Stock Mispricing and Dual Holders' Loan Pricing*

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August 2026

Abstract

We investigate how dual holders that simultaneously hold loans and equity shares of a firm respond to stock mispricing of the firm. Using the fire-sales shock induced by mutual fund outflows as a measure of stock mispricing, we find that dual holders provide lower loan spreads in times of fire-sales shocks. The result is driven by dual holders' incentive to support the firm as long-term investors. Dual holders offer lower loan spreads to help firms maintain investments, as the effect is greater when firms exhibit better growth prospects or face financial constraints due to higher equity financing costs. In a firm-level analysis, we find that dual holders' loan provisions offset the negative effects of the fire-sales shock on firms' capital investments.

JEL classification: G21, G23, G32
Keywords: Dual Holder, Loan Spread, Stock Mispricing, Corporate Investment

*We appreciate helpful comments from Allen Berger, Hyun-Soo Choi, Jaewon Choi, Jason Choi, Wei Jiang, Byoung Uk Kang, Hugh Kim, Taeyeon Kim, Inmoo Lee, Meghana Vaidya, Joakim Westerholm, Yongxin Xu, Heejin Yoon, and Qifei Zhu as well as participants at 2025 AFA PhD Poster Session, 2024 Australasian Finance and Banking Conference, 2024 FMA, and 2023 Sydney Banking and Financial Stability Conference.

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1. Introduction

Institutional investors hold a significant proportion of U.S. stocks. In the last quarter of 2019, the average institutional ownership of non-financial firms in the Russell 3000 index is around 80% (Glossner et al. (2025)). An important concern in this regard is the potential risk induced by the fluctuation of mutual fund flows. Starting from Coval and Stafford (2007), the literature documents that mutual funds' asset sales driven by large outflows create a downward price pressure on stocks held by the funds, which is often called the "fire-sales pressure." The pressure generates a temporary stock mispricing that is not related to the fundamentals of firms. The temporary market inefficiency also incurs negative real effects on a variety of corporate policies, including the reduction in investment (Derrien et al. (2013); Lou and Wang (2018)).

In this paper, we study the unique role of "dual holders" in mitigating the adverse effects of the fire-sales shock. Dual holders are financial institutions that hold a firm's equity shares and provide loans to the firm. For example, a lender is defined as a dual holder if it holds equity shares of the borrower through an asset management division within the same financial conglomerate. Loans originated by dual holders tend to reflect their incentives as shareholders of the firm (Jiang et al. (2010); Chava et al. (2019)).

We investigate how dual holders price loans when their portfolio firms experience the fire-sales shock. As shareholders of the firms, dual holders experience temporary capital losses following the shock. However, dual holders would not charge higher loan spreads as long as the shock does not increase the credit risk of the firms. Rather, they have an incentive to offer loans with *lower* spreads to mitigate the adverse effects of the shock on the firms and preserve the value of their equity stakes. For example, dual holders can help the firms maintain investments in projects with positive net present values (NPVs) by providing loans at lower spreads, despite the increased equity financing costs resulting from the fire-sales shock.

We employ the measure of fire-sales pressure driven by extreme mutual fund outflows

in Edmans et al. (2012). To measure the fire-sales pressure, it captures hypothetical trades of mutual funds that have experienced outflows of more than 5% of the total assets. Our variable for the fire-sales shock is $Flow\ Shock$, which is an indicator variable that equals one if the fire-sales pressure measure is in the bottom decile of the distribution in each quarter. The variable reflects a temporary and unanticipated fire-sales shock that incurs stock mispricing and is also accompanied by higher equity financing costs for the firm.

To preview our main result, we find that dual holders provide loans with lower spreads when the borrower experiences the fire-sales shock on the equity side. In terms of the magnitude, dual holders lower the loan spreads of firms experiencing the fire-sales shock by 0.121%p (12.1bp), which corresponds to 9.12% of one standard deviation of loan spreads. The results are robust to using alternative definitions of dual holders and fire-sales shock.

We argue that the incentive on the borrower's equity is an underlying mechanism. As the dual holders maintain their equity stakes after the fire-sales shock, they would support the borrower by reducing its debt financing costs as long-term investors. The incentive channel is confirmed as our results are driven by dual holders acting as lead lenders of the loan and by non-commercial bank dual holders that possess cash flow rights in the borrower through their equity investment. We also find that the loan spread discount associated with the fire-sales shock gets larger as the equity shares of the dual holders increase. These all support the idea that the dual holders' loan pricing is explained by the motive to support the borrower firm and maintain their equity value.

To further highlight dual holders' incentive to support borrowers that experience the fire-sales shock, we examine the role of the borrowers' growth opportunities and equity-focused financial constraints. The adverse impact of the fire-sales shock on future investment is more concerning for firms with good investment opportunities as it may limit their growth prospects. Consistent with this idea, our baseline results are more pronounced in firms with higher growth opportunities proxied by the market-to-book ratio. And since the fire-sales shock increases equity financing costs, its impact would be more severe for

financially constrained firms that had planned to issue equity. Relying on the measure of financial constraints based on textual analysis of 10-K reports (Hoberg and Maksimovic (2015); Linn and Weagley (2024)), we assess a firm's financial constraint and the intent to issue equity in the year before the loan issuance. We find that dual holders provide more favorable loan spreads to firms with binding equity financial constraints when they experience the fire-sales shock. The cross-sectional tests show that the loan spread discount associated with the fire-sales shock can reach up to 37.6bp, depending on borrower characteristics.

We address the concern that the measure of fire-sales pressure may not precisely capture a transitory and nonfundamental shock to stock prices. First, we run the baseline regression controlling for different variables that capture firm-level financial risks and their interaction with the dual holders' presence. In this horse-racing regression, we obtain consistent results that dual holders lower loan spreads to the firms affected by the fire-sales shock. Second, our results remain robust to controlling for potential selection bias in the fire-sales shock (Berger (2023)) and using an alternative measure of mutual fund flow pressure (Wardlaw (2020)) to define the fire-sales shock. We also test the robustness of our results using propensity score matching to control for differences between firms with and without fire-sales shocks.

We also examine other loan outcomes in additional analyses. First, we find that dual holders are more likely to participate in the loan as lead lender when the borrower experience the fire-sales shock. Second, we find a trade-off between loan spreads and covenant intensity. Specifically, loans with dual holder presence are more likely to be secured by collateral and have stricter covenants when borrowers face fire-sales shocks. The trade-off provides an incentive for non-dual holders to participate in the loans with dual holders, as they can obtain stronger control rights over the borrowers.

Next, we examine dual holders' information advantage from equity investments as an additional mechanism. Why do some firms facing the fire-sales shock borrow from dual

holders while others do not? We find that firms receiving loans from dual holders are sold less by mutual funds that experience extreme outflows. The result is consistent with Huang et al. (2023), who show that fund managers choose to sell low-quality stocks more and high-quality stocks less during the fire-sales shock. In our framework, the result suggests that dual holders' equity investments provide an information advantage that helps them select which firms to lend to among those experiencing fire-sales shocks.

Firms receiving loans from dual holders following the fire-sales shock also have higher stock returns than firms receiving loans from non-dual holders. While both groups experience a sharp initial decline in stock returns, the decline is substantially smaller for firms receiving loans from dual holders, consistent with their lower selling pressure. Moreover, the returns of firms with dual holder loans recover more quickly and continue to improve, reaching 2.8% by the 12th quarter after the shock. In contrast, the returns of firms without dual holder loans recover slowly and revert toward zero over the longer term. Overall, the results are consistent with the information advantage channel and highlight the equity-side benefit to dual holders.

This channel is distinct from the traditional information advantage of relationship lenders. In a placebo test that replaces the dual holders' presence in a loan with the relationship lenders' presence, we do not find that relationship lenders provide cheaper loans to borrowers facing the fire-sales shock. We also find that dual holders with prior lending relationships with the borrower do not provide significantly lower loan spreads than those without such relationships. Rather, the results are more pronounced when dual holders have held the borrower's equity for a longer period prior to loan issuance.

We also exploit mergers between banks to address potential endogeneity in dual holders' equity stakes. If a bank acquires another bank, it obtains equity shares of firms in the target bank's portfolio. Such acquisition of equity shares generates plausibly exogenous variation in dual holders' equity stakes since mergers between financial institutions are not driven by individual characteristics of the portfolio firms (He and Huang (2017); Gian-

netti and Saidi (2019)). We instrument the dual holders' presence by the target's significant equity stakes in the borrowers before the merger. In our first-stage regression, we find that the acquiring banks are more likely to be dual holders when the target held equity stakes in the borrower prior to the merger. And the second-stage regression confirms our finding that dual holders provide cheaper loans to borrowers facing the fire-sales shock.

In the last part of the paper, we examine the effects of dual holders' favorable loan provision on the borrowers' investment following the fire-sales shock. We find that firms that received loans from dual holders do not reduce their investment in capital expenditure. Although the fire-sales shock reduces future corporate investments on average, firms with dual holder loans offset the negative effects thanks to the lowered financing costs evidenced by our loan-level analyses. Overall, dual holders prevent the fire-sales shock from affecting the firm's investment decisions by their loan provision.

This paper makes a unique contribution to the literature on the role of dual ownership in resolving shareholder-creditor conflicts within a firm. Dual holders charge lower loan spreads (Jiang et al. (2010)) and are less likely to impose restrictive covenants on capital expenditure (Chava et al. (2019)). At the firm level, firms held by dual holders reduce excessive dividend payments and risk-taking (Chu (2018); Chen et al. (2023); Yang (2021)), and improve efficiency in investment and resolution of financial distress (Antón and Lin (2020); Chu et al. (2024)). Distinct from these studies, we highlight the unique role of dual holders in mitigating the adverse effects of stock mispricing through their loan market activities. Dual holders' loan provision allows firms to maintain investments despite the stock market inefficiencies.

We also contribute to the literature on the fire-sales shock in stock prices driven by mutual funds (Coval and Stafford (2007); Edmans et al. (2012)) and its real effects. Although the sales pressure generates a temporary stock underpricing, it has been documented to have real effects on corporate policies including investment (Lou and Wang (2018); Hau and Lai (2013)), equity issuance (Derrien et al. (2013)), and R&D activities (Dong et al.

(2021)). We show that dual holders' loan provision effectively offsets the impact of the fire-sales shock on corporate investments. Our loan-level analysis provides a novel mechanism through which dual holders, as long-term investors, insulate firms' investment decisions and growth prospects from the distortions caused by such stock mispricing.[1]

The remainder of the paper is organized as follows. In Section 2, we develop our research hypothesis. Section 3 introduces the data and describes how we identify dual holders and measure the fire-sales shock driven by mutual fund outflows. In Section 4, we provide analyses on dual holders' loan pricing for firms facing the fire-sales shock and firm-level effects of dual holders' loan provision. Section 5 concludes.

2. Hypothesis Development

Mutual funds that experience large outflows sell their portfolio shares to cover redemption, which induces a sudden drop in the price of the stocks held by them. When a firm faces the "fire-sales shock," dual holders that hold the firm's equity shares experience capital losses. However, the shock induced by mutual fund outflows is nonfundamental and unrelated to the credit risk of the firm. Dual holders that are aware of such nature would not increase credit spreads for the firm.

Rather, they have an incentive to support the firm by charging lower credit spreads. If dual holders continue to hold equity stakes in the firm after the fire-sales shock, they would have an incentive to mitigate the adverse effects of the shock and thereby preserve the value of their equity stakes. For example, they would help the firm maintain its investments in projects with positive net present values (NPVs), which may also affect the firm's long-term growth prospects. One way to support the firm is to reduce its debt financing cost through the favorable loan provision, which can offset the increased equity financing cost

[1]Our results are also consistent with Derrien et al. (2013) who show that the ownership of long-term investors attenuates the effect of stock mispricing on corporate investments. While they interpret their results as firms catering to shareholders with different investment horizons (Stein (1996); Polk and Sapienza (2009)), we provide direct evidence that dual holders support the firms in the loan market.

resulting from the fire-sales shock. Hence, we develop the following hypothesis.

Hypothesis 1. Dual holders would provide loans with lower spreads to firms that face the fire-sales shock on equity driven by mutual fund outflows.

Since Hypothesis 1 is based on dual holders' incentive associated with the firm's equity, the extent to which dual holders reduce the debt financing cost of the firm with the fire-sales shock would vary across their equity stakes in the firm. Also, dual holders would have a greater incentive to reduce loan spreads if the firm has good investment opportunities but is constrained from pursuing them due to an increase in equity financing cost caused by the fire-sales shock.

In addition to their equity-side incentives, we hypothesize that dual holders have an information advantage about borrowers through equity investments. Huang et al. (2023) show that fund managers choose to sell low-quality stocks more and high-quality stocks less during the fire-sales shock. Similarly, as equity investors, dual holders may use their information advantage to identify and lend to more valuable borrowers among firms affected by fire-sales shocks. This channel may also explain dual holders' favorable loan pricing in response to the fire-sales shock.

Hypothesis 2. Dual holders would select more valuable borrowers among firms affected by the fire-sales shock.

As dual holders attenuate the firm's liquidity concerns with the favorable loan provision, the negative impact of the fire-sales shock on future investments would be offset. This leads to our third hypothesis.

Hypothesis 3. Firms that received loans from dual holders would not reduce their investments after the fire-sales shock on equity driven by mutual fund outflows.

3. Data and Key Variables

3.1. Sample Construction and Identification of Dual Holders

For our analysis, we use the information on syndicated loans from Loan Pricing Corporation's (LPC) DealScan database. We focus on loans issued to public firms in the U.S. from 1987 to 2019 and match the borrowers' financial information from Compustat by using a link table extended from Chava and Roberts (2008).[2] We exclude loans issued to financial firms (SIC codes 6000-6999) and utilities (SIC codes 4900-4999) in our sample. For the lenders, we match their respective bank holding companies (BHCs) using the link table from Schwert (2018). Thus, our sample includes lenders that acted as lead arrangers on at least 50 loans or at least $10 billion in volume during the sample period and their related subsidiaries.

Our measure of loan spread is the all-in-drawn spread (in percentage points), which is the interest rate spread over LIBOR for each dollar drawn down. Throughout the empirical analysis, we control for firm-level and loan-level characteristics that may influence the loan spread. For firm-level characteristics, we consider borrowers' total assets, return on assets, leverage ratio, the ratio of tangible assets, and book-to-market ratio (BM), all obtained from Compustat. For loan-level characteristics, we control for the loan amount, loan maturity, number of participating lenders, collateral, covenant intensity, and performance pricing provisions available in DealScan. All variables are defined in Table A.1.

We report the summary statistics of our sample in Table 1. The sample consists of 30,382

[2]The current link table provided by Chava and Roberts (2008) covers matches between DealScan borrowers and Compustat GVKEY by the end of 2017. We extend the 2017 link table by 1) tracking the GVKEY for borrowers in the table and 2) matching the DealScan borrower names to company names in Compustat using a fuzzy matching algorithm and manual checks for borrowers not in the table.

loan facilities issued for 4,682 borrowing firms. The loan spread has an average of 2.002 percentage points with a standard deviation of 1.332 percentage points. Given the large loan amounts in our sample, this suggests significant variation in borrowers' interest expenses. The median loan amount is $150 million and the median loan maturity is 60 months.[3]

Table 1 also reports the summary statistics of the borrowers' firm-level characteristics. In our sample, the borrowers have a median total asset size of $1.01 billion and a median ROA of 4.4%. The leverage ratio is 30.3% on average, with a standard deviation of 21.0%.

We use DealScan and Thomson 13F institutional holdings data from Thomson Reuters to identify dual holders. As the first step, we match lender names in DealScan and manager names in 13F data by using a fuzzy matching algorithm and manual checks. We aggregate the match between a lender and 13F institutions by the lender's parent bank holding company (BHC) level. Thus, the equity holdings of 13F institutions matched with the parent's subsidiaries are considered as the BHC's equity positions.[4] Then we define each lender of a loan facility as a dual holder if it holds at least 1% of the borrower's equity stakes in the last quarter before the loan origination date following Jiang et al. (2010). For each loan facility, $Dual\ Hold$ is an indicator variable that equals one if the loan facility has at least one dual holder.

Table 1 reports the summary statistics of dual holders' presence in our sample. 41.6% of the loan facilities in the sample have dual holder(s) as the lenders. In Section 4.2, we further decompose the indicator for the presence of dual holder(s) by the dual holder's lender role, institution type, equity shares and investment horizon, and prior lending relationship with the borrower.

[3]Since we take natural log in the variables, the median of Loan Amount is 18.826 and the median of Loan Maturity is 4.094. The average loan amount is $398 million and the average loan maturity is 49 months.

[4]We search for the 10-K filings of the lenders' parent bank holding companies to obtain the names of their subsidiaries. Since we define lenders at the bank holding company (BHC) level, we use the terms "lender" and "BHC" interchangeably.

3.2. Mutual Fund Flow Pressure

We use the sales pressure driven by mutual fund outflows to identify nonfundamental and temporary negative shocks on equity prices. This has also been called the "fire-sales pressure" in previous studies following the analysis of Coval and Stafford (2007). More specifically, our shock variable is based on the measure of Edmans et al. (2012) that uses hypothetical trades of mutual funds with extreme outflows. It measures the fraction of outflow-induced trading volume to the total trading volume of a stock, under the assumption that funds with outflows sell each stock in proportion to their beginning-of-quarter shares of that stock. The intuition of using hypothetical (proportional) trades is to exclude information effects that may exist in the sales decisions of mutual funds.

Following the notation of Edmans et al. (2012) and Wardlaw (2020), the measure can be expressed as

$$s_{i,j,t-1} = \frac{SHARES_{i,j,t-1} \times PRC_{i,t-1}}{TA_{j,t-1}}, \tag{1}$$

$$\begin{aligned} MFFlow_{i,t} &= \sum_{j=1}^{m} \left(\frac{F_{j,t} s_{i,j,t-1}}{VOL_{i,t}} \right) \times \mathbb{I} \left(\frac{F_{j,t}}{TA_{j,t-1}} < -0.05 \right) \\ &= \sum_{j=1}^{m} \left(\frac{F_{j,t} \times SHARES_{i,j,t-1} \times PRC_{i,t-1}}{TA_{j,t-1} \times VOL_{i,t}} \right) \times \mathbb{I} \left(\frac{F_{j,t}}{TA_{j,t-1}} < -0.05 \right), \end{aligned} \tag{2}$$

where indices i, j, and t denote firm, fund, and quarter, respectively. $s_{i,j,t-1}$ denotes the value of shares of a firm i that the mutual fund j holds in quarter $t-1$ expressed as a fraction of the fund j's total assets. $F_{j,t}$ denotes the net dollar flow of mutual fund j in quarter t and $VOL_{i,t}$ denotes the traded dollar volume of stock i in quarter t. $MFFlow_{i,t}$ aggregates the flow-induced trades of funds that have experienced extreme outflows of greater than 5% of the total assets ($F_{j,t}/TA_{j,t-1} < -0.05$), because they are most likely to fire-sale their shares. Note that $MFFlow_{i,t}$ is negative by construction, and a larger magnitude of $MFFlow_{i,t}$ implies that the stock is subject to a higher fire-sale pressure.

The data sources to construct $MFFlow$ are the same as in Edmans et al. (2012) and

Wardlaw (2020). We obtain information on fund assets, returns, and flows from the CRSP Survivor-Bias-Free US Mutual Funds database. We focus on US domestic equity funds excluding sector funds. Quarterly holdings data of mutual funds are from the Thomson Mutual Fund Holdings Database (formerly known as CDA/Spectrum). We merge the two databases by the MFLINKS table and calculate $MFFlow$.

We define our measure of fire-sales shock, $Flow\ Shock_{i,t}$, as the indicator variable that equals one if $MFFlow_{i,t}$ is in the bottom decile of the distribution in quarter t, which is the last quarter before the loan origination date. Using the threshold of the bottom decile ensures that firms facing the fire-sales shock experience a substantial drop in stock prices, which eventually reverses to the level before the shock. The short-lived nature of the price effect suggests that the shock is a temporary and nonfundamental one.

While the measure of Edmans et al. (2012) is considered to capture the short-term price effect of mutual fund outflows, it is directly related to the current return by construction, raising concerns about the identification of nonfundamental shocks (Wardlaw (2020)). Hence, we also employ an alternative measure of flow pressure suggested by Wardlaw (2020) to define the $Flow\ Shock$ variable and check the robustness of our results. The alternative measure is defined as

$$Flow\text{-}to\text{-}Volume_{i,t} = \sum_{j=1}^{m} \left(\frac{F_{j,t}}{TA_{j,t-1}} \times \frac{SHARES_{i,j,t-1}}{SHARE\_VOL_{i,t}} \right) \times \mathbb{I} \left(\frac{F_{j,t}}{TA_{j,t-1}} < -0.05 \right), \qquad (3)$$

where $SHARE\_VOL_{i,t}$ is the number of firm i's shares traded in quarter t. Intuitively, $Flow\text{-}to\text{-}Volume_{i,t}$ scales the outflow-induced sales of a stock by its traded share volume rather than the traded dollar volume. In Section 4.5, we use $Flow\ Shock\ (Flow\text{-}to\text{-}Volume)_{i,t}$, the indicator variable that equals one if $Flow\text{-}to\text{-}Volume_{i,t}$ is in the bottom decile of the distribution in quarter t, to check the robustness of the main analysis.

Table 1 reports the summary statistics of $MFFlow_{i,t}$ and $Flow\text{-}to\text{-}Volume_{i,t}$. The two measures of mutual fund flow pressure are correlated by definition, with a correlation

coefficient of 97.5%. The $Flow\ Shock_{i,t}$ variables constructed from the two measures are also highly correlated, with a correlation coefficient of 88.4%.

3.3. Flow Shock and Dual Holders' Equity Shares

We first check whether the fire-sales shock driven by mutual fund outflows affects dual holders' equity shares of the borrower after the loan issuance. As we build upon the idea that dual holders are long-term investors, it is important to ensure that their incentive on the borrower's equity does not decline after the fire-sales shock. To this end, we compare the cumulative change in dual holders' equity shares of firms experiencing and not experiencing the fire-sales shock by the following regression:

$$\Delta Share_{i,l,t,t+k} = \beta Flow\ Shock_{i,t} + \alpha_i + \alpha_l + \alpha_t + \epsilon_{i,l,t,t+k}, \tag{4}$$

where i, l, and t indicate the firm, lender, and quarter, respectively. $\Delta Share_{i,l,t,t+k}$ is the cumulative change in dual holder l's equity shares of firm i up to k quarters after t, where t is the last quarter before the loan origination date. $Flow\ Shock_{i,t}$ is the indicator variable that equals one if $MFFlow_{i,t}$ is in the bottom decile of the distribution in quarter t and zero otherwise. α_i, α_l, and α_t denote firm, lender, and year-quarter fixed effects, respectively.[5]

Figure 1 displays estimates of β for up to 8 quarters after the fire-sales shock. The estimated coefficients are close to zero with corresponding 95% confidence intervals around zero, indicating that there is no statistically significant difference between firms with and without the fire-sales shock. Once the loan is issued, dual holders do not tend to sell their equity shares of the shocked borrower more compared to the equity shares of the borrowers without the shock. The results support our hypothesis that dual holders would alleviate the temporary shock on the borrower's equity as long-term investors.

[5]The results are similar in stricter specifications such as the one with lender $\times$ year-quarter fixed effects.

4. Empirical Results

4.1. Mutual Fund Flow Shock and Dual Holders' Loan Pricing

To investigate the effects of dual holders' participation and mutual fund flow shock on loan pricing, we estimate the following regression:

$$Loan\ Spread_{f,i,t} = \beta_1(Dual\ Hold_{f,i,t} \times Flow\ Shock_{i,t}) + \beta_2 Dual\ Hold_{f,i,t} + \beta_3 Flow\ Shock_{i,t} + \gamma X_{i,t} + \delta W_{f,i,t} + \alpha_i + \alpha_t + \epsilon_{f,i,t}, \quad (5)$$

where f, i, and t indicate the loan facility, firm, and time, respectively. $Loan\ Spread_{f,i,t}$ is the all-in-drawn loan spread over the LIBOR rate of loan facility f in percentage points. $Dual\ Hold_{f,i,t}$ is the indicator variable that equals one if the loan facility f has at least one dual holder and zero otherwise. $Flow\ Shock_{i,t}$ is the indicator variable that equals one if the mutual fund flow pressure for firm i at quarter t is in the bottom decile of the distribution in quarter t and zero otherwise, where the quarter t is the last quarter before the loan origination date. $X_{i,t}$ is a set of firm-level control variables and $W_{f,i,t}$ is a set of loan-level control variables as well as loan type fixed effects. We also include firm fixed effects (α_i) to control for time-invariant characteristics of the borrowing firms and year-quarter fixed effects (α_t) to control for macro trends that may affect the loan spreads. Standard errors are clustered at the firm and year-quarter level.

Table 2 reports the estimated coefficients in the regression model. In Column (1), we find that the estimated coefficient on $Dual\ Hold_{f,i,t} \times Flow\ Shock_{i,t}$ is negative and statistically significant without the control variables. In terms of economic significance, dual holders lower the loan spreads of firms with the fire-sales shock by 0.114%p (11.4bp), which corresponds to 8.54% of one standard deviation of loan spreads. The estimated coefficient on $Dual\ Hold_{f,i,t}$ is also negative and statistically significant, consistent with prior studies that examine the effect of dual holders' participation on loan spread (Jiang et al. (2010);

Chava et al. (2019)). While dual holders generally offer lower loan spreads to the borrower firms, they provide even lower spreads when the firms experience the fire-sales shock. The estimated coefficient on $Flow\ Shock_{i,t}$ is positive but not statistically significant at the 10% level.[6]

In Column (2), we control for firm-level characteristics that are possibly related to loan spreads, such as total assets, ROA, leverage ratio, the ratio of tangible assets, and book-to-market ratio. The estimated coefficients on the firm-level control variables are generally in line with prior studies. For example, firms with high leverage ratio pay higher loan spreads, while firms with high profitability pay lower loan spreads. We continue to find that the estimated coefficient on $Dual\ Hold_{f,i,t} \times Flow\ Shock_{i,t}$ is negative and statistically significant.

In Column (3), we additionally control for loan-level characteristics, such as loan amount, loan maturity, number of lenders in the loan syndicate, and loan covenants. Column (4) adds loan type fixed effects in the regression. The results are consistent after controlling for the loan-level variables. In Column (4), we find that the estimated coefficient on $Dual\ Hold_{f,i,t} \times Flow\ Shock_{i,t}$ is negative and statistically significant at the 1% level. The magnitude of the coefficient in the full specification is -12.1%p (-12.1bp), which corresponds to 9.12% of one standard deviation of loan spreads. Given the average loan amount of $398 million, this translates to a $0.48 million reduction in annual interest payments, or a total reduction of $2.4 million assuming a 5-year loan maturity.

To ensure the robustness of our results, we repeat our analysis by using continuous measures of dual holders' presence and fire-sales shock. In Table A.2, we replicate Column (4) of Table 2 with the sum of the lenders' equity shares of the borrower ($Dual\ Shares_{f,i,t}$) and the borrower's percentile rank of the fire-selling pressure in the quarter ($MFFlow\ pctl_{i,t}$).[7]

[6] Although we do not hypothesize about the effect of $Flow\ Shock$ on loan spreads, the sign on the estimated coefficient is consistent with the literature. For example, Xiao (2020) shows that nonfundamental price volatility driven by mutual fund flows is positively associated with the firm's loan spreads, as it may increase the lenders' *perceived* level of risk on that firm.

[7] We define $MFFlow\ pctl$ as the reverse percentile rank of $MFFlow$. A higher $MFFlow\ pctl$ indicates a lower value of $MFFlow$, which implies a stronger downward price pressure.

The results are consistent with Table 2, suggesting that the lower loan spreads are not driven by specific thresholds of dual holders' presence and the fire-sales shock.

4.2. Heterogeneity by Dual Holder Characteristics

In this section, we examine cross-sectional variations in dual holder characteristics to study the mechanism behind dual holders' loan pricing for firms affected by the fire-sales shock. Specifically, we argue that dual holders have an incentive to support a borrower facing the fire-sales shock to maintain the value of their equity stakes in the borrower. In our framework, we show that the incentive on the borrowers' equity side explains dual holders' loan pricing in response to the fire-sales shock.

We begin by decomposing $Dual\ Hold_{f,i,t}$ based on whether the dual holder is a lead lender of a loan or not.[8] In a syndicated loan, the lead lenders negotiate with the borrower to set initial loan terms and solicit participation from other lenders to fund the required loan amount. Moreover, they tend to maintain a strong relationship with the borrower to the loan maturity as they are responsible for due diligence and monitoring (Sufi (2007)). Therefore, we expect the reduction in loan spread to be more pronounced when dual holders have greater bargaining power over loan terms by serving as lead lenders. We define $Dual\ Hold\ (Lead)_{f,i,t}$ as the indicator that equals one if the loan facility f has at least one dual holder as a lead lender and zero otherwise. And $Dual\ Hold\ (Participant)_{f,i,t}$ is the indicator variable that equals one if $Dual\ Hold_{f,i,t}$ is one but all dual holders are not lead lenders.

We also separate $Dual\ Hold_{f,i,t}$ by whether the dual holder is a commercial bank (CB) or a non-commercial banking institution (non-CB).[9] In most cases, commercial banks hold equity shares in a fiduciary capacity (e.g., trust accounts) that give them voting rights, but

[8] A lead lender is defined as a lender whose "Lead Arranger Credit" field is marked "Yes" or whose lender role is administrative agent, agent, arranger, lead arranger, or lead bank.

[9] We identify CB and non-CB equity holdings based on whether the Thomson 13F institution type code is 1 (commercial bank) or not. And we define a CB (non-CB) dual holder at the bank holding company level if the aggregated CB (non-CB) equity share of the borrower is at least 1%.

not cash flow rights, of a firm (Santos and Wilson (2017)). Therefore, we expect our baseline results to be driven by non-commercial bank dual holders that have both cash flow rights and voting rights. We define $Dual\ Hold\ (Non\text{-}CB)_{f,i,t}$ as the indicator variable that equals one if the loan facility f has at least one non-CB dual holder and zero otherwise. And $Dual\ Hold\ (CB)_{f,i,t}$ is the indicator that equals one if $Dual\ Hold_{f,i,t}$ is one but all dual holders are CB dual holders.

We estimate the model (5) by replacing the $Dual\ Hold_{f,i,t}$ with the decomposed variables. Panel A of Table 3 presents the estimated coefficients. In Column (1), we find that the dual holders charge lower loan spreads to the firms experiencing the fire-sales shock when they serve as lead lenders, while such an effect is muted when they are mere participants of the syndicate. The estimated coefficient on $Dual\ Hold\ (Lead)_{f,i,t} \times Flow\ Shock_{f,i,t}$ is negative and statistically significant, with a magnitude of -0.166%p (-16.6bp). In contrast, the estimated coefficient on $Dual\ Hold\ (Participant)_{f,i,t} \times Flow\ Shock_{f,i,t}$ is negative but not statistically significant. Similarly, we find that only non-commercial bank dual holders offer cheaper loans to the borrower firms in times of fire-sales shocks. In Column (2), the estimated coefficient on $Dual\ Hold\ (Non\text{-}CB)_{f,i,t} \times Flow\ Shock_{f,i,t}$ is -0.149 with a t-statistic of -2.79, whereas the estimated coefficient on $Dual\ Hold\ (CB)_{f,i,t} \times Flow\ Shock_{f,i,t}$ is negative but not statistically significant.

Next, we examine the role of the dual holder's equity stakes in the firm. Dual holders with larger equity stakes in the firm experience larger (unrealized) losses in their portfolios from the fire-sales shock on the firm. Thus, they have a stronger incentive to support the firm by providing cheaper loans. We define $Dual\ Hold\ (High\ Share)_{f,i,t}$ as the indicator variable that equals one if the sum of dual holders' equity shares of the borrower is in the top quintile of the distribution and zero otherwise. And $Dual\ Hold\ (Low\ Share)_{f,i,t}$ is the indicator variable that equals one if $Dual\ Hold_{f,i,t}$ is one but the sum of dual holders' equity shares of the borrower is below the top quintile of the distribution.

As we have shown the influence of lead lenders in Panel A, we also expect our baseline

results to be stronger when dual holders with larger equity stakes serve as lead lenders of the loan. To test this prediction, we define the variable $Dual\ Hold\ (Lead\ Blockholder)_{f,i,t}$, which indicates the presence of lead lenders that hold the borrower's equity stake of at least 5% (i.e., blockholder). And $Dual\ Hold\ (No\ Lead\ Blockholder)_{f,i,t}$ is defined as the indicator variable that equals one if $Dual\ Hold_{f,i,t}$ is one but the loan is not lead-arranged by a blockholder.

Panel B of Table 3 reports the results based on the equity stakes of dual holders. In Column (1), the estimated coefficients on $Dual\ Hold\ (High\ Share)_{f,i,t} \times Flow\ Shock_{f,i,t}$ and $Dual\ Hold\ (Low\ Share)_{f,i,t} \times Flow\ Shock_{f,i,t}$ are -0.231 (t=-3.60) and -0.093 (t=-1.71), respectively. The difference between the two estimated coefficients is -0.138 (t=-2.21), which is both economically and statistically significant. In Column (2), the estimated coefficients on $Dual\ Hold\ (Lead\ Blockholder)_{f,i,t} \times Flow\ Shock_{f,i,t}$ and $Dual\ Hold\ (No\ Lead\ Blockholder)_{f,i,t} \times Flow\ Shock_{f,i,t}$ are -0.281 (t=-2.98) and -0.100 (t=-1.88), respectively. Although both coefficients are negative and statistically significant, the impact on loan spread is greater with the presence of blockholding lead lenders, with the difference of -0.182 (t=-1.92).

Overall, the results in Table 3 support the idea that dual holders' favorable loan pricing when borrowers experience the fire-sales shock is driven by their incentive on the borrowers' equity side.

4.3. Heterogeneity by Borrower Characteristics

In this section, we analyze cross-sectional variations in borrower characteristics to better understand why dual holders provide loans with lower spreads to the firms that experience the fire-sales shock. As our hypothesis suggests that dual holders support borrowers in maintaining their investments despite the increased equity financing costs, we expect our results to be driven by loans to (1) firms with higher growth opportunities and (2) financially constrained firms that rely on equity financing.

We first examine the heterogeneity of our results based on the borrower's growth op-

portunities. The negative impact of the fire-sales shock on future investment would be more problematic when a firm has good investment opportunities because the reduction of such investment could constrain the firm's growth. In this case, as long-term investors, dual holders would have a greater incentive to lower the loan spread and reduce the likelihood that the firm forgoes the investment. We proxy firms' growth opportunities using the market-to-book ratio (Kogan and Papanikolaou (2014); Van Binsbergen et al. (2010)) and test this channel in our framework.

We estimate our regression model (5) for subsamples depending on whether the borrower's lagged M/B is higher than the top tercile of the distribution for each year. In Panel A of Table 4, we find that loan spreads offered by the dual holders are significantly lower for firms with better growth prospects when the fire-sales shock occurs. In Column (1), the estimated coefficient on $Dual\ Hold_{f,i,t} \times Flow\ Shock_{i,t}$ for high M/B firms is -0.276 with a t-statistic of -2.62. In contrast, in Column (2), the estimated coefficient for low M/B firms is -0.078 and is not statistically significant. The magnitude of the effect for high M/B firms is more than three times as large as that for low M/B firms, and the difference in coefficients is statistically significant (t=$-$1.86).

Next, we investigate whether the effect of the fire-sales shock on dual holders' loan pricing varies with the borrower's equity-focused financial constraints. Since the fire-sales shock increases equity financing costs, it has a greater impact on firms that plan to raise liquidity through equity issuance. Firms are more likely to delay or curtail investments due to liquidity issues when they face more stringent equity financing conditions. Therefore, dual holders would be more incentivized to support these firms by lowering loan spreads to offset the upward pressure on financing costs.

To assess the borrower's financial constraints and intent to issue equity, we use the measure of equity-focused financial constraints based on textual analysis of 10-K reports by Hoberg and Maksimovic (2015). The measure ($equitydelaycon$) captures the stringency of financial constraints that firms face and the firms' intent to issue equity by searching for

related words in the Liquidity and Capitalization Resource Subsection of Management's Discussion and Analysis (MD&A) in the 10-K.

However, the measure of Hoberg and Maksimovic (2015) has limited sample coverage as it is available from 1997 to 2015 for firms that have the machine-readable Capitalization Resource Subsection of the MD&A. As our sample period spans from 1987 to 2019, only 53% of the sample firms have an available lagged $equitydelaycon$ measure. Thus, we employ the equity-focused financial constraint measure of Linn and Weagley (2024) that expands the coverage of the text-based measure by using a random forest model to estimate a multi-dimensional mapping between firm characteristics and the text-based measure.[10]

In Panel B of Table 4, we estimate our baseline model (5) for subsamples depending on whether the borrower's lagged equity-focused financial constraint is higher than the top tercile of the distribution in the year or not. We find that dual holders attenuate the pressure on equity financing costs to a greater extent when firms rely on equity financing to address their liquidity needs. Column (1) shows that the estimated coefficient on $Dual\ Hold_{f,i,t} \times Flow\ Shock_{i,t}$ is -0.376 with a t-statistic of -3.77. However, in Column (2), the estimated coefficient is -0.061 and is not statistically significant. The loan spread associated with $Dual\ Hold_{f,i,t} \times Flow\ Shock_{i,t}$ is lower by 0.315%p (31.5bp) for the constrained firms than for the unconstrained firms, and the difference is statistically significant (t=-2.89). In Column (3), we also report that the baseline result in Table 2 holds for the full sample where the financial constraint measure is available.

In sum, we find that dual holders provide more favorable loan spreads to firms with high growth opportunities and binding equity financial constraints when they experience the fire-sales shock. The results are consistent with the idea that dual holders support these firms as long-term investors.

[10] We use the estimates from the full model, which includes 19 predictors of firm-level accounting variables. Our results are also robust to using the estimates from the "primitive" model with a small set of predictors that are less likely to be endogenously determined by the firm.

4.4. Robustness Tests for Mutual Fund Flow Shock

There is a concern about the outflow measure of Edmans et al. (2012) that it is affected by firm fundamentals and does not precisely capture a temporary and nonfundamental shock to stock prices. For example, Wardlaw (2020) shows that the measure is a direct function of the stock's return during the quarter, which is a significant driver of the return variation associated with the measure. If the $Flow\ Shock$ variable in our analysis identifies firms with low returns due to bad fundamentals, the results so far would be interpreted as dual holders bearing costs from borrowers' weak performance and financial distress.

To address this concern, we first conduct robustness tests to validate that the differences in firm risks do not drive our main results. Specifically, we consider four measures of risk in the last quarter before loan origination - stock return, DGTW characteristic-adjusted return (Daniel et al. (1997)), S&P long-term credit rating, and 5-year CDS spread.[11][12] For each measure, we construct an indicator variable that equals one if the borrower's risk level is higher than the top quartile of the distribution in the quarter. We include the indicator variable and its interaction term with $Dual\ Hold$ in (5) and examine whether the results in Table 2 are affected.[13]

Table 5 reports the results. We find that the estimated coefficients on $Dual\ Hold \times Flow\ Shock$ are negative and statistically significant after controlling for different risk indicators and their interaction terms with dual holders' presence. The results are robust in terms of economic significance. As expected, the estimated coefficients on the risk indicators are positive and statistically significant. However, the estimated coefficients on the interaction terms between $Dual\ Hold$ and risk indicators are neither statistically nor economically significant, which suggests that dual holders do not provide cheaper

[11] We obtain daily 5-year CDS spreads from Markit following Lee et al. (2018) and average them by quarter.

[12] There are sample reductions except for raw stock returns because the other risk measures are not perfectly matched with our sample. DGTW-adjusted returns are not available for stock returns before the first formation date of the benchmark portfolio. And not all firms in our sample have credit ratings or credit default swaps.

[13] We get similar results when we change the threshold by top quintile or decile and when we substitute the indicator variable with the risk measure itself.

loans to risky borrowers in general. The estimated coefficients on the interaction terms are still insignificant when we estimate regression models without including $Flow\ Shock$ and $Dual\ Hold \times Flow\ Shock$.

We also consider the recent critique by Berger (2023) that the proportional trading assumption of Edmans et al. (2012) creates selection bias in the $MFFlow$ measure. Mutual funds are less likely to sell small, poorly performing, and illiquid firms, which inflates the magnitude of selling pressure on these firms under the proportional trading assumption. To address this concern, we follow the approach of Gredil et al. (2022) and additionally control for the firm's minimum $MFFlow$ decile (= highest fire sale pressure) rank in the past 3 years, interacted with its mutual fund ownership. In Column (1) of Table 6, we continue to find that the estimated coefficients on $Dual\ Hold \times Flow\ Shock$ are negative and statistically significant with the additional control variables. And the magnitudes of the coefficients (-12.8bp to -15.9bp) are greater than those in our baseline results.

Next, we use an alternative measure of outflow suggested by Wardlaw (2020) to define the $Flow\ Shock$ variable. The alternative measure changes the traded dollar volume $VOL_{i,t}$ in Equation (2) by $VOL^*_{i,t} = PRC_{i,t-1} \times SHARE\_VOL_{i,t}$, where $SHARE\_VOL_{i,t}$ is the number of firm i's shares traded in quarter t, and it is equivalent to the measure defined by Equation (3). By using this alternative measure, we can avoid a mechanical relation between the current quarter's return and the outflow measure. In Column (2) of Table 6, we replicate the results in Column (4) of Table 2 using the alternative measure of fire-sales shock. We find that the estimated coefficient on $Dual\ Hold \times Flow\ Shock$ is negative and statistically significant, and the magnitude (-10.8bp) is similar to the one in Table 2 (-12.1bp). The result further supports our hypothesis that dual holders provide cheaper loans in response to temporary and nonfundamental shocks in borrowers' stock prices.

We also check the robustness of our results using propensity score matching that controls for heterogeneity between firms that experience fire-sale shocks and those that do not. Specifically, we use firm-level characteristics included in our main regression as well as the

indicator for receiving loans from dual holders, and match each firm affected by the fire-sale shock in each quarter with an unaffected firm in the same quarter. In Panel A of Table 7, the differences in firm characteristics between the two groups are small and statistically insignificant after matching. And in Panel B, we find that our baseline results in Table 2 are replicated in the matched sample with similar economic magnitudes.

4.5. Additional Analyses

4.5.1. Dual Holders' Participation as Lead Lenders

While our analysis mainly focuses on the effects of dual holder status on loan spreads, we also test whether dual holders are more likely to participate in the loan as lead lenders when the borrower experiences the fire-sales shock. To this end, we follow Zhu (2021) and examine the probability of participation based on the expanded sample of each loan facility paired with all potential lenders (BHCs) that serve as lead lenders in the same quarter. We estimate the following regression model:

$$D(Lead\ Lender)_{f,i,l,t} = \beta_1(Dual\ Holder_{f,i,l,t} \times Flow\ Shock_{i,t}) + \beta_2 Dual\ Holder_{f,i,l,t} + \alpha_f + \alpha_{l,t} + \alpha_{i,l} + \epsilon_{f,i,l,t} \quad (6)$$

where f, i, l, and t indicate the loan facility, firm, lender (BHC), and quarter, respectively. We include loan facility fixed effects (α_f) to control for individual loan-level characteristics. In addition, we include BHC $\times$ year-quarter fixed effects ($\alpha_{l,t}$) and firm $\times$ BHC fixed effects ($\alpha_{i,l}$) to control for time-varying characteristics of BHCs and time-invariant characteristics between the firm and the BHC, respectively.[14]

Column (1) of Table 8 shows that dual holders are more likely to participate in loans for borrowers affected by the fire-sales shock as lead lenders. The magnitude (0.64%p)

[14]We exclude loan facilities identified as loan amendments or renegotiations (2% of the sample). The results are robust to controlling for prior lending relationships between the firm and the BHC.

corresponds to a 14% increase in the likelihood compared to the unconditional average (4.57%). In Column (2), we also find consistent results when we condition on a loan being originated: dual holders are more likely to take lead roles in the loans when borrowers experience the fire-sales shock. The results from the within-loan estimation are also consistent with our argument that dual holders would support firms experiencing fire-sales shocks through loan provision.

4.5.2. Effects on Non-Pricing Loan Terms

Our main results provide strong evidence that loans with dual holder presence have lower spreads when the borrowers experience the fire-sales shock. A key question in interpreting the results is whether dual holders provide lower loan spreads at no cost for potential benefits on the borrowers' equity side. Another important question is why non-dual holding lenders are willing to participate in such loans with lower spreads.

To answer these questions, we examine the effects of dual holders' presence and the fire-sales shock on non-pricing loan terms — loan amount, loan maturity, collateral, and the index of covenant intensity (Bradley and Roberts (2015)). We estimate (5) with the non-pricing loan terms as dependent variables, controlling for firm- and loan-level control variables as well as loan spread.

Table 9 reports the results. We find positive and statistically significant associations between $Dual\ Hold \times Flow\ Shock$ and the presence of collateral and covenant intensity. In Column (3), dual holder loans issued to borrowers experiencing fire-sales shocks are 3.9 percentage points more likely to be secured by collateral, which corresponds to 7.91% of a standard deviation of the collateral indicator. Column (4) reports that the increase in covenant intensity associated with $Dual\ Hold \times Flow\ Shock$ is 0.143, or 6.95% of one standard deviation of the covenant intensity.

We interpret the results as a trade-off between lower loan spreads and stricter loan covenants (Matvos (2013); Bradley and Roberts (2015)). While dual holders provide cheaper

loans to help borrowers maintain their corporate activities despite the fire-sales shock, such loans are subject to stricter covenants. The trade-off also provides an incentive for non-dual holding lenders to participate in the loans, as they can obtain stronger control rights over the borrowers in exchange for accepting lower spreads.

4.6. Information Advantage of Dual Holders

Our analyses in Section 4.2 suggest that dual holders' favorable loan pricing for borrowers experiencing the fire-sales shock is driven by their incentive on the borrowers' equity. In this section, we examine an additional channel: dual holders' information advantage arising from their equity investments. Do dual holders provide lower spreads because they choose to lend to more valuable borrowers among firms affected by fire-sale shocks?

To answer this question, we test whether dual holders' lending decisions are associated with the actual trading decisions of mutual funds that experience outflows. Specifically, we consider a measure of selling pressure defined as

$$Selling\ Pressure_{i,t} = -\sum_{j=1}^{m}\left(\frac{\max(0, -\Delta Holdings_{i,j,t})}{VOL_{i,t}}\right) \times \mathbb{I}\left(\frac{F_{j,t}}{TA_{j,t-1}} < -0.05\right) \quad (7)$$

where i, j, and t denote firm, fund, and quarter, respectively. $\Delta Holdings_{i,j,t}$ denotes the change in fund i's holdings of firm j in quarter t. As we contruct $MFFlow_{i,t}$ in (2), the measure $Selling\ Pressure_{i,t}$ also focuses on the funds that have experienced outflows of greater than 5% of total assets. However, it aggregates the actual decreases in holdings of these funds at the individual firm level. Similar to $MFFlow_{i,t}$, a lower value of $Selling\ Pressure_{i,t}$ indicates greater selling pressure.

Next, we aggregate our loan-level sample at the firm-quarter level and estimate the following regression model:

$$Selling\ Pressure_{i,t} = \beta_1(Dual\ Loan_{i,t} \times Flow\ Shock_{i,t}) + \beta_2 Dual\ Loan_{i,t} + \beta_3 Flow\ Shock_{i,t}$$

$$+ \gamma X_{it} + \alpha_i + \alpha_t + \epsilon_{i,t}, \tag{8}$$

where i and t indicate the firm and quarter, respectively. $Dual\ Loan_{i,t}$ is the indicator that equals one if firm i receives a loan from dual holders in the quarter following t. $X_{i,t}$ is a set of firm-level control variables as in our loan-level analyses. We also include firm fixed effects (α_i) and year-quarter fixed effects (α_t) in the model.

Table 10 presents the estimated coefficients of the above regression model. We first find that firms experiencing the fire-sales shock are subject to greater selling pressure, confirming the validity of the proportional trading assumption in the construction of $MFFlow$. However, firms receiving loans from dual holders face lower selling pressure (i.e., higher values of $Selling\ Pressure_{i,t}$) when they experience the fire-sales shock. In terms of economic significance, the difference corresponds to 15.63% of one standard deviation of the selling pressure.

Recent work by Huang et al. (2023) shows that information asymmetries generate price pressure during fire sales, and fund managers choose to sell low-quality stocks more and high-quality stocks less when their funds experience outflows. From this perspective, the results in Table 10 also suggest that dual holders have an information advantage through their equity investments. This information advantage helps dual holders select which firms to lend to among those experiencing fire-sales shocks.

We also examine the stock returns of firms that receive loans from dual holders following the fire-sales shock. Specifically, we focus on the quarterly cumulative average abnormal returns (CAAR) over the characteristic-matched benchmark portfolio (DGTW portfolio) by Daniel et al. (1997). First, we construct a firm-quarter level sample of firms experiencing fire-sale shocks from our loan-level sample. Then, we compare the DGTW-adjusted CAAR of firms that receive loan(s) from dual holders in the quarter following the shock with that of firms that receive loans from non-dual holding lenders.

Figure 2 shows the quarterly CAARs of the two groups of firms over the 12 quarters

following the fire-sales shock. While both groups experience a sharp decline in stock returns at the onset of the fire-sales shock, the decline is smaller for firms receiving loans from dual holders. The difference in the initial price decline is consistent with the differential selling pressure reported in Table 10. Moreover, firms receiving loans from dual holders experience a faster recovery in stock returns and exhibit positive cumulative returns over the longer term, reaching 2.8% by the 12th quarter after the shock. While the returns of firms without dual holder loans also gradually recover from the initial decline, a substantial difference between the two groups persists. Overall, the stock return results are consistent with dual holders' information advantage in their lending decisions, providing an explanation for their favorable loan pricing in response to fire-sales shocks.

We show that our loan pricing results are not driven by the traditional information advantage of lenders obtained through repeated lending relationships (Berger and Udell (1995); Bharath et al. (2011)). To rule out the relationship lending channel, we conduct a placebo test by replacing the presence of dual holders with the presence of relationship lenders that have lead-arranged a loan for the borrower in the past five years (Bharath et al. (2011)). We also test whether dual holders' loan pricing is affected by whether the dual holders are relationship lenders or not.

Since we argue that dual holders' information advantage stems from their equity investments (Huang et al. (2023)), we test whether our results are more pronounced for dual holders that have held the borrower's equity for a longer period.[15] We follow Jiang et al. (2010) and measure the investment horizon as the time between the first quarter in which each dual holder holds at least 1% of the borrower's equity and the last quarter before loan origination. And we decompose $Dual\ Hold_{f,i,t}$ by whether the dual holder(s)' average investment horizon for the borrower is in the top quintile of the sample distribution or not, defined as $Dual\ Hold\ (Long\ Horizon)_{f,i,t}$ and $Dual\ Hold\ (Short\ Horizon)_{f,i,t}$.

In Panel A of Table 11, we find that the estimated coefficient on the interaction term

[15] Prior studies such as Lan et al. (2024) and Borochin and Yang (2017) document that long-horizon investors have an information advantage about firms' long-term fundamentals.

$Relationship_{f,i,t} \times Flow\ Shock_{i,t}$ is negative but not statistically significant. The results are consistent in the full sample (Column (1)) and in the sample of loans without dual holders (Column (2)). Although relationship lenders are better informed in general, as supported by the negative estimated coefficient on $Relationhip_{f,i,t}$, they do not provide loans with lower spreads when borrowers experience fire-sale shocks.

Panel B of Table 11 report the results with the decomposed variables of dual holder presence. In Column (1), the estimated coefficients on $Dual\ Hold\ (Relationship) \times Flow\ Shock$ and $Dual\ Hold\ (No\ Relationship) \times Flow\ Shock$ are both negative and statistically significant, with no statistically significant difference between the two coefficients. Column (2) also reports that the estimated coefficients on $Dual\ Hold\ (Long\ Horizon) \times Flow\ Shock$ and $Dual\ Hold\ (Short\ Horizon) \times Flow\ Shock$ are both negative and statistically significant. However, the difference between the two estimated coefficients is -0.133 (t=-2.20), suggesting that dual holders with a longer investment horizon in the borrower's equity lower loan spreads more.

Taken together, we find that dual holders' information advantage arises from their equity investments and is distinct from that of relationship lenders. In addition to the equity-side incentive channel in Section 4.2, dual holders' information advantage further explains their loan pricing for borrowers experiencing fire-sales shocks.

4.7. Instrumental Variable Analysis using Bank Mergers

Our previous analyses provide two channels that explain dual holders' loan pricing in response to fire-sales shocks: the incentive from their equity stakes and the information advantage arising from their equity investments. The two channels are complementary and are both associated with dual holders' equity investments in borrowers.

In this section, we exploit mergers between banks to address potential endogeneity in dual-holding status. Specifically, we use the target bank's pre-merger equity holdings in the borrower as an instrumental variable for the acquiring bank's dual-holding status.

When a bank acquires another bank, it also gains the equity stakes in the firms that the target bank held before the merger. Then the acquiring bank becomes a dual holder when it participates in loans issued to the firms after the merger. Since mergers between financial institutions are not determined by individual characteristics of their portfolio firms, the merger-induced equity holdings of acquiring banks are less likely to be driven by the bank's pre-existing information advantage on these firms (He and Huang (2017); Giannetti and Saidi (2019)).

We obtain merger information from the SDC mergers and acquisitions database. We focus on merger events in which both the acquirer and the target are bank holding companies (BHCs) in our sample. During our sample period, we identify 37 bank mergers between 22 acquiring BHCs and 37 target BHCs.[16] For each merger event, we collect the target BHC's equity holdings in the last quarter before the merger announcement date, referred to as "pre-merger equity holdings."

For the instrumental variable analysis, we impose two sample restrictions to better examine the effect of merger-induced equity holdings. First, we start with an expanded sample where each loan is paired with all participating lenders and restrict our sample to the loans in which the acquiring BHCs participate as lead lenders.[17] Second, we only include the loans originated within five years after the merger announcement dates. Using this sample, we define $Dual\ Holder$ as an indicator variable that equals one if the lender (i.e., the acquiring BHC) holds at least 1% of the borrower's equity in the last quarter before the loan origination date. We then define the instrumental variable, $Target\ Hold$, as an indicator variable that equals one if the target BHC's pre-merger equity holdings in the borrower are at least 1%.[18] As reported in Table 1, $Dual\ Holder$ and $Target\ Hold$ account for 31.3%

[16] Lewellen and Lowry (2021) raise a concern that using financial institution mergers during the 2008 financial crisis may capture differential responses of firms to the crisis. However, our results do not change when we exclude mergers that occurred during the financial crisis.

[17] We focus on the lead lenders because our baseline results are driven by dual holders as lead lenders (Table 3). When we include the loans where the acquiring BHCs serve as participant lenders, we obtain qualitatively similar results with smaller economic magnitudes.

[18] We aggregate the target BHCs' equity holdings when the acquiring BHC is involved in multiple bank mergers. Importantly, our results are robust when we exclude the cases where the acquiring BHC already held

and 17.0% of the controlled sample, respectively.

Table 12 reports the estimated coefficients from the two-stage least squares regression for our baseline model. Since the sample consists of loan facility-BHC pairs, we replace year-quarter fixed effects with BHC $\times$ year-quarter fixed effects. Columns (1)-(2) show the estimated coefficients from the first-stage regression of $Dual\ Holder$ and $Dual\ Holder \times Flow\ Shock$ on $Target\ Hold$ and $Target\ Hold \times\ Flow\ Shock$. The estimated coefficient on $Target\ Hold$ is 0.160 (t=7.00) in Column (1), suggesting that lenders are 16 percentage points more likely to become dual holders for the firms in which they obtain equity stakes by the merger. The results are consistent with our identifying assumption that lenders do not sell the acquired equity holdings right after the merger. The Cragg-Donald F-statistic for weak instrument test is 46.8, well above the Stock and Yogo (2005) critical value for 10% maximum Wald test size distortion (7.03). Column (3) reports estimated coefficients from the second-stage regression, where $Dual\ Holder$ and $Dual\ Holder \times Flow\ Shock$ are instrumented by $Target\ Hold$ and $Target\ Hold \times Flow\ Shock$. The estimated coefficient on $Dual\ Hold \times Flow\ Shock$ is -1.018 (-1.018%p) with a t-statistic of -2.83.

Overall, the instrumental variable analysis based on bank mergers corroborates our finding that dual holders provide cheaper loans to borrowers experiencing fire-sales shocks.

4.8. Effects on Corporate Investment

Prior studies document that the stock mispricing driven by mutual funds has negative real effects. In particular, it is associated with a reduction in investments (Hau and Lai (2013), Lou and Wang (2018)). Our final analysis examines whether loan provision by dual holders attenuates the negative effect of fire-sales shocks on firms' investment decisions. To this end, we construct a firm-quarter panel from our loan-level sample and estimate the

at least 1% of the borrower's equity in the pre-merger announcement quarter.

following regression:

$$CAPEX_{i,t+k} = \beta_1(Dual\ Loan_{i,t} \times Flow\ Shock_{i,t}) + \beta_2 Dual\ Loan_{i,t} + \beta_3 Flow\ Shock_{i,t} + \gamma X_{it} + \alpha_i + \alpha_t + \epsilon_{i,t}, \quad (9)$$

where i and t indicate the firm and quarter, respectively. $CAPEX_{i,t+k}$ is firm i's capital expenditure (relative to its total assets in the previous quarter) after k quarters from the shock at quarter t. $Dual\ Loan_{i,t}$ is the indicator variable that equals one if the firm i receives a loan by dual holders in the quarter following t and zero otherwise. $Flow\ Shock_{i,t}$ is the indicator variable that equals one if the price pressure by mutual fund outflows ($MFFlow_{i,t}$) is in the bottom decile of the distribution in quarter t and zero otherwise. $X_{i,t}$ is a set of firm-level control variables as in our loan-level analyses. We include firm and year-quarter fixed effects denoted by α_i and α_t, respectively. Standard errors are clustered at the firm and year-quarter level.

Table 13 reports the estimated coefficients in the above regression model. Columns (1) through (4) present the effects on capital expenditure up to 4 quarters after the fire-sales shock. Consistent with prior studies (Derrien et al. (2013); Lou and Wang (2018)), firms reduce capital investment in response to the fire-sales shock. The estimated coefficient on $Flow\ Shock_{i,t}$ is negative and statistically significant from 2 to 4 quarters after the shock, but it is not statistically significant immediately after the shock. For the quarters $t+2$ to $t+4$, the fire-sales shock is associated with a reduction in capital expenditure by 0.18%p on average, which corresponds to 9.76% of one standard deviation of capital expenditure.

However, the dual holders' loan provisions offset the negative effects of the fire-sales shock on the firms' investments. The estimated coefficients on $Dual\ Loan_{i,t} \times Flow\ Shock_{i,t}$ are positive and statistically significant for quarters $t+2$ to $t+4$, with magnitudes comparable to those of the coefficients on $Flow\ Shock_{i,t}$. Specifically, $Dual\ Loan_{i,t} \times Flow\ Shock_{i,t}$ is associated with an increase in capital expenditure by 0.15%p on average, which corre-

sponds to 8.09% of one standard deviation of capital expenditure. We also find that the sum of the two coefficients is not statistically different from zero for each quarter, indicating that firms receiving loans from dual holders following the fire-sales shock do not reduce their capital expenditures (untabulated).

Overall, the results in Table 13 show that dual holders help the firms maintain their investments in the face of fire-sales shocks. Dual holders' favorable loan provisions allow flexibility in terms of financing and prevent the stock mispricing shocks from derailing the firms' investment decisions and growth prospects.

5. Conclusion

This paper provides a unique role of dual holders that mitigates the adverse effects of stock mispricing driven by mutual fund outflows. We show that dual holders provide lower loan spreads to firms that experience the fire-sales shock. The favorable loan pricing is consistent with dual holders' incentives arising from their equity stakes in the borrowers. Moreover, we provide evidence that dual holders provide loans to more valuable borrowers. Our results are robust across various specifications and tests. We also show that the loan provisions by dual holders offset the negative effects of the fire-sales shock on firms' investment in capital expenditure. We argue that dual holders' loan provision plays an important role in mitigating the potential real effects of temporary and nonfundamental shocks in the capital market.

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Figure 1: Fire-Sales Shock and Dual Holders' Change in Equity Shares

This figure plots the cumulative change in dual holders' equity shares of the borrower after the fire-sales shock driven by mutual fund outflows. We plot the coefficient estimates and the corresponding 95% confidence intervals from regressions of cumulative change in dual holders' equity shares on the indicator of fire-sales shock with firm, lender, and year-quarter fixed effects. The fire-sales shock indicator equals one if the outflow-driven pressure by Edmans et al. (2012) is in the bottom decile of the quarter and zero otherwise. Standard errors are clustered at the lender and year-quarter level.

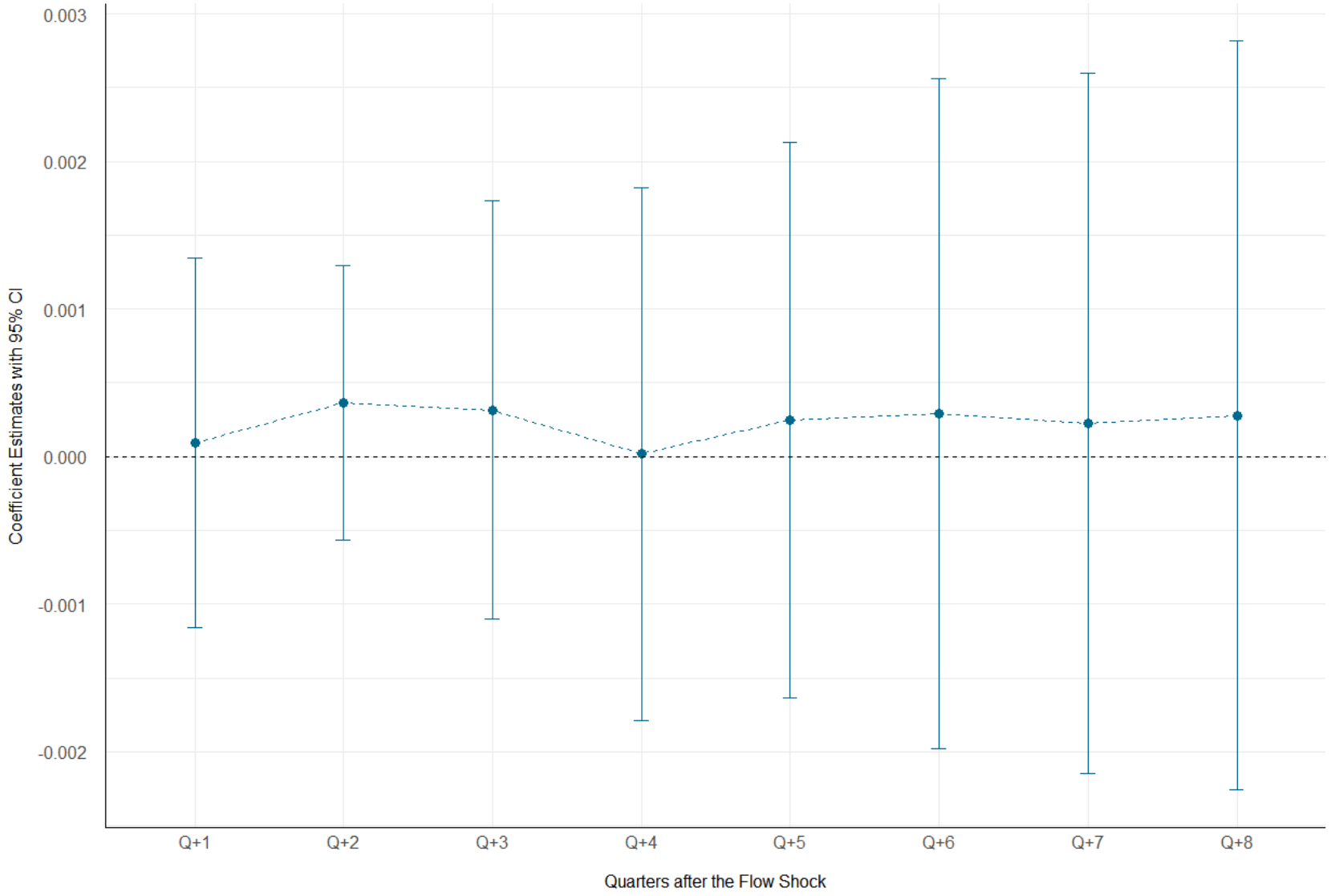

Figure 2: Exposure to Dual Holder Loans and Stock Returns after the Fire-Sales Shock

This figure plots the monthly cumulative average abnormal returns (CAAR) over the characteristic-matched benchmark portfolio by Daniel et al. (1997) for firms experiencing the fire-sales shock driven by mutual fund outflows. For each quarter, firms in the bottom decile of the $MFFlow$ measure by Edmans et al. (2012) are defined to have the fire-sales shock. We first get cross-sectional average returns for each quarter and average across quarters. The red line plots the CAAR of firms that receive loans from dual holders in the next quarter of the fire-sales shock. The blue line plots the CAAR of firms that receive loans from other non-dual holding lenders in the next quarter of the fire-sales shock.

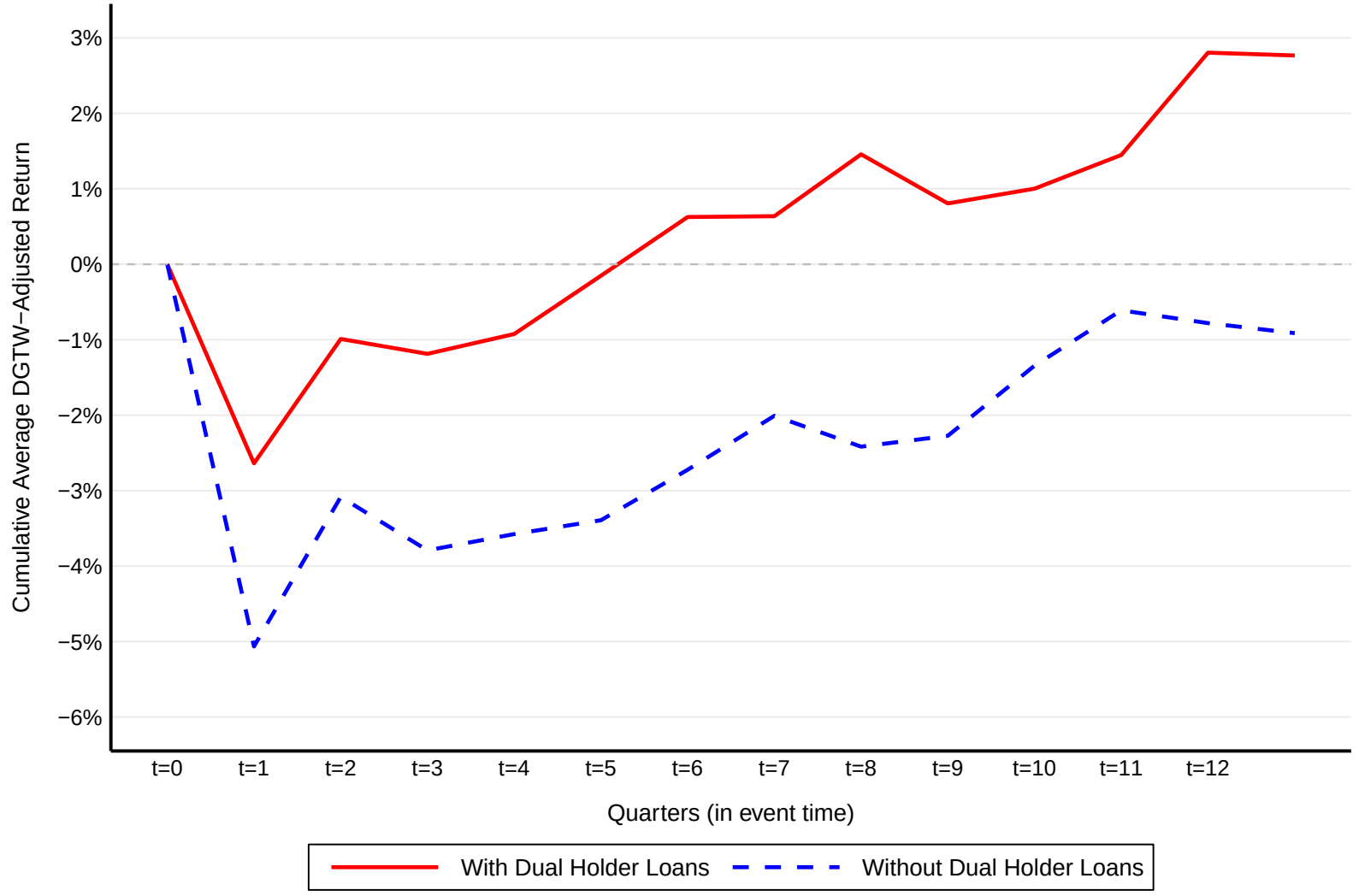

Table 1: Summary Statistics

This table reports the summary statistics for variables used in the analysis. The sample consists of 30,382 loan facilities issued for 4,682 borrowing firms. The sample period is from 1987 to 2019. All variables are defined in Table A.1. All continuous variables are winsorized at 1% and 99% levels.

	N	Mean	Std.Dev	10th Perc	Median	90th Perc
Loan Spread (%p)	30,382	2.002	1.332	0.500	1.750	3.750
Dual Hold	30,382	0.416	0.493	0.000	0.000	1.000
Flow Shock	30,382	0.098	0.298	0.000	0.000	0.000
Flow Shock (Flow-to-Volume)	30,382	0.099	0.299	0.000	0.000	0.000
MFFlow	30,382	-0.531	0.973	-1.269	-0.213	0.000
Flow-to-Volume	30,382	-0.515	0.894	-1.259	-0.217	0.000
Size	30,382	6.952	1.812	4.586	6.918	9.336
ROA	30,382	0.035	0.087	-0.046	0.044	0.115
Leverage	30,382	0.303	0.210	0.027	0.281	0.577
Tangibility	30,382	0.290	0.225	0.053	0.227	0.643
Book-to-Market	30,382	0.555	0.518	0.125	0.455	1.119
Loan Amount	30,382	18.732	1.619	16.524	18.826	20.723
Loan Maturity	30,382	3.732	0.650	2.485	4.094	4.304
Syndicate Size	30,382	1.394	0.926	0.000	1.609	2.565
Secured	30,382	0.530	0.499	0.000	1.000	1.000
Covenant Index	30,382	1.982	2.060	0.000	1.000	5.000
Performance Pricing	30,382	0.395	0.489	0.000	0.000	1.000
Dual Hold (Lead)	30,382	0.236	0.425	0.000	0.000	1.000
Dual Hold (Participant)	30,382	0.179	0.384	0.000	0.000	1.000
Dual Hold (Non-CB)	30,382	0.284	0.451	0.000	0.000	1.000
Dual Hold (CB)	30,382	0.132	0.338	0.000	0.000	1.000
Dual Hold (High Share)	30,382	0.081	0.274	0.000	0.000	1.000
Dual Hold (Low Share)	30,382	0.334	0.472	0.000	0.000	1.000
Dual Hold (Lead Blockholder)	30,382	0.043	0.204	0.000	0.000	0.000
Dual Hold (No Lead Blockholder)	30,382	0.373	0.484	0.000	0.000	1.000
Dual Hold (Long Horizon)	30,382	0.078	0.268	0.000	0.000	1.000
Dual Hold (Short Horizon)	30,382	0.338	0.473	0.000	0.000	1.000
Dual Hold (Relationship)	30,382	0.152	0.359	0.000	0.000	1.000
Dual Hold (No Relationship)	30,382	0.264	0.441	0.000	0.000	1.000
Raw Return	30,382	0.043	0.235	-0.226	0.031	0.312
DGTW-Adjusted Return	27,680	0.010	0.199	-0.215	0.007	0.239
Credit Rating	15,022	10.432	3.328	6.583	10.000	15.000
CDS Spread	4,193	0.016	0.019	0.002	0.009	0.036
Dual Shares	30,382	0.028	0.041	0.000	0.009	0.090
MFFlow pctl	30,382	0.472	0.314	0.000	0.489	0.895
Relationship	30,382	0.571	0.495	0.000	1.000	1.000
MF Own	30,382	0.245	0.153	0.045	0.237	0.458
Min MFFlow Decile	30,382	2.043	1.540	1.000	2.000	4.000
Dual Holder	10,189	0.313	0.464	0.000	0.000	1.000
Target Hold	10,189	0.170	0.376	0.000	0.000	1.000

Table 2: Fire-Sales Shock and Dual Holders' Loan Pricing

This table reports the coefficient estimates from regressions of loan spreads on the indicator of dual holder presence and the indicator of fire-sales shock driven by mutual fund outflows. All variables are defined in Table A.1. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	Dep.var = Loan Spread (%p)			
Dual Hold × Flow Shock	-0.114**	-0.142**	-0.150***	-0.121**
	(-2.00)	(-2.58)	(-2.84)	(-2.38)
Dual Hold	-0.335***	-0.267***	-0.080***	-0.070***
	(-14.40)	(-11.86)	(-3.95)	(-3.68)
Flow Shock	0.060	0.074*	0.080**	0.071**
	(1.50)	(1.85)	(2.14)	(2.00)
Size		-0.243***	-0.094***	-0.096***
		(-11.33)	(-4.31)	(-4.78)
ROA		-1.830***	-1.404***	-1.544***
		(-11.24)	(-9.02)	(-10.06)
Leverage		1.012***	0.826***	0.743***
		(11.12)	(10.02)	(9.52)
Tangibility		-0.161	-0.003	0.038
		(-1.15)	(-0.02)	(0.29)
BM		0.333***	0.257***	0.246***
		(11.26)	(9.20)	(8.90)
Loan Amount			-0.134***	-0.171***
			(-10.12)	(-14.80)
Loan Maturity			0.078***	0.088***
			(3.97)	(2.99)
Syndicate Size			-0.185***	-0.089***
			(-9.51)	(-5.03)
Secured			0.422***	0.386***
			(13.98)	(14.60)
Covenant Index			0.051***	0.027***
			(6.62)	(3.85)
Performance Pricing			-0.351***	-0.257***
			(-14.21)	(-11.98)
Observations	30,382	30,382	30,382	30,382
R^2	0.609	0.633	0.678	0.711
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Loan Type FE	No	No	No	Yes

Table 3: Heterogeneity by Dual Holder Characteristics

This table replicates Column (4) of Table 2 by separating the indicator of dual holder presence by characteristics of the dual holders. In Panel A, we separate the presence of dual holders by whether there is a dual holder as a lead lender of the loan (Column (1)) and whether there is a non-commercial bank dual holder (Column (2)). In Panel B, we separate the presence of dual holders by whether the sum of dual holders' equity shares of the borrower is in the top quintile of the distribution (Column (1)) and whether there is a lead lender that holds the borrower's equity stake of at least 5% (Column (2)). All variables are defined in Table A.1. *t*-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Heterogeneity by Lender Type		
	(1)	(2)
	Dep.var = Loan Spread (%p)	
Dual Hold (Lead) × Flow Shock	-0.166***	
	(-2.97)	
Dual Hold (Participant) × Flow Shock	-0.074	
	(-1.20)	
Dual Hold (Lead)	-0.080***	
	(-3.53)	
Dual Hold (Participant)	-0.058***	
	(-2.70)	
Dual Hold (Non-CB) × Flow Shock		-0.149***
		(-2.79)
Dual Hold (CB) × Flow Shock		-0.073
		(-1.11)
Dual Hold (Non-CB)		-0.069***
		(-3.40)
Dual Hold (CB)		-0.073***
		(-2.99)
Flow Shock	0.071**	0.071**
	(2.01)	(2.00)
Observations	30,382	30,382
R^2	0.711	0.711
Controls	Yes	Yes
Firm FE	Yes	Yes
Year-Quarter FE	Yes	Yes
Loan Type FE	Yes	Yes

Table 3 continues

Panel B: Heterogeneity by Equity Shares		
	(1)	(2)
	Dep.var = Loan Spread (%p)	
Dual Hold (High Share) × Flow Shock	-0.231***	
	(-3.60)	
Dual Hold (Low Share) × Flow Shock	-0.093*	
	(-1.71)	
Dual Hold (High Share)	-0.100***	
	(-3.32)	
Dual Hold (Low Share)	-0.068***	
	(-3.49)	
Dual Hold (Lead Blockholder) × Flow Shock		-0.281***
		(-2.98)
Dual Hold (No Lead Blockholder) × Flow Shock		-0.100*
		(-1.88)
Dual Hold (Lead Blockholder)		-0.075*
		(-1.80)
Dual Hold (No Lead Blockholder)		-0.070***
		(-3.54)
Flow Shock	0.071**	0.071**
	(2.00)	(2.00)
Observations	30,382	30,382
R^2	0.711	0.711
Controls	Yes	Yes
Firm FE	Yes	Yes
Year-Quarter FE	Yes	Yes
Loan Type FE	Yes	Yes
Difference in	-0.138**	-0.182*
Main Coefficients	(-2.21)	(-1.92)

Table 4: Heterogeneity by Borrower Characteristics

This table replicates Column (4) of Table 2 for subsamples based on borrower characteristics. Panel A divides the sample depending on whether the borrower's lagged market-to-book ratio (M/B), defined as the ratio of market equity to book equity, is higher than the top tercile of the distribution in the year or not. Panel B divides the sample depending on whether the borrower's lagged equity-focused financial constraint by Linn and Weagley (2024), which measures the borrower's intent to issue equity to address liquidity concerns, is higher than the top tercile of the distribution in the year or not. All variables are defined in Table A.1. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Heterogeneity by Growth Opportunities			
Sample:	High M/B	Low M/B	Full Sample
	(1)	(2)	(3)
	Dep.var = Loan Spread (%p)		
Dual Hold × Flow Shock	-0.276***	-0.078	-0.121**
	(-2.62)	(-1.46)	(-2.38)
Dual Hold	-0.025	-0.080***	-0.070***
	(-0.71)	(-3.60)	(-3.68)
Flow Shock	0.232**	0.044	0.071**
	(2.58)	(1.15)	(2.00)
Observations	10,240	20,142	30,382
R^2	0.791	0.717	0.711
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes
Difference in	-0.199*		
Dual Hold × Flow Shock	(-1.86)		

Table 4 continues

Panel B: Heterogeneity by Equity-Focused Financial Constraints			
Sample:	Constrained	Unconstrained	Full Sample
	(1)	(2)	(3)
	Dep.var = Loan Spread (%p)		
Dual Hold × Flow Shock	-0.376***	-0.061	-0.114**
	(-3.77)	(-1.05)	(-2.14)
Dual Hold	-0.036	-0.070***	-0.065***
	(-0.91)	(-2.85)	(-3.26)
Flow Shock	0.175**	0.030	0.065*
	(2.45)	(0.71)	(1.74)
Observations	9,200	18,393	27,593
R^2	0.788	0.722	0.714
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes
Difference in	-0.315***		
Dual Hold × Flow Shock	(-2.89)		

Table 5: Horse Race with Measures of Firm Risk

This table reports the coefficient estimates from regressions of loan spreads on the dual holder indicator and the fire-sales shock indicator with measures of firm risk. For each measure, we use the indicator of whether the borrower's risk level is higher than the top quartile of the distribution in the quarter. All variables are defined in Table A.1. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
	Dep.var = Loan Spread (%p)			
Dual Hold × Flow Shock	-0.118**	-0.110**	-0.288***	-0.387***
	(-2.32)	(-2.18)	(-3.80)	(-2.85)
Dual Hold × Low Return	-0.030			
	(-0.96)			
Dual Hold × Low Excess Return		-0.018		
		(-0.58)		
Dual Hold × Low Credit Rating			0.003	
			(0.05)	
Dual Hold × High CDS				-0.016
				(-0.18)
Low Return	0.068***			
	(2.98)			
Low Excess Return		0.065***		
		(2.90)		
Low Credit Rating			0.242***	
			(5.20)	
High CDS				0.249***
				(2.99)
Dual Hold	-0.063***	-0.065***	-0.008	0.043
	(-3.03)	(-3.21)	(-0.31)	(0.94)
Flow Shock	0.065*	0.065*	0.156**	0.367***
	(1.84)	(1.76)	(2.50)	(3.09)
Observations	30,382	27,680	15,022	4,193
R^2	0.711	0.716	0.746	0.745
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes

Table 6: Robustness Tests for the Mutual Fund Flow Pressure

This table examines the robustness of the fire-sales shock driven by mutual fund outflows. Column (1) replicates Column (4) of Table 2 by additionally controlling for the interaction between the borrower's mutual fund ownership and its minimum $MFFlow$ decile rank in the past 3 years. Column (2) replicates Column (4) of Table 2 by using the indicator of fire-sales shock defined by the *Flow-to-Volume* measure in Wardlaw (2020). t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	(1)	(2)
	Dep.var = Loan Spread (%p)	
Dual Hold × Flow Shock	-0.130**	
	(-2.55)	
Flow Shock	0.094**	
	(2.61)	
MF Own × Min MFFlow Decile	-0.059	
	(-1.41)	
MF Own	-0.546***	
	(-4.39)	
Min MFFlow Decile	0.023**	
	(2.13)	
Dual Hold × Flow Shock (Flow-to-Volume)		-0.108**
		(-2.27)
Flow Shock (Flow-to-Volume)		0.058*
		(1.69)
Dual Hold	-0.054***	-0.071***
	(-2.90)	(-3.73)
Observations	30,382	30,382
R^2	0.712	0.711
Controls	Yes	Yes
Firm FE	Yes	Yes
Year-Quarter FE	Yes	Yes
Loan Type FE	Yes	Yes

Table 7: Propensity Score Matching

This table examines the robustness of our baseline results using propensity score matching. For each firm experiencing the fire-sale shock in a given quarter, we match it with the firm in the same quarter that does not experience the shock and has the closest firm characteristics. Panel A presents the comparison of firm characteristics before and after matching. Panel B replicates Table 2 using the matched sample. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Firm Characteristics before and after Matching

		Flow Shock=1	Flow Shock=0	Difference
Size	Before	6.401	6.971	-0.570*** (t=-15.87)
	After	6.401	6.405	-0.003 (t=-0.07)
ROA	Before	0.034	0.036	-0.002 (t=-0.80)
	After	0.034	0.036	-0.002 (t=-0.60)
Leverage	Before	0.268	0.288	-0.020*** (t=-4.21)
	After	0.268	0.264	0.004 (t=0.62)
Tangibility	Before	0.275	0.298	-0.022*** (t=-4.27)
	After	0.275	0.269	0.006 (t=0.89)
BM	Before	0.637	0.554	0.083*** (t=6.77)
	After	0.637	0.611	0.026 (t=1.56)
Dual Loan	Before	0.393	0.426	-0.033*** (t=-2.92)
	After	0.393	0.413	-0.021 (t=-1.34)

Table 7 continues

Panel B: Baseline Regression after Matching				
	(1)	(2)	(3)	(4)
	Dep.var = Loan Spread (%p)			
Dual Hold × Flow Shock	-0.161*	-0.228***	-0.201**	-0.191***
	(-1.78)	(-2.76)	(-2.58)	(-2.63)
Dual Hold	-0.401***	-0.282***	-0.064	-0.063
	(-4.91)	(-3.74)	(-0.88)	(-0.94)
Flow Shock	0.056	0.115	0.128*	0.127**
	(0.72)	(1.56)	(1.97)	(2.05)
Size		-0.282***	-0.118**	-0.130***
		(-5.97)	(-2.55)	(-2.89)
ROA		-2.039***	-1.541***	-1.744***
		(-3.84)	(-2.91)	(-3.32)
Leverage		1.385***	1.117***	1.063***
		(5.93)	(4.99)	(5.08)
Tangibility		-0.324	-0.206	-0.146
		(-0.86)	(-0.58)	(-0.44)
BM		0.438***	0.384***	0.378***
		(5.07)	(4.55)	(4.75)
Loan Amount			-0.100***	-0.118***
			(-4.76)	(-6.04)
Loan Maturity			0.116***	0.110**
			(3.21)	(2.03)
Syndicate Size			-0.266***	-0.171***
			(-5.87)	(-3.68)
Secured			0.357***	0.371***
			(5.24)	(5.86)
Covenant Index			0.045***	0.019
			(2.62)	(1.18)
Performance Pricing			-0.379***	-0.266***
			(-7.68)	(-5.66)
Observations	6,012	6,012	6,012	6,012
R^2	0.759	0.777	0.802	0.819
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Loan Type FE	No	No	No	Yes

Table 8: Dual Holders' Loan Participation as Lead Lenders

This table reports the coefficient estimates from regressions of loan participation decision on the BHC's equity shares of the borrower and the indicator of fire-sales shock. The sample consists of each loan facility paired with all BHCs active as lead lenders in the current quarter. D(Lead Lender) is an indicator that equals one if the BHC participates in the loan as a lead lender. Dual Holder is an indicator that equals one if the BHC's equity shares of the borrower in the last quarter before the loan origination date is greater or equal to 1%. The sample in Column (2) only includes loan-BHC pairs in which the BHC is involved in the loan, either as a lead lender or a participant lender. t-statistics are reported in parentheses and are based on standard errors clustered at the BHC and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Sample:	All	Matched Pairs
	(1)	(2)
	Dep.var = D(Lead Lender)	
Dual Holder × Flow Shock	0.0064***	0.0406**
	(2.62)	(2.55)
Dual Holder	0.0032	-0.0087
	(1.01)	(-1.07)
Observations	894,481	123,573
R^2	0.644	0.870
Loan Facility FE	Yes	Yes
BHC × Year-Quarter FE	Yes	Yes
Firm × BHC FE	Yes	Yes

Table 9: Non-Pricing Loan Terms

This table reports the coefficient estimates from regressions of loan amount, loan maturity, existence of collateral, and covenant index on the indicator for the presence of dual holders and the indicator of fire-sales shock. We control for other firm-level and loan-level variables as well as the loan spread. All variables are defined in Table A.1. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
Dep.var =	Loan Amount	Loan Maturity	Secured	Covenant Index
Dual Hold × Flow Shock	0.004	-0.008	0.039*	0.143*
	(0.11)	(-0.45)	(1.72)	(1.74)
Dual Hold	0.029	0.004	-0.013	-0.044
	(1.65)	(0.51)	(-1.47)	(-1.24)
Flow Shock	-0.009	0.001	-0.022	-0.066
	(-0.32)	(0.07)	(-1.41)	(-1.11)
Observations	30,382	30,382	30,382	30,382
R^2	0.804	0.762	0.614	0.651
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes

Table 10: Information Advantage of Dual Holders

This table reports the coefficient estimates from the panel regressions of actual selling pressure defined in Section 4.6 on the exposure of dual holder loans and the indicator of fire-sales shock. Dual Loan is an indicator variable that equals one if the firm receives a loan from dual holders. All variables are defined in Table A.1. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	(1)	(2)
	Dep.var = Selling Pressure	
Dual Loan × Flow Shock	0.010*	0.011**
	(1.96)	(2.04)
Dual Loan	0.001	-0.001
	(0.66)	(-1.15)
Flow Shock	-0.050***	-0.050***
	(-10.72)	(-10.77)
Size		0.009***
		(6.18)
ROA		0.036***
		(3.35)
Leverage		-0.003
		(-0.59)
Tangibility		-0.006
		(-0.61)
BM		-0.010***
		(-4.96)
Observations	20,394	20,394
R^2	0.330	0.336
Controls	Yes	Yes
Firm FE	Yes	Yes
Year-Quarter FE	Yes	Yes

Table 11: Relationship Lending and Dual Holders' Equity Investment Horizon

This table replicates Column (4) of Table 2 with different lender types. Panel A replaces the indicator of dual holder presence with the indicator for the presence of a relationship lender. A relationship lender is a lender that has lead-arranged a loan for the borrower in the past five years (Bharath et al. (2011)) Column (1) presents the results for the full sample, and Column (2) presents the results for loans without dual holder presence. In Panel B, we decompose dual holder presence into whether a dual holder is a relationship lender (Column (1)) and whether the dual holders' average investment horizon in the borrower's equity is in the top quintile of the distribution (Column (2)). All variables are defined in Table A.1. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Relationship Lenders		
Sample:	Full Sample	Dual Hold=0
	(1)	(2)
	Dep.var = Loan Spread (%p)	
Relationship × Flow Shock	-0.021	-0.042
	(-0.49)	(-0.68)
Relationship	-0.145***	-0.155***
	(-7.87)	(-6.11)
Flow Shock	0.030	0.108**
	(0.84)	(2.17)
Observations	30,382	17,744
R^2	0.712	0.723
Controls	Yes	Yes
Firm FE	Yes	Yes
Year-Quarter FE	Yes	Yes
Loan Type FE	Yes	Yes

Table 11 continues

Panel B: Heterogeneity by Dual Holder Types		
	(1)	(2)
	Dep.var = Loan Spread (%p)	
Dual Hold (Relationship) × Flow Shock	-0.155***	
	(-2.64)	
Dual Hold (No Relationship) × Flow Shock	-0.112**	
	(-2.05)	
Dual Hold (Relationship)	-0.135***	
	(-5.57)	
Dual Hold (No Relationship)	-0.041**	
	(-2.09)	
Dual Hold (Long Horizon) × Flow Shock		-0.229***
		(-3.71)
Dual Hold (Short Horizon) × Flow Shock		-0.096*
		(-1.75)
Dual Hold (Long Horizon)		-0.113***
		(-3.66)
Dual Hold (Short Horizon)		-0.064***
		(-3.25)
Flow Shock	0.071**	0.071**
	(2.00)	(2.01)
Observations	30,382	30,382
R^2	0.712	0.711
Controls	Yes	Yes
Firm FE	Yes	Yes
Year-Quarter FE	Yes	Yes
Loan Type FE	Yes	Yes
Difference in	-0.044	-0.133**
Main Coefficients	(-0.87)	(-2.20)

Table 12: IV Regression

This table reports the two-stage least squares results with the sample of loan facility × BHC pairs as explained in Section 4.7. Columns (1)-(2) report coefficient estimates from the first-stage regression of Dual Holder and Dual Holder × Flow Shock on Target Hold and Target Hold × Flow Shock. Dual Holder is the indicator of whether the lender holds at least 1% of the borrower's equity in the last quarter before the loan origination date. Target Hold is the indicator of whether the target BHC holds at least 1% of the borrower's equity in the last quarter before the merger announcement date. Column (3) reports coefficient estimates from the second-stage regression, where Dual Holder and Dual Holder × Flow Shock are instrumented by Target Hold and Target Hold × Flow Shock. All variables are defined in Table A.1. t-statistics are reported in parentheses and are based on standard errors clustered at the firm, BHC, and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	First Stage	First Stage	Second Stage
	(1)	(2)	(3)
Dep. var =	Dual Holder	Dual Holder × Flow Shock	Loan Spread (%p)
Target Hold	0.160***	-0.002	
	(7.00)	(-0.37)	
Target Hold × Flow Shock	-0.042	0.161***	
	(-0.78)	(4.02)	
$\widehat{Dual\ Holder} \times Flow\ Shock$			-1.018**
			(-2.83)
$\widehat{Dual\ Holder}$			0.205
			(1.22)
Flow Shock	-0.004	0.244***	0.217*
	(-0.15)	(10.48)	(2.00)
Cragg-Donald F-statistic			46.8
Observations	10,189	10,189	10,189
R^2	0.514	0.558	0.793
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
BHC × Year-Quarter FE	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes

Table 13: Effects on Corporate Investment

This table reports the coefficient estimates from the panel regressions of future capital expenditures in the 1, 2, 3, and 4 quarters on the exposure to the dual holder loans and the fire-sales shock indicator. Dual Loan is an indicator variable that equals one if the firm i receives a loan from dual holders. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)	(4)
Dep.var=	$CAPEX_{t+1}$	$CAPEX_{t+2}$	$CAPEX_{t+3}$	$CAPEX_{t+4}$
Dual Loan × Flow Shock	0.0005	0.0016**	0.0011*	0.0018**
	(0.64)	(2.15)	(1.70)	(2.19)
Dual Loan	0.0009***	0.0006**	0.0005**	0.0002
	(3.01)	(2.49)	(2.44)	(0.94)
Flow Shock	-0.0008	-0.0018***	-0.0014***	-0.0022***
	(-1.47)	(-3.08)	(-2.75)	(-3.62)
Observations	16,898	16,898	16,898	16,898
R^2	0.700	0.713	0.703	0.690
Firm Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes

Table A.1: Variable Definitions

Variable	Description
Main variables	
Loan Spread	The All-In-Drawn Spread (in percentage points) that the borrower pays over LIBOR for each dollar drawn down.
Dual Hold	Indicator that equals one if the loan facility has at least one dual holder. A lender is a dual holder if it holds at least 1% of the borrower's equity stakes in the last quarter before the loan origination date.
MFFlow	Price pressure of a stock by mutual fund outflows, scaled by dollar value of traded share volume (Edmans et al. (2012)).
Flow-to-Volume	Price pressure of a stock by mutual fund outflows, scaled by number of traded share volume (Wardlaw (2020)).
Flow Shock	Indicator that equals one if MFFlow is in the bottom decile of the distribution in the quarter.
Flow Shock (Flow-to-Volume)	Indicator that equals one if Flow-to-Volume is in the bottom decile of the distribution in the quarter.
Firm characteristics	
Size	Log of total assets.
ROA	Net income divided by total assets.
Leverage	Total debt divided by total assets.
Tangibility	Net property, plant, and equipment divided by total assets.
Book-to-Market	Book value of equity over market value of equity.
Loan characteristics	
Loan Amount	Log of loan facility amount in dollars.
Loan Maturity	Log of loan maturity in months.
Syndicate Size	Log of the number of lenders in the syndicate of the loan facility.
Secured	Indicator that equals one if the loan facility is secured by collateral.
Covenant index	Index of covenant intensity (Bradley and Roberts (2015)): secured loan, dividend restrictions, more than two restrictions on financial ratios, asset sweep, debt sweep, and equity sweep.
Performance Pricing	Indicator that equals one if the loan facility contains a performance pricing provision.
Heterogeneity in Dual Hold	
Dual Hold (Lead)	Indicator that equals one if the loan facility has at least one dual holder as a lead lender.
Dual Hold (Participant)	Indicator that equals one if Dual Hold is one but all dual holder(s) are not lead lenders.
Dual Hold (Non-CB)	Indicator that equals one if the loan facility has at least one non-commercial bank dual holder.
Dual Hold (CB)	Indicator that equals one if Dual Hold is one but all dual holder(s) are commercial bank dual holders.

Continued on the next page

Table A.1: Variable Definitions (Cont'd.)

Variable	Description
Heterogeneity in Dual Hold	
Dual Hold (High Share)	Indicator that equals one if the sum of the dual holders' equity shares of the borrower is in the top quintile of the distribution.
Dual Hold (Low Share)	Indicator that equals one if Dual Hold is one but Dual Hold (High Share) is zero.
Dual Hold (Lead Blockholder)	Indicator that equals one if the loan facility has at least one lead lender that holds at least 5% of the borrower's equity stakes (i.e,. blockholder).
Dual Hold (No Lead Blockholder)	Indicator that equals one if Dual Hold is one but Dual Hold (Lead Blockholder) is zero.
Dual Hold (Relationship)	Indicator that equals one if the loan facility has at least one dual holder that is a relationship lender of the borrower.
Dual Hold (No Relationship)	Indicator that equals one if Dual Hold is one Dual Hold (Relationship) is zero.
Dual Hold (Long Horizon)	Indicator that equals one if the average investment horizon of dual holders in the borrower's equity (Jiang et al. (2010)) is in the top quintile of the distribution.
Dual Hold (Short Horizon)	Indicator that equals one if Dual Hold is one but Dual Hold (Long Horizon) is zero.
Instrumental variable	
Target Hold	Indicator that equals one if the target BHC holds at least 1% of the borrower's equity shares in the last quarter before the merger announcement.
Variables for Robustness Tests	
Raw Return	Borrower's stock return in the last quarter before loan origination.
DGTW-Adjusted Return	Borrower's DGTW-characteristic adjusted stock return in the last quarter before loan origination (Daniel et al. (1997)).
Credit Rating	Borrower's average long-term S&P credit rating in the last quarter before loan origination, increasing by one from 0 (C or below) to 20 (AAA) for each rating symbol.
CDS Spread	Borrower's average 5-year CDS spread in the last quarter before loan origination.
Dual Shares	Sum of the lenders' equity shares of the borrower in the last quarter before the loan origination date.
MFFlow pctl	Percentile rank of MFFlow in the quarter. A higher MFFlow pctl corresponds to a lower value of MFFlow.
Relationship	Indicator that equals one if the loan facility has at least one lead lender that has been a lead lender of the borrower's loans in the past five years.
MF Own	Mutual fund ownership of the borrower in the last quarter before the loan origination date.
Min MFFlow Decile	Minimum MFFlow decile rank of the borrower in the past 3 years.

Table A.2: Robustness Tests with Continuous Measures

This table replicates Column (4) of Table 2 with continuous measures of dual holder presence and fire-sales pressure. Column (1) replaces the indicator of dual holder presence by the sum of the lenders' equity shares of the borrower, and Column (2) replaces the fire-sales shock indicator by the percentile rank of fire-sales pressure in the quarter. Column (3) uses both continuous measures in the regression. All variables are defined in Table A.1. t-statistics are reported in parentheses and are based on standard errors clustered at the firm and year-quarter level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	(1)	(2)	(3)
	Dep.var = Loan Spread (%p)		
Dual Shares × Flow Shock	-1.446***		
	(-2.85)		
Dual Hold × MFFlow pctl		-0.122**	
		(-2.48)	
Dual Shares × MFFlow pctl			-1.131**
			(-2.15)
Dual Shares	-1.030***		-0.560
	(-4.29)		(-1.55)
Flow Shock	0.061**		
	(1.98)		
Dual Hold		-0.016	
		(-0.50)	
MFFlow pctl		-0.035	-0.053*
		(-1.02)	(-1.73)
Observations	30,382	30,382	30,382
R^2	0.711	0.711	0.711
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes