−6.71)	(−3.05)	(−4.48)
Tangibility	−0.022***	−0.551**	−0.218	−0.237***	−0.046**	−0.073*	−0.009	−0.032***	0.047	0.157***
	(−3.77)	(−2.11)	(−0.97)	(−6.16)	(−2.28)	(−1.89)	(−0.93)	(−9.32)	(1.50)	(5.40)
Book-to-market	0.005***	0.490***	0.713***	0.075***	0.027***	0.050***	−0.454***	0.000	0.020***	−0.005***
	(2.97)	(9.92)	(17.77)	(4.62)	(4.45)	(3.60)	(−11.33)	(0.83)	(3.43)	(−5.30)
Book leverage	−0.011***	1.212***	2.311***	1.613***	0.457***	0.710***	−0.018*	−0.008***	−0.056**	
	(−6.22)	(7.67)	(13.27)	(30.72)	(18.24)	(14.22)	(−1.79)	(−3.28)	(−2.40)	

(continued on next page)

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

TABLE 11 (continued)

Instrumental Variables Regression

	First-Stage Regression	Second-Stage Regressions								
	VW Leverage Constraint	CDS Spread	Yield Spread	Loan Spread	Collateral Requirement	Number of Covenants	Max. Lev. Slack	Operating Volatility	Operating Leverage	Book Leverage
	1	2	3	4	5	6	7	8	9	10
Amihud illiquidity	−0.004***	10.195***	0.798**	0.158***	0.055***	−0.061**	0.002	−0.001	−0.007	0.011***
	(−4.26)	(5.09)	(2.38)	(5.80)	(5.06)	(−2.55)	(0.09)	(−1.62)	(−1.25)	(8.75)
Correlation in liquidity shocks	0.018**	0.020*	0.013	0.000	−0.000***	0.000**	−0.003	0.000	0.000***	−0.000
	(2.37)	(1.73)	(1.23)	(1.46)	(−2.75)	(2.07)	(−1.05)	(1.28)	(3.29)	(−0.79)
Correlation in fund holdings	0.018**	−0.000	0.002**	0.051	−0.058**	−0.085	−0.000	−0.001	0.003	0.000
	(2.21)	(−0.24)	(2.04)	(1.03)	(−2.01)	(−1.64)	(−0.02)	(−0.44)	(0.14)	(0.08)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes
Industry FE	No	No	No	Yes	Yes	Yes	Yes	No	No	No
Credit rating FE	No	No	No	Yes	Yes	Yes	Yes	No	No	No
No. of obs.	59,176	5,531	8,139	14,234	14,297	8,609	2,079	50,581	51,371	59,176

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

operating leverage, and a 1.5% decrease in book leverage, relative to the unconditional sample average. Overall, these results provide further evidence of causality.

Taken together, all previous results suggest a causal relationship between shareholder leverage constraints and debtholder-related outcomes. Furthermore, we address concerns regarding reverse causality by performing Granger causality tests. Specifically, we regress the yearly change in the value-weighted fund leverage constraint on the yearly change in key variables identified as being affected by leverage constraints (i.e., CDS spread, bond yield spread, loan spread, likelihood of collateral requirements, number of covenants, maximum leverage covenant slack, operating cash flow volatility, operating leverage, and book leverage). All independent variables are lagged by 1 year.[31] We also include lagged changes in all relevant control variables and lagged shareholder leverage constraints in each regression. The results show no significant evidence of reverse causality from debtholder-related variables to shareholder leverage constraints.[32]

VI. Additional Analyses

A. Implications on Market Risk of Corporate Bonds

As previously discussed, even though leverage-constrained investors are willing to accept a lower return–risk tradeoff than their unconstrained counterparts, this does not imply that they become risk-loving in all respects. In particular, leverage-constrained investors increase firms' exposure to priced systematic risk. Our results confirm this, and the economic channel operates through business activities such as higher operating cash flow volatility and higher operating leverage. We now explore the implications of such systematic business risk exposure for debtholders. Extant studies have documented that firms with greater business exposure to macroeconomic shocks, as measured by operating leverage, face a higher cost of borrowing (Chen, Collin-Dufresne, and Goldstein (2009), Kuehn and Schmid (2014), and Bhojraj et al. (2021)). This suggests that the systematic risk profile of a firm's underlying business is an important consideration for debtholders. In addition, recent research has shown that exposure to the overall corporate bond market is a key factor in explaining cross-sectional bond returns (Dickerson, Mueller, and Robotti (2023)).

Therefore, we expect that the higher systematic risk embedded in a firm's business should manifest in the sensitivity of bond returns to the overall bond market. This suggests a positive relationship between shareholder leverage constraints and the sensitivity of bond returns to the corporate bond market ("bond beta"). To test this, we estimate the bond-specific beta as the regression coefficient of monthly excess bond returns (over the risk-free rate) on the bond market's excess return (over the risk-free rate), using monthly bond returns from the current year and the following 2 years. We then calculate the issue-amount-weighted bond beta at the

[31] As the previous analyses for loan spread, likelihood of collateral, number of covenant, and maximum leverage covenant slack are not based on panel regressions. We take the average for each firm-year to run the time-series regressions.

[32] These results are reported in the Supplementary Material (Table IA-2).

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issuer level and examine its relationship with the measure of shareholder leverage constraints.

The results reveal that a firm's shareholder leverage constraint is positively related to its bond beta. This suggests that higher systematic risk-taking in the firm's business operations increases the sensitivity of bond returns to the overall bond market, prompting bondholders to demand a higher cost of borrowing for firms held by leverage-constrained shareholders.[33]

B. Implications on Cost of Equity

Next, we consider the implications on cost of equity. All else equal, leverage-constrained investors are willing to accept a lower net-of-risk return in exchange for higher gross-of-risk performance. They achieve this by influencing corporate managers to increase business exposure to systematic risks, thereby raising the cost of equity. To quantify this effect, we match each firm with a comparable firm that is closest in terms of market size and belongs to the same industry (using either the 3-digit SIC code or the Hoberg–Phillips industry classification). We then calculate the excess cost of equity as the excess market beta (i.e., the beta of the stock minus the beta of the matched firm) multiplied by an assumed market risk premium of 6%. Finally, we relate the excess cost of equity to shareholder leverage constraints.[34] The intuition is that the comparable firm has the "correct" beta given its characteristics, whereas the studied firm's beta may be distorted by the influence of leverage-constrained funds. The excess cost of equity serves as a proxy for the higher cost of equity associated with leverage-constrained investors. We find that a 1-standard-deviation increase in shareholder leverage constraints is associated with a 5.6% to 6.7% standard deviation higher excess cost of equity.[35]

C. Discussions on Equity Value

Finally, we discuss the implications of shareholder leverage constraints on equity value. We argue that leverage constrained mutual funds want to influence their portfolio companies to take higher risk in their business operations, which would elevate the stockholder–bondholder conflict and cause a wealth transfer from debtholders to equity holders. In other words, when facing mutually exclusive projects with similar NPVs, we expect that firms influenced by leverage constrained mutual funds would favor the high-beta projects at the expense of debtholders.[36]

[33]These results are reported in the Supplementary Material (Table IA-3).

[34]We choose this approach to analyze the value implications for shareholders rather than relying on price-related multiples or realized stock returns, as these metrics can be directly influenced by the beta anomaly.

[35]These results are reported in the Supplementary Material (Table IA-4).

[36]For example, a firm is evaluating two mutually exclusive projects, Project A and Project B, each requiring an initial investment of $5 million and lasting 1 year. The projects differ in their operating risks: one involves a speculative technology with high market sensitivity (higher beta, riskier), while the other involves a proven technology with stable demand (lower beta, less risky). Each project uses a discount rate based on its beta, derived from the CAPM. Assume a risk-free rate of 5% and a market risk premium of 5%. Project A is the riskier project with a high beta of 3. Therefore, the discount rate for Project A is: $5\% + 3 \times 5\% = 20\%$. It will generate a future cash flow of $10 million in good market conditions (50% chance) and a future cash flow of $2 million in bad market conditions (50% chance). Project B is the less

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This is due to the nature of equity as a call option on the firm's underlying asset (Merton (1974)). Greater operational risks enhance the call option's value (equity) due to the asymmetric nature of option value: equity holders gain from upside potential while facing limited downside risk. More severely, firms may even choose negative NPV projects if the wealth transfer effect is large enough to compensate the loss in firm value in choosing negative NPV projects (Damodaran (1999)).

These discussions align with our previous findings that shareholder leverage constraints have a greater influence on corporate risk-taking and debt costs for firms experiencing heightened debtholder-shareholder conflict. In this scenario, the impact on equity value resulting from the transfer of wealth from debtholders to equity holders will be more pronounced in financially distressed firms, while this effect tends to be mitigated for those where shareholders hold both equity and debt stakes in the company.[37]

VII. Conclusion

We examine how shareholder leverage constraints affect the cost of debt, loan contract design, and corporate risk-taking. When equity investors face constraints in their ability to use leverage, they tilt their portfolios toward riskier high-beta assets. The direct implication is that leverage-constrained shareholders encourage firms to engage in risk-taking activities, potentially at the expense of debtholders. We hypothesize that asset managers' leverage constraints increase the risk-taking activities of portfolio companies, translating into higher credit risk and exacerbating debtholders' concerns regarding risk-shifting and wealth transfer. As a result, debtholders respond by demanding a higher cost of borrowing and more stringent borrowing conditions, such as collateral requirements and covenant restrictions.

Using a large sample of U.S. mutual funds and their portfolio firms, we find strong support for our hypotheses. We document that fund leverage constraints induce portfolio firms to take on more business risk, as evidenced by higher operating cash flow volatility and greater operating leverage, which materializes in the form of more concentrated product and geographical segments and fewer diversification enhancing acquisitions. In response, lenders protect themselves by increasing the cost of borrowing and imposing stricter borrowing restrictions. Moreover, these effects are more pronounced for firms facing higher levels of conflict between debtholders and shareholders, and when mutual funds exert greater influence over portfolio companies. Econometric analyses based on mergers

risky project with a low beta of 1. Therefore, the discount rate for Project B is: 5% + 1 × 5% = 10%. It will generate a future cash flow of $7 million in good market conditions (50% chance) and a future cash flow of $4 million in bad market conditions (50% chance). Therefore, both projects have zero NPVs but different beta. In this case, firms influenced by leverage constrained mutual funds would favor Project A over Project B, despite of having a higher cost of capital.

[37]Additionally, increases in risk measures (such as cash flow volatility, operating leverage, and diversification) may be further positively correlated with firms' future expected cash flows. For example, firms might encounter an underinvestment problem due to debt overhang or managerial risk aversion, leading managers to avoid positive-NPV projects if the benefits primarily go to debtholders (Myers (1977)). Enhanced risk-taking driven by leverage-constrained shareholders could alleviate this underinvestment issue by prioritizing projects where shareholders can capture a larger share of the upside, thereby increasing equity value.

https://doi.org/10.1017/S0022109025102317 Published online by Cambridge University Press

of asset management companies and instrumental variable specifications suggest a causal interpretation.

Overall, our results indicate that frictions in the portfolio allocation of institutional asset managers have significant implications for corporate risk-taking, the cost of borrowing, and debt contract design.

Appendix: Variable Definitions

This Appendix provides detailed descriptions of all the variables used in the tables.

Value-weighted leverage constraint *(VW leverage constraint)*: The ownership-weighted fund loading on the negative betting-against-beta (BAB) factor among all U.S. domestic equity mutual funds aggregated at the stock level. The value-weighted market-neutral BAB factors are constructed by longing leveraged low-beta stocks and shorting high-beta stocks, directly obtained from Novy-Marx and Velikov (2022). We obtain the return loading $\gamma_{i,t}$ as our proxy for the tightness of fund leverage constraint from rolling regressions detailed as follows: For each month t and for each fund i, we estimate:

$$R_{i,\tau} - r_{f,\tau} = \alpha_{i,t} + \beta_{i,t}^{MKT}\left(R_{Mkt,\tau} - r_{f,\tau}\right) + \gamma_{i,t}(-BAB_{\tau}) + \varepsilon_{i,\tau}, \tau \in [t-23, t].$$

$R_{i,\tau}$ is the monthly return of fund i in month τ. $R_{mkt,\tau}$ and $r_{f,\tau}$ are the monthly market return and the risk-free rate in month τ. We require each fund to have nonmissing returns for at least 12 months within the 24-month estimation period.

Equal-weighted leverage constraint *(EW leverage constraint)*: The equal-weighted fund loadings on the negative BAB factor among U.S. domestic equity mutual funds aggregated at the stock level.

Yield spread: The issue amount-weighted bond yield spreads aggregated the issuer level. Bond yield spread is the number of percentage points that the fair value of the treasury spot curve is shifted to match the present value of the discounted cash flows to the bond's price. For bonds with embedded options, such as callability, a log-normal short interest rate model is used to evaluate the present value of the bond's potential cash flows. In this case, the option adjusted spread is equal to the number of percentage points that the short interest rate tree must be shifted to match the discounted cash flows to the bond's price.

Issue-amount outstanding: The logarithm of total bond face value aggregated at the bond issuer level.

Bond maturity (years): The issue amount-weighted bond maturity at the bond issuer level.

CDS spread: The credit default swap (CDS) spread of 5-year CDS contracts with the modified restructuring clause.

CDS recovery rate: The recovery rate of CDS contract.

Loan spread: The all-in-drawn spread that the borrower pays over LIBOR for the drawn portion of the loan.

Collateral requirement: An indicator variable that equals 1 if the loan is secured by collateral, and 0 otherwise.

Number of covenants: The total number of covenants included in a loan agreement.

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Maximum leverage slack: The maximum leverage ratio set by the bank minus the most recent book leverage ratio reported in the Compustat quarterly data.

Loan maturity (years): The maturity of a bank loan expressed in years.

Loan size: The logarithm of loan amount outstanding.

Operating cash flow volatility: For each firm year, we calculate operating cash flow volatility as the standard deviation of quarterly operating cash flows in the next 3 years including the current year. Operating cash flow is defined as the difference between income before extraordinary items and total accruals (IB – ΔACT + ΔCHE + ΔLCT – ΔDLC + DP) using the Compustat quarterly data.

Operating leverage: We follow Aboody, Levi, and Weiss (2018) to estimate a time-series regression for each firm i and quarter t with a rolling window of next 12 quarters: $OC_{\mathrm{i,k}} = \alpha + \beta_{i,t}\, REV_{\mathrm{i,k}} + \varepsilon_{i,k}$, $k = t + 1, \ldots, t + 12$, where OC is the logarithm of operating costs (XOPRQ), and REV is the logarithm of sales revenue (REVTQ). If costs are primarily fixed, then the estimated $1 - \beta_{\mathrm{i,t}}$ is high, indicating a high ratio of fixed to variable costs, which results in a high operating leverage. We then average $1 - \beta_{\mathrm{i,t}}$ at the firm-year level to proxy for operating leverage.

Number of business segments: The number of business segments, which are reported by a company as industry or product line segments breakouts.

Number of geographic segments: The number of geographic segments, which are reported by a company as country by country segments breakouts.

Book leverage: Long-term debt (DLTT)/book asset (AT).

Ownership-weighted fund beta: The ownership-weighted fund loading β^{MKT} among U.S. domestic equity mutual funds aggregated at the stock level.

Fund ownership: The ratio between holdings by U.S. domestic equity mutual funds divided by shares outstanding of a stock.

Firm size: Logarithm of book asset (AT).

Profitability: Income before extraordinary items (IB)/book asset (AT).

Free cash flow: Sum of income before extraordinary items (IB) plus depreciation and amortization (DP) less cash dividends (DV) less nonequity and minority interest dividends paid (NEQMI) less equity dividends paid (EQDIVP) less capital expenditures (CAPX) to fixed assets (AFXA).

Tangibility: Net PPE (PPENT)/book asset (AT).

Book-to-market ratio: Book value of equity (SEQ)/market value of equity (CSHO *PRCC_F).

Amihud illiquidity: The Amihud illiquidity measure, defined as the daily ratio of absolute stock return to its dollar volume averaged by year.

Industry-diversifying merger: An indicator variable which equals 1 if the acquirer and the target are in different industries, and 0 otherwise, where the industry is identified by the 2-digit SIC code.

Geography-diversifying merger: An indicator variable equal to 1 if the acquirer and the target are in different states and are not in adjacent states, and 0 otherwise.

Relative size: Relative acquisition size is defined as the payment made for the target divided by market value of acquiring firm.

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Deal value: The logarithm of deal amount in a merger deal.

Industry fixed effects: Indicators for 2-digit SIC codes.

S&P credit rating fixed effects: Indicators for nine credit rating categories (AAA to C plus nonrated) corresponding to long-term S&P credit ratings.

Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109025102317.

Funding statement

Huang acknowledges the funding support from the National Social Science Fund of China (Project No. 23BJY111).

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