The Role of Equity Financing Constraints in the Transmission of Monetary Policy*

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Abstract

Our study reveals that equity financing constraints play a unique role in the amplification of monetary policy shocks. By using a text-based metric of financial constraint that distinguishes between a company's emphasis on equity versus debt financing, we show that equity-focused constrained firms endure more substantial declines in stock prices and implement deeper cuts in capital expenditure and R&D when faced with a contractionary monetary policy shock. These declines are translated into reductions in innovation output (e.g., patents). Equity-focused constrained firms significantly reduce equity issuance and are more reluctant to run down cash holdings in response to tighter monetary policy, while debt-focused constraints do not seem to play an economically significant role in magnifying the impact of monetary policy shocks. Our findings suggest that the transmission of monetary policy shocks to the corporate sector may not significantly rely on changes in debt financing terms.

KEYWORDS: Equity financing, financial constraint, investment, monetary policy, stock returns.

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1. Introduction

The influence of financial constraints on firm behavior has been extensively researched in economics and finance. When firms lack access to financing from equity or debt markets, they might forego investing in projects with positive net present values (NPV). This phenomenon, as documented by the financial accelerator literature, often exacerbates the effects of economic shocks. Consequently, to grasp the full impact of contractionary monetary policy shocks, it is crucial to understand how financial constraints shape firms' reactions to such shocks.

Many empirical and theoretical studies have sought to measure the role of financial constraints in monetary policy transmission to firm investment.[1] To address the unobservable nature of financial constraints, the literature has proposed proxies for financial constraints that largely revolve around the intuition for debt financing, using firm-level characteristics such as age, size, leverage, and debt maturity. As a result, most studies have focused on the "debt channel" of monetary policy and its interactions with firm financing constraints. The starting point for our paper is that more financially constrained firms often turn to equity financing rather than debt to access liquidity. Notably, the role of equity-financing constraints in transmitting monetary policy to firms remains an open empirical question.

Our paper investigates the impact of equity-financing constraints and shows that it can reconcile the inconsistent findings of the literature when different debt-based proxies are used to proxy for financing constraints. For instance, Jungherr, Meier, Reinelt, and Schott (2022) find that firms with a higher maturing bond share experience an additional reduction of their capital stock after contractionary monetary policy shocks. In contrast, Ottonello and Winberry (2020) show that firms with low debt burdens and high "distance to default" are the most responsive to monetary

[1] Examples include Gertler and Gilchrist (1994); Ottonello and Winberry (2020); Jungherr, Meier, Reinelt, and Schott (2022); Cloyne, Ferreira, Froemel, and Surico (2023); Cao, Juelsrud, Hegna, and Holm (2023); Perez-Orive, Timmer, and van der Ghote (2024).

shocks. While the heterogeneous impact of monetary policy on corporations facing different levels of financial constraint has long been recognized, comprehensive empirical evidence of the consequences is lacking.

We leverage new and detailed information on firms' constraints and use a text-based measure of financial constraint that also separates whether the firm primarily uses equity- or debt-financing sources to identify financially constrained firms that rely on equity financing (Hoberg and Maksimovic, 2015; Linn and Weagley, 2023). A firm is defined as equity-focused constrained if it mentions in its 10-K filing that investment is delayed due to liquidity issues and mainly relies on equity financing. Debt-focused constrained firms are defined similarly but rely more on debt financing.

The pecking order theory and its extensive empirical foundations (Myers and Majluf, 1984; Leary and Roberts, 2010) suggest that equity finance is the least preferred form of finance for firms. Therefore, equity-focused constrained firms are likely to be more constrained than debt-focused constrained firms, and potentially more sensitive to contractionary monetary policy shocks. In fact, Hoberg and Maksimovic (2015) show that equity-focused constrained firms are likely to be more constrained in general and are particularly affected by large negative shocks (the financial crisis of 2008-2009, and the tech bust of 2001-2002). Firm characteristics in our sample are also consistent with these firms being more constrained (see Table 2 for details).[2] Debt-focused constrained firms could be particularly affected by monetary policy since changes in monetary policy have direct impacts on interest rates. However, equity-focused financial constraints can amplify the effects of monetary policy even for firms that do not rely heavily on debt financing. Following increases in interest rates, equity issuance may become more difficult and/or more expensive since higher interest rates also increase the cost of equity

[2]It is possible that equity-focused constrained firms are constrained by debt financing, as suggested by the pecking order theory. However, only equity-focused constrained firms rely on equity financing at the margin.

capital. Our goal is to uncover the heterogeneous impact of monetary policy on firm stock prices, investment policies, innovation (e.g., patents), and financing policies.

Our focus on equity-focused constrained firms allows us to provide novel evidence on the "equity channel" of monetary policy. We show that contractionary monetary policy shocks adversely affect all firms on average, with equity-focused constraints significantly amplifying their responses to these shocks. These findings hold even after controlling for debt-focused constraints and other debt-related firm attributes (e.g., leverage or refinancing constraints). In sharp contrast, we find that debt-focused constraints do not significantly magnify the impact of monetary policy shocks. Our results suggest that contrary to the motivation for much of the existing literature, the transmission of monetary policy shocks to the corporate sector may not significantly rely on changes in debt financing terms. Since equity-focused constrained firms rely on equity financing on the margin, changes in the cost of equity capital may be a more important transmission mechanism.

We obtain daily stock returns data from CRSP, data on firm investment policies and other characteristics from COMPUSTAT, equity and debt issuance from both COMPUSTAT and SDC Platinum, patent filings from Kogan, Papanikolaou, Seru, and Stoffman (2017), and a series of monetary policy shocks from Jarociński and Karadi (2020), who separate the "pure" monetary policy shock from the "information effect". Recent studies have emphasized that the "information effect" of monetary policy may have brought significant biases to the empirical estimation of monetary policy transmission.[3] We first address how a "pure" monetary policy shock affects the stock market performance of constrained firms relative to unconstrained ones. We then use instrumental-variable local projections, an identification strategy that combines instrumental variables (IV) to a time series setting using local projections (Jordà, 2005), to empirically estimate how a monetary policy shock impacts the slow-moving adjustment of firm investment and R&D.[4]

[3]See, for example, Nakamura and Steinsson (2018); Miranda-Agrippino and Ricco (2021).

[4]We follow Döttling and Ratnovski (2023) to use high-frequency shocks to instrument the longer-term Treasury yield, which is more relevant in a low-frequency dynamic environment. See Section 4.2 for details.

We start by showing that following a one standard deviation positive monetary policy shock, equity-focused constrained firms experience an average return that is 17.9 bps lower than that for unconstrained firms on the day of FOMC announcement, while debt-focused constrained firms have an average realized return that is 11.0 bps lower than that for unconstrained firms. The results are obtained after controlling for firm-level characteristics (e.g., leverage, book-to-market ratio, size, profitability, and cash holding). The heterogeneous impact continues on the days after the announcement. In a cumulative 5-day window, equity-focused constraints amplify the stock price response by 48.1 bps while debt-focused constraints amplify it by only 15.3 bps. We also show that, consistent with Jarociński and Karadi (2020), the "information effect" has the opposite (transitory) impact on the heterogeneous stock price response, vis à vis the "pure" monetary policy shock.

We uncover significant real effects of monetary policy on firms. In response to a 25 bps increase in the 1-year Treasury rate, CAPX and R&D significantly drop by 5.2% and 1.3% after 16 quarters, respectively. Equity-focused constraints again significantly amplify these effects of monetary policy shocks. A one standard deviation increase in the equity-focused constraint measure amplifies a firm's average investment (CAPX) response by 5% after 16 quarters and it magnifies the R&D response by 17% after 16 quarters. Debt-focused constraints amplify the effect of monetary policy shocks, by far less. For example, a one standard deviation increase in the debt-focused constraint measure significantly increases a firm's average investment (CAPX) response to a 25 bps higher 1-year rate by 1.5%. These findings suggest that firms relying on equity financing are more financially constrained and that the equity channel of monetary policy is quantitatively significant.

The decrease in R&D expenses in response to contractionary shocks is translated to lower innovation output. In response to a 25 bps increase in the 1-year Treasury rate, the number of patent filings drops by 1.69% on average after 17 quarters. A one

standard deviation increase in the equity-focused constraint measure amplifies the innovation response by 15.73 bps, corresponding to approximately 9.3% of the average response. We do not find such an amplification effect for debt-focused constrained firms after 17 quarters. This result suggests that the "equity channel" might explain the suppressed innovation in the corporate sector in response to contractionary shocks, which could lead to lower economic growth in the long term.

We provide additional evidence of the effects of equity-focused financial constraints by studying the response of firm financing policies to monetary policy shocks. Following a contractionary shock, equity-focused constrained firms cut equity and SEO issuance. For instance, in response to a 25 bps increase in the 1-year treasury rate, equity-focused constrained firms significantly cut equity and SEO issuance by 6.9% and 10% (relative to their means). Equity-focused constrained firms also significantly cut debt issuance by -0.0003 units, which is only 0.9% relative to mean debt issuance.

Since we also observe a reduction in debt issuance by equity-focused constrained firms, one may be concerned that monetary policy transmission could still operate through debt financing for these firms. We provide additional evidence for the equity channel by employing aggregate-level financing shocks constructed using the methodology in Belo, Lin, Salomao, and Yang (2024). This procedure allows us to measure separate shocks for the equity (EIS) and debt (DIS) markets. We expect that investment policies of equity-focused constrained firms mainly react to EIS. In contrast to EIS, DIS should weakly affect the investment of equity-focused constrained firms. That is exactly what we find. Thus, monetary policy is unlikely to affect firms' investment decisions by impacting the debt issuance of equity-focused constrained firms.[5]

We then turn to investigate the effect of monetary policy shocks on cash holdings. Previous research suggests that firms save cash that is raised by equity issuance for pre-

[5]The fact that only unexpected changes in equity market conditions are economically significant for the investment decisions of equity-focused constrained firms supports the idea that these firms primarily rely on equity and likely plan to issue equity, presumably to address their liquidity challenges.

cautionary reasons (McLean, 2011). Therefore, we expect that a contractionary monetary policy shock would lead firms to draw down their cash holdings to mitigate the increase in financing costs. However, it may not be optimal for equity-focused constrained firms to use up all of their cash precisely because they need to hold cash for precautionary reasons. Our findings show that while firms do cut cash reserves in response to contractionary shocks, the effect is significantly smaller for equity-focused constrained firms. This suggests that these firms are more reluctant to run down cash holdings following contractionary shocks, likely due to the increased difficulty in raising new equity to replenish cash. This behavior helps explain why equity-focused constrained firms reduce real investments by more than other firms.

Hoberg and Maksimovic (2015) show that equity-focused constrained firms tend to be smaller, high-growth firms with lower leverage and lower current cash flows. These features raise the concern that the amplification effects identified may not be due to equity-focused constraints per se but rather to other correlated characteristics. For example, equity-focused constrained firms may also have a higher duration, and previous literature suggests that such firms suffer more in the aftermath of negative monetary policy shocks. To address this possibility, we control for duration using the cash flow duration measure of Gonçalves (2021) and find similar results.

Hoberg and Maksimovic (2015) also show that firms classified as debt-focused constrained frequently report issues related to covenant violations. Our results suggest that such debt-related issues amplify the effects of monetary policy shocks, but by far less than equity-focused constraints. However, covenant violations may not be the only mechanism through which debt-related constraints affect firms. For example, there is evidence that refinancing constraints matter in the aftermath of large shocks and can amplify the effects of monetary policy shocks (Jungherr, Meier, Reinelt, and Schott, 2022). To address this possibility, we construct a sample of firms likely to face refinancing constraints following Almeida, Campello, Laranjeira, and Weisbenner (2012).

Our results are robust to controlling for debt-refinancing constraints. Overall, our results suggest that equity-focused constraints play a unique role in the amplification of monetary policy shocks. In particular, our paper is the first to identify the importance of equity financing constraints to monetary policy transmission.

The remainder of the paper proceeds as follows. In Section 2, we discuss the related literature. In Section 3, we describe the data and the financial constraint measures. In Section 4, we present the empirical strategy and main results. In Section 5, we offer evidence on the "equity channel" of monetary policy. Section 6 concludes.

2. Related Literature

Our paper is related to several strands of the literature. The first studies the investment channel of monetary policy transmission both theoretically and empirically. In a seminal work, Bernanke, Gertler, and Gilchrist (1999) incorporates the financial accelerator in a New Keynesian model, emphasizing the feedback loop where tight monetary conditions magnify financial constraints. A large literature has proposed various measures of financial conditions, including cash flows (Fazzari, Hubbard, Petersen, Blinder, and Poterba, 1988; Oliner and Rudebusch, 1992), size (Gertler and Gilchrist, 1994), bank debt (Ippolito, Ozdagli, and Perez-Orive, 2018), leverage (Lakdawala, Moreland, and Schaffer, 2021; Ottonello and Winberry, 2020), liquidity (Jeenas, 2019), and tight covenants (Perez-Orive, Timmer, and van der Ghote, 2024).

More recently, using the universe of firm level data from European countries, Durante, Ferrando, and Vermeulen (2022) find that investments by young firms are more sensitive to monetary policy shocks and that high leverage amplifies the effects. Similarly, Cloyne, Ferreira, Froemel, and Surico (2023) show younger firms that do not pay dividends react more strongly, focusing on public firms in the U.S. Meanwhile, Cao, Juelsrud, Hegna, and Holm (2023) utilize administrative data from Norway, demon-

strating that higher interest costs relative to earnings are associated with more pronounced investment response. Deng and Fang (2022), Jungherr, Meier, Reinelt, and Schott (2022), and Oliveira, Rafi, and Simon (2024) find that debt maturity also matters for the transmission of monetary policy.

These papers mostly focus on one or two proxies that are potentially correlated with the unobservable financial constraint.[6] These characteristics are also highly related to the debt channel. We borrow from the corporate finance literature by using text-based firm-level financial constraints for both debt and equity financing to gauge the monetary policy sensitivity of investment. Consistent with the fact that equity-focused constrained firms are likely to be more constrained because firms generally prefer not to issue equity to finance investments, we show that equity- and debt-focused constraints play a distinct role and that equity financing constraints matter the most for the amplification of shocks.

There is evidence that the information effect matters for the transmission of monetary policy to firms' investment. Hsu, Mitra, Xu, and Zeng (2023) argue that the Fed's private information about economic conditions revealed through FOMC announcements affect firm investment and show that the sensitivity of the investment rate to a Fed information shock is greater for more cyclical firms. Our paper uses high-frequency "pure" monetary policy shocks to show that equity-focused constrained firms implement deeper cuts in CAPX and R&D when faced with a contractionary monetary policy shock. In particular, we are the first to identify that equity financing constraints play a central role in the amplification of monetary policy shocks.[7]

Our paper also draws on a literature that investigates the response of stock market to monetary policy shocks. In a seminal work, Bernanke and Kuttner (2005) show that aggregate stock market fall significantly in response to an unexpected increase in

[6]The findings in this literature are generally consistent with theories that predict stronger reactions of financially constrained firms to monetary policy (Bernanke and Gertler, 1989). However, the use of different proxies inevitably make cross-validation difficult.

[7]In the Online Appendix, we estimate our baseline specification controlling for the information effect and the results remain unchanged.

the federal funds rate around FOMC announcements. More recently, many theoretical contributions have been made in this direction to explain the salient stock market response in aggregate (Bianchi, Lettau, and Ludvigson, 2022; Pflueger and Rinaldi, 2022; Kekre and Lenel, 2022). On the cross section of stocks, there are relatively few papers in this nexus, with conflicting evidence of the heterogeneous monetary policy sensitivity of stock prices. Lamont, Polk, and Saaá-Requejo (2001) find no evidence of relative performance differences for constrained firms in response to changes in the federal funds rate or the discount window rate. This result is probably not surprising because interest rate changes have both an anticipated and an unanticipated component and stock prices are unlikely to respond to anticipated changes in monetary policy. Using the Whited and Wu (2006) index, Ozdagli (2017) shows that during 1994-2008, the stock prices of financially constrained firms respond less to the monetary policy shocks. Chava and Hsu (2020) reach the opposite conclusion using the same index as a proxy. They find that the stock prices of constrained firms are more responsive, though at a delay of up to 4 days, consistent with the financial accelerator channel.

This discrepancy might stem not only from their different empirical design and sample, but also from the fact that the measures of financial constraint they use may not capture financing constraints.[8] Borrowing from recent advancements in the measurement of financial constraint (Hoberg and Maksimovic, 2015; Linn and Weagley, 2023), we show that both equity- and debt-focused constrained firms experience disproportionately lower returns following contractionary monetary policy shocks, and that impacts are far higher for equity-focused constrained firms. The responses of stock prices are also consistent with the real effects, e.g., response in firm capital expenditure, and R&D that we document. We also build on the recent progress in high-frequency identification of monetary policy shocks (see, e.g., Jarociński and Karadi (2020); Miranda-Agrippino

[8]See, for example, Farre-Mensa and Ljungqvist (2016).

and Ricco (2021)) that isolates the "information effect" of monetary policy, and thus improve on the empirical estimation of stock price sensitivity.

Our paper is related to recent work focusing on the importance of equity financing in the aftermath of monetary policy shocks. Beyhaghi, Frank, McLemore, and Sanati (2024) show that equity issuance by public firms helps alleviate the impact of negative monetary policy shocks on investment. Jeenas and Lagos (2024) show that changes in asset prices induced by monetary policy shocks significantly affect equity-financed investment (which the authors call the "Tobin's Q" channel). In contrast, we focus on measuring the role of equity financing constraints and show that when public firms report equity-focused constraints, they become very sensitive to negative shocks because they are unable to alleviate the impact of such shocks by issuing equity.[9]

We also contribute to the literature on the effects of monetary policy on innovation. Döttling and Ratnovski (2023) show that firms with high intangible assets respond less to monetary policy than those with lower intangible assets. Caggese and Pérez-Orive (2022) find that high-intangibles firms are more likely to be net savers and, for them, low interest rates are not as stimulative as for high-tangibles firms. Our focus on equity-focused constrained firms, which tend to be more R&D intensive, emphasizes the equity financing channel. Ma and Zimmermann (2023) document a decline in R&D and patenting in response to a tightening shock. We find consistent average results and show that equity channel plays a critical role in the cross-section, especially for R&D expenses and the number of patent filings.

[9]We estimate the effect of contractionary monetary policy shocks on firms' equity issuance as defined in Beyhaghi, Frank, McLemore, and Sanati (2024) and find that equity-focused constrained firms significantly reduce their equity issuance, consistent with having worse access to equity financing. The results are available upon request.

3. Data

We employ a comprehensive dataset covering the 1991-2019 period. We obtain both annually and quarterly data on firm characteristics from COMPUSTAT. Daily stock returns data from CRSP are merged with COMPUSTAT using the linking table from WRDS. We obtain public SEOs from SDC Platinum. Following the literature, we exclude financial firms, regulated utilities, and government. We require firms to provide valid and positive information on their total assets and sales. We also exclude very small firms with physical capital under $5 million, missing capital expenditures (CAPX), and negative R&D.

3.1 Firm-level Variables

CAPX is quarterly capital expenditures (COMPUSTAT's capxy). *R&D* is quarterly R&D (COMPUSTAT's xrdq). *Public SEO* is quarterly SDC Platinum SEO dollars raised. *Equity Issuance* is quarterly sale of common and preferred stock (COMPUSTAT's sstky). *Repurchases* is quarterly purchase of common and preferred stock (COMPUSTAT's prstkcy). *Debt issuance* is quarterly newly issued long-term debt (COMPUSTAT's dltis). *Cash flow* represents the ratio of operating income before depreciation (COMPUSTAT's oibdpq) to the lag of total assets. *Size* is given by the logarithm of total assets. *Cash holdings* are measured as the ratio of cash and short-term investments (COMPUSTAT's cheq) to total assets. *Total debt* is long-term debt (COMPUSTAT's dlttq) plus debt in Current Liabilities (COMPUSTAT's dlcq). *Book leverage* denotes the ratio of total debt to total assets. *Long-term leverage* is long-term debt maturing within one-year (COMPUSTAT's dd1q) plus long-term debt (COMPUSTAT's dlttq) divided by total assets. *Maturity* is long-term debt (COMPUSTAT's dlttq) divided by *Total debt*. *Q* is defined as the ratio of total assets plus market capitalization minus common equity minus deferred taxes and investment tax credit (atq + prccq$\times$cshoq - ceqq -txditcq) to total assets (atq). *Age* is the number of years since a firm first appears in Compustat. *Dividend* is a dummy whether

$dvtq > 0$ in a given quarter. *RFC* is defined as the ratio of long term debt maturing within one year (COMPUSTAT's dd1q) to the sum of long term debt maturing within one year (COMPUSTAT's dd1q) and long-term debt (COMPUSTAT's dlttq).[10] Table 1 provides the summary statistics for the basic firm characteristics.

3.2 Financial Constraint Measures

It is a well-known empirical challenge to measure firms' financial constraints due to the fact that these constraints are not observable to the econometricians (Farre-Mensa and Ljungqvist, 2016). The monetary economics literature has proposed to use various variables from a firm's balance sheet as proxies, such as age, size, and leverage, etc. Another common way is to use indices constructed from the accounting variables, as proposed by Kaplan and Zingales (1997), Whited and Wu (2006), and Hadlock and Pierce (2010). Though Farre-Mensa and Ljungqvist (2016) demonstrate that these methods do not necessarily identify the supposedly constrained behavior, either in the debt or equity markets.[11]

We rely on the recent advancements in measuring financial constraint based on textual analysis of firms' 10-K filings. Hoberg and Maksimovic (2015) focus on mandated disclosures in the Management's Discussion and Analysis (MD&A) section of the 10-K, where firms discuss liquidity issues and financing sources they intend to use for the investment.[12] More precisely, the authors first identify a relatively small training sample of firms that they can confidently conclude are financially constrained, by counting instances when a firm mentioned words such as *delay*, *abandon*, and *post-*

[10] The variables capxy, sstky, and prstkcy represent "year-to-date". We adjust these variables to reflect quarterly values.

[11] We do not aim to compare different measurements for financial constraints in this paper. Instead, we uncover the role of equity financing constraints in the transmission of monetary policy.

[12] Buehlmaier and Whited (2018) follow the similar approach. Bodnaruk, Loughran, and McDonald (2015) classify constrained firms by parsing the disclosures from the universe of 10-K archive to measure the tone as indicated by the percentage of constraining words, such as *required*, *obligations*, and *requirements*, etc.

pone in close proximity with mentions of a form of investment (*construction*, *expansion*, *acquisition*, etc). Then, the cosine similarity between the text in each firm's 10-K and the text used by firms in the training sample is computed, which becomes the score of financial constraint for each firm.

More importantly, the authors further distinguish between firms that focus on the equity or debt market for financing needs, by levering on the financing sources discussed in the 10-K filings. Thus, a firm-year is defined as equity-focused constrained, for instance, if this firm mentions that it is at risk of delaying the investment due to liquidity issues and mainly relying on equity financing. Debt-focused constrained firms are defined in a similar way, though they rely more on debt financing. It is worth noting that, for example, equity-focused constrained firms are not necessarily constrained by equity financing. Instead, this measure classifies if a constrained firm is primarily in the equity or debt market, which allows us to isolate and evaluate the role of each financing constraint in the monetary policy transmission.

One potential limitation of the text-based measures remains, which results from analyzing specific sections of firms' 10-K filings that tend to be missing or cannot be parsed by machines.[13] Thus in our empirical analysis, we utilize the work of Linn and Weagley (2023), who create a statistical mapping (i.e., a random forest) between various accounting variables and the text-based measure developed by Hoberg and Maksimovic (2015). As a result, this methodology significantly increases the coverage of the text-based measure both at the time-series and the cross-section level, and inherits the realistic behavior of the measure from Hoberg and Maksimovic (2015). The authors also conduct several tests to show that the measures are aligned and consistent with the theoretical intuitions for the behavior of financial constraints and provide evidence that firms indeed face constraints in the relevant source of financing (see Linn and Weagley (2023) for further discussion).

[13] Hoberg and Maksimovic (2015) are able to classify 42%-68% of U.S. domestic firms in Compustat each year.

We thus use the measure *FCE* and *FCD* from Linn and Weagley (2023) to proxy for equity- and debt-focused constraint at firm level and annual frequency, respectively. We sort firms into terciles each year on each dimension, thus we end up creating 9 groups of firms in total. Here, we focus on two groups of firms: equity-focused constrained firms (firms that are in the top tercile of *FCE* and in the bottom tercile of *FCD*) and debt-focused constrained firms (firms that are in the top tercile of *FCD* and in the bottom tercile of *FCE*). We do not specifically focus on the firms that are in the top tercile of both *FCD* and *FCE*, because we aim to separate the role of equity financing and debt financing constraints in the transmission of monetary policy. It is possible that equity-focused constrained firms are constrained by debt financing, as suggested by the pecking order theory. However, only equity-focused constrained firms rely on equity financing at the margin.

Tables 2 and 3 present the summary statistics for those groups. Equity-focused constrained firms invest more in CAPX and R&D, hold more cash, have lower cash flow and higher Q, and are smaller and younger than unconstrained counterparts. They also have longer cash flow duration. Debt-focused constrained firms invest less in R&D, hold less cash, and have lower Q than unconstrained counterparts. The debt structure is also different between two sets of firms in that debt-focused constrained firms tend to have higher leverage (consistent with Hoberg and Maksimovic (2015)), which also tends to be longer-term. Debt-focused constrained firms have higher book leverage, long-term leverage, long-term debt and maturity than equity-focused constrained firms. For instance, the book leverage for debt-focused constrained firms is 0.306 and only 0.149 for equity-focused constrained firms. Equity-focused constrained firms invest more in CAPX and R&D, and also hold more cash than debt-focused constrained firms.

3.3 Macroeconomic Variables

The main source is FRED. We use the following macroeconomic variables: 1-year Treasury (Interest Rate on 1-year U.S. Treasuries), CPI (Consumer Price Index), Employment Ratio (Employment-Population Ratio), Industrial Production (Industrial Production Index), GDP Growth (Change in Real Gross Domestic Product), and Excess Bond Premium (Excess bond premium of Gilchrist and Zakrajšek (2012)).

4. Empirical Strategy and Main Results

This section presents the empirical strategy that we employ, followed by the main results. We first examine how the stock prices of financially constrained firms respond to monetary policy shocks, as motivating evidence for the equity channel that we propose. We then investigate the dynamic heterogeneous response of firm investment policies (i.e., capital expenditures, and R&D) to monetary policy, to further emphasize the quantitative importance of the equity channel. Subsequently, we study the heterogeneous response of financing policies (i.e., equity and debt issuance) to monetary policy, verifying that the equity channel plays an important role in the transmission of monetary policy.

4.1 Stock Price Response

We rely on the high-frequency identification of monetary policy surprises to assess the stock price response to monetary policy (Kuttner, 2001; Bernanke and Kuttner, 2005; Gürkaynak, Sack, and Swanson, 2005). The surprise component is constructed by price changes of Federal funds rate futures contracts in the 30-minute window around FOMC announcements. The identifying assumption is that all public information is already incorporated into the prices at the beginning of the narrow window and therefore contains no other news that affect interest rate expectations. However, as recent studies have shown, this methodology might capture the "information effect" of monetary pol-

icy, which could bring biases in the estimation of monetary policy transmission (Nakamura and Steinsson, 2018). The idea is, for example, an unexpected monetary easing might lead to pessimism among the market participants about economic fundamentals. Therefore, central banks could potentially convey information of their perception of the economic state to the investors, through various communication tools.[14] Arguably, the "information effect" could be an important factor for understanding how stock prices respond to monetary policy, especially when the financial constraint is also at play.

We use monetary policy shocks from the work of Jarociński and Karadi (2020), which separates the "pure" monetary policy effect and "information effect" by imposing sign restrictions in a Bayesian structural VAR framework. According to a broad range of models, a "pure" monetary policy tightening leads to lower stock market valuation. The empirical separation comes from identifying a shock that leads to a negative co-movement between interest rate and stock price changes (monetary policy shock), versus a shock that increases both stock market prices and interest rate simultaneously (information shock), in a narrow window around an FOMC announcement. The two series of shocks cover all FOMC announcements from 1990 to 2019.[15] Figure 1 shows the time series plot of the two shocks. The mean of two series of shocks is negative 1 bp, while the monetary policy shock is more volatile than the information shock, as shown in Table 4.

We first analyze whether monetary policy shocks affect firm-level returns using a panel regression of event window returns around the FOMC announcements during the period of 1990-2019. We estimate the following regression equation:

$$r_{ij,t} = \alpha + \beta mps_t + Controls_{ij,t} + FE_{j,y} + e_{ij,t}, \tag{1}$$

[14]Recently, Bauer and Swanson (2022) provide evidence of a "Fed response to news" channel, i.e., the incoming public economic news causes the Fed to adjust the monetary policy, is potentially at play. We show that our results are robust to the monetary policy shocks constructed in Bauer and Swanson (2023).

[15]We thank Jarociński and Karadi (2020) for providing the data.

where $r_{ij,t}$ is the return for stock i of industry j on the day of the FOMC announcement t. mps_t is the standardized monetary policy shock of that announcement, from Jarociński and Karadi (2020). The analysis is conducted on the firm-announcement level, which allows us to control for firm-level characteristics, including size, book-to-market ratio, leverage, operating profitability, and cash holdings. All regressions include industry-year fixed effects ($FE_{j,y}$). Standard errors are robust and clustered at the firm level. We consider multiple event windows around the FOMC announcements as the information of monetary policy may not be fully reflected immediately for all the firms, which is one of the main analyses of Chava and Hsu (2020). Table 5 reports the coefficient estimates that are consistent with the literature. Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Column (2) reports the results when we use the daily return 1 day after the FOMC announcements. Column (3) to (5) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements, respectively. On average, when there is a positive one standard deviation surprise in the monetary policy, firms experience a significantly negative 51.4 bps return on the day of the FOMC announcements. The negative relation between monetary policy shock and realized stock price persists in a five-day cumulative window, with a negative 1 percentage point response of stock price. The results are quantitatively similar when firm fixed effects are included.

We then assess heterogeneous stock price response around FOMC announcements during the same time period. We double sort firms into terciles each year based on the lagged financial constraint measures from Linn and Weagley (2023), following the standard practice in the literature. Firm returns at daily level are regressed on the financial constraint indicator, monetary policy shock and their interactions using the following specification:

$$r_{ij,t} = \alpha + \beta mps_t + \gamma I_{ij,t} + \delta[mps_t \times I_{ij,t}] + Controls_{ij,t} + FE_{j,y} + e_{ij,t}, \tag{2}$$

where $r_{ij,t}$ is the return for stock i of industry j on the day of the FOMC announcement t. Financial constraint indicator $I_{ij,t}$ takes the value of one if a firm is equity-focused constrained (i.e., firms fall in the top tercile of FCE and in the bottom tercile of FCD). The dummy for other groups and their interaction with mps_t are included in the regression but not shown for brevity, except for the unconstrained group of firms. $Controls_{ij,t}$ are lagged firm-level controls, such as size, book-to-market ratio, leverage, operating profitability, and cash holding, and their interactions with mps_t. We include industry and year fixed effects $FE_{j,y}$ in all the regressions. Standard errors are robust and clustered at the firm level. We also consider multiple event windows around the FOMC announcements.

Table 6 presents the results of Equation (2). The dependent variable in Column (1) is daily return on the day of FOMC announcements. Columns (2) and (3) reports the estimates using daily returns 1 day after, and 2 days after the FOMC announcements as the dependent variable, respectively. Estimates from Table 6 indicate that equity-focused constrained firms respond more to an unexpected change in the monetary policy rate than unconstrained firms, as the coefficient on the interaction term is significantly negative. When there is a positive one standard deviation surprise in the monetary policy, equity-focused constrained firms have an average realized return that is 17.9 bps lower than that of the unconstrained firms on the day of FOMC announcement, even after controlling for leverage, book-to-market ratio, size, operating profitability, and cash holdings. The response corresponds to 34.8% of the average stock price response on the day of FOMC announcement. Debt-focused constrained firms experience a 11.0 bps lower return than unconstrained firms do, representing 21.4% of the average response. The heterogeneous impact remains significant for daily returns 2 days after FOMC announcements.

Table 7 reports the results of the cumulative return window 1 day after, 2 days after, and 5 days after the FOMC announcements. The heterogeneous impact of equity-

focused constraint remains significant for a cumulative return window of several days. For example, Column (2) shows that for the holding period of 2 days after the FOMC announcement, equity-focused constrained firms have an average realized return that is 29.2 bps lower than that of the unconstrained firms for a one standard deviation surprise increase of monetary policy rate, representing 37.9% of the average response in a 2-days window. Debt-focused constrained firms, on the other hand, have an average realized return that is 18.3 bps lower, which is 23.8% of the average response. The magnitudes of amplification on the stock price responses go up when we look at a cumulative return window of 5 days after the FOMC announcements, confirming that the effect is not temporary. More importantly, the amplification of equity-focused constraint is quantitatively larger. Over a cumulative return window of 5 days after the FOMC announcements, the equity-focused constraint causes a 48.1 bps lower realized return, while the debt-focused constraint causes a 15.3 bps lower realized return. Collectively, tables 6 and 7 demonstrate that the equity channel is important in explaining the heterogeneous stock price response to monetary policy shocks.

As explained above, we choose not to use raw high-frequency change in the price of fed funds rate futures around FOMC announcements due to the potential estimation bias it could bring. The stock market valuations could be sensitive to the "information effect", especially when we focus on the stock price of financially constrained firms. The potential signal of a "bad" economy from an easing monetary policy might be bad news for constrained firms. We use the separated series of the information shock of FOMC announcements to directly test whether this effect has an impact on stock price responses. Column (1) of Table 8 show that stock price of equity-focused constrained firms tend to increase more to such a surprise than that of unconstrained firms, while debt-focused constrained firms tend to have a lower amplification. The effect does not persist after the day of FOMC announcements, as the coefficients on the interaction term become insignificant when the returns are cumulative over a longer period. This

suggests that isolating the "information effect" is important for understanding the stock price response to monetary policy, as the signs on the interaction terms of shocks and financial constraint indicators flip, compared to the Table 7.

4.2 Real Effects

In this section, we study the dynamic real effects (i.e., firm investment policies) of monetary policy. We measure the monetary policy stance as the 1-year U.S. Treasury rate. The adjustment of investment is slow-moving, with long and uncertain lags, and is measured at a quarterly frequency. As a result, the 1-year Treasury rate appropriately captures the gradual adjustment of firm investment and R&D, while also better reflecting interest rate variations during the unconventional monetary policy environment in the latter part of our sample period.

Since monetary policy is endogenous to macroeconomic conditions, we instrument the treasury rate using cumulative "pure" monetary policy shocks from Jarociński and Karadi (2020) as a level measure of monetary policy surprises (as in Bu, Rogers, and Wu (2021), Cloyne, Ferreira, Froemel, and Surico (2023) and Döttling and Ratnovski (2023)), while controlling for key lagged macroeconomic variables.[16] In the Online Appendix, we confirm the validity of our approach as follows. First, we plot the predicted 1-year treasury rate (Figure A.1) and report the results from the first-stage regression (Table A.1), which confirms that cumulative "pure" monetary policy shocks are a strong instrument for the 1-year Treasury rate. Second, all results on the effects of monetary policy on firm investment policies are mirrored by the results on the effects of monetary policy on firm stock prices, estimated in a much higher frequency setting. Third, we show our results remain quantitatively the same when instrumenting the 1-year Treasury rate without controlling for lagged macroeconomic variables.

[16] We follow Döttling and Ratnovski (2023) and construct the cumulative "pure" monetary policy shocks by first creating a quarterly series that accounts for the timing of FOMC announcements within a quarter. We then cumulate this quarterly series to obtain a level measure.

We use instrumental-variable local projections (Jordà, 2005) to trace out the dynamic impact of monetary policy on firm investment policies. Specifically, for each horizon h, we estimate the regression specification:

$$y_{i,t+h} - y_{i,t-1} = \beta_1^h \, \hat{yt}_t + \gamma_1^{h'} \, X_{t-1} + \gamma_2^{h'} \, Z_{i,t-1} + \alpha_i + \mu_{fq} + \epsilon_{i,t}, \tag{3}$$

where $y_{i,t}$ is the outcome variable (CAPX/Assets and R&D/Assets in logarithm) and $\hat{yt}$ is the instrumented 1-year Treasury rate. X_{t-1} is a vector of lagged macroeconomic control variables (log CPI, log industrial production, the excess bond premium, and the employment ratio). $Z_{i,t-1}$ is a vector of firm controls, which includes Q, leverage, size, cash flow, cash holdings, age, dividend, and the interaction of each control with the instrumented 1-year Treasury rate. We also include firm fixed effects and fiscal-quarter fixed effects. Note that we cannot include time fixed effects in Equation (3) because the time series variation on $\hat{yt}$ would be absorbed.

Figure 2 shows the impulse response function (IRF) for the response of CAPX and R&D, estimated using Equation (3). In response to a 25bps higher 1-year Treasury rate, CAPX and R&D significantly drop by 5.2% and 1.3% after 16 quarters, respectively. This is in line with the literature analyzing the average investment response of U.S. COMPUSTAT firms. Intuitively, higher interest rates would increase the firms' cost of capital, and, as a result, firms decrease physical and intangible capital investment.

To investigate the real effects of monetary policy and the role of financial constraint, we use the financial constraint measure *FCE* and *FCD* from Linn and Weagley (2023), and we run the following specification:

$$\begin{aligned} y_{ij,t+h} - y_{ij,t-1} = \beta_1^h \, FCE_{ij,t-1} + \beta_2^h \, FCE_{ij,t-1} \times \hat{yt}_t + \gamma_1^{h'} \, Z_{ij,t-1} \times \hat{yt}_t \\ + \gamma_2^{h'} \, Z_{ij,t-1} + \alpha_i + \eta_{jt} + \mu_{fq} + \epsilon_{ij,t}, \end{aligned} \tag{4}$$

where $y_{ij,t}$ is the outcome variable (CAPX/Assets and R&D/Assets in logarithm) and $\hat{y}t$ is the instrumented 1-year Treasury rate. FCE is the proxy for equity-focused constraint. The proxy for debt-focused constraint, FCD, and its interaction with $\hat{y}t$ are included in the regression but not shown for brevity. $Z_{ij,t-1}$ is a vector of firm level controls, which includes Q, leverage, size, cash flow, cash holdings, age, and dividend. We also include firm fixed effects, fiscal-quarter fixed effects, and industry$\times$ time fixed effects. Therefore, by controlling for the firm level characteristics that have been shown to affect the heterogeneous response of firm investment policies, and especially, the debt channel, we quantitatively capture and isolate the differential effect of monetary policy shocks on equity-focused constrained firms, i.e, the equity channel of monetary policy.

Figure 3 shows the differential effect of monetary policy shocks for equity-focused constrained firms, estimated using Equation (4). A one standard deviation increase in the FCE measure significantly increases a firm's investment (CAPX) response to a 25bps higher 1-year Treasury rate by 26.14bps, representing approximately 5% (one-twentieth) of the average CAPX response of 5.2%. The amplification effect is even larger on the response of R&D. A one standard deviation increase in the FCE measure significantly increases a firm's R&D response to a 25bps higher 1-year Treasury rate by 22.50bps after 16 quarters, corresponding approximately 17% (one-sixth) of the average R&D response of 1.3%. The amplification is estimated after controlling for the debt-focused constraint and other debt-related characteristics.

Figure 4 shows the differential effect of monetary policy shocks for debt-focused constrained firms, estimated using Equation (4). A one standard deviation increase in the FCD measure significantly increases a firm's investment (CAPX) response to a 25bps higher 1-year Treasury rate by 8.19bps. This magnitude represents only 1.5% of the average CAPX response of 5.2%. The heterogeneous effect of debt-focused constraint is not statistically significant for R&D, implying that the amplification of the debt-focused constraint is less economically significant than that of the equity-focused constraint.

Our results show that monetary policy shocks have significant real effects on both equity-focused and debt-focused-constrained firms, but the equity channel appears to be quantitatively and statistically more important than the debt channel. First, while equity-focused constraints amplify the negative effect of monetary policy shocks on both types of investment, CAPX and R&D, debt-focused constraints amplify the effect only on CAPX. Second, the amplification effect for equity-focused firms persists after 16 quarters, while the effect on debt-focused firms seems to be more transitory, as it dissipates after 5 quarters. Third, the magnitude of the amplification of the shock is larger for equity-focused firms. While equity-focused constraints amplify the negative effect of monetary policy shocks on CAPX by 26.14bps, debt-focused constraints amplify by only 8.19bps. These results underscore the equity channel of monetary policy.[17]

4.3 Impact on Innovation

Building on the evidence that monetary policy shocks have more pronounced effects through the equity channel, we further explore how these shocks impact firms' innovation outputs, such as patent filings. We hypothesize that contractionary monetary policy shocks can significantly lower innovation, especially among equity-focused constrained firms, given that these firms are typically R&D intensive (see Table 2). To test this hypothesis, we utilize patent data from Kogan, Papanikolaou, Seru, and Stoffman (2017). We construct the variable *Patents Count*, defined as the logarithm of the number of patents filed, and estimate the impact of monetary policy shocks on *Patents Count* using Equations (3) and (4). Additionally, we control for lagged R&D over assets to address potential correlations between R&D intensity and financial constraints.

Figure 5 illustrates the average effect of monetary policy on patent filings. A 25bps increase in the 1-year Treasury rate (instrumented) leads to a significant reduction in

[17] This is also consistent with Hoberg and Maksimovic (2015), which shows that equity-focused constrained firms tend to be more constrained in general.

the number of patents filed by 1.69% after 17 quarters. Table 9 further examines the amplification effect of financing constraints. We choose quarters $h = 17$ and $h = 20$, where the impulse response functions show the strongest responses (see Figure 5). Our results reveal that equity-focused constrained firms exhibit a much larger reduction in patent filings in response to a contractionary shock compared to unconstrained firms. Conversely, we find no evidence of amplification effects among debt-focused constrained firms at either 17 or 20 quarters, underscoring the critical role of the equity channel in transmitting the effects of monetary policy shocks to the coporate sector.

4.4 Additional Results

Section C in the Online Appendix discusses additional results and rules out alternative channels that might explain why equity-focused constraints amplify the effect of monetary policy shocks.

Duration. Constrained firms focusing on equity financing tend to have longer duration as shown in Table 2, since these firms tend to invest heavily in R&D. Previous literature also has suggested that firms with high duration do suffer more in the aftermath of negative monetary policy shocks. In Section C.1, we show that stock price and investment responses are robust after controlling for duration.

Refinancing Constraints. There is recent evidence that refinancing constraints can amplify the effects of monetary policy shocks (Jungherr, Meier, Reinelt, and Schott, 2022; Oliveira, Rafi, and Simon, 2024). If equity-focused constrained firms are also likely to face refinancing risk, the refinancing constraints channel could be potentially attenuating the equity channel. In Section C.2, we use the refinancing constraint measure from Almeida, Campello, Laranjeira, and Weisbenner (2012) and show our results are quantitatively the same after controlling for this additional dimension of financing constraints.

Information Effect. Hsu, Mitra, Xu, and Zeng (2023) argue that the Fed's private information about economic conditions revealed through FOMC announcements affect

firm investment and show that the sensitivity of the investment rate to a Fed information shock is greater for more cyclical firms. To rule out that our results are driven by the information effect, in Section C.3, we estimate Equation (4) adding the information shock from Jarociński and Karadi (2020) interacted with the FCE and FCD measures as controls variables and show our results are virtually unchanged.

Alternative Shocks and Cyclicality. In Section C.4, we show our results are robust to the monetary policy shocks from Bauer and Swanson (2023). In Section C.5, we guarantee that the results are not driven by differences in cyclicality or other observable differences between equity-focused constrained firms and unconstrained firms, time-invariant unobservable firm characteristics, nor by economy-wide or industry-specific trends by estimating Equation (4) and adding the FCE and FCD measures interacted with GDP growth.

2-year Treasury Rate. We measure the stance of monetary policy using the instrumented 2-year U.S. Treasury rate, following the procedure outlined in Section 4.2. Figures C.15 and C.16 shows our findings are virtually the same.

Zero Lower Bound. Brennan, Jacobson, Matthes, and Walker (2024) show that different series of high-frequency monetary shocks can have a low correlation coefficient, and that the shock series become even more distinct when the federal funds rate is at its effective lower bound (ELB) due to data. One concern is that our results might be driven by the use of a specific shock or by the zero lower bound period. As discussed above, we first address this concern by showing that our results are robust to the monetary policy shocks from Bauer and Swanson (2023) and to the use of the instrumented 2-year U.S. Treasury rate. We then estimate Equation (4) excluding the zero lower bound period (January 2009 to December 2015). Figure C.17 shows that equity-focused constraints significantly amplify the effect of monetary policy shocks on CAPX and R&D. Overall, our results suggest that the "equity channel" remains robust even when the zero lower bound period is excluded from our sample.

Intangibility. There is evidence that intangible firms are less sensitive to monetary policy shocks (Caggese and Pérez-Orive, 2022; Döttling and Ratnovski, 2023). Although our focus is on equity-focused constrained firms rather than intangible firms, the former tend to be more R&D-intensive, as suggested by Table 2. This indicates a potential correlation between our proxy for equity-focused constraints and intangibility, which could introduce biases into our estimations. In Section C.8, we address this concern by controlling for intangible ratio and its interaction with monetary policy shocks in Equation (4). Tables C.7 and C.8, and Figures C.19 and C.20 demonstrate that our results remain robust to this additional control.

5. The Equity Channel

Our findings suggest that the transmission of monetary policy shocks to the corporate sector may not be predominantly driven by changes in debt financing terms. Since equity-focused constrained firms tend to be more sensitive to monetary policy shocks and rely on equity financing on the margin, the cost of equity appears to play a more critical role as a transmission mechanism. In this section, we provide further evidence to support the equity channel. First, we analyze the impact of monetary policy shocks on equity issuance, debt issuance, and cash holdings. Second, we examine the effect of financing shocks on firms' investment.

5.1 Equity and Debt Issuance

Following increases in interest rates, equity issuance may become more difficult and/or more expensive since higher interest rates also increase the cost of equity capital. In the presence of financing constraints, this should translate to lower investment in capital expenditures and R&D. If the equity channel of monetary policy is quantitatively important (as shown above), we expect to observe that equity-focused constrained firms

react to monetary policy shocks by cutting equity issuance more than other firms. This would help explain our results in Section 4.2 that equity-focused firms cut both CAPX and R&D by more after a monetary policy tightening.

We estimate the following equation:

$$\begin{aligned}\Delta y_{ij,t} =& \beta_1 \times \hat{yt}_t + \beta_2 \times I_{ij,t} + \beta_3 \times I_{ij,t} \times \hat{yt}_t + \gamma_1 \times Z_{ij,t-1} \\ &+ \gamma_2 \times X_{t-1} + \alpha_i + \mu_{fq} + \lambda_{q,j} + \epsilon_{it},\end{aligned} \tag{5}$$

where $y_{ij,t}$ is the outcome variable (equity issuance, repurchases, public SEO issuance, and debt issuance) and $\hat{yt}$ is the instrumented 1-year Treasury rate. Financial constraint indicator $I_{ij,t}$ takes the value of one if a firm is equity-focused constrained (i.e., firms fall in the top tercile of FCE and in the bottom tercile of FCD). The dummy for the other groups and its interaction with $\hat{yt}$ are included in the regression but not shown for brevity, except for the unconstrained group. Therefore, we capture the differential effect of monetary policy shocks relative to unconstrained firms for two different groups of financially constrained firms: equity-focused constrained firms, and debt-focused constrained firms. $Z_{ij,t-1}$ is a vector of firm controls, which includes Q, leverage, size, cash flow, age, cash holdings, and dividend payer (a dummy that takes value one when firms pay dividend). We also include firm fixed effects, fiscal-quarter fixed effects, and sector-quarter fixed effects. Finally, X_{t-1} is a vector of lagged macroeconomic control variables (log CPI, log industrial production, the excess bond premium, and the employment ratio).

One concern when using equity issuance data from Compustat is that employee-initiated and firm-initiated share issues are commingled. Therefore, we follow McKeon (2015) and construct the variable *Equity Issuance Adjusted* to exclude equity issuances resulting from the exercise of employee stock options. *Equity Issuance Adjusted* is then defined as gross equity issuance (COMPUSTAT's sstk) divided

by lagged assets when gross equity issuance exceeds 3% of market equity, and zero otherwise (see McKeon (2015) for details).

Table 10 shows the results of estimating Equation (5) for equity issuance and repurchases. In response to a 1% higher 1-year treasury rate, equity-focused constrained firms reduce equity issuance by -0.0047. This effect represents approximately a 27.3% (-0.0047/0.0172) drop relative to the mean equity issuance, suggesting that the results are economically significant. We also show that in response to a 1% increase in the one-year treasury yield, unconstrained firms reduce repurchases by 6.63% relative to the mean. We find no significant amplification effect for equity-focused constrained firms. This result is intuitive: as higher interest rates increase costs, firms become less likely to repurchase shares. However, since equity-focused constrained firms already repurchase relatively few shares, the effect is likely to be insignificant for them. In contrast, unconstrained firms are typically larger and repurchase more shares than constrained firms. In fact, the mean repurchase-to-assets ratio for unconstrained firms is nearly three times greater than that for constrained firms. As a result, unconstrained firms significantly reduce repurchases following an interest rate hike.

Table 11 shows the effect of monetary policy shocks on firms' SEO issuance and debt issuance. In response to a 1% higher 1-year treasury rate, equity-focused constrained firms significantly cut SEO issuance by -0.003. This magnitude represents a 40.0% (-0.003/0.0075) decrease relative to the mean public SEO issuance. Equity-focused constrained firms also significantly cut debt issuance by -0.0012. However, the drop is only 3.5% (-0.0012/0.0342) relative to mean debt issuance. Therefore, the amplification of equity issuance by equity-focused constrained firms is quantitatively larger relative to the debt issuance results for equity-focused constrained firms.

Overall, we show that equity-focused constrained firms reduce both equity and debt issuance after a contractionary shock, but the effect is much smaller for debt issuance. The drop in equity issuance is approximately eight times greater than the drop in debt

issuance. Even if we take into account that the mean of debt issuance is two times greater than the mean of equity issuance (see Table 1), the drop in equity issuance is still four times greater, which is a very relevant magnitude. These results support and explain why equity-focused constrained firms are strongly affected by monetary policy shocks, underscoring the equity channel.

5.2 Cash Holdings

Previous research suggests that firms save cash that is raised by equity issuance for precautionary reasons (McLean, 2011). It is natural to expect that a contractionary monetary policy shock (for example) would cause firms to draw down on cash holdings, in order to mitigate the increase in financing costs. Our previous results suggest that equity-focused constrained firms reduce equity issuance and real investments by more than other firms, in the aftermath of contractionary policy shocks. However, it is not necessarily optimal for equity-focused constrained firms to use up all of their cash precisely because they need to hold cash for precautionary reasons. In fact, Table 2 shows that equity-focused constrained firms hold more cash than other firms. For instance, the average cash holdings for the former is 0.294, and only 0.139 for the overall sample of firms.

In Table 12, we look at the effect of monetary policy shocks on cash holdings, for different types of firms. Our results suggest that firms do cut cash reserves in response to contractionary shocks. However, the effect is significantly smaller for equity-focused constrained firms. In response to a 1% increase in the 1-year treasury rate (instrumented), firms reduce, on average, cash savings by approximately -2.1% (-0.0029/0.139) relative to the mean. Equity-focused constrained firms reduce it by only 1% relative to the mean. These results suggest that equity-focused constrained firms are more reluctant to run down cash holdings following negative shocks, possibly due to the increased difficulty in raising new equity to replenish cash. This behavior can help explain why equity-focused constrained firms cut real investments by more than other firms.

5.3 Financing Shocks

A potential concern with the notion that changes in debt financing terms may not be a primary mechanism of monetary policy transmission is that we also observe a reduction in debt issuance by equity-focused constrained firms, albeit to a lesser extent. This might indicate that the transmission of monetary policy could still operate through debt financing rather than equity financing channel.

We address this concern as follows. Using aggregate level financing shocks for both equity (EIS) and debt (DIS) market from Belo, Lin, Salomao, and Yang (2024)[18], we estimate the heterogeneous impact of these two financing shocks on firms' investment. We expect that investment policies of equity-focused constrained firms mainly react to EIS. That is, in contrast to EIS, DIS should weakly affect the investment of equity-focused constrained firms. If this is the case, it is very unlikely that monetary policy affects firms' investment decisions by impacting the debt issuance of equity-focused constrained firms.

We test our hypothesis formally using the following specification:

$$\begin{aligned} y_{ij,t+h} - y_{ij,t-1} = \beta_1^h \, FCE_{ij,t-1} + \beta_2^h \, FCE_{ij,t-1} \times EIS_t + \beta_3^h \, FCE_{ij,t-1} \times DIS_t \\ + \gamma_1^{h'} \, Z_{ij,t-1} \times EIS_t + \gamma_2^{h'} \, Z_{ij,t-1} \times DIS_t + \gamma_3^{h'} \, Z_{ij,t-1} + \alpha_i + \eta_{jt} + \epsilon_{ij,t}, \end{aligned} \tag{6}$$

where $y_{ij,t}$ is the outcome variable (CAPX/Assets and R&D/Assets in logarithm) for firm i in industry j at year t, and EIS_t and DIS_t are the financing shocks from Belo, Lin, Salomao, and Yang (2024).[19] FCE is the proxy for equity-focused constraint. The proxy for debt-focused constraint, FCD, and its interaction with EIS_t and DIS_t are included in the regression but not shown for brevity. $Z_{ij,t-1}$ is a vector of firm level controls,

[18] The Equity Issuance Shocks (EIS) and Debt Issuance Shocks (DIS) are the residuals from regressions that include several aggregate variables to control for investment opportunities, and costs of equity and debt financing, thus capturing the expected normal variation in issuance activity. That way, there are two financial shocks from the time series variation in the fractions of firms issuing equity and debt in the cross-section of U.S. publicly traded firms using Compustat data. See Belo, Lin, Salomao, and Yang (2024) for more details.

[19] A positive EIS (DIS) represents an unexpected improvement in equity (debt) market conditions.

which includes Q, leverage, size, cash flow, cash holdings, age, and dividend. We also include firm fixed effects and industry$\times$ time fixed effects.

Table 13 collects our results. We choose horizons of $h = 4$ and $h = 5$ years (at which the impulse response functions demonstrate the strongest response). We find a statistically significant coefficient of the interaction between FCE and EIS (β_2^h) for both CAPX and R&D. Therefore, unexpected changes in equity market conditions affect the investment decisions of equity-focused constrained firms. Importantly, we do not find a statistically significant coefficient of the interaction between FCE and DIS (β_3^h) for both CAPX and R&D, suggesting that unexpected changes in debt market conditions are not economically important for the investment decisions of these firms.

6. Conclusion

Researchers and policymakers agree that financing constraints play an important role in the monetary policy transmission to firms. Previous literature on the effects of monetary policy on financially constrained firms has focused on the "debt channel" of monetary policy (Ottonello and Winberry, 2020; Deng and Fang, 2022; Cloyne, Ferreira, Froemel, and Surico, 2023; Döttling and Ratnovski, 2023). However, Hoberg and Maksimovic (2015) show that equity-focused constrained firms are particularly affected following large negative shocks, decreasing R&D, capital expenditures and equity issuance more than other firms. This would suggest that equity-focused constrained firms might be more sensitive to monetary policy shocks as well.

In this paper, we use a new measure of financing constraints that identify whether the firm is debt- or equity-focused constrained (Hoberg and Maksimovic (2015), Linn and Weagley (2023)) to provide novel evidence for an equity channel of monetary policy. Following increases in interest rates, equity issuance may become more difficult and/or more expensive since higher interest rates also increase the

cost of equity capital. In the presence of financing constraints, this translates to lower investment in capital expenditures and R&D.

Our empirical results show that after a contractionary monetary policy shock, on average, stock prices decline, firms decrease capital expenditures, R&D, and the number of patent filings. This effect is amplified by debt-focused constraints, as debt-focused constrained firms experience a larger decline in stock price and capital expenditures than unconstrained firms. Notably, we find that equity-focused constraints amplify the effects of monetary policy by more than debt-focused constraints do, as equity-focused constrained firms experience an even larger decline in stock prices, capital expenditure, R&D, and number of patent filings. Consistent with the equity channel, we show that equity-focused constrained firms significantly cut equity issuance when monetary policy tightens. Also, in contrast to financing shocks in the equity market, financing shocks in the debt market are not economically important for the investment decisions of equity-focused constrained firms.

Our findings suggest that the equity channel of monetary policy is quantitatively important and plays a unique and significant role in the monetary policy transmission to firms. Uncovering the equity channel not only fills the gap in the corporate finance and monetary policy literature, but also provides insights for the conduct of monetary policy by the Federal Reserve.

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Table 1. Summary Statistics: Firm Characteristics

	Obs	Mean	Std. Dev.
CAPX/Assets	451,559	0.021	0.043
R&D/Assets	178,272	0.020	0.038
Cash Flow	429,404	0.024	0.053
Cash holdings	468,193	0.139	0.176
Size	471,315	6.038	1.952
Q	395,554	1.892	2.154
Duration	210,848	62.24	67.64
Age	471,315	14.63	11.86
Dividend	471,315	0.086	0.281
FCE	401,639	-0.138	0.572
FCD	401,639	0.173	0.616
Book Leverage	452,275	0.272	0.286
Long-term Leverage	467,572	0.227	0.258
Long-term Debt/Assets	448,026	0.229	0.273
Short-term Debt/Assets	435,038	0.054	0.135
Maturity	393,388	0.743	0.314
RFC	386,617	0.032	0.129
Public SEO issuance/ Assets	386,256	0.0075	0.113
Δ Public SEO issuance/ Assets	369,621	-0.0003	0.153
Debt issuance/ Assets	364,683	0.0342	0.135
Δ Debt issuance/ Assets	342,919	-0.0006	0.171
Equity issuance/ Assets	377,086	0.0172	0.131
Δ Equity issuance/ Assets	358,988	-0.0027	0.159
Repurchase/ Assets	360,848	0.0041	0.022
Δ Repurchase/ Assets	340,305	-0.0000	0.029

This table provides summary statistics for basic firm characteristics (see Subsection 3.1). The sample covers the years 1991 to 2019. Source: COMPUSTAT and SDC Platinum.

Table 2. Summary Statistics: Equity-Focused Constrained Firms vs. Unconstrained Firms

	Equity-Focused Constrained Firms			Unconstrained Firms		
	Obs	Mean	Std. dev.	Obs	Mean	Std. dev.
CAPX/Assets	65,934	0.028	0.057	30,056	0.014	0.022
R&D/Assets	32,598	0.044	0.064	15,902	0.018	0.022
Cash Flow	61,861	-0.011	0.085	28,219	0.038	0.035
Cash holdings	65,742	0.294	0.242	30,023	0.196	0.164
Size	65,934	4.948	1.857	30,056	6.183	1.930
Q	62,688	2.607	3.442	27,855	2.074	1.498
Duration	21,311	92.41	106.1	21,816	49.08	43.09
Age	65,934	9.474	8.441	30,056	20.77	12.49
Dividend	65,934	0.062	0.242	30,056	0.047	0.213
FCE	64,697	0.560	0.498	29,696	-0.681	0.290
FCD	64,697	-0.453	0.322	29,696	-0.442	0.395
Book Leverage	63,887	0.149	0.269	29,000	0.146	0.178
Long-term Leverage	65,475	0.118	0.219	29,743	0.122	0.167
Long-term Debt/Assets	65,475	0.118	0.232	29,743	0.123	0.177
Short-term Debt/Assets	64,053	0.040	0.162	29,146	0.028	0.060
Maturity	42,230	0.645	0.355	22,314	0.714	0.319
RFC	39,141	0.053	0.179	21,435	0.035	0.127

This table provides summary statistics for basic firm characteristics (see Subsection 3.1). We sort firms into terciles each year based on the lagged financial constraints, following the standard practice in the literature. Equity-focused constrained firms are firms in the top tercile of the *FCE* and bottom tercile of *FCD* distribution. Unconstrained firms are firms in the bottom tercile of both measures. The sample covers the years 1991 to 2019. Source: COMPUSTAT.

Table 3. Summary Statistics: Debt-Focused Constrained Firms vs. Unconstrained Firms

	Debt-Focused Constrained Firms			Unconstrained Firms		
	Obs	Mean	Std. dev.	Obs	Mean	Std. dev.
CAPX/Assets	58,472	0.015	0.022	30,056	0.014	0.022
R&D/Assets	20,948	0.007	0.013	15,902	0.018	0.022
Cash Flow	55,341	0.032	0.029	28,219	0.038	0.035
Cash holdings	58,099	0.056	0.080	30,023	0.196	0.164
Size	58,472	5.917	1.518	30,056	6.183	1.930
Q	54,304	1.414	0.794	27,855	2.074	1.498
Duration	36,725	51.79	52.91	21,816	49.08	43.09
Age	58,472	17.40	11.84	30,056	20.77	12.49
Dividend	58,472	0.056	0.231	30,056	0.047	0.213
FCE	57,639	-0.689	0.294	29,696	-0.681	0.290
FCD	57,639	0.857	0.457	29,696	-0.442	0.395
Book Leverage	56,860	0.306	0.205	29,000	0.146	0.178
Long-term Leverage	58,243	0.254	0.202	29,743	0.122	0.167
Long-term Debt/Assets	58,243	0.255	0.212	29,743	0.123	0.177
Short-term Debt/Assets	56,974	0.059	0.102	29,146	0.028	0.060
Maturity	54,806	0.773	0.295	22,314	0.714	0.319
RFC	54,318	0.024	0.103	21,435	0.035	0.127

This table provides summary statistics for basic firm characteristics (see Subsection 3.1). We sort firms into terciles each year based on the lagged financial constraints, following the standard practice in the literature. Debt-focused constrained firms are firms in the top tercile of the *FCD* and bottom tercile of *FCE* distribution. Unconstrained firms are firms in the bottom tercile of both measures. The sample covers the years 1991 to 2019. Source: COMPUSTAT.

Table 4. Summary Statistics: Monetary Policy Shocks

	N	Mean	SD	Min	P25	Median	P75	Max
Monetary Policy Shock	261	-0.01	0.06	-0.34	-0.03	0.00	0.02	0.14
Information Shock	261	-0.01	0.03	-0.16	-0.02	0.00	0.01	0.15

This table provides summary statistics for the "pure" monetary policy shocks and information shocks. The sample covers the years 1990 to 2019. Source: Jarociński and Karadi (2020).

Table 5. Stock Price Response to Monetary Policy Shocks

Window:	(0,0)	(+1,+1)	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)	(4)	(5)
mps	-0.514***	-0.272***	-0.787***	-0.770***	-1.05***
	(0.009)	(0.009)	(0.013)	(0.014)	(0.018)
Controls	Yes	Yes	Yes	Yes	Yes
Fixed-effects					
industry-year	Yes	Yes	Yes	Yes	Yes
Fit statistics					
Observations	905,306	853,799	905,017	904,738	903,908
R^2	0.019	0.015	0.024	0.023	0.029

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019. The firm level returns are calculated over five different event windows and shown in Columns (1) to (5). Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Column (2) reports the results when we use the daily return 1 day after the FOMC announcements as the dependent variable. Column (3) to (5) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, and cash holdings at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Table 6. Heterogeneous Stock Price Response to Monetary Policy Shocks

Window:	(0,0)	(+1,+1)	(+2,+2)
	(1)	(2)	(3)
$mps \times equity\_focused$	-0.179***	-0.026	-0.119***
	(0.039)	(0.041)	(0.038)
$mps \times debt\_focused$	-0.110***	0.035	-0.102***
	(0.032)	(0.033)	(0.030)
$mps \times leverage$	0.312***	0.070	-0.227***
	(0.049)	(0.082)	(0.053)
$mps \times bm$	0.044***	-0.029*	-0.069***
	(0.014)	(0.016)	(0.014)
$mps \times size$	-0.082***	-0.008*	0.064***
	(0.006)	(0.005)	(0.005)
$mps \times profitability$	0.058***	0.128***	-0.012
	(0.016)	(0.038)	(0.020)
$mps \times cashholding$	-0.381***	-0.049	0.129**
	(0.072)	(0.055)	(0.059)
Fixed-effects			
industry-year	Yes	Yes	Yes
Fit statistics			
Observations	844,031	795,949	728,257
R^2	0.020	0.016	0.015

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019. The firm level returns are calculated over three different event windows and shown in Columns (1) to (3). Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Column (2) reports the results when we use the daily return 1 day after the FOMC announcements as the dependent variable. Column (3) reports the results when we use the daily return 2 days after the FOMC announcements as the dependent variable. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, and cash holdings at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Table 7. Cumulative Heterogeneous Stock Price Response to Monetary Policy Shocks

Window:	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)
$mps \times equity\_focused$	-0.201***	-0.292***	-0.481***
	(0.055)	(0.063)	(0.081)
$mps \times debt\_focused$	-0.077*	-0.183***	-0.153**
	(0.043)	(0.048)	(0.062)
$mps \times leverage$	0.350***	0.210**	0.122
	(0.092)	(0.101)	(0.121)
$mps \times bm$	0.011	-0.031	-0.130***
	(0.020)	(0.024)	(0.030)
$mps \times size$	-0.091***	-0.040***	-0.005
	(0.008)	(0.008)	(0.010)
$mps \times profitability$	0.182***	0.175***	0.262***
	(0.039)	(0.042)	(0.050)
$mps \times cashholding$	-0.449***	-0.344***	-0.175
	(0.091)	(0.102)	(0.123)
Fixed-effects			
industry-year	Yes	Yes	Yes
Fit statistics			
Observations	843,764	843,501	842,718
R^2	0.025	0.023	0.030

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019. The firm level cumulative returns are calculated over three different event windows and shown in Columns (1) to (3). Columns (1) to (3) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, and cash holdings at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Table 8. Heterogeneous Stock Price Response to Information Shocks

Window:	(0,0)	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)	(4)
$info \times equity\_focused$	0.121***	0.062	0.029	0.097
	(0.034)	(0.053)	(0.060)	(0.079)
$info \times debt\_focused$	0.064**	0.027	0.059	0.122**
	(0.028)	(0.041)	(0.047)	(0.059)
$info \times leverage$	-0.003	0.163	0.427***	0.590***
	(0.047)	(0.115)	(0.121)	(0.133)
$info \times bm$	0.036**	0.165***	0.226***	0.323***
	(0.016)	(0.022)	(0.025)	(0.032)
$info \times size$	0.020***	-0.029***	-0.066***	-0.062***
	(0.007)	(0.008)	(0.009)	(0.010)
$info \times profitability$	-0.052***	-0.109***	-0.098**	-0.080
	(0.016)	(0.040)	(0.042)	(0.051)
$info \times cashholding$	-1.18***	-1.85***	-1.82***	-2.45***
	(0.041)	(0.057)	(0.061)	(0.074)
Fixed-effects				
industry-year	Yes	Yes	Yes	Yes
Fit statistics				
Observations	844,031	843,764	843,501	842,718
R^2	0.017	0.021	0.021	0.027

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019. The firm level daily and cumulative returns are calculated over four different event windows and shown in Columns (1) to (4). Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Columns (2) to (4) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The $info$ variable denotes information shock from Jarociński and Karadi (2020). The $equity\_focused$ variable denotes the indicator for firms that are in the top tercile of FCE and bottom tercile of FCD. The $debt\_focused$ variable denotes the indicator for firms that are in the top tercile of FCD and bottom tercile of FCE. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, and cash holdings at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Table 9. Monetary Policy and Innovation

	Log(Number of Patents Filed)	
	$h = 17$	$h = 20$
$mps \times FCE$	-0.011*	-0.017***
	(0.006)	(0.006)
$mps \times FCD$	-0.003	-0.004
	(0.007)	(0.007)
Observations	39,634	36,079
Firm Controls	Yes	Yes
Firm FE	Yes	Yes
Fiscal Quarter FE	Yes	Yes
Industry $\times$ Time	Yes	Yes

This table analyzes the effect of monetary policy shocks on firms' innovation using Equation (4). The dependent variable is the h-year change in the log of the number of patents filed. The *FCE* and *FCD* variables denote the proxies for equity-focused and debt-focused constrained firms, respectively (Hoberg and Maksimovic, 2015; Linn and Weagley, 2023). We report Driscoll-Kraay heteroscedasticity and autocorrelation robust standard errors in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10. Effect of Monetary Policy Shocks on Financing Policies

	Δ Equity issuance/Assets (1)	Δ Equity issuance Adjusted/Assets (2)	Δ Repurchases/Assets (3)
mps	-0.0024***	-0.0024***	-0.0002***
	(0.0005)	(0.0005)	(0.00007)
$mps \times equity\_focused$	-0.0023***	-0.0026***	0.0000
	(0.0007)	(0.0007)	(0.00007)
$mps \times debt\_focused$	0.0002	0.0003	0.0001
	(0.0004)	(0.0004)	(0.00009)
Observations	306,279	306,279	289,959
R^2	0.038	0.039	0.003
Firm Controls	Yes	Yes	Yes
Aggregate Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Fiscal Quarter FE	Yes	Yes	Yes
Quarter × Sector FE	Yes	Yes	Yes

This table analyzes the effect of monetary policy shocks on firms' equity issuance and repurchases using Equation (5). The dependent variables are Δ Equity issuance/Assets, Δ Equity issuance Adjusted/Assets and Δ Repurchases/Assets (for details, see Section 3). Therefore, this table shows the response of equity issuance and repurchase to a 1% higher 1-year Treasury rate. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarocinski and Karadi (2020). The $equity\_focused$ variable denotes the indicator for firms that are in the top tercile of FCE and bottom tercile of FCD. The $debt\_focused$ variable denotes the indicator for firms that are in the top tercile of FCD and bottom tercile of FCE. All other group indicators are included in the regression, but omitted for brevity except for the unconstrained group of firms. All regressions control for Q, leverage, size, cash flow, cash holdings, age, and dividend. Standard errors are heteroskedasticity robust and clustered at the firm level. We report the respective standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 11. Effect of Monetary Policy Shocks on Financing Policies

	Δ Public SEO issuance/Assets (1)	Δ Debt issuance/Assets (2)
mps	-0.001*	-0.0002
	(0.0006)	(0.0004)
$mps \times equity\_focused$	-0.002***	-0.001**
	(0.0007)	(0.0004)
$mps \times debt\_focused$	-0.000	0.0003
	(0.0004)	(0.0004)
Observations	314,614	293,471
R^2	0.013	0.014
Firm Controls	Yes	Yes
Aggregate Controls	Yes	Yes
Firm FE	Yes	Yes
Fiscal Quarter FE	Yes	Yes
Quarter × Sector FE	Yes	Yes

This table analyzes the effect of monetary policy shocks on firms' SEO issuance and debt issuance using Equation (5). The dependent variables are Δ Public SEO issuance/Assets and Δ Debt issuance/Assets (for details, see Section 3). Therefore, this table shows the response of SEO issuance and debt issuance to a 1% higher 1-year Treasury rate. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarocinski and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity except for the unconstrained group of firms. All regressions control for Q, leverage, size, cash flow, cash holdings, age, and dividend. Standard errors are heteroskedasticity robust and clustered at the firm level. We report the respective standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 12. Effect of Monetary Policy Shocks on Cash

	Δ Cash	
	(1)	(2)
mps	-0.0029***	-0.0029***
	(0.0003)	(0.0004)
$mps \times equity\_focused$		0.0014**
		(0.0006)
$mps \times debt\_focused$		-0.0002
		(0.0003)
Observations	316,593	316,593
R^2	0.0783	0.0797
Firm Controls	Yes	Yes
Aggregate Controls	Yes	Yes
Firm FE	Yes	Yes
Fiscal Quarter FE	Yes	Yes
Quarter × Sector FE	Yes	Yes

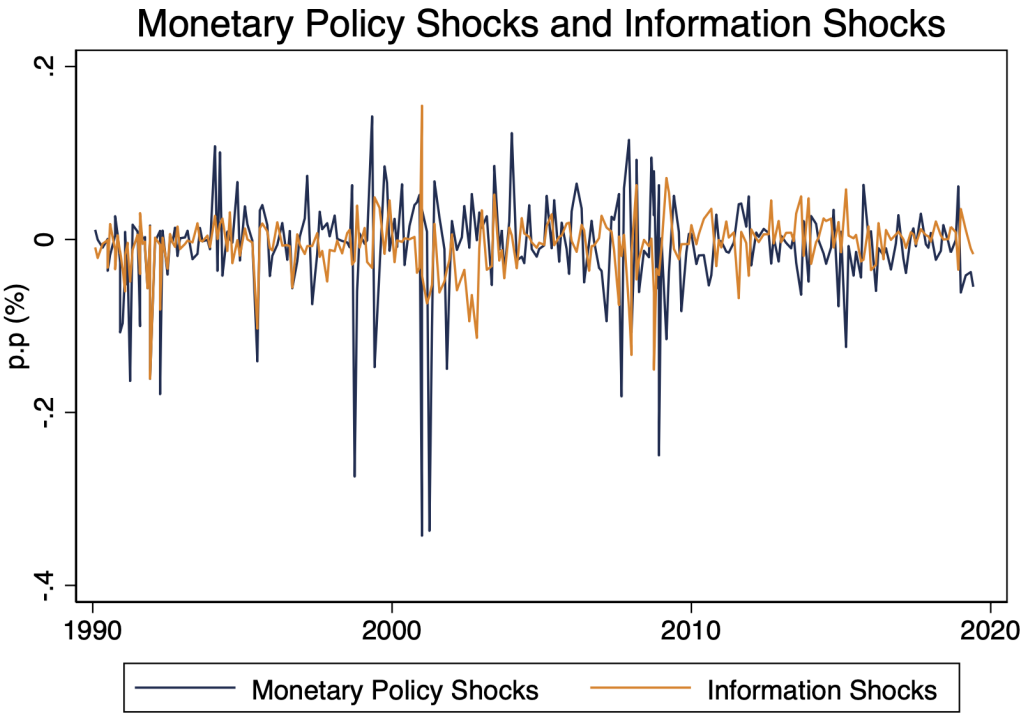
This table analyzes the effect of monetary policy shocks on firms' cash savings using Equation (5). The dependent variable, Δ Cash, is the difference between cash at quarter t and cash at quarter t-1, scaled by lagged total assets as in McLean (2011). Cash is measured as cash and short-term investments (COMPUSTAT's cheq). Therefore, this table shows the response of cash to a 1% higher 1-year Treasury rate. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarocinski and Karadi (2020). The $equity\_focused$ variable denotes the indicator for firms that are in the top tercile of FCE and bottom tercile of FCD. The $debt\_focused$ variable denotes the indicator for firms that are in the top tercile of FCD and bottom tercile of FCE. All other group indicators are included in the regression, but omitted for brevity except for the unconstrained group of firms. All regressions control for Q, leverage, size, cash flow, cash holdings, age, and dividend. Standard errors are heteroskedasticity robust and clustered at the firm level. We report the respective standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 13. Effect of Financing Shocks on firms' Investment

	$h = 4$		$h = 5$	
	ΔI_t	ΔRD	ΔI_t	ΔRD
$EIS \times FCE$	0.011***	0.006*	0.007**	0.005*
	(0.004)	(0.003)	(0.003)	(0.002)
$DIS \times FCE$	0.001	0.001	-0.0001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
R^2	0.4385	0.4580	0.4589	0.4967
Observations	50,581	18,911	44,707	16,657
Firm Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry $\times$ Time	Yes	Yes	Yes	Yes

This table analyzes the effect of financing shocks on firms' investment using Equation (6). The dependent variable is the h-year change in the log CAPX over assets and R&D over assets, respectively (for details, see Section 3). EIS and DIS are the financing shocks from Belo, Lin, Salomao, and Yang (2024). The Equity Issuance Shocks (EIS) and Debt Issuance Shocks (DIS) are the residuals from regressions that include several aggregate variables to control for investment opportunities, and costs of equity and debt financing, thus capturing the expected normal variation in issuance activity (see Belo, Lin, Salomao, and Yang (2024) for details). The *FCE* variable denotes the proxy for equity-focused constrained firms (Hoberg and Maksimovic, 2015; Linn and Weagley, 2023). We report heteroskedasticity robust and two-way clustered at the firm and year level standard errors in parenthesis. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

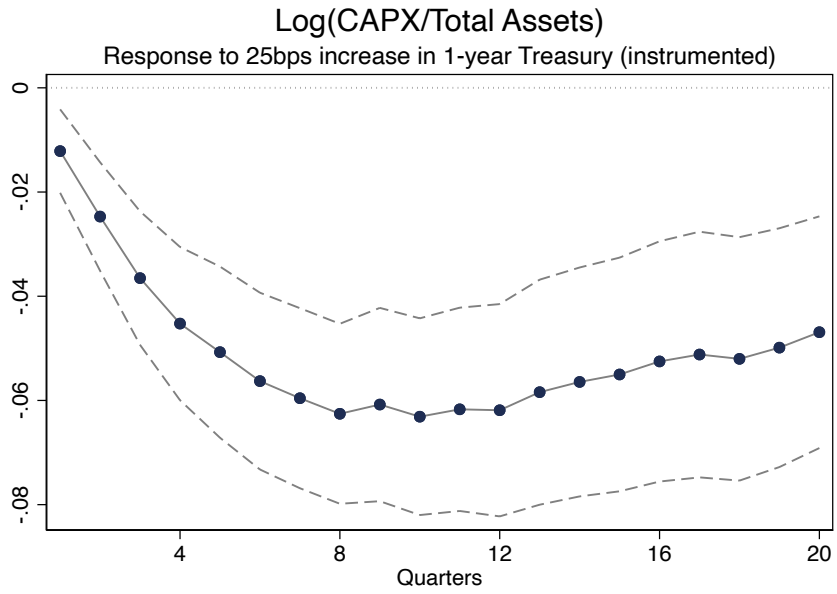
Figure 1. Monetary Policy Shocks and Information Shocks over 1990-2019



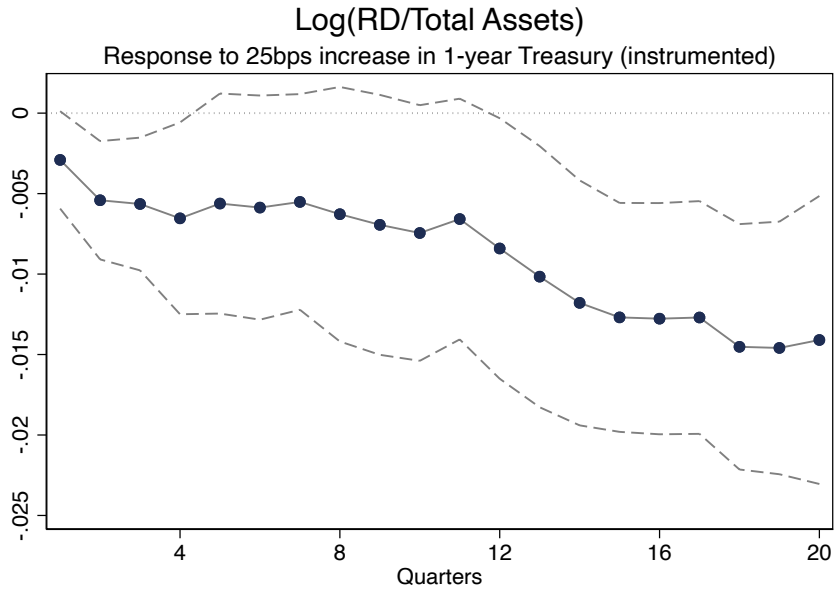
This figure shows the two components of high-frequency surprises of fed funds rate around FOMC announcements during the period 1990-2019, from Jarociński and Karadi (2020), namely "pure" monetary policy shocks and information shocks.

Figure 2. Dynamic Response of Investment to Monetary Policy

(A) CAPX



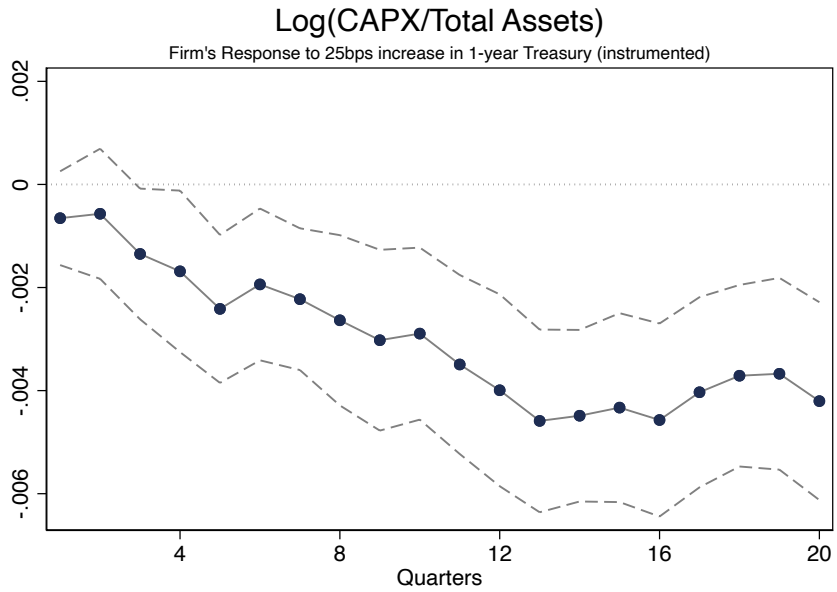
(B) R&D



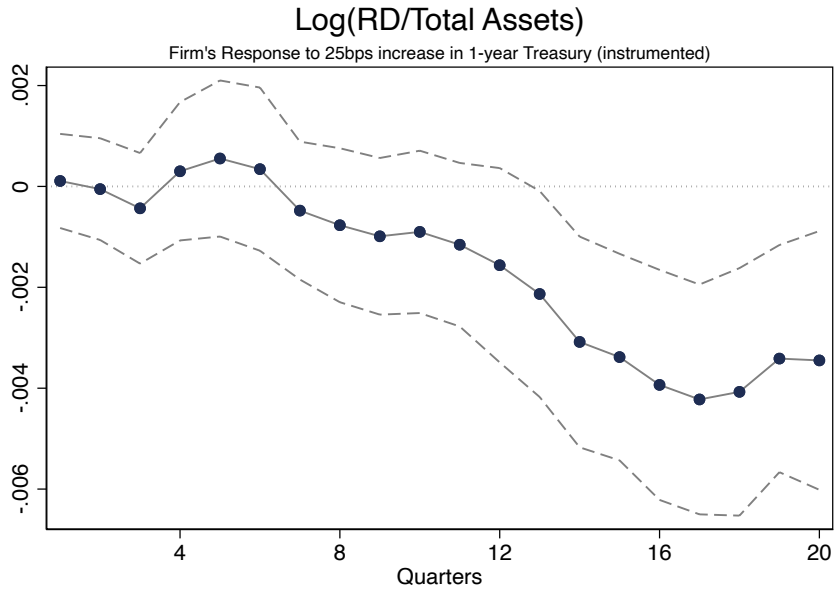
This figure shows the Impulse Response Function (IRF) for the response of CAPX, and R&D to a 25bps higher 1-year Treasury rate. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Figure 3. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy

(A) CAPX



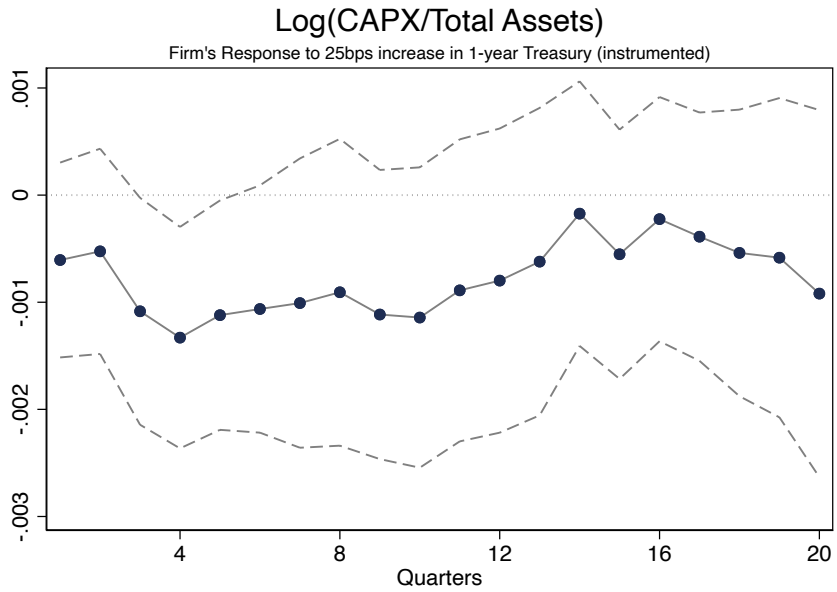
(B) R&D



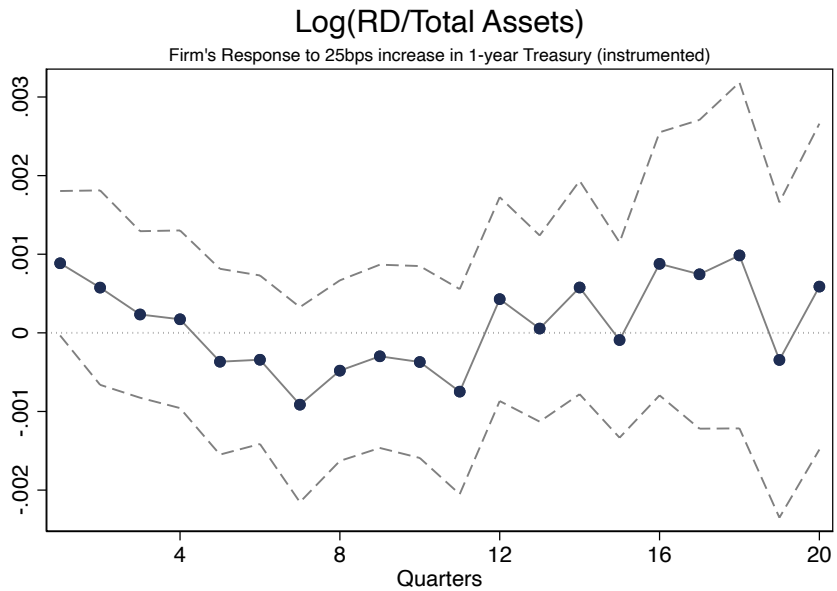
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Figure 4. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy

(A) CAPX

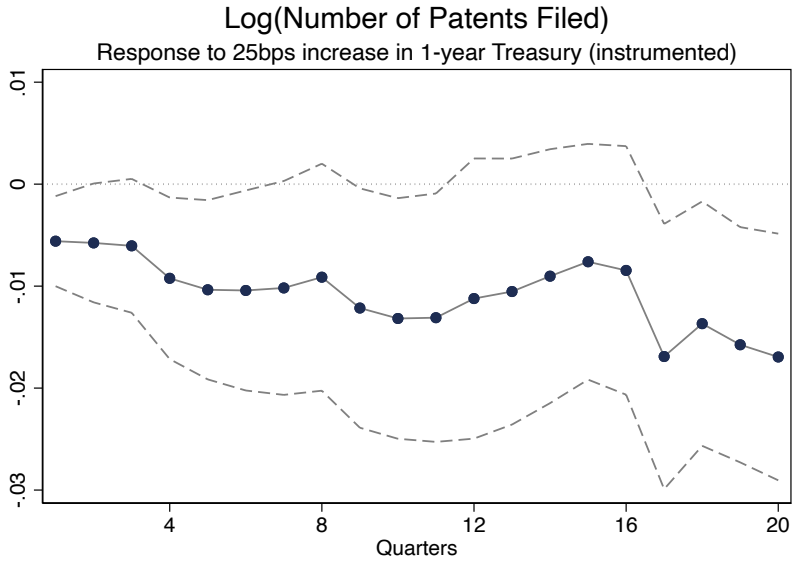


(B) R&D



This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Figure 5. The Dynamic Response of Innovation to Monetary Policy



This figure shows the Impulse Response Function (IRF) for the response of Innovation to a 25bps higher 1-year Treasury rate. The outcome variable is the log of the number of patents filed. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Online Appendix for "The Role of Equity Financing Constraints in the Transmission of Monetary Policy" by Heitor Almeida, Timothy Johnson, Sebastiao Oliveira and Yucheng Zhou

This online appendix is organized as follows. Section A shows the validity of our instrument of monetary policy measure used in the Section 4.2. Section B compares the results of stock price sensitivity with those in the literature. Section C presents additional results and robustness tests.

A. Real Effects and Monetary Policy Measure

In this section, we show that cumulative "pure" monetary policy shocks are a strong instrument for the 1-year Treasury rate. Figure A.1 plots the predicted 1-year treasury rate, and Table A.1 reports the results from the first stage regression. The statistically significant coefficient estimates on the cumulative high-frequency "pure" monetary policy shocks (JK shock) and the "F stat IV" confirm we have a strong instrument for the 1-year Treasury rate.

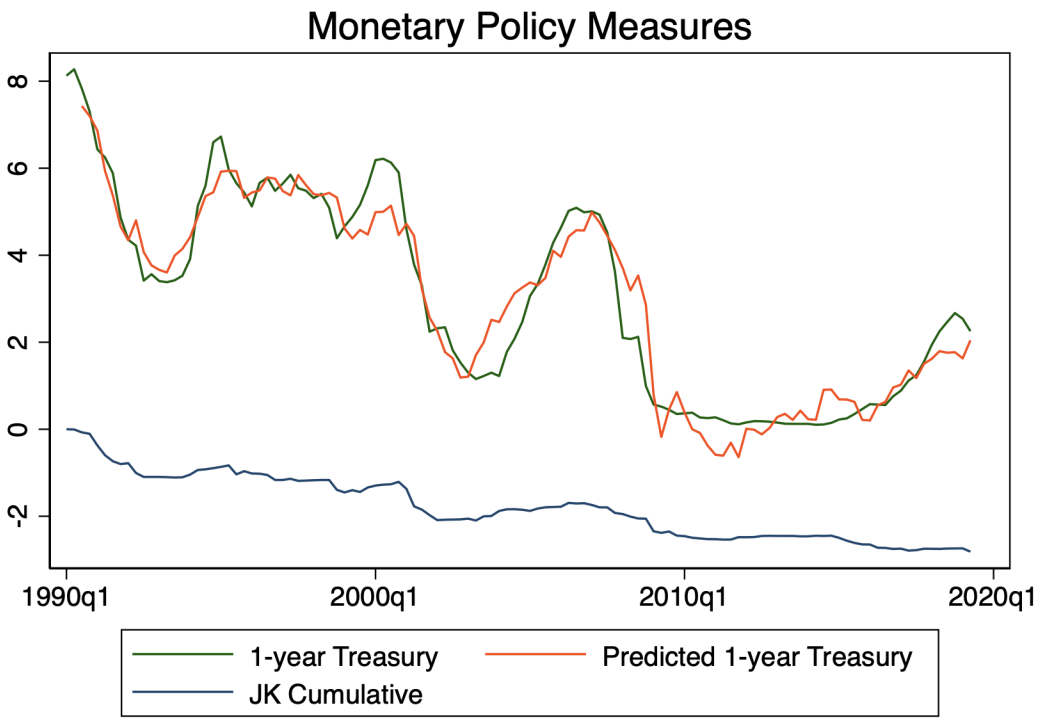
As a robustness exercise, we also instrument the 1-year Treasury rate without controlling for lagged macroeconomic variables. Figure A.2 shows our results remain quantitatively the same for equity-focused constrained firms, underscoring the equity channel of monetary policy. Figure A.3 presents the results for debt-focused constrained firms. The amplification effect on CAPX and R&D is not statistically significant.

Appendix Table A.1. First Stage Regression

	$1yt$
JK shock	3.45***
	(0.50)
Log CPI	16.0***
	(3.56)
Log Industrial Production	-9.78***
	(2.75)
Log Employment Ratio	54.0***
	(7.77)
Excess Bond Premium	-0.50***
	(0.18)
GDP Growth	0.0018*
	(0.0010)
Observations	116
F stat all	232
F stat IV	48.1

This table reports the results from the first-stage regression. The dependent variable is the 1-year Treasury rate and the instrument is the cumulative high-frequency shocks from Jarociński and Karadi (2020), lagged by one quarter. Newey-West standard errors are reported in parentheses. F statistics are reported for all variables and the instrument, respectively.

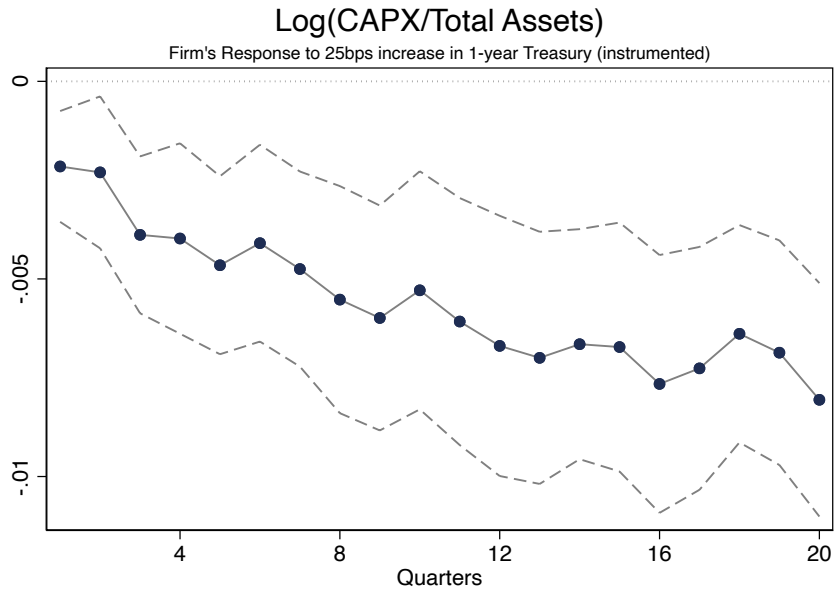
Appendix Figure A.1. Monetary Policy Measure (Instrumented)



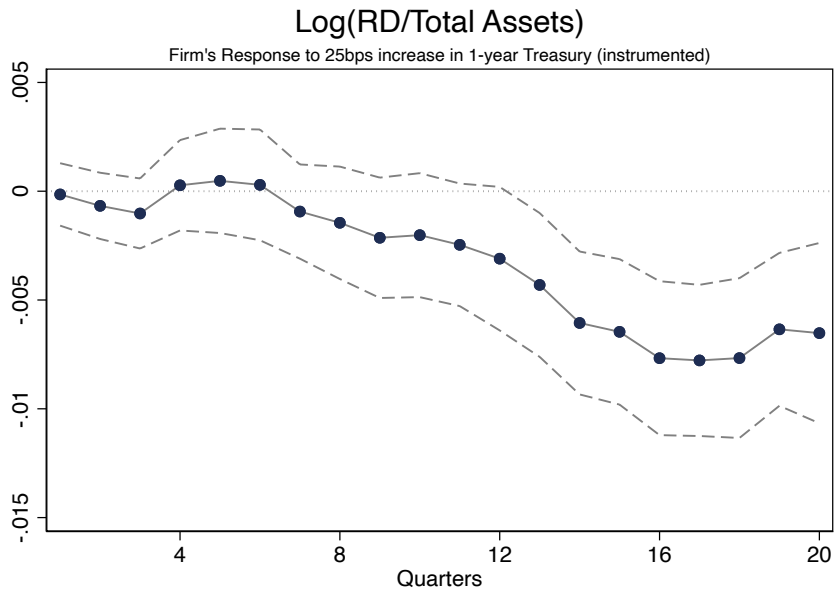
This figure plots the 1-year Treasury rate and the predicted 1-year Treasury rate predicted rate from the first-stage regression with cumulative Jarociński and Karadi (2020) shocks and macroeconomic control variables

Appendix Figure A.2. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Alternative Instrument

(A) CAPX



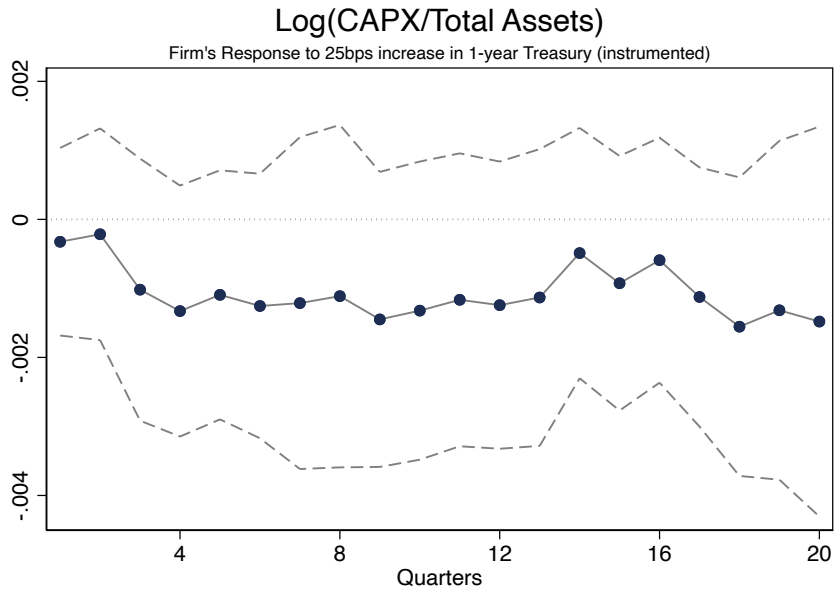
(B) R&D



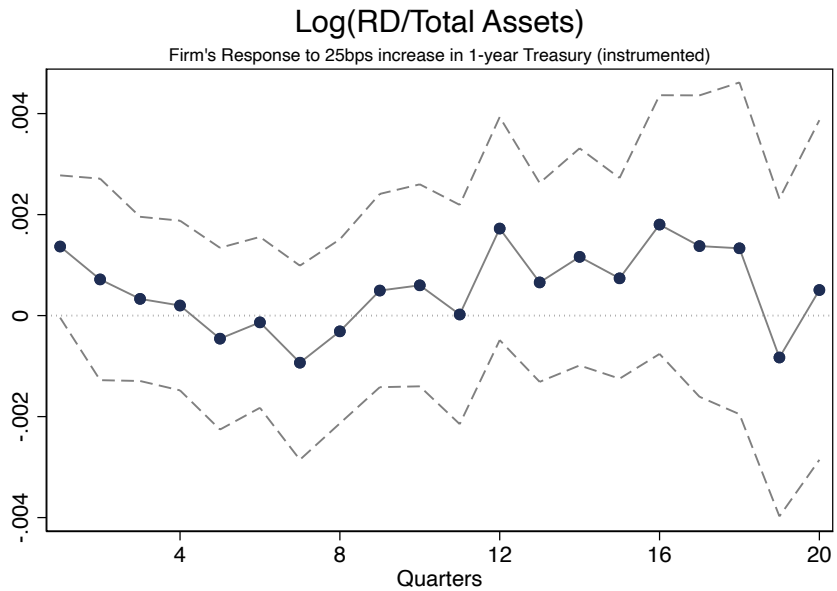
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020), without controlling for macroeconomic variables. Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure A.3. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Alternative Instrument

(A) CAPX



(B) R&D



This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020), without controlling for macroeconomic variables. Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

B. Stock Price: Comparison with Literature

In this section, we discuss how our paper is related to two papers of the literature in more details. Ozdagli (2017) finds that financially constrained firms have relatively lower returns than unconstrained firms on the day of FOMC announcement when there is an expansionary monetary shock, as the stock price of these firms respond less to such a surprise. In a contemporaneous work, Chava and Hsu (2020) show that financially constrained firms have higher response to monetary surprises, e.g., these firms have higher relative returns when the Fed decreases the rate unexpectedly. Financial constraints are defined using Whited and Wu (2006) index, and the monetary policy shock is identified as high-frequency change of fed funds futures contract. On the surface, these two papers contradict with each other, and they indeed differ in several aspects, e.g., sample period and empirical specification. Moreover, Chava and Hsu (2020) successfully replicate the findings in Ozdagli (2017), but further conclude that such an effect diminishes in a few days after the FOMC announcement and eventually goes in the opposite direction, which indicates that the result of Ozdagli (2017) might well be a result of delayed reaction of market participants, i.e., illiquidity among stocks of financially constrained firms.

We want to first note that, we include the zero lower bound (ZLB) in order to study the stock price response in a sample period as long as possible and to gain more statistical power. Second, we use monetary policy shocks from Jarociński and Karadi (2020), who isolate the "information effect" of high-frequency identification of monetary policy shocks. The two papers mentioned above construct monetary policy shock as price changes of current fed funds rate futures contract, while Jarociński and Karadi (2020) and others use "FF4", i.e., the change in the three-month fed funds future, which is less sensitive to the "timing surprises", i.e., a short-term advancement or postponement of a widely expected policy decision (Nakamura and Steinsson, 2018).[20] Third,

[20] As a robustness check, we also use series of monetary policy shocks from Bauer and Swanson (2023), and the results are qualitatively similar (see Section C)

the proxy for financial constraints is another important dimension that we differ from the above two papers (see Section 3 for more discussion). Lastly, we control for the firm characteristics and their interactions with the monetary policy shocks to isolate the potential impact of these characteristics.

We also cluster standard errors at firm and FOMC date level as Chava and Hsu (2020) do. Table B.1 shows that the significance of the coefficients on the interaction terms survive when we focus on the cumulative returns. The equity-focused constraint significantly amplifies the negative stock price response to monetary policy shocks. We also control for industry and FOMC date fixed effects and cluster standard errors at industry and FOMC date level. The equity channel is still statistically significant, as shown in Table B.2.

For comparison, we also construct financial constraint measures following Kaplan and Zingales (1997), Whited and Wu (2006), Hadlock and Pierce (2010).[21] First, these indices do not seem to align well in that the coefficients on the interaction term now are sensitive to the controls and specification. The results are not consistent across these indices as well. For example, the KZ-index seems to produce a positive but not significant heterogeneous impact, while WW-index and HP-index produce a significantly negative coefficient on the day of FOMC announcements, which does not persist in a cumulative return analysis.

[21] Results are not included in the paper for brevity, but available upon request.

Appendix Table B.1. Cumulative Heterogeneous Stock Price Response to Monetary Policy Shocks: Two-way Cluster

Window:	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)
$mps \times equity\_focused$	-0.201*	-0.292**	-0.481***
	(0.106)	(0.145)	(0.166)
$mps \times debt\_focused$	-0.077	-0.183**	-0.153
	(0.058)	(0.078)	(0.107)
$mps \times leverage$	0.350**	0.210	0.122
	(0.145)	(0.197)	(0.212)
$mps \times bm$	0.011	-0.031	-0.130
	(0.101)	(0.129)	(0.168)
$mps \times size$	-0.091***	-0.040	-0.005
	(0.025)	(0.038)	(0.040)
$mps \times profitability$	0.182**	0.175**	0.262***
	(0.075)	(0.080)	(0.098)
$mps \times cashholding$	-0.449**	-0.344	-0.175
	(0.198)	(0.307)	(0.329)
Fixed-effects			
sic3-year	Yes	Yes	Yes
Std. error cluster			
Firm-date	Yes	Yes	Yes
Fit statistics			
Observations	843,764	843,501	842,718
R^2	0.025	0.024	0.030

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019. The firm level cumulative returns are calculated over three different event windows and shown in Columns (1) to (3). Columns (1) to (3) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, cash holding at the firm level. Robust standard errors clustered at the firm and FOMC announcement date levels are in reported parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table B.2. Cumulative Heterogeneous Stock Price Response to Monetary Policy Shocks: Industry-Date FE

Window:	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)
$mps \times equity\_focused$	-0.321***	-0.330***	-0.425***
	(0.049)	(0.074)	(0.092)
$mps \times debt\_focused$	-0.055	-0.141**	-0.134**
	(0.049)	(0.055)	(0.061)
$mps \times leverage$	-0.019	-0.058	-0.201
	(0.148)	(0.180)	(0.236)
$mps \times bm$	-0.022	-0.088	-0.161
	(0.085)	(0.110)	(0.132)
$mps \times size$	-0.052**	-0.026	-0.023
	(0.024)	(0.042)	(0.044)
$mps \times profitability$	0.122**	0.137**	0.232***
	(0.053)	(0.061)	(0.062)
$mps \times cashholding$	-0.165	-0.179	-0.191
	(0.169)	(0.261)	(0.303)
Fixed-effects			
sic3-date	Yes	Yes	Yes
Std. error cluster			
sic3-date	Yes	Yes	Yes
Fit statistics			
Observations	843,764	843,501	842,718
R^2	0.127	0.129	0.148

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019. The firm level cumulative returns are calculated over three different event windows and shown in Columns (1) to (3). Columns (1) to (3) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and FOMC announcement date fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, and cash holding at the firm level. Robust standard errors clustered at the industry and FOMC announcement date levels are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

C. Additional Results and Robustness

This section rules-out potential alternative mechanisms that may explain why equity-focused constraints amplify the effect of monetary policy shocks and provide robustness exercises for the response of stock prices and investment policy to monetary policy.

C.1 The Duration Channel

In the recent asset pricing literature, there is evidence that firms with shorter duration tend to carry a premium in stock price (see Gonçalves (2021) for further discussion). Constrained firms focusing on equity financing tend to have longer duration as shown in Table 2, since these firms tend to invest heavily in R&D. Moreover, previous literature has suggested that firms with high duration do suffer more in the aftermath of negative monetary policy shocks.

To address this possibility, we control for duration in our specification. Table C.1 shows that our results are robust to controlling for duration in that the amplification of equity channel still prevails.[22] In a 5-day cumulative return window after the FOMC announcements, the equity-focused constrained firms experience a significantly 22 bps lower return than unconstrained firms do, controlling for duration. The coefficients on the interaction between monetary policy shocks and duration measure is significantly negative, consistent with the idea that firms with longer duration tend to be more sensitive to the monetary policy.

The investment response is also robust after controlling for duration. Figure C.1 shows that a one standard deviation increase in the $FCE_{ij,t}$ measure significantly increases a firm's investment (CAPX) response to a 25bps higher 1-year rate by 16.15bps after 9 quarters and R&D response by 21.94bps after 14 quarters. Figure C.3 presents the results for debt-focused constrained firms. A one standard deviation increase in

[22] We thank Gonçalves (2021) for providing the data on duration.

the $FCD_{ij,t}$ measure significantly increases a firm's investment (R&D) response to a 25bps higher 1-year rate by 12.37bps. The differential effect is not statistically significant for CAPX. Our results show that the equity channel remains significant and distinct from the duration and debt channels.

Hoberg and Maksimovic (2022) develop a novel 10-K text-based model of product life cycles. They define a four-stage product life cycle: product innovation, process innovation, maturity, and decline. They refer to these stages as Life1, Life2, Life3, and Life4, respectively. Life1 firms intensively discuss an "explanation of material product research and development to be performed during the period covered". As Life1 firms are still in the product development stage, these firms are likely to have higher duration. We extend our baseline regressions by including the Life1 variable and its interaction with monetary policy shocks. Table C.2, Figure C.2 and C.4 show that our findings remain qualitatively the same.

C.2 The Refinancing Constraints Channel

Debt-focused constrained firms frequently report issues related to covenant violations (Hoberg and Maksimovic, 2015). In our baseline results, we control for FCD while estimating the effect of monetary policy shocks on equity-focused constrained firms. One potential concern with these results is that covenant violations may not be the only mechanism through which debt-related constraints affect firms. For example, there is evidence that refinancing constraints can amplify the effects of monetary policy shocks (Jungherr, Meier, Reinelt, and Schott, 2022; Oliveira, Rafi, and Simon, 2024). If equity-focused constrained firms are also likely to face refinancing risk, the refinancing constraints channel could be potentially attenuating the equity channel.

Following up on this idea, we follow Almeida, Campello, Laranjeira, and Weisbenner (2012) and use the ex-ante maturity structure of long-term debt to predict firms' financial

position in a given year. Our measure of refinancing constraint is:

$$RFC_{ij,t} = \frac{dd1q_{ij,t}}{dd1q_{ij,t} + dlttq_{ij,t}}, \tag{7}$$

COMPUSTAT's $dd1q$ is the amount of long-term debt maturing during the first year after the annual report, e.g., the long-term debt maturing in 2008 for firms with a December 2007 fiscal year-end. COMPUSTAT's $dlttq$ represents the amount of long-term debt that matures in more than one year. Therefore, the one-year lag of the ratio of $dd1q$ to $dd1q + dlttq$ is the fraction of a firm's long-term debt due in a given year as predicted in the previous year.

We then estimate Equation (4) controlling for $RFC_{ij,t-1}$ and its interaction with the instrumented 1-year Treasury rate $\hat{yt}_t$. It is worth noting that we are controlling for both refinancing constraints and FCD. Figure C.5 shows that the equity channel remains economically and statistically significant. Figure C.6 shows the results for debt-focused constrained firms. The differential effect is not statistically significant for both types of investment, CAPX and R&D.

One could argue that equity-focused constrained firms have relatively low leverage and are R&D intensive, so even if they have shorter debt maturity, they may not face much refinancing risk. As a result, controlling for refinancing constraints do not affect the equity channel. However, in a sub-sample of firms more likely to face refinancing risk (firms with more long-term debt), the refinancing constraints channel could attenuate the equity channel.

In line with this idea, we follow Almeida, Campello, Laranjeira, and Weisbenner (2012) and restrict our sample to firms whose long-term debt is greater than 5% of assets. We then estimate Equation (4) controlling for $RFC_{ij,t-1}$ and its interaction with the instrumented 1-year Treasury rate $\hat{yt}_t$. Consistent with previous findings, Figure C.7 shows that the equity channel remains economically and statistically significant. Figure C.8

shows the results for debt-focused constrained firms. As in the baseline results, we find that debt-focused constraints do amplify the effects of monetary policy shocks, though by a smaller magnitude than equity-focused constraints. Overall, our results show that the equity channel is distinct and quantitatively more important than the debt channel.

C.3 Information Effect and Investment Response

Hsu, Mitra, Xu, and Zeng (2023) argue that the Fed's private information about economic conditions revealed through FOMC announcements affect firm investment and show that the sensitivity of the investment rate to a Fed information shock is greater for more cyclical firms. To rule out that our results are driven by the information effect, we estimate Equation 4 adding the information shock from Jarociński and Karadi (2020) interacted with the FCE and FCD measures as controls variables. Figures C.13 and C.14 show that our results are virtually unchanged.

C.4 Alternative Monetary Policy Shocks

One potential concern is whether our results are robust to the measure of monetary policy. We address this concern by using an alternative shock measure, the monetary policy shocks from Bauer and Swanson (2023). By orthogonalizing the high-frequency identified monetary policy shocks with respect to the macroeconomic and financial data observed before the FOMC announcements, Bauer and Swanson (2023) construct a series of shocks that eliminate any attenuation bias or "price puzzle" types of effects in output, inflation, or other variables in a structural VAR or local projections framework, providing better estimates of monetary policy's true effects.

We start by analyzing firms' stock price response. Tables C.3 and C.4 report the coefficient estimates of Equation (2), using the monetary policy shocks from Bauer and Swanson (2023). Equity-focused constrained firms have a realized return that is

31.6 bps lower than that of unconstrained firms in a 5-day cumulative return window, while the debt-focused constrained firms do not show a statistically significant larger response than unconstrained firms do.

We then analyze the real effects. First, using the same approach explained in Subsection 4.2, we instrument the treasury rate using cumulative monetary policy shocks from Bauer and Swanson (2023). We then estimate Equation (4). Figures C.9 and C.10 show the results are virtually the same. We conclude that our findings are robust to the choice of shock construction.

C.5 Cyclicality and Investment Response

We guarantee that the results are not driven by differences in cyclicality or other observable differences between equity-focused constrained firms and unconstrained firms, time-invariant unobservable firm characteristics, nor by economy-wide or industry-specific trends by estimating Equation 4 and adding the FCE and FCD measures interacted with GDP growth. It is worth noting that this specification includes firm characteristics interacted with the monetary policy shock, FCE and FCD measures interacted with GDP growth, firm fixed effects, and industry-time fixed effects. Figures C.11 and C.12 show that our results are remain very similar after controlling for cyclicality.

C.6 2-year Treasury Rate

We measure the stance of monetary policy using the instrumented 2-year U.S. Treasury rate, following the procedure outlined in Section 4.2. Figures C.15 and C.16 shows our findings are virtually the same.

C.7 Zero Lower Bound

Brennan, Jacobson, Matthes, and Walker (2024) show that different series of high-frequency monetary shocks can have a low correlation coefficient, and that the shock series become even more distinct when the federal funds rate is at its effective lower bound (ELB) due to data. One concern is that our results might be driven by the use of a specific shock or by the zero lower bound period. As discussed above, we first address this concern by showing that our results are robust to the monetary policy shocks from Bauer and Swanson (2023) and to the use of the instrumented 2-year U.S. Treasury rate. We estimate the results excluding the zero lower bound period (January 2009 to December 2015). Tables C.5, C.6 and Figures C.17, C.18 display the findings. Equity-focused constraints significantly amplify the effect of monetary policy shocks on stock returns, CAPX, and R&D. Overall, our results suggest that the "equity channel" remains robust even when the zero lower bound period is excluded from our sample.

C.8 Intangibility

There is evidence that intangible firms are less sensitive to monetary policy shocks (Caggese and Pérez-Orive, 2022; Döttling and Ratnovski, 2023). Although our focus is on equity-focused constrained firms rather than intangible firms, the former tend to be more R&D-intensive, as suggested by Table 2. This indicates a potential correlation between our proxy for equity-focused constraints and intangibility, which could introduce biases into our estimations.

We address the concern discussed above as follows. First, we adopt the methodology of Peters and Taylor (2017) to measure intangible capital, incorporating both externally purchased and internally created intangible capital. Externally purchased intangible capital is defined as intangible assets reported on the balance sheet (Compustat item intan). Internally created intangible capital is calculated as the sum of knowledge capital and

organizational capital. Knowledge capital is measured by capitalizing R&D expenses, while organizational capital is measured by capitalizing selling, general, and administrative (SG&A) expenses weighted by a factor of 0.3. We directly use this measure from Peters and Taylor (2017), available through Wharton Research Data Services (WRDS).

Next, we compute the intangible capital ratio, defined as intangible capital divided by the sum of intangible capital and physical capital (Compustat item ppent). To mitigate potential biases, we control for this variable and its interaction with monetary policy shocks in Equation (4). Tables C.7 and C.8, and Figures C.19 and C.20 show that our results remain robust to this additional control, underscoring the unique role of equity-focused financing constraints in the transmission of monetary policy to the corporate sector.

C.9 Growth/Value and Stock Price Response

We split the sample by book-to-market ratio to make sure that the results are not entirely driven by the growth firms. We estimate Equation 2 within each subsample and report the coefficients in Tables C.9 and C.10 for value firms and growth firms respectively. We see that the strong amplification of equity-focused constraint on stock return response to monetary policy shocks is prevalent in both subsamples.

Appendix Table C.1. Heterogeneous Stock Price Response Controlling for Duration (Gonçalves, 2021)

Window:	(0,0)	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)	(4)
$mps \times equity\_constraint$	-0.104**	-0.114*	-0.109	-0.220**
	(0.047)	(0.063)	(0.072)	(0.098)
$mps \times debt\_constraint$	0.004	0.030	-0.116**	-0.134**
	(0.032)	(0.042)	(0.048)	(0.062)
$mps \times duration$	-0.001***	-0.001***	-0.001***	-0.002***
	(0.0002)	(0.0004)	(0.0004)	(0.0004)
Fixed-effects				
sic3-year	Yes	Yes	Yes	Yes
Fit statistics				
Observations	576,494	576,326	576,158	575,649
R^2	0.020	0.026	0.025	0.032

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1997 to 2019. The firm-level cumulative returns are calculated over four different event windows and shown in Columns (1) to (4). Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Columns (2) to (4) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The mps variable denotes monetary policy shock from Jarociński and Karadi (2020). The $equity\_focused$ variable denotes the indicator for firms that are in the top tercile of FCE and bottom tercile of FCD. The $debt\_focused$ variable denotes the indicator for firms that are in the top tercile of FCD and bottom tercile of FCE. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, operating profitability, and duration at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table C.2. Heterogeneous Stock Price Response Controlling for Duration (Hoberg and Maksimovic, 2022)

Window:	(0,0)	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)	(4)
$mps \times equity\_constraint$	-0.277***	-0.328***	-0.403***	-0.630***
	(0.042)	(0.060)	(0.070)	(0.092)
$mps \times debt\_constraint$	-0.034	0.048	-0.111**	-0.162**
	(0.033)	(0.046)	(0.052)	(0.067)
$mps \times duration$	-0.357***	-0.265**	-0.355***	-0.585***
	(0.073)	(0.116)	(0.130)	(0.164)
Fixed-effects				
sic3-year	Yes	Yes	Yes	Yes
Fit statistics				
Observations	542,331	542,143	541,959	541,417
R^2	0.025	0.032	0.029	0.038

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1997 to 2019. The firm-level cumulative returns are calculated over four different event windows and shown in Columns (1) to (4). Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Columns (2) to (4) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The mps variable denotes monetary policy shock from Jarociński and Karadi (2020). The $equity\_focused$ variable denotes the indicator for firms that are in the top tercile of FCE and bottom tercile of FCD. The $debt\_focused$ variable denotes the indicator for firms that are in the top tercile of FCD and bottom tercile of FCE. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, operating profitability, and duration at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table C.3. Heterogeneous Stock Price Response to Bauer and Swanson (2023) Shock

Window:	(0,0)	(+1,+1)	(+2,+2)
	(1)	(2)	(3)
$mps \times equity\_focused$	-0.161***	-0.060*	-0.113***
	(0.029)	(0.032)	(0.037)
$mps \times debt\_focused$	-0.035	-0.002	-0.097***
	(0.023)	(0.026)	(0.029)
$mps \times leverage$	0.317***	0.199***	-0.164***
	(0.039)	(0.046)	(0.046)
$mps \times bm$	0.059***	0.053***	-0.030**
	(0.011)	(0.013)	(0.013)
$mps \times size$	-0.047***	-0.037***	0.039***
	(0.004)	(0.004)	(0.004)
$mps \times profitability$	0.028**	0.083***	-0.013
	(0.013)	(0.023)	(0.018)
Fixed-effects			
sic3-year	Yes	Yes	Yes
Fit statistics			
Observations	939,535	875,227	789,621
R^2	0.015	0.016	0.014

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1989 to 2019. The firm level returns are calculated over three different event windows and shown in Columns (1) to (3). Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Column (2) reports the results when we use the daily return 1 day after the FOMC announcements as the dependent variable. Column (3) reports the results when we use the daily return 2 days after the FOMC announcements as the dependent variable. The *mps* variable denotes monetary policy shock from Bauer and Swanson (2023). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, and operating profitability at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table C.4. Cumulative Heterogeneous Stock Price Response to Bauer and Swanson (2023) Shock

Window:	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)
Variables			
$mps \times equity\_focused$	-0.2158***	-0.3104***	-0.3158***
	(0.0400)	(0.0475)	(0.0650)
$mps \times debt\_focused$	-0.0285	-0.1335***	-0.0665
	(0.0331)	(0.0383)	(0.0523)
$mps \times leverage$	0.4839***	0.4160***	0.5164***
	(0.0545)	(0.0630)	(0.0849)
$mps \times bm$	0.1005***	0.0915***	0.0215
	(0.0157)	(0.0183)	(0.0241)
$mps \times size$	-0.0843***	-0.0596***	-0.0410***
	(0.0051)	(0.0056)	(0.0075)
$mps \times op$	0.1107***	0.1019***	0.1889***
	(0.0243)	(0.0272)	(0.0352)
Fixed-effects			
sic3-year	Yes	Yes	Yes
Fit statistics			
Observations	939,235	938,944	938,066
R^2	0.02066	0.01976	0.02600

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1989 to 2019. The firm level cumulative returns are calculated over three different event windows and shown in Columns (1) to (3). Columns (1) to (3) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Bauer and Swanson (2023). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, and operating profitability at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table C.5. Heterogeneous Stock Price Response: Excluding the ZLB

Window:	(0,0)	(+1,+1)	(+2,+2)
	(1)	(2)	(3)
$mps \times equity\_focused$	-0.196***	-0.049	-0.113***
	(0.040)	(0.040)	(0.040)
$mps \times debt\_focused$	-0.119***	0.010	-0.094***
	(0.033)	(0.033)	(0.032)
$mps \times leverage$	0.352***	0.155***	-0.166***
	(0.051)	(0.052)	(0.056)
$mps \times bm$	0.052***	-0.034**	-0.059***
	(0.013)	(0.016)	(0.014)
$mps \times size$	-0.091***	-0.014***	0.062***
	(0.005)	(0.005)	(0.005)
$mps \times profitability$	0.065***	0.110***	-0.011
	(0.017)	(0.032)	(0.021)
$mps \times cashholding$	-0.408***	-0.057	0.147**
	(0.075)	(0.058)	(0.062)
Fixed-effects			
sic3-year	Yes	Yes	Yes
Fit statistics			
Observations	706,300	658,251	595,320
R^2	0.021	0.015	0.014

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1989 to 2019, excluding ZLB (January 2009-December 2015). The firm level returns are calculated over three different event windows and shown in Columns (1) to (3). Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Column (2) reports the results when we use the daily return 1 day after the FOMC announcements as the dependent variable. Column (3) reports the results when we use the daily return 2 days after the FOMC announcements as the dependent variable. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The $equity\_focused$ variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The $debt\_focused$ variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, and cash holding at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table C.6. Cumulative Heterogeneous Stock Price Response: Excluding the ZLB

Window:	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)
$mps \times equity\_focused$	-0.241***	-0.319***	-0.538***
	(0.055)	(0.063)	(0.083)
$mps \times debt\_focused$	-0.111**	-0.215***	-0.227***
	(0.046)	(0.051)	(0.066)
$mps \times leverage$	0.469***	0.386***	0.294***
	(0.069)	(0.082)	(0.109)
$mps \times bm$	0.013	-0.019	-0.094***
	(0.020)	(0.024)	(0.030)
$mps \times size$	-0.106***	-0.058***	-0.026***
	(0.007)	(0.007)	(0.010)
$mps \times profitability$	0.172***	0.168***	0.250***
	(0.034)	(0.038)	(0.047)
$mps \times cashholding$	-0.484***	-0.381***	-0.287**
	(0.096)	(0.106)	(0.129)
Fixed-effects			
sic3-year	Yes	Yes	Yes
Fit statistics			
Observations	706,061	705,829	705,166
R^2	0.028	0.026	0.030

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019, excluding ZLB (January 2009-December 2015). The firm level cumulative returns are calculated over three different event windows and shown in Columns (1) to (3). Columns (1) to (3) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, and cash holdings at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table C.7. Heterogeneous Stock Price Response Controlling for Intangibility

Window:	(0,0)	(+1,+1)	(+2,+2)
	(1)	(2)	(3)
$mps \times equity\_focused$	-0.183***	-0.018	-0.126***
	(0.040)	(0.037)	(0.038)
$mps \times debt\_focused$	-0.120***	0.013	-0.101***
	(0.033)	(0.031)	(0.030)
$mps \times intangible$	-0.214***	-0.058**	-0.002
	(0.033)	(0.028)	(0.031)
Fixed-effects			
sic3-year	Yes	Yes	Yes
Fit statistics			
Observations	813,363	766,761	701,424
R^2	0.020	0.016	0.016

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019. The firm level returns are calculated over three different event windows and shown in Columns (1) to (3). Column (1) reports the results when we use the daily return on the day of the FOMC announcements as the dependent variable. Column (2) reports the results when we use the daily return 1 day after the FOMC announcements as the dependent variable. Column (3) reports the results when we use the daily return 2 days after the FOMC announcements as the dependent variable. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, cash holdings, and intangible ratio at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table C.8. Cumulative Heterogeneous Stock Price Response Controlling for Intangibility

Window:	(0,+1) (1)	(0,+2) (2)	(0,+5) (3)
$mps \times equity\_focused$	-0.197***	-0.288***	-0.492***
	(0.053)	(0.060)	(0.079)
$mps \times debt\_focused$	-0.109**	-0.214***	-0.205***
	(0.044)	(0.049)	(0.064)
$mps \times intangible$	-0.260***	-0.208***	-0.315***
	(0.043)	(0.049)	(0.064)
Fixed-effects			
industry-year	Yes	Yes	Yes
Fit statistics			
Observations	813,264	813,173	812,891
R^2	0.026	0.024	0.031

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm level returns around FOMC announcements from 1991 to 2019. The firm level cumulative returns are calculated over three different event windows and shown in Columns (1) to (3). Columns (1) to (3) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, operating profitability, cash holdings, and intangible ratio at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Table C.9. Cumulative Heterogeneous Stock Price Response: Value Firms

Window:	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)
Variables			
$mps \times equity\_focused$	-0.1977**	-0.3398***	-0.5040***
	(0.0840)	(0.1033)	(0.1323)
$mps \times debt\_focused$	-0.0315	-0.1579**	-0.1093
	(0.0565)	(0.0667)	(0.0873)
$mps \times leverage$	0.3202***	0.0264	-0.3880***
	(0.0929)	(0.1128)	(0.1462)
$mps \times bm$	-0.0069	-0.0353	-0.1460***
	(0.0253)	(0.0299)	(0.0383)
$mps \times size$	-0.1223***	-0.0673***	-0.0323**
	(0.0092)	(0.0108)	(0.0140)
$mps \times op$	0.5482***	0.5504***	0.8960***
	(0.0927)	(0.0982)	(0.1312)
Fixed-effects			
sic3-year	Yes	Yes	Yes
Fit statistics			
Observations	423,247	423,092	422,671
R^2	0.03064	0.02888	0.03711

This table reports the coefficient estimates of the cross-sectional regression by pooling firm level returns of value firms (firms whose book-to-market ratio is above median) around FOMC announcements from 1991 to 2019. The firm level cumulative returns are calculated over three different event windows and shown in Columns (1) to (3). Columns (1) to (3) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, and operating profitability at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

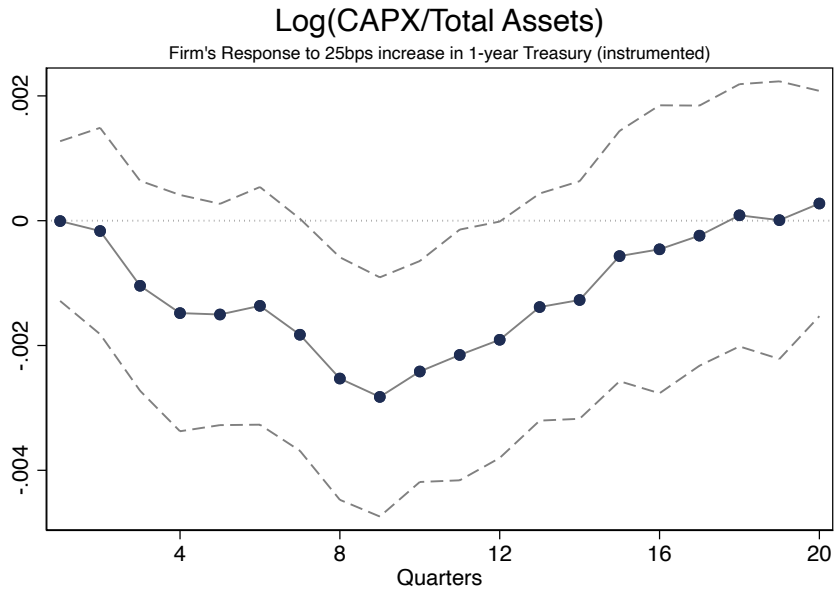
Appendix Table C.10. Cumulative Heterogeneous Stock Price Response: Growth Firms

Window:	(0,+1)	(0,+2)	(0,+5)
	(1)	(2)	(3)
Variables			
$mps \times equity\_focused$	-0.2109***	-0.2451***	-0.3742***
	(0.0698)	(0.0761)	(0.0981)
$mps \times debt\_focused$	-0.0601	-0.1686**	-0.2317***
	(0.0628)	(0.0682)	(0.0899)
$mps \times leverage$	0.6705***	0.5779***	0.6066***
	(0.1538)	(0.1595)	(0.1799)
$mps \times bm$	0.9515***	0.8376***	0.7715***
	(0.1495)	(0.1603)	(0.1864)
$mps \times size$	-0.0630***	-0.0136	0.0215
	(0.0121)	(0.0123)	(0.0146)
$mps \times op$	0.1242***	0.1198**	0.1781***
	(0.0437)	(0.0469)	(0.0541)
Fixed-effects			
sic3-year	Yes	Yes	Yes
Fit statistics			
Observations	420,517	420,409	420,047
R^2	0.02985	0.02826	0.03514

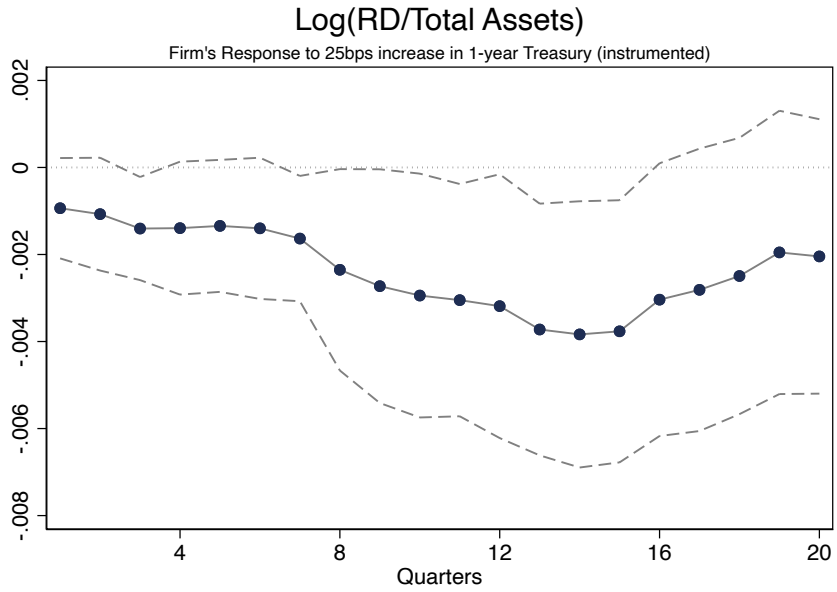
This table reports the coefficient estimates of the cross-sectional regression by pooling firm level returns of growth firms (firms whose book-to-market ratio is below median) around FOMC announcements from 1991 to 2019. The firm level cumulative returns are calculated over three different event windows and shown in Columns (1) to (3). Columns (1) to (3) report the results when we use the 1-, 2-, and 5-day cumulative returns since the FOMC announcements as the dependent variable, respectively. The *mps* variable denotes monetary policy shock from Jarociński and Karadi (2020). The *equity_focused* variable denotes the indicator for firms that are in the top tercile of *FCE* and bottom tercile of *FCD*. The *debt_focused* variable denotes the indicator for firms that are in the top tercile of *FCD* and bottom tercile of *FCE*. All other group indicators are included in the regression, but omitted for brevity, except for the unconstrained group of firms. All regressions include industry and year fixed effects and control for log asset (size), book-to-market ratio, leverage, and operating profitability at the firm level. Robust standard errors clustered at the firm level are reported in parentheses. Significance codes: ***: 0.01, **: 0.05, *: 0.1.

Appendix Figure C.1. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Duration (Gonçalves, 2021)

(A) CAPX



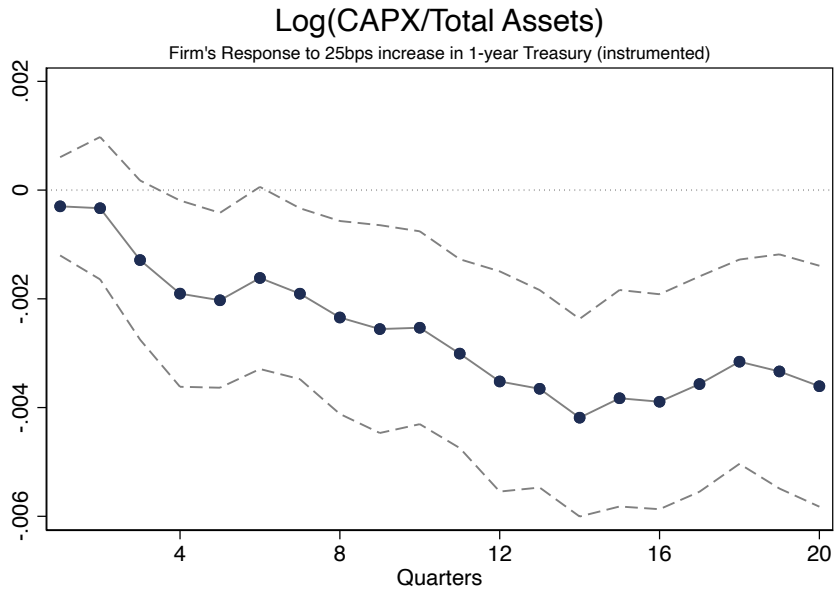
(B) R&D



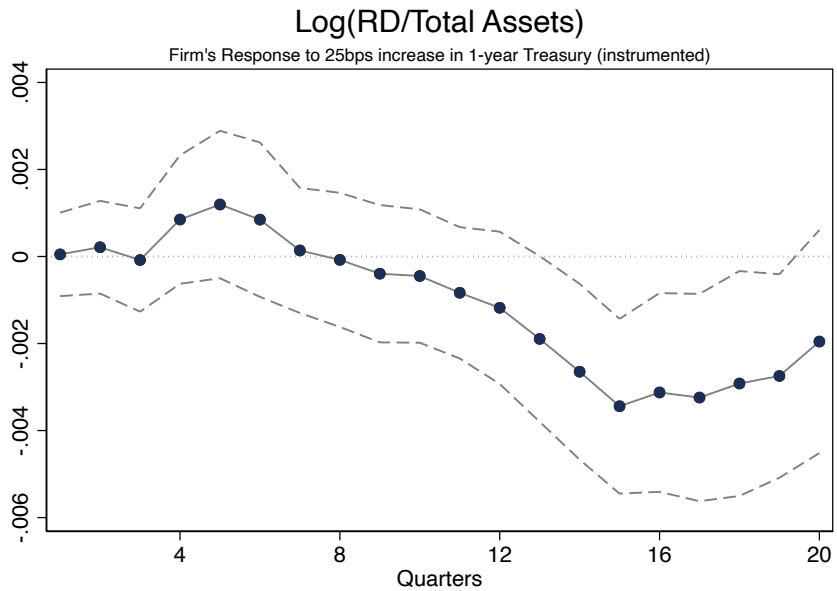
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for Duration (Gonçalves, 2021). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.2. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Duration (Hoberg and Maksimovic, 2022)

(A) CAPX



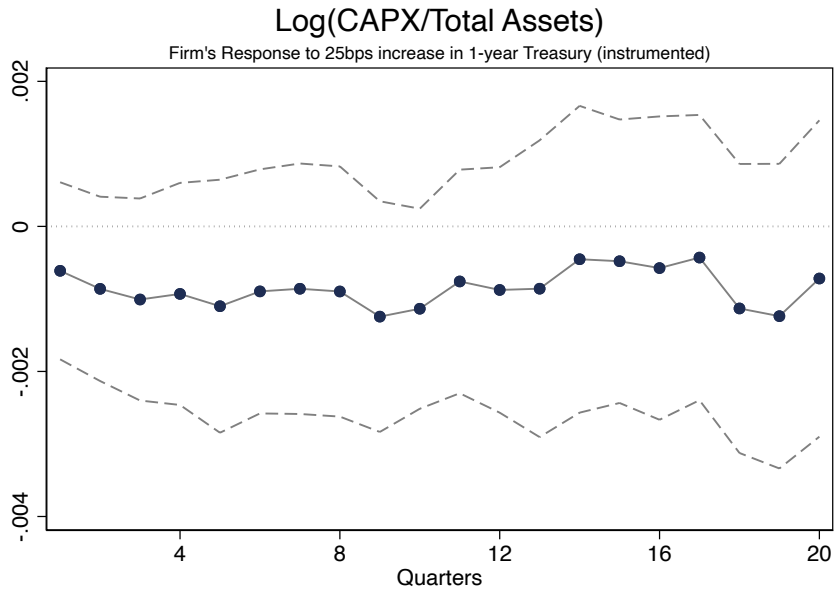
(B) R&D



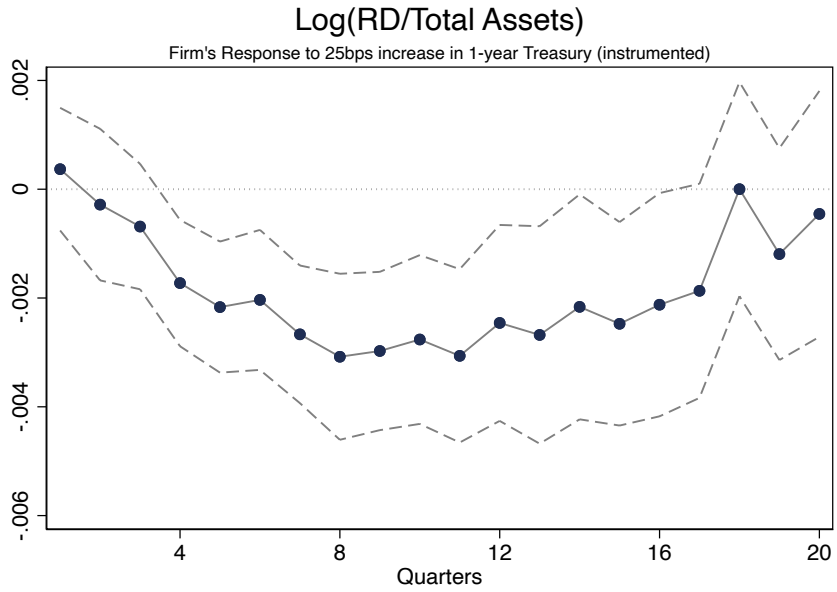
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for Duration (Hoberg and Maksimovic, 2022). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.3. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Duration (Gonçalves, 2021)

(A) CAPX



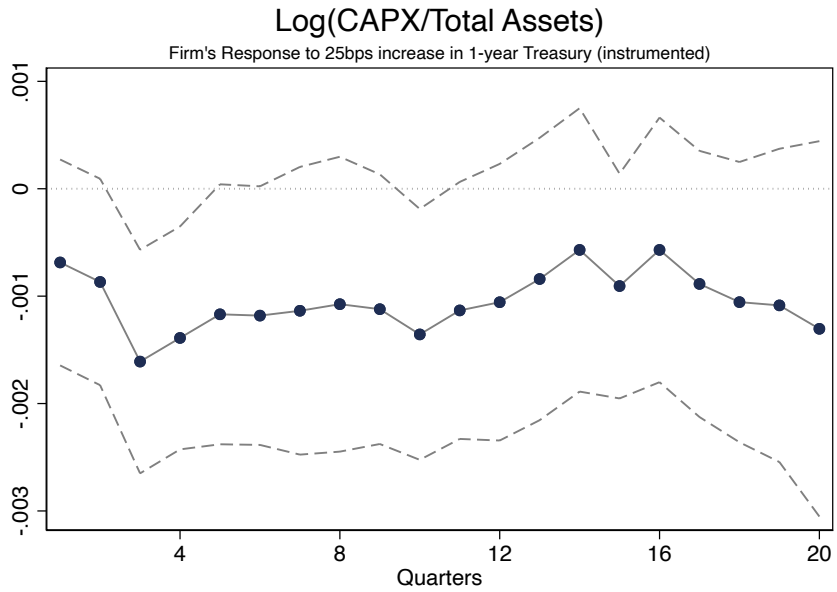
(B) R&D



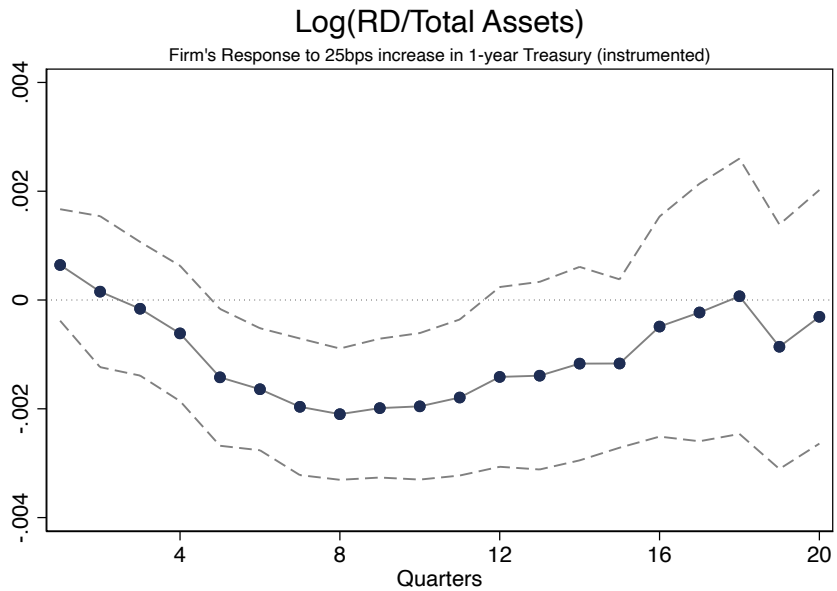
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for Duration (Gonçalves, 2021). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.4. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Duration (Hoberg and Maksimovic, 2022)

(A) CAPX



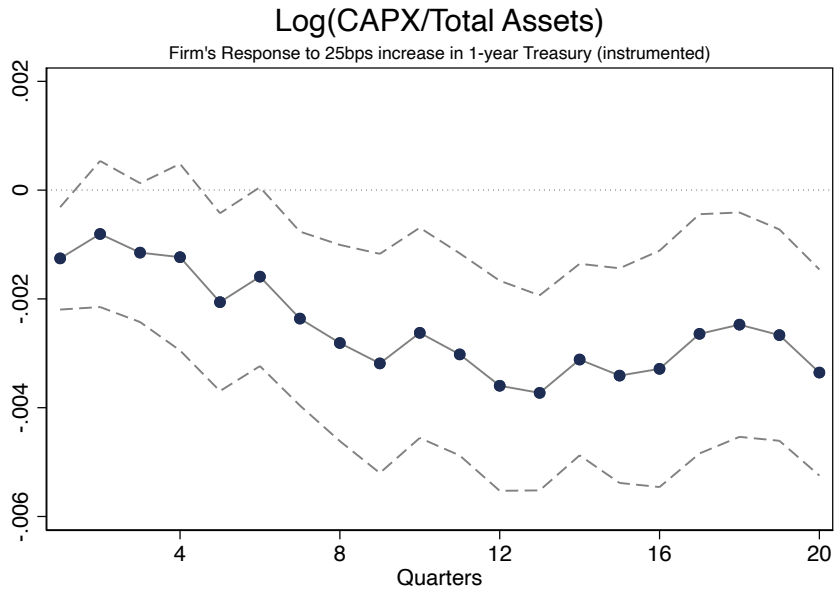
(B) R&D



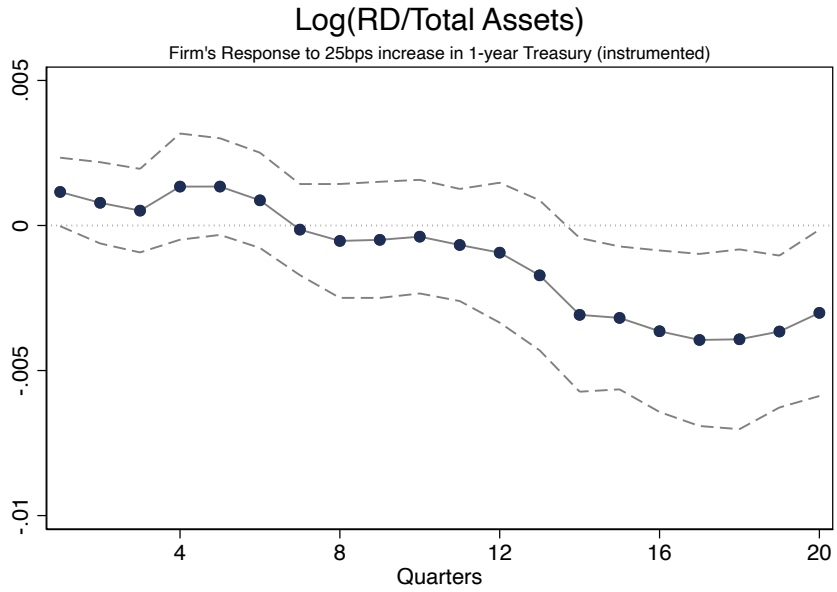
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for Duration (Hoberg and Maksimovic, 2022). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.5. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Refinancing Constraints

(A) CAPX



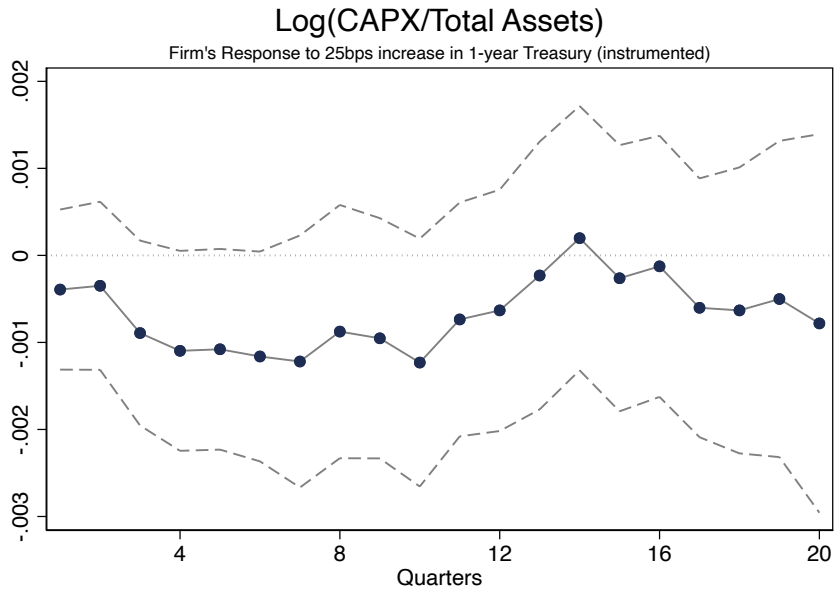
(B) R&D



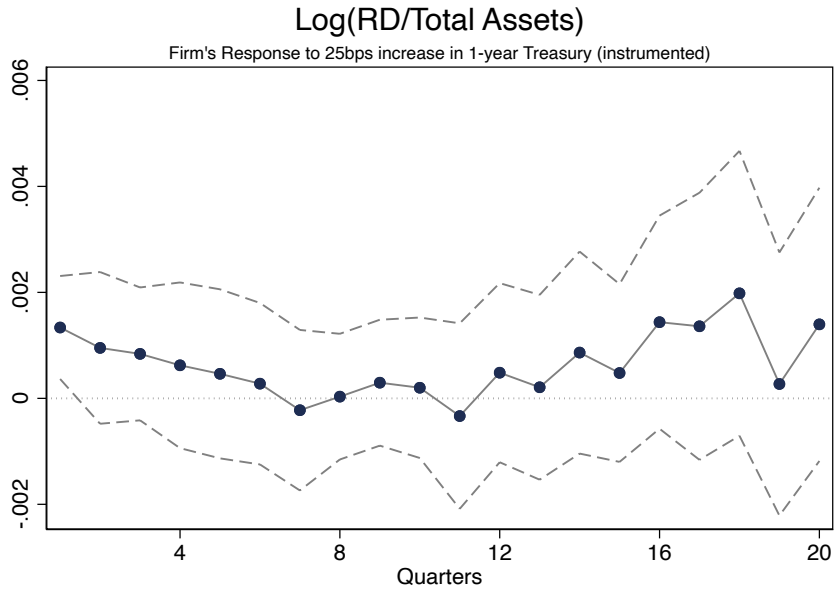
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for refinancing constraints (see Subsection C.2). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.6. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Refinancing Constraints

(A) CAPX



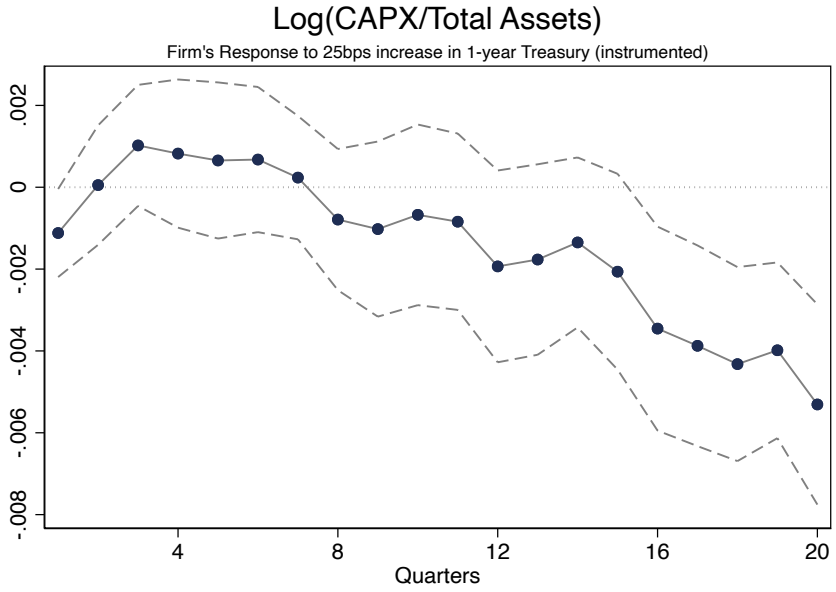
(B) R&D



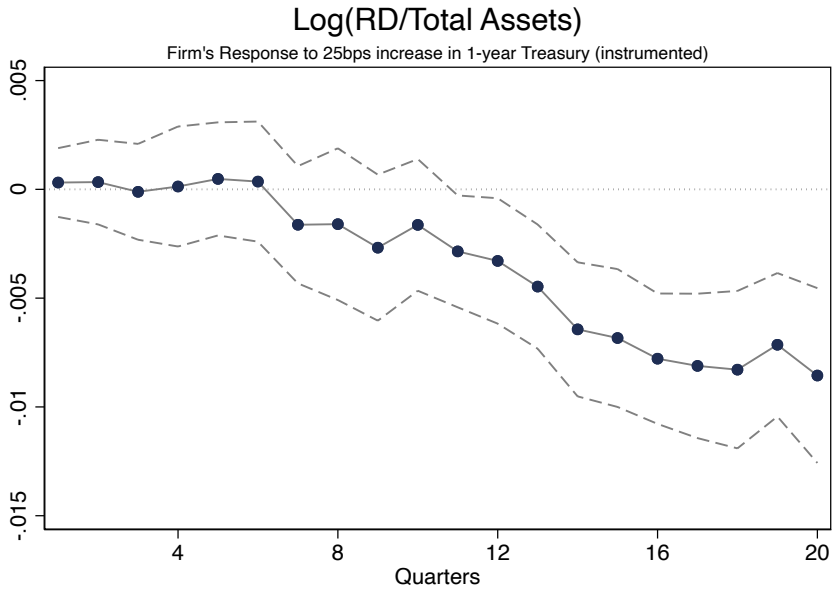
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for refinancing constraints (see Subsection C.2). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.7. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Refinancing Constraints and Restricting the Sample to Firms whose long-term debt is greater than 5% of assets

(A) CAPX



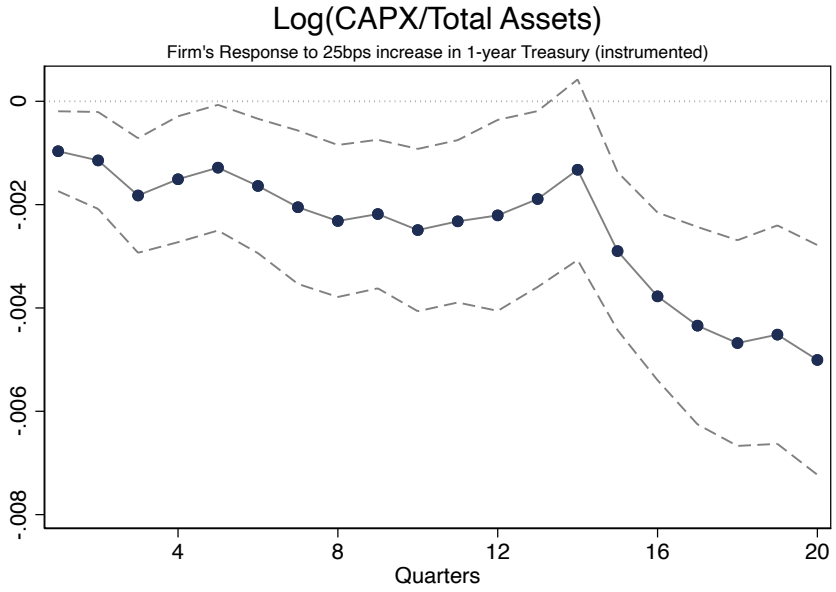
(B) R&D



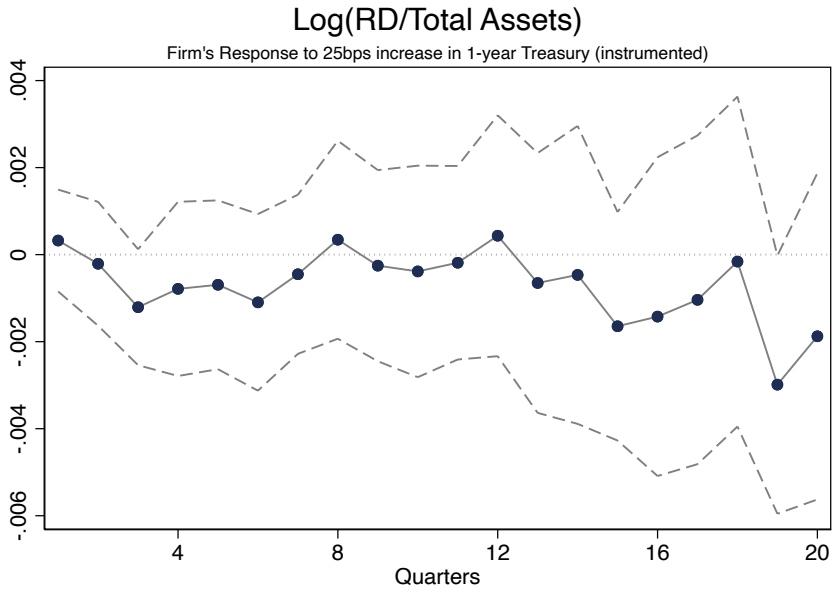
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for refinancing constraints (see Subsection C.2). We restrict our sample to firms whose long-term debt is greater than 5% of assets. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.8. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Refinancing Constraints and Restricting the Sample to Firms whose long-term debt is greater than 5% of assets

(A) CAPX



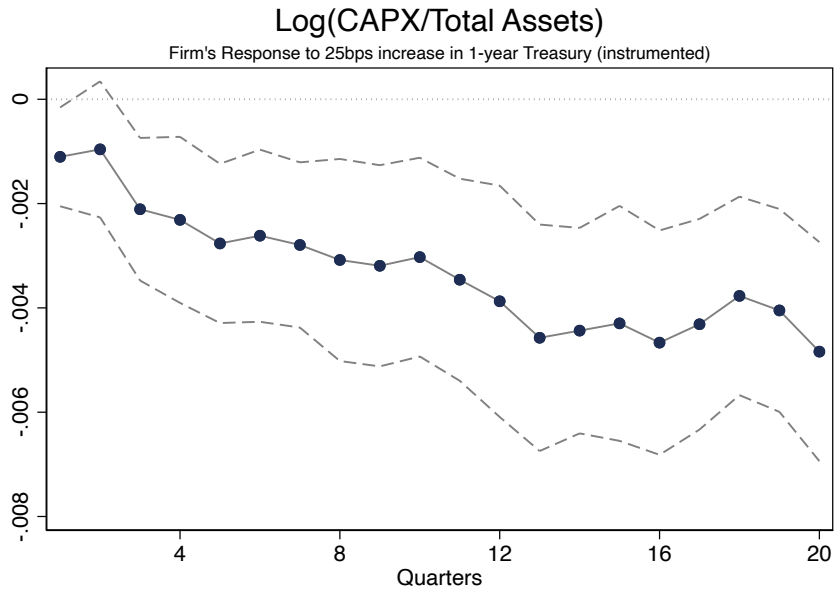
(B) R&D



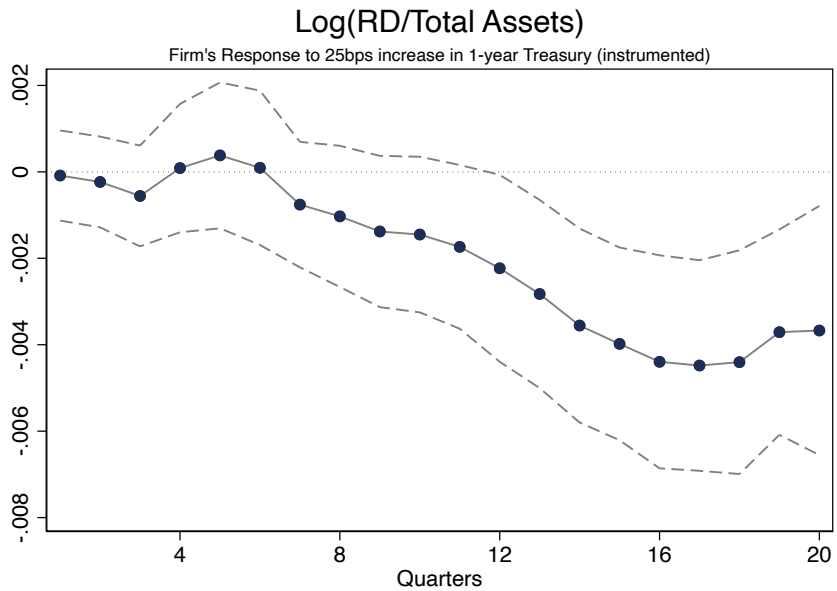
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for refinancing constraints (see Subsection C.2). We restrict our sample to firms whose long-term debt is greater than 5% of assets. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.9. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy Shocks from Bauer and Swanson (2023)

(A) CAPX



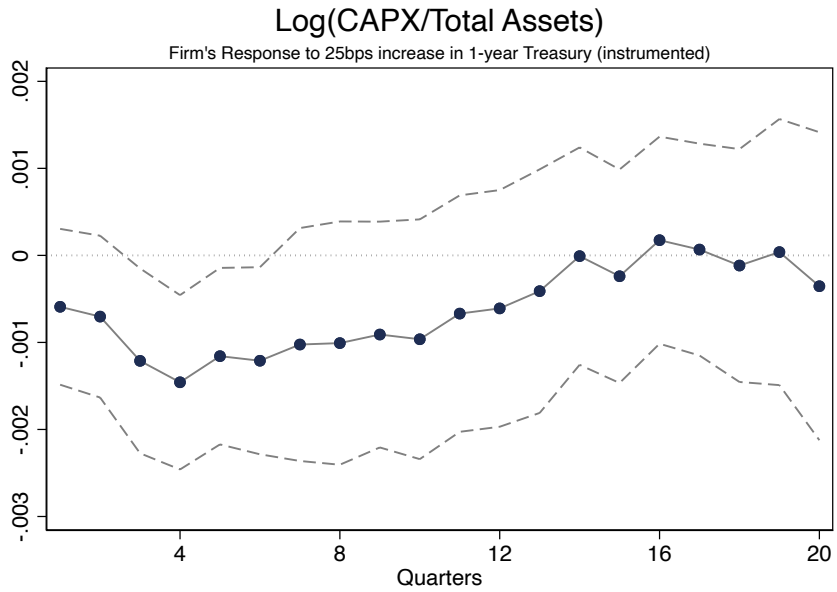
(B) R&D



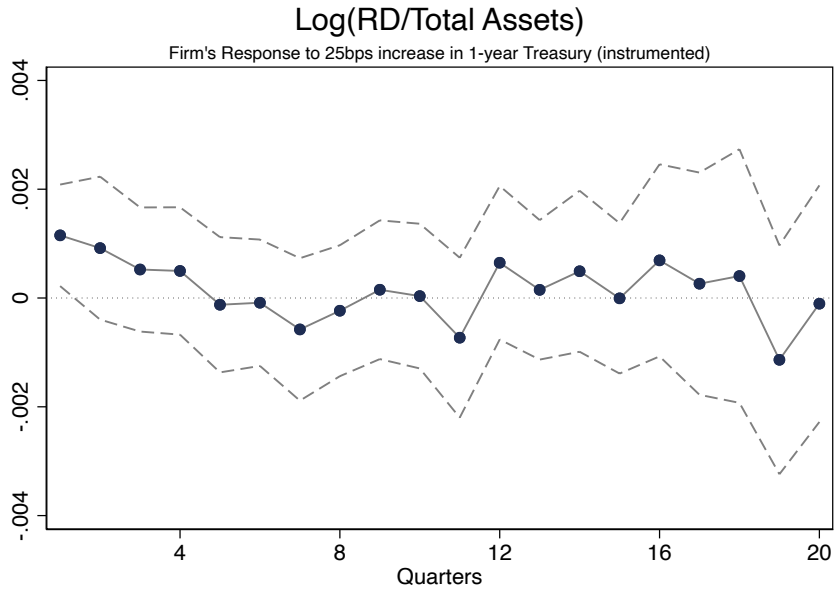
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from Bauer and Swanson (2023). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.10. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy Shocks from Bauer and Swanson (2023)

(A) CAPX



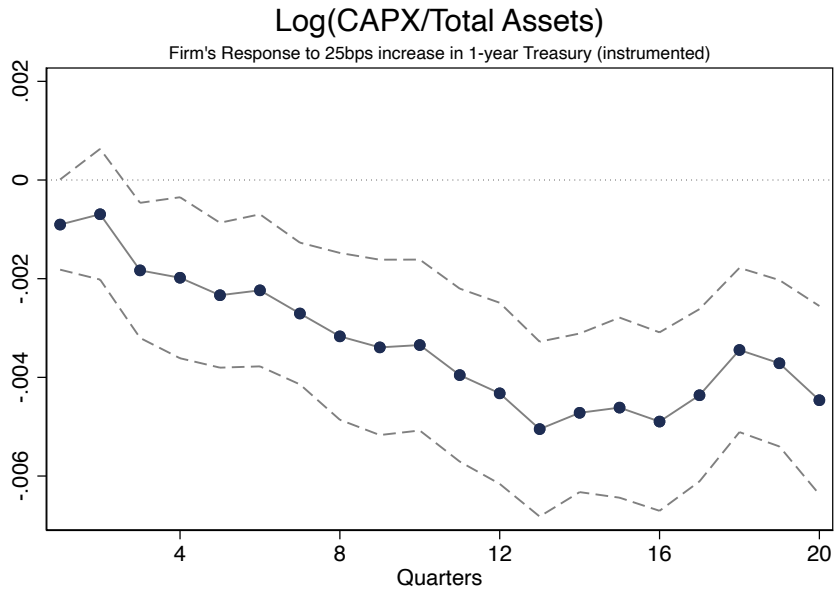
(B) R&D



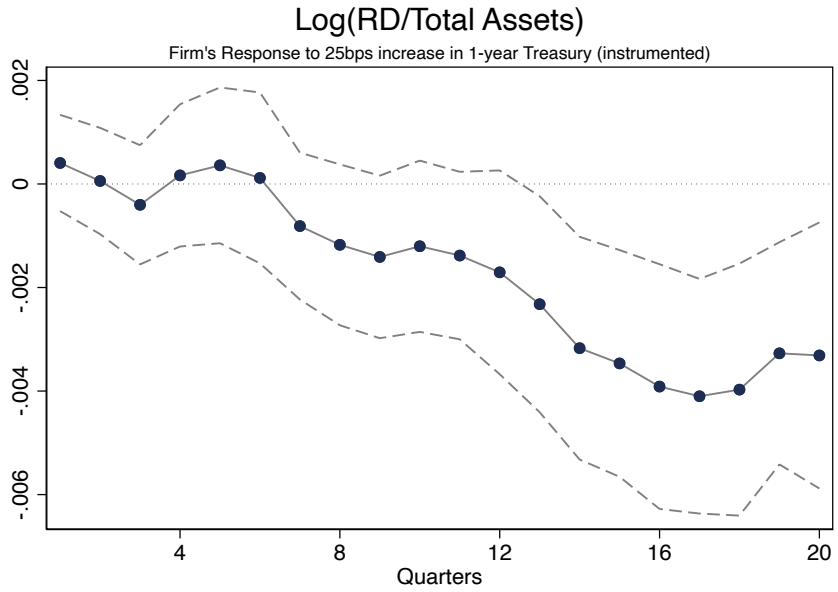
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from Bauer and Swanson (2023). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.11. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Cyclicality

(A) CAPX



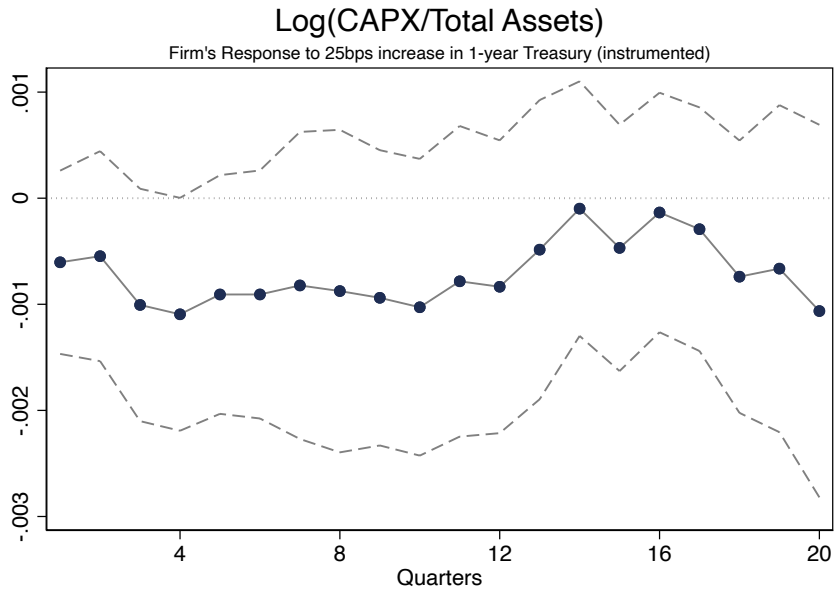
(B) R&D



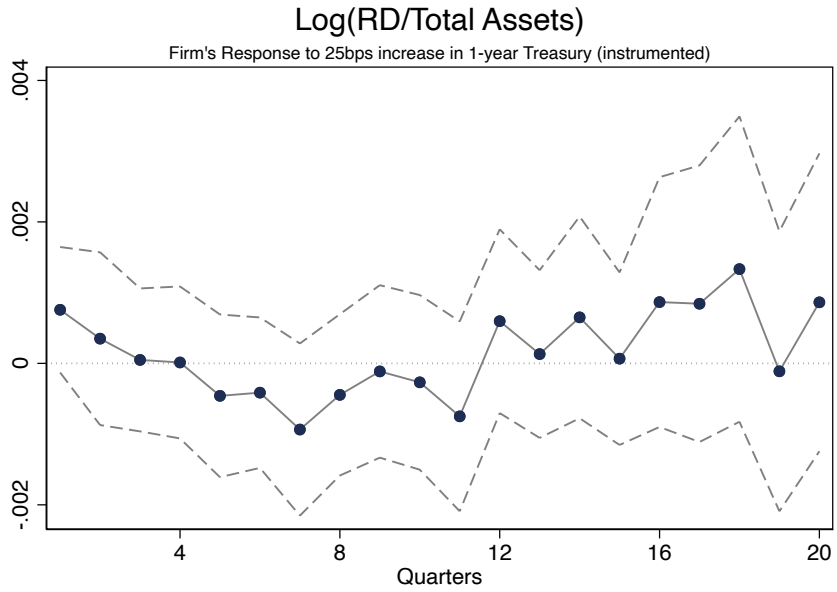
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for cyclicality. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.12. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Cyclicality

(A) CAPX



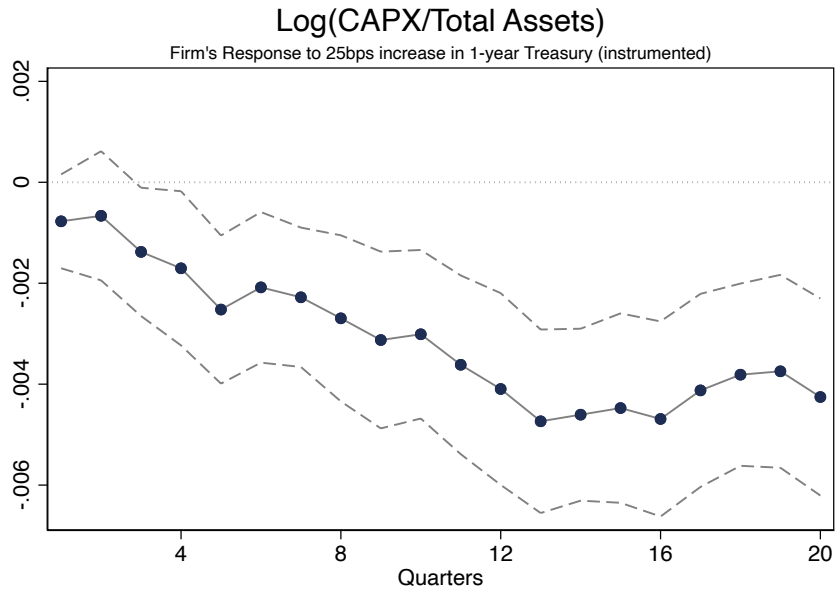
(B) R&D



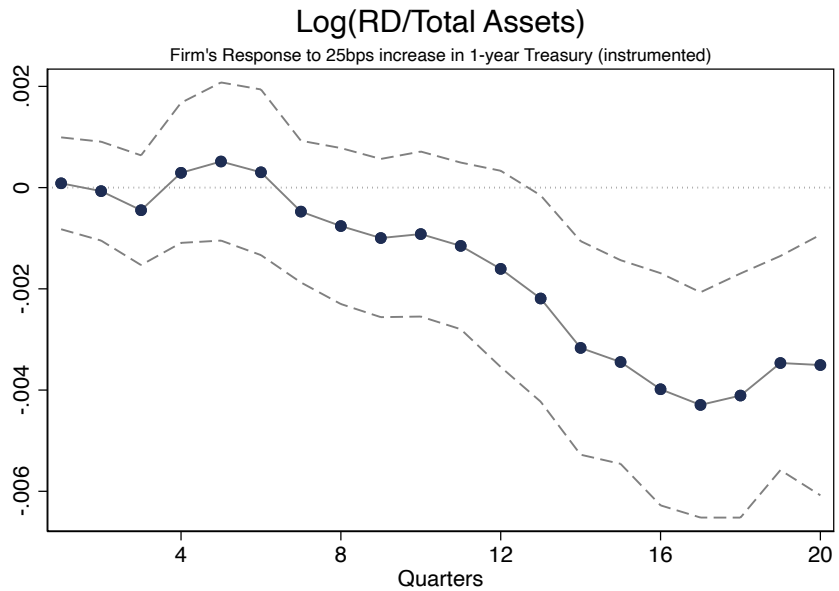
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for cyclicality. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.13. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for the Information Effect

(A) CAPX



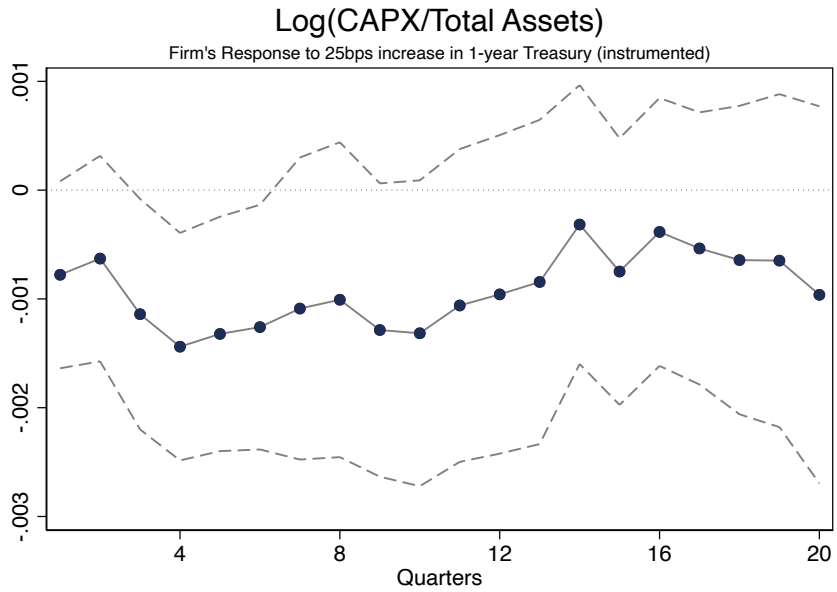
(B) R&D



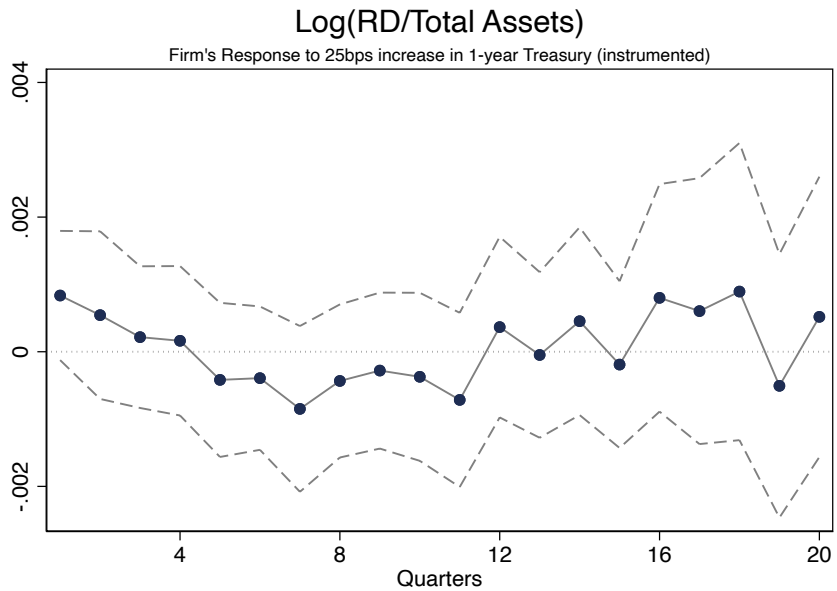
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for the information effect. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.14. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for the Information Effect

(A) CAPX



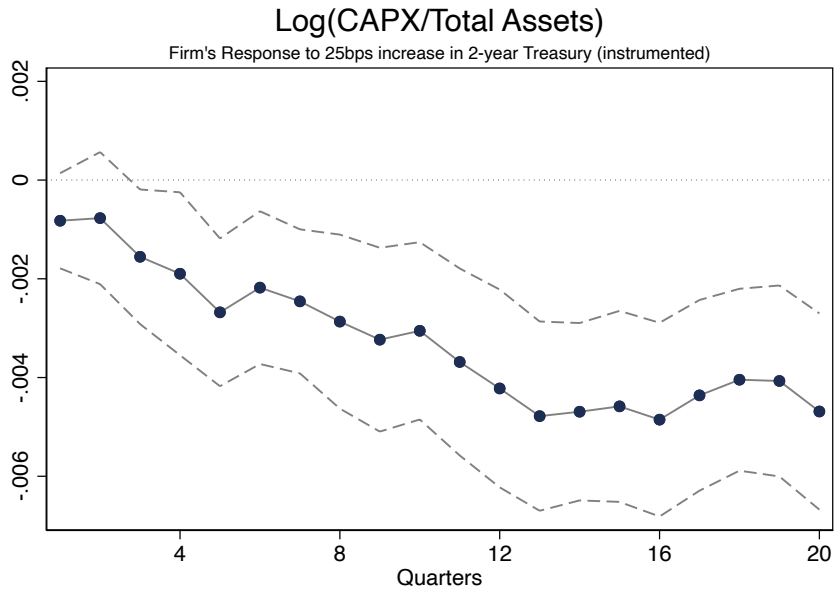
(B) R&D



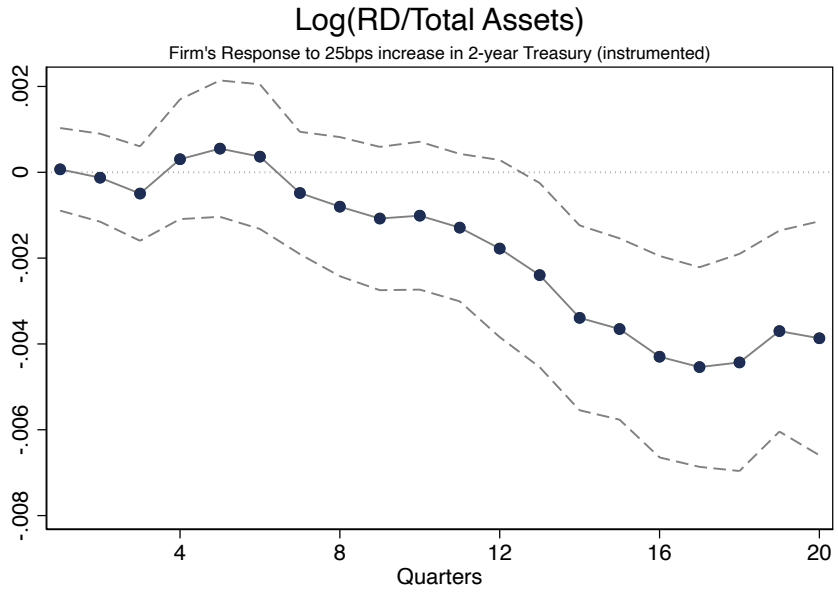
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for the information effect. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.15. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy Shocks

(A) CAPX



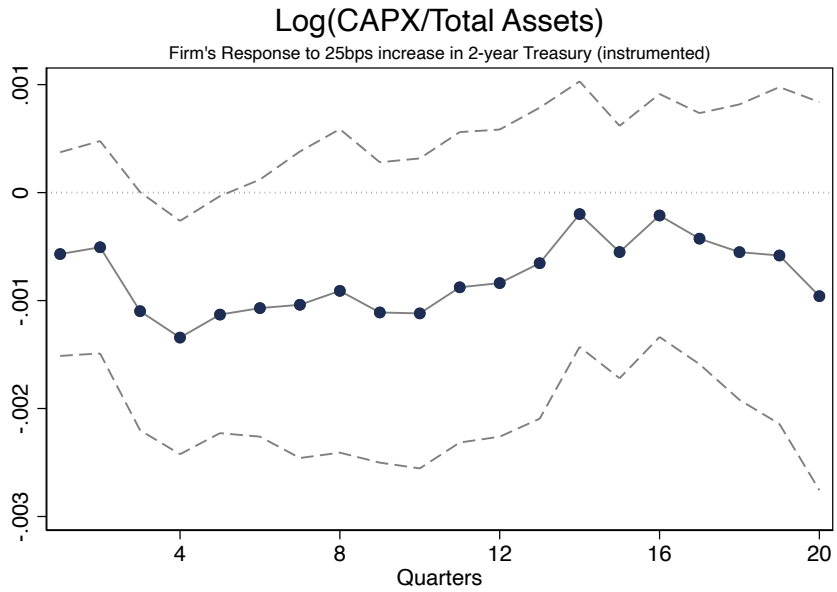
(B) R&D



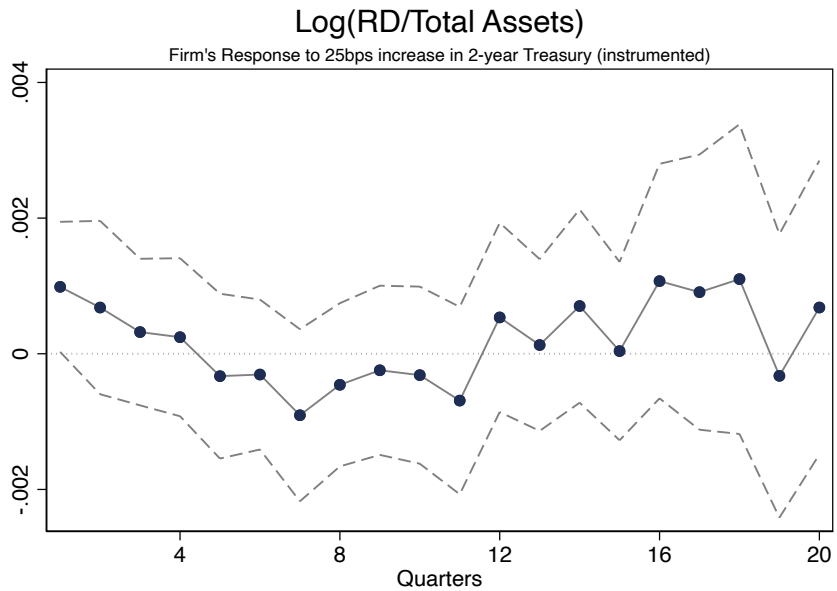
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 2-year Treasury (instrumented), estimated using Equation (4). The 2-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 2-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.16. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy Shocks

(A) CAPX



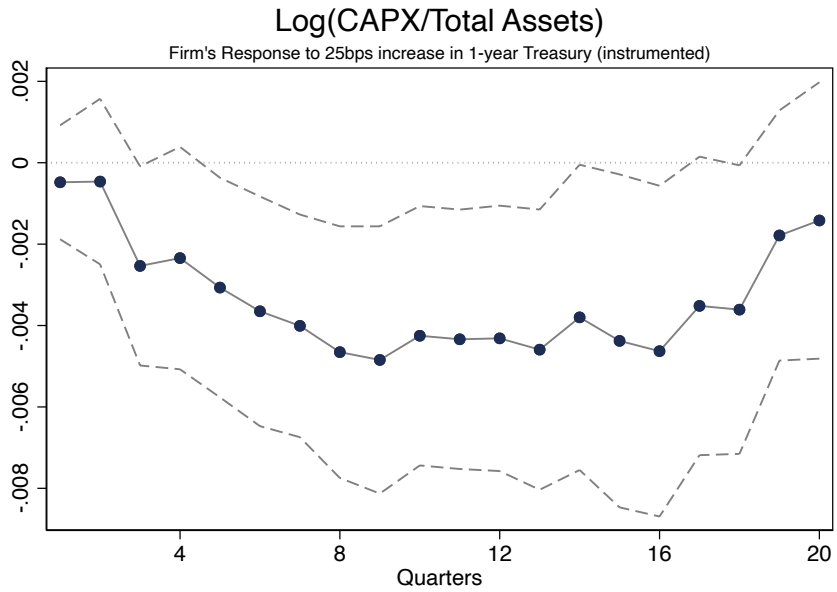
(B) R&D



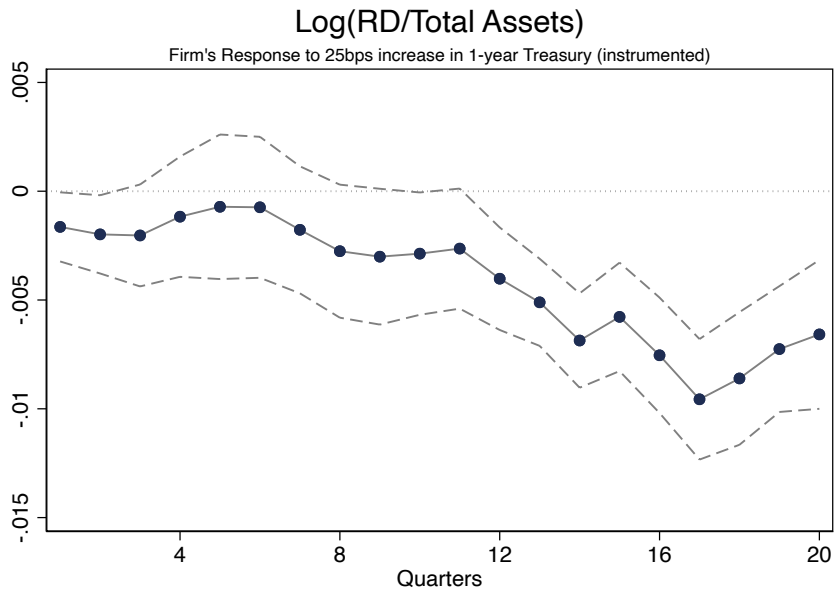
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 2-year Treasury (instrumented), estimated using Equation (4). The 2-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 2-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.17. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Excluding the ZLB

(A) CAPX



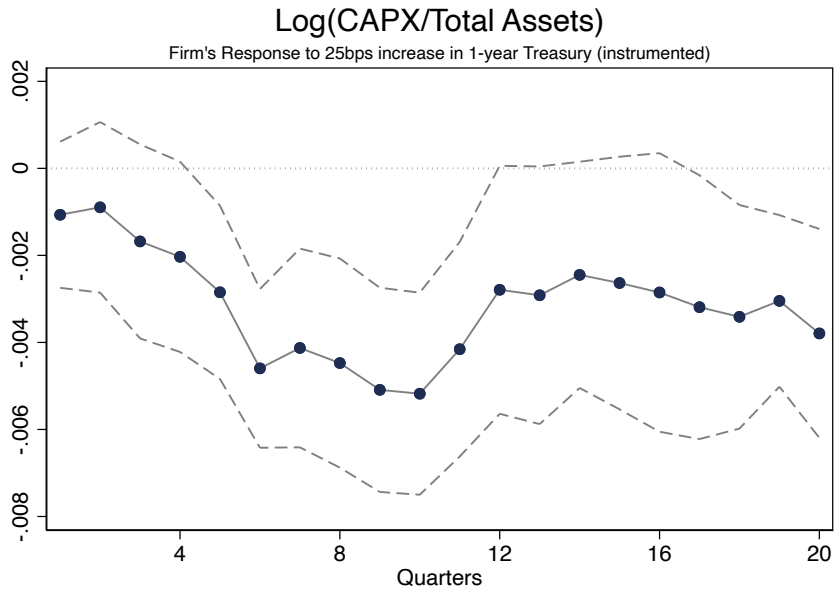
(B) R&D



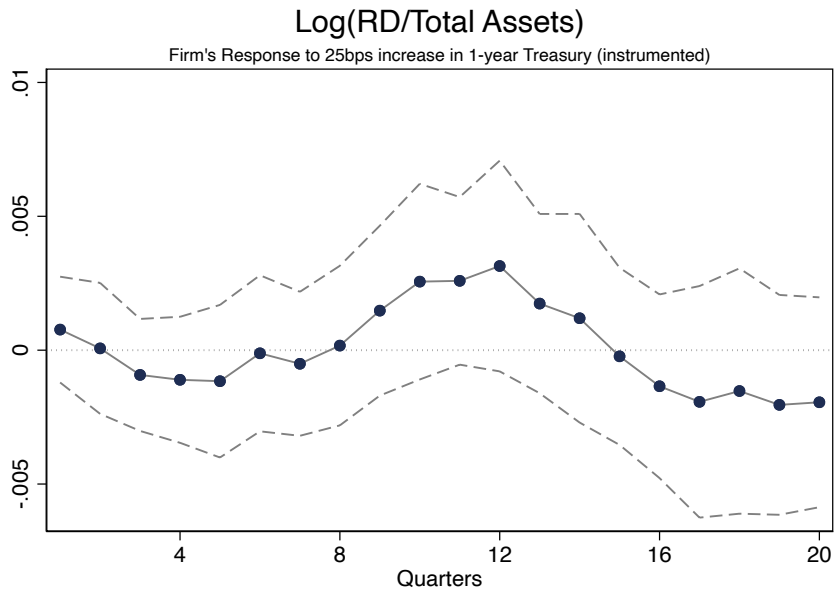
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and excluding the zero lower bound (ZLB) period (January 2009 to December 2015). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.18. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Excluding the ZLB

(A) CAPX



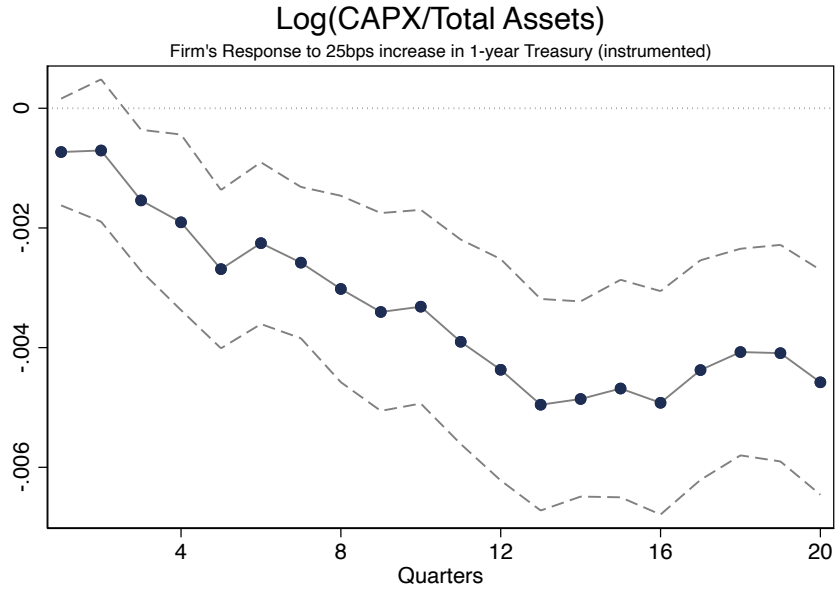
(B) R&D



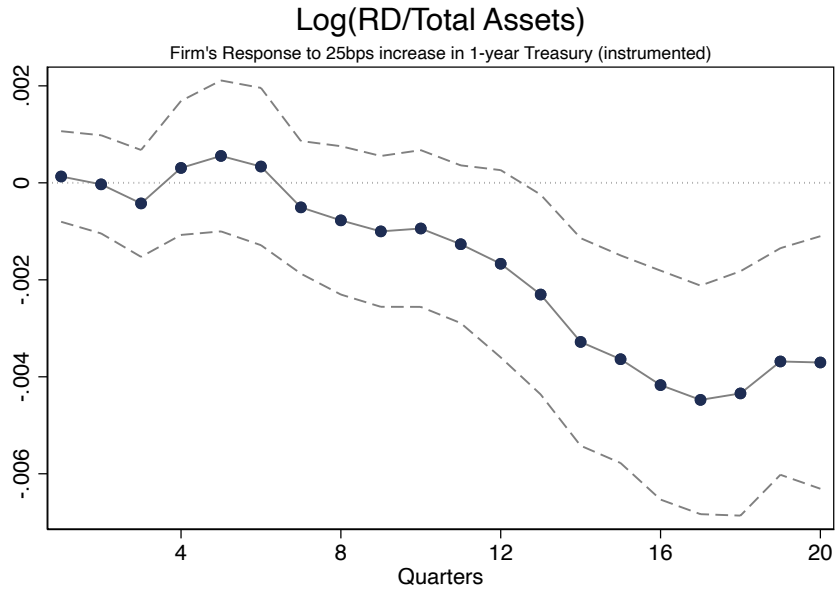
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and excluding the zero lower bound (ZLB) period (January 2009 to December 2015). The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.19. Equity-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Intangibility

(A) CAPX



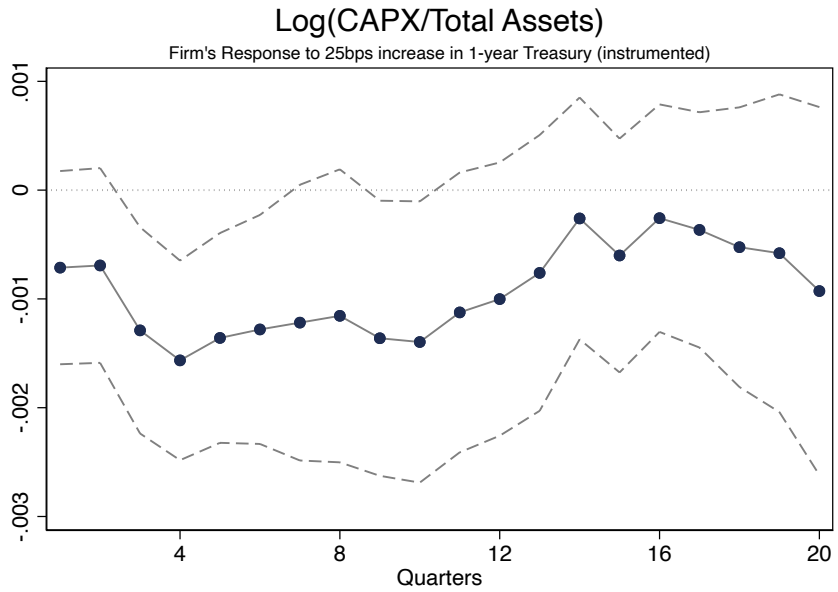
(B) R&D



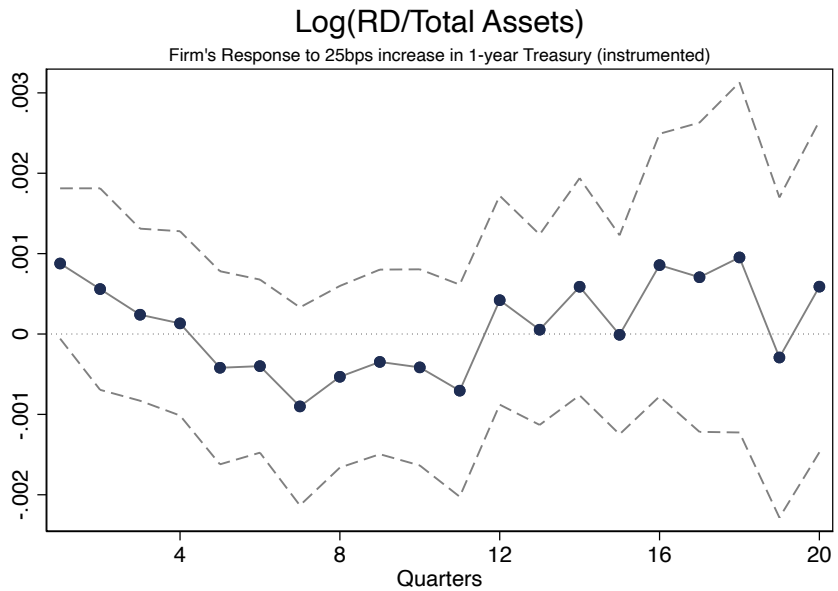
This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for intangibility. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure (β_2^h in Equation (4)). The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.

Appendix Figure C.20. Debt-Focused Constraints and the Dynamic Response of Investment to Monetary Policy: Controlling for Intangibility

(A) CAPX



(B) R&D



This figure shows the effect of financing constraints on firm's response to a 25bps increase in 1-year Treasury (instrumented), estimated using Equation (4) and controlling for intangibility. The 1-year Treasury rate is instrumented by cumulative high-frequency monetary policy shocks measured as monetary policy shocks from the decomposition by Jarociński and Karadi (2020). Each point represents the point estimate of the coefficient of the instrumented 1-year Treasury rate interacted with the financing constraint measure $FCD_{ij,t-1}$. The dashed line represents 90% confidence intervals using heteroscedasticity and autocorrelation robust Driscoll-Kraay standard errors.