

Through the supply chains it may not transmit? A case of monetary policy bottlenecks.*

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Abstract

We investigate the transmission of monetary policy through the supply chains with US data on corporate linkages. Our analysis uncovers three key insights. First, contractionary monetary conditions lead to disruptions in financially constrained firms' purchases and sales. Second, these disruptions extend to the unconstrained suppliers and customers of such firms. Third, disruptions intensify when financially constrained firms purchase or sell specialized goods. These findings suggest that monetary tightening creates bottlenecks in supply chains, forcing firms to curtail business when they cannot substitute their constrained business partners. "Monetary policy bottlenecks" amplify the impact of monetary policy beyond the standard balance sheet channel of transmission.

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1 Introduction

Recent world events, such as the COVID-19 pandemic or the blockage of the Strait of Hormuz, have illustrated how unexpected shocks to some firms can have a large impact on the production and delivery of goods through the supply chain. These disruptions are consistent with a literature documenting how large shocks are transmitted upstream and downstream along supply chains (Hertzel et al., 2008; Acemoglu et al., 2012; Barrot and Sauvagnat, 2016; Carvalho et al., 2021).

This paper focuses on smaller and much more common shocks—those driven by changes in monetary policy rates—and analyzes the role of input-output linkages as a channel for their propagation. Two established strands of the literature suggest that monetary policy can affect a firm through production linkages. First, the “interest rate” or “balance sheet” channel argues that changes in monetary policy can alter demand for a firm’s products by financially constrained clients (Bernanke and Blinder, 1988; Kashyap et al., 1993; Gertler and Gilchrist, 1994). Second, the “cost” channel contends that changes in the monetary policy rate may affect the marginal costs of production of suppliers who must borrow to pay factors of production before receiving revenues (Christiano et al., 1997; Barth and Ramey, 2001; Gaiotti and Secchi, 2006). Given firms sell customized goods to their customers and rely on a variety of different and specific inputs for production from their suppliers, an implication is that disruptions of a firm’s financially constrained business partners induced by changes in the policy rate may create bottlenecks that force the firm to cut back its own activities. We refer to these supply-chain induced changes as “monetary policy bottlenecks.”

To study monetary policy bottlenecks, we exploit detailed information on firm supply chains and inter-sectoral input-output linkages to test whether firms with financially weak suppliers and clients are more affected by changes in monetary conditions than firms with healthy business partners. What is new in our approach is that we allow for the balance sheet

channel to work through the balance sheets of firms’ clients and suppliers, while controlling for the effect of monetary policy on the firm’s own balance sheet.

In our main analysis, we analyze the impact of a monetary policy tightening on sales and purchases for publicly traded US firms, and rely on input-output matrices to calculate average financial health in downstream and upstream sectors. Identification is based on the assumption that average financial conditions in downstream and upstream sectors are largely exogenous to an individual firm’s ability to supply products or demand inputs; we exclude the firm’s own sector from these measures. We also control for endogenous changes in the monetary policy rate using different measures of monetary conditions, including monetary policy surprises.

We validate our identification strategy using data from actually existing business relationships that are available to us. These data allow us to measure business partners’ financial health precisely and observe firms’ sales to actual clients. We identify the monetary policy bottlenecks by introducing firm-by-time fixed effects to control for all firm-level time-varying factors (Khwaja and Mian, 2008). Additionally, we exploit heterogeneity across client or supplier financial health driven by exogenous shocks to local real estate prices (Chaney et al., 2012). Results from these internally valid approaches are consistent with our main firm-level estimates.

Our analysis uncovers several novel patterns. First, firm sales fall with monetary tightening when downstream clients have weak balance sheets, and input purchases fall when suppliers have weak balance sheets. These bottlenecks operate through the weakest links within the supply chain and have sizable immediate impact on firms’ operations.

Second, supply and demand bottlenecks act on top of the standard balance sheet channel of transmission. This implies that monetary conditions can affect financially *unconstrained* firms if these are linked to financially constrained business partners. Our estimates suggest that supply-chain amplification due to the poor financial health of business partners accounts

for 56 to 87 percent of the total effect of a monetary policy tightening that operates through financial constraints.

Third, the nature of the traded good interacts with business partners’ financial constraints to amplify or dampen these effects. Firms that sell or purchase *specialized* goods from financially constrained partners are more affected by changes in monetary conditions than firms trading standardized goods.

In extensions, we find that bottlenecks induced by constrained suppliers are more persistent than those induced by constrained customers. These results can be explained if firms only gradually reduce their exposure to financially constrained suppliers as they factor in higher risks of failure (Titman, 1984; Opler and Titman, 1994; Custódio et al., 2023), lower input quality (Maksimovic and Titman, 1991; Matsa, 2011), and/or higher input prices (Chevalier and Scharfstein, 1996). We also find that the documented bottleneck effects are not undone within the supply chain through trade credit provision; they are instead amplified, akin to the “flight-to-quality” effect observed in bank lending (Bernanke et al., 1996).

Overall, our results suggest that bottlenecks in supply chains may amplify the effects of changes in monetary policy conditions, especially when firms cannot switch swiftly to less constrained business partners.

Our paper contributes to the literature analyzing the specific transmission of monetary policy through supply chains. It bridges a gap between two strands of the literature. The first strand documents how shocks propagate through input-output linkages. Acemoglu et al. (2012) and Acemoglu et al. (2016) emphasize the role of production networks as a mechanism for propagation and amplification of shocks. Barrot and Sauvagnat (2016) and Carvalho et al. (2021) focus on natural disasters to study whether firm-level shocks propagate through these networks. Our findings suggest that such propagation mechanisms also operate for monetary policy shocks.

The second strand studies the transmission channels of monetary policy, focusing primar-

ily on how conventional monetary policy is transmitted from financial intermediaries to firms (Bernanke and Blinder, 1988; Kashyap and Stein, 2000; Jiménez et al., 2012). Within this strand, a few papers have examined the role of supply chains. Ozdagli and Weber (2025) and Ghassibe (2021) show that supply chain effects account for a large fraction of stock market prices and aggregate consumption, respectively. Our contribution is to identify a specific mechanism through which monetary policy transmits along the supply chain: *production disruptions* and *supply chain bottlenecks* arising from business partners’ financial constraints. As such, our findings also relate to the literature documenting a key role for leverage in the transmission of shocks (Mian and Sufi, 2010; Giroud and Mueller, 2017). What is new here is that we compare the leverage effect from downstream firms through a demand effect with the leverage effect at upstream firms through a supply effect, finding that these two effects can be compounded.

2 Data and methodology

Our analysis uses quarterly balance sheet data for all non-financial, non-government, publicly traded US firms from Compustat (1990 Q1–2016 Q4). We measure the average financial health of each firm’s clients and suppliers in two stages. First, we calculate sector-level financial health at the 4-digit SIC code as the average across firms. Second, we use input-output matrices from the Bureau of Economic Analysis to compute weighted averages of the financial health of sectors buying from (selling to) each firm as proxies for client (supplier) balance sheet weakness. We exclude the firm’s own sector from these calculations to increase exogeneity. Following Bernanke and Gertler (1995), our main measure of financial weakness is the inverse coverage ratio (interest expenses to EBIT); we also use debt-to-assets in tests for the robustness of our results. We denote client and supplier financial weakness by x^c and x^s , respectively. While these measures proxy for (rather than directly capture) the weakness of actual business partners, they allow us to obtain upstream and downstream financial

weakness measures for every firm. In Section 4.3 we relax this assumption using firm-to-firm sales data.

Our baseline regression estimates dynamic effects using local projections (Jordà, 2005):

$$\begin{aligned} \Delta y_{i,t+h} = & \beta_c^h \Delta r_{t-1} x_{i,t-1}^c + \beta_s^h \Delta r_{t-1} x_{i,t-1}^s + \beta_f^h \Delta r_{t-1} x_{i,t-1}^f + \\ & + \Gamma_c^{h'} X_{i,t-1}^c + \Gamma_s^{h'} X_{i,t-1}^s + \Gamma_f^{h'} X_{i,t-1}^f + \mu_t^h + \eta_{S(i)}^h + \psi_{Q(i)}^h + \epsilon_{it}^h \end{aligned} \quad (1)$$

The dependent variable $\Delta y_{i,t+h} = y_{i,t+h} - y_{i,t-1}$ measures changes in firm i 's activity between quarters $t-1$ and $t+h$, for $h \in \{0, 1, \dots, 12\}$.¹ $\Delta r_t = r_t - r_{t-1}$ captures changes in monetary conditions, and $x_i^k, k \in \{f, c, s\}$ denotes balance sheet weakness of the firm itself (f), its clients (c), or suppliers (s). Coefficients β_c^h , β_s^h , and β_f^h measure how the response to a monetary policy shock depends on client, supplier, and own-firm financial weakness, respectively, h quarters after the rate change.²

To examine client-side bottlenecks, the dependent variable is the h -quarter log difference in sales, and we focus on β_c^h , the interaction term. If monetary tightening creates bottlenecks among the firms' clients, sales should decline relatively more when clients are financially weak ($\beta_c^h < 0$). For supplier-side effects, the dependent variable is the log difference in purchases, and we focus on β_s^h . Bottlenecks among constrained suppliers could lead to difficulties or delays in the production process, affecting their ability to provide the goods, and resulting in lower purchases by clients ($\beta_s^h < 0$). Alternatively, financially weak suppliers might seek to boost their cash flows by lowering prices, leading to an increase in purchases ($\beta_s^h > 0$). The sign for β_s^h is therefore ex-ante ambiguous.³

Specifications include firm-level controls X_{it-1}^f (industry sales growth, size, debt, Tobin's Q, PPE ratio, and their interactions with monetary policy changes) and average client and supplier characteristics X_{it-1}^c and X_{it-1}^s (industry sales growth, size, debt, Tobin's Q, and PPE ratio). We include time fixed effects μ_t , sector fixed effects $\eta_{S(i)}$, and fiscal year-end

¹The dependent variables are deflated and seasonally adjusted using rolling annual figures; in addition, all variables are winsorized at the 1st and 99th percentiles. See Appendix Table A1 for variable definitions.

²Table A2 illustrates how financial weakness varies across sectors, and Table A3 provides stylized examples of client and supplier linkages.

³Our data does not allow us to distinguish between quantity bottlenecks vs. price pass-through.

quarter fixed effects $\psi_{Q(i)}$. Our preferred specification substitutes sector with firm fixed effects ν_i . Standard errors are clustered at the firm level. Results are robust to double clustering by sector and year; see Section 5.

Our main measure of monetary conditions is quarterly changes in the federal funds rate from FRED. The coefficients of interest are interactions of rate changes with client or supplier financial weakness, which are plausibly exogenous to firm decisions. To address potential correlation between fed funds changes and unobserved economic activity, we lag monetary policy changes. For robustness, we use surprise changes in the federal funds target and changes in the 2-year Treasury rate; see Sections 4 and 5.

Table 1 presents summary statistics of the main variables in our analysis. Panel A shows that quarterly sales (purchases) growth averages 0.4% (0.1%), with substantial variation. Firms have slightly better financial health than their suppliers and clients but are smaller on average. Panel B describes the monetary policy variables. The fed funds rate averages 2.97%, ranging from above 8% early in the sample to near zero from 2009 onward. Average (median) quarterly rate changes are -10 (-0.6) basis points. Monetary surprises correlate strongly with fed funds changes (0.79) but have lower variation, averaging -4 (-1.6) bps quarterly.

3 Results

3.1 Client bottlenecks

We begin by exploring client bottlenecks induced by monetary policy. Table 2 estimates Equation 1 on the firm-level sample at the four-quarter horizon. The dependent variable is the change in firm sales between $t - 1$ and $t + 4$, and we use average client inverse coverage ratio, our main parameter of interest, as our measure of customer financial weakness. The coefficient of interest is β_c^4 , corresponding to $x^c \times \Delta r$ in the table. Following the common practice in the literature (see e.g. Mitton, 2024), in this and the following tables we standardize the inverse coverage ratio and rescale the estimate coefficient by a factor of 25 to

enhance the interpretability of the economic significance of our results while preserving the effects of interest. As a result, the reported estimates of β_c represent the impact of a 25 basis point increase in the monetary policy rate for firms whose clients’ inverse coverage ratio is one standard deviation above average, expressed in percentage points. We similarly standardize supplier and firm financial health to facilitate the comparison across the coefficients of variables with different levels of variation.

Column 1 controls only for time and industry fixed effects; columns 2–6 include firm-level controls; and columns 3–6 also include client-level controls. Columns 4–6 substitute industry with firm fixed effects; columns 5–6 add supplier controls. Column 6, our preferred specification, additionally includes interactions of the monetary policy rate with firm, client-sector, and supplier-sector characteristics. For simplicity, we only report the main coefficients of interest; Table A4 in the Appendix contains all estimated coefficients.

The results in Table 2 show evidence of client-induced bottlenecks. The estimated β_c^4 is negative and statistically significant at the 99% level in all specifications, remaining significant and similar in magnitude even after controlling for all observable characteristics and interactions with the policy rate (column 6). These findings suggest that client-side bottlenecks can affect financially unconstrained firms if their clients have weak balance sheets. Economically, the estimate $\beta_c^4 = -0.267$ implies that a 0.25pp rate hike leads to 0.27pp lower purchase growth for firms whose customers’ average inverse coverage ratio is one standard deviation above average. This is quantitatively large compared to average sales growth $\Delta \ln \text{sales}_{t+4}$ of 3.8pp. In Section 3.3 we discuss the economic magnitudes of these effects.

Despite these controls, estimates could be subject to residual bias from unobserved heterogeneity—such as price stickiness or other heterogeneous transmission effects (see e.g. Pasten et al., 2020). Section 4.3 addresses this concern with more granular data and exogenous changes in partners’ financial conditions. Meanwhile, in an analysis following Oster (2019), we find that unobserved factors would need to be 1.95 times larger than observed character-

istics to render β_c^4 statistically insignificant.

The results observed four quarters after the changes in monetary policy extend qualitatively to longer horizons. Table A5 reports coefficients β_c^h for different horizons h based on our preferred specification (column 6). The upper panel of Figure 1 summarizes these estimates, together with 95% confidence intervals, for all horizons $h \in \{0, 1, \dots, 12\}$. The differential response for firms with weak clients peaks around six quarters after the rate change and reverts toward zero thereafter, remaining significant for at least 10 quarters. As we discuss below in Section 3.3, firms' own balance sheet weakness has a smaller impact on transmission.

3.2 Supplier bottlenecks

We next examine supplier effects by estimating Equation 1 with log purchases as the dependent variable. Table 3 reports results for the main coefficients of interest at $h = 4$, adding controls parsimoniously as before; the rest of the estimated coefficients are available in Table A6 in the Appendix.

Results show that changes in monetary conditions affect the purchases of firms buying from financially weak suppliers negatively: the interaction between supplier financial weakness and rate changes is negative and significant at the 99% level in all specifications. The coefficient decreases with additional controls but remains substantial in our preferred specification (column 6). Following Oster (2019), we find that unobserved factors would need to be at least 1.6 times larger than observed ones to render estimates statistically insignificant, suggesting limited impact from unobserved heterogeneity. The negative coefficients are consistent with the existence of supplier bottlenecks and indicate that monetary policy can induce disruptions in the production process or trigger price increases by weak suppliers, affecting even financially unconstrained firms.

Estimates of supplier bottlenecks in Table 3 are economically large. For example, the

coefficient $\beta_s^4 = -0.454$ in column 6 implies that a 0.25pp rate hike leads to 0.45pp lower purchase growth for firms whose suppliers' average inverse coverage ratio is one standard deviation above average, and it is quantitatively large compared to average purchase growth $\Delta \ln \text{purch}_{t+4}$ of 2.9pp. The table also shows that the reduction in purchases through the supplier-bottleneck effect is about fourfold that through firms' own balance sheets ($\beta_s^4 = -0.454$ versus $\beta_f^4 = -0.117$). This result is consistent with firms responding to supply chain disruptions —e.g. delivery delays, quality reductions, or potential supplier bankruptcy— by reducing orders during monetary tightening. This is consistent with shock amplification through supply chains modeled by Acemoglu et al. (2012). We discuss the relative magnitudes of the firm's financial constraints versus those of its partners, the consistency of our estimates across the tables, and the aggregate effects of our findings in Section 3.3.

Admittedly, as our data do not allow us to disentangle the volume of purchases from their prices, we cannot entirely rule out the possibility that the relatively large decline in nominal purchases from financially constrained suppliers (coefficient $\beta_s^4 = -0.454$) may stem from these suppliers lowering their prices to sustain sales. However, such an explanation appears inconsistent with the empirical evidence supporting the cost channel of monetary policy. Specifically, this evidence suggests that interest rate hikes increase borrowing costs for financially constrained suppliers, leading them to raise (rather than reduce) their prices (Barth and Ramey, 2001).⁴ Thus, the interpretation of our results as indicative of supply-chain bottlenecks is supported by the empirical evidence on the cost channel of monetary policy. Further evidence supporting this interpretation comes from the negative sign of β_s in Table 2. If financially constrained suppliers lower their prices, this would be a boon for the firms purchasing from these suppliers. Such firms should plausibly be able to increase their sales, leading to a positive coefficient for β_s^4 in Table 2. By contrast, the coefficient associated with suppliers' financing in Table 2 is significantly negative ($\beta_s^4 = -0.281$). This

⁴Additional notable evidence based on granular good-level or firm-level data includes Gilchrist et al. (2017) and Gaiotti and Secchi (2006).

negative sign is inconsistent with a price pass-through from financially constrained suppliers. In Section 5.2 we further reinforce this interpretation using sector-level proxies for prices.

The lower panel of Figure 1 plots β_s^h for $h \in \{0, 1, \dots, 12\}$; Table A7 reports a selection of these dynamic estimates. Results show negative coefficients throughout horizons. The differential negative effects peak around six quarters but, unlike client bottlenecks, persists for at least 12 quarters. This asymmetry may reflect compounding of supply disruptions with demand-side motives to reduce purchases from constrained suppliers: Customers might reduce purchases from constrained suppliers due to higher failure risk (Titman, 1984; Opler and Titman, 1994), lower product quality (Maksimovic and Titman, 1991; Matsa, 2011), higher prices (Chevalier and Scharfstein, 1996), lower availability of trade credit (Almeida et al., 2024), or predatory actions by competitors of the distressed suppliers (Bolton and Scharfstein, 1990); see Custódio et al. (2023) and Hortaçsu et al. (2013) for related evidence.

3.3 Discussion of main results

3.3.1 Signs and relative magnitudes

The key takeaway from our results is that, in response to a monetary policy shock, a firm’s business activity is influenced not only by its own financial health but also by the financial health of its suppliers and customers. Specifically, our main finding is the negative estimated coefficients for suppliers’ and customers’ financial health (interacted with changes in the monetary policy rate); this suggests that monetary policy can impact firms through the financial health of suppliers and clients on top of their own financial health. In Section 4 we show that the signs are robust to several endogeneity concerns, such as the use of proxies for the financial health of the firms’ partners, a potential correlation between the firm’s and its partners’ financial health, and the joint determination of interest rates and macroeconomic aggregates.

The point estimates in Tables 2 and 3 suggest that the effect of clients’ (suppliers’) financial health is approximately three (four) times larger than the firm’s own financial health.

These relative differences can be explained if firms can flexibly use different margins of adjustment to overcome their own financial difficulties, but are less able to substitute partners in distress; we explore this idea in Section 3.4.2. Our use of average health of firms within the suppliers’ and clients’ sectors can also explain part of the relative differences in magnitude. In essence, a single supplier’s financial health might have a small effect on sales if the firm can find another supplier. However, our proxy captures a sector-level decline in financial health, which suggests that substitute partners may not be available.

Like us, other studies have documented larger effects on firms stemming from their partners rather than from the firm itself. For example, Acemoglu et al. (2016) document that the supply-chain effects due to trade imports from China are about six times more pronounced than the own effects. In the next subsection we provide estimates for aggregate effects and benchmark these to other studies in the literature.

3.3.2 Aggregate effects

To provide a back-of-the-envelope quantification of the aggregate importance of partner financial health in the transmission of monetary policy, we start by computing, for each sector, the predicted responses of sales and purchases four quarters after a 25 basis point monetary tightening. We do so by combining our estimates from column 6 of Tables 2 and 3 with the observed first and second moments of the distributions of client, supplier, and own financial health within each sector defined by the 2-digit SIC sector (contained in Table A2). This calculation yields average predicted effects $\widehat{\beta}_{c(S)}$, $\widehat{\beta}_{s(S)}$ and $\widehat{\beta}_{f(S)}$ for each sector S . We then compute the fraction of the total predicted decline attributable respectively to clients, suppliers and the own firm within each sector as

$$\frac{\widehat{\beta}_{k(S)}}{\widehat{\beta}_{c(S)} + \widehat{\beta}_{s(S)} + \widehat{\beta}_{f(S)}}, \quad k \in \{c, s, f\}.$$

Figure 2 reports the distribution of these fractions across 2-digit SIC sectors, separately for

sales (a) and purchases (b). The figure shows that the firm’s own financial health typically explains a smaller share of the decline than the financial health of trading partners, with substantial heterogeneity across sectors. Partner effects are largest in manufacturing sectors and smallest in downstream service sectors. In addition, supplier financial health generally accounts for the largest share of the decline in purchases.

To assess aggregate implications, we reweight the sector-level fractions using input–output sector shares and report the results in Table 4, for horizons of four and twelve quarters after the shock. Across horizons, the firm’s own financial health accounts for between 13 and 44 percent of the total decline in economic activity, implying that supply-chain propagation explains at least 56 percent of the overall effect. These results indicate that amplification through business partners’ financial health is a quantitatively important component of monetary policy transmission. Results are consistent with previous estimates in related contexts. For example, Ghassibe (2021) finds that at least 34% of the effect of monetary policy shocks on aggregate consumption comes from amplification through input-output linkages, while Ozdagli and Weber (2025) attribute between 55% and 85% of stock market reactions to network effects.

3.3.3 Consistency of estimates in Tables 2 and 3

Since a firm’s sales (purchases) correspond to its clients’ purchases (suppliers’ sales), Tables 2 and 3 represent two sides of the same coin. The results are consistent: coefficients β_f , β_c , and β_s are all negative and significant throughout both tables. Table 3 (column 6) shows that a 0.25pp rate hike leads to 0.12pp lower purchase growth for firms one standard deviation above average in inverse coverage ratio. Similarly, Table 2 (column 6) shows the same hike leads to 0.27pp lower sales growth for these firms’ suppliers.

Admittedly, these estimates do not align perfectly and interpreting their relative magnitudes across the tables is difficult for several reasons. First, the term x_c reflects the *average* financial weakness of downstream sectors (i.e., an aggregate shock), while x_f captures the

financial weakness of an *individual* firm weakness (an idiosyncratic shock). Thus, when downstream sectors experience financing constraints and reduce their demand following a rate hike, it may be difficult for a firm to compensate for the resulting fall in sales. The aggregate (“uninsurable”) nature of the sector-level downstream and upstream shocks could explain the relatively high estimates of β_c and β_s . In contrast, following the same hike, a financially constrained individual firm may be able to internally adjust its operations in a flexible way —e.g., by improving efficiency or reaching out to new clients— and minimize the direct impact on its sales. The idiosyncratic (“insurable”) nature of the firm-level shock could explain the relatively low estimate of β_f .

Second, firms’ sales (purchases) include purchases (sales) from firms outside of the Compustat universe, such as small unlisted firms, international firms, government institutions, and retail clients. Third, the composition of the sample in Table 2 differs slightly from that in 3, driven by missing observations for the dependent variables. Finally, comparing the coefficients across the two tables is challenging given the different scales and variances of the two different dependent variables.

3.4 Parsing the mechanism

3.4.1 Balance sheet channel

A necessary condition for our results is that monetary conditions affect firms differentially according to their financial health, consistent with the balance sheet channel (Blinder, 1987; Bernanke and Gertler, 1995). Facing tighter conditions, constrained firms may adjust production – for example by reducing or delaying output, or modifying input quality or composition. These adjustments can affect suppliers through reduced purchases and clients through production delays, quantity constraints, or price and quality changes (Barth and Ramey, 2001; Chevalier and Scharfstein, 1996; Maksimovic and Titman, 1991).

We test whether the balance sheet channel underlies our results by examining the coefficient of the interaction of the firm’s own health with changes in monetary conditions (i.e.,

coefficient β_f in Appendix Tables A5 and A7). Estimates β_f^h for $h \in \{0, \dots, 12\}$ are summarized visually in Figure 3. As before, the control variables correspond to the model estimated in column 6 of Tables 2 and 3. In the upper panel, the dependent variable is $\Delta \ln \text{sale}$ and hence the interaction term captures differential changes in the supply of goods for firms with weak balance sheets (relative to healthier firms) when monetary conditions change. In the lower panel, the dependent variable is $\Delta \ln \text{purch}$ and hence the interaction term captures differential changes in the purchases of inputs for firms with weak financial health. The interaction coefficients are negative and statistically significant over a long horizon. These results suggest that the balance sheet channel of transmission underlies the monetary policy bottlenecks.

3.4.2 Specialized goods

Production disruptions in constrained firms need not transmit through supply chains if firms can substitute constrained partners. For spillovers to occur, firms must face difficulties replacing constrained suppliers or clients. If our results reflect monetary policy-induced bottlenecks, we should observe stronger effects for firms trading relationship-specific or specialized goods.

We test this idea by estimating Equation 1 separately for different types of goods traded between the firm and its business partners. The upper panel of Figure 4 presents β_c^h estimated separately for firms selling specialized versus non-specialized goods, splitting firms at the median following the definitions of goods specialization proposed by Rauch (1999) and Giannetti et al. (2011). Results show that the drop in sales for firms selling specialized goods to constrained clients consistently exceed those for non-specialized goods. The lower panel shows similar results for supplier bottlenecks, plotting β_s^h when classifying firms by whether they buy from industries producing specialized goods.⁵

Results hold using alternative specialization measures. Appendix Figure A1 classifies

⁵We split firms by whether they purchase from a higher-than-median fraction of specialized-good industries.

firms as specialized if industry patent filings exceed the median, using data from Kogan et al. (2017). Appendix Figures A2 and A3 use patent value and forward citations, respectively, with similar results.

Overall, these findings support our interpretation that monetary policy changes induce bottlenecks through difficulties in substituting financially constrained business partners.

4 Identification

4.1 Monetary policy surprises

One concern of our previous estimates is that our setting does not account for changes in economic conditions that simultaneously affect the monetary policy stance and aggregate demand, which itself drives changes in firm sales and purchases. Notably, central banks typically raise interest rates when the economy is performing well —specifically, when sales and purchases are on the rise. As a result, the negative impact of interest rate changes on these outcome variables is mitigated by their upward trends. Even though the endogeneity of monetary policy introduces a bias that makes it *less* likely to detect significant effects on sales and purchases, it is important to account for such bias. One common way to do so consists in considering the effect of monetary *surprises* (i.e., unexpected changes in the federal fund rate) rather than lagged changes in the policy rate (Gürkaynak et al., 2005). These surprises are calculated using changes in asset prices within short windows around the FOMC announcements, and capture changes in the target rate that are unexpected by market participants and hence exogenous to economic activity.

Results of estimating Equation 1 using monetary surprises are summarized in Figure 5. As before, the upper panel presents results for client bottlenecks, while the lower panel focuses on supplier bottlenecks. The results are qualitatively similar to our main estimations, though the estimated effects are approximately threefold larger.⁶

⁶The difference is in line with that found in other studies, such as Jordà et al. (2020).

We also check the robustness of the channels underlying the results –the balance sheet channel and supply-chain disruptions– to the use of monetary policy surprises. Appendix Figure A4 shows that the negative coefficients for the firm’s own balance sheet conditions are robust to using monetary policy surprises as the measure of changes in the policy rate, albeit the estimates are less precise. Appendix Figures A5 and A6 show separate estimated coefficients for specialized and standardized goods and use monetary policy surprises to estimate the effect on sales and purchases. Coefficients are negative and statistically significant when the traded goods are specialized, confirming our interpretation of supply chain bottlenecks driving the results.

4.2 Trade credit as a potential confounder

Upstream firms typically extend trade credit to the downstream firms. This might affect our estimations of client-driven bottlenecks β_c if trade credit provision simultaneously affects firm sales (Daripa and Nilsen, 2011) and influence downstream firms’ leverage (Burkart and Ellingsen, 2004; Garcia-Appendini and Montoriol-Garriga, 2013). By the same token, this might affect our estimations for supplier-driven bottlenecks if the upstream firm has to borrow to finance the provision of trade credit. In this case, the use of trade credit by downstream firms would simultaneously affect their purchases and influence the coverage ratio of the upstream firm.

We address this concern in Figure 6 by comparing estimates across firms with different trade credit intensities. In the upper panel, we estimate Equation 1 separately for upstream firms providing above-median trade credit (measured as accounts receivable to lagged assets) versus below-median providers. If endogeneity were driving our results, the relationship should differ between these groups. Instead, the results are virtually identical.

The lower panel applies the same strategy to supplier bottlenecks, splitting firms by trade credit use (accounts payable to lagged assets). Results again show similar patterns

for high and low trade credit users. These findings suggest our main results are not driven by endogenous relationships between leverage and economic activity through trade credit channels.

4.3 Estimations with supplier-client pairs

Despite our comprehensive set of controls and robustness to monetary surprises, unobserved heterogeneity, such as price stickiness or other heterogeneous transmission effects (see e.g., Pasten et al., 2020), could still bias our estimates. We address this issue using actual supplier-client pairs from Compustat’s Segment files. US regulations (SFAS 14 and 131) require publicly listed firms to disclose clients representing more than 10% of total sales. Using text-matching algorithms and manual searches, we match reported client names to Compustat to obtain their balance sheet information, creating a sample of firm-client pairs, the “paired client sample.” Symmetrically, to construct a “paired supplier sample,” we indirectly identify suppliers as all those firms reporting a client in the Compustat Segment file; we designate these firms as that client’s suppliers.

These pair-level data offer two identification advantages. First, business partners’ financial health is directly observed rather than proxied by industry averages. Second, we observe actual bilateral sales, allowing us to exploit heterogeneity in partners’ financial health while controlling for all firm characteristics through time-varying controls. In the most saturated specifications, we control for time-varying and time-invariant unobserved characteristics of the firm itself, including price stickiness and other sources of firm unobserved heterogeneity with firm $\times$ year fixed effects.

We estimate the following equations for firm i with clients j and suppliers k :

$$\Delta \ln \text{sales}_{ijt} = \beta_c \Delta r_t x_{j,t-1} + \Gamma'_c X_{j,t-1} + \Gamma'_f X_{i,t-1} + \mu_{i(S)t} + \epsilon_{ijt} \quad (2)$$

$$\Delta \ln \text{purch}_{ikt} = \beta_s \Delta r_t x_{k,t-1} + \Gamma'_s X_{k,t-1} + \Gamma'_f X_{i,t-1} + \mu_{i(S)t} + \epsilon_{kit} \quad (3)$$

In Equation 2, $\Delta \ln \text{sales}_{ijt}$ is the change in log sales from firm i to client j , and $x_{j,t-1}$

is client j 's balance sheet weakness.⁷ The specifications above allow us to control for sector downturns through industry-by-time fixed effects $\mu_{i(S)t}$. In more saturated specifications we substitute these fixed effects with industry $\times$ size $\times$ age $\times$ time interactions (Degryse et al., 2019), or with firm $\times$ year fixed effects μ_{it} . The latter control for all time-varying firm characteristics, achieving identification by comparing demand changes across clients with varying financial health for the same firm-year. Equation 3 applies analogously to supplier bottlenecks; here, $\Delta \ln \text{purch}_{ikt}$ is the change in the natural logarithm of the purchases of firm i from supplier k , and x_{kt-1} is the balance sheet weakness of supplier k .

We acknowledge several limitations of the paired samples. First, the annual frequency reduces variation relative to the quarterly firm-level sample. Second, we cannot identify clients representing less than 10% of sales, aggregate clients, or clients without Compustat coverage (private firms, individuals, governments, foreign firms). Third, while clients in the paired client sample are important partners by construction, suppliers in the paired supplier sample sell large amounts to the observed firms but are not necessarily important input suppliers. This asymmetry makes the paired sample more informative for client bottlenecks than supplier bottlenecks.

Table 5 contains descriptive statistics for the paired samples, and Table 6 presents results for client bottlenecks. Columns 1–3 include industry $\times$ time fixed effects; columns 4–6 have industry, size, age and time interactions; columns 7–9 use firm $\times$ year fixed effects. All columns except 1, 4 and 7 and 8 include client controls (industry growth, Tobin's Q, size, and PPE) and market power measures for the client and the supplier, and columns 3, 6 and 9 additionally include interactions of all these controls with Δr . All variables are standardized so the interacted coefficients account for a 0.25pp change in the monetary policy rate for firms one standard deviation above the average inverse coverage ratio, expressed in

⁷The pair-level sample is not available at the quarterly frequency. To preserve a large sample size, we use contemporaneous changes in monetary policy for these estimations. Figure A7 in the Appendix shows comparable results using contemporaneous changes in monetary policy for the firm-level sample.

percentage points. Standard errors are clustered at the client, supplier and time level (three-way clustering).

Panel A shows that the interaction of monetary policy changes with client financial weakness is negative and significant across most of the specifications, confirming our firm-level results in a better-identified setting. The coefficient in column 4 implies that a 25bps rate increase reduces sales growth by 0.66pp for clients with one standard deviation higher inverse coverage ratio, compared to average annual sales growth of 4.2%.

To test for bottlenecks, Panels B and C split the sample by product specialization following as before the definition by Rauch (1999). Bottleneck effects are larger and only significant for specialized goods, suggesting these firms face greater difficulty substituting constrained clients. Appendix Table A10 confirms this using patent-based measures, and Table A11 shows robustness to monetary surprises.

Table 7 presents supplier bottleneck results. Panel A shows no significant differential effect of monetary policy interacted with supplier financial weakness. However, as noted, suppliers in this sample are not necessarily important input providers, reducing the sample’s information content. Panel B re-estimates the model weighting observations by input-output importance. The number of observations drops in these estimations due to very small weights for some observations. We find negative but mostly insignificant coefficients. This factor might also contribute to not finding significant negative estimates, given the dependent variable is the product of price times the quantity. We further subdivide the sample into suppliers selling specialized (Panel C) and non-specialized goods (Panel D). Coefficients in Panel C are negative in all columns except column 5, larger in absolute terms than those in Panel D, and statistically significant in the first three columns. While this evidence broadly supports our firm-level findings, the relatively weak results likely reflect the sample’s limitations discussed above. This suggests an admittedly speculative qualification of our results, namely, that monetary conditions are transmitted through the supply chain mostly when *important*

business partners have weak balance sheet positions. We unfortunately do not have the data to test this hypothesis, but it would be interesting to explore it with more adequate data.

4.4 Exogenous variation in partner financial health

Firms may endogenously match with partners of similar financial health. We address this concern by exploiting exogenous variation from real estate prices. As argued among others by Gan (2007), Chaney et al. (2012), Cvijanović (2014) and Custódio et al. (2023), declines in local real estate prices provide an idiosyncratic shock to financial conditions for firms using real estate as collateral. Following this idea, we construct a dummy for firms highly exposed to real estate that experienced local price declines, and interact this with Δr and partner financial conditions in Equations 2 and 3.

Table 8 reports the results. The triple interaction coefficients are negative in both Panel A (client bottlenecks) and Panel B (supplier bottlenecks), indicating that sales to clients, and purchases from suppliers, with exogenously shocked financial conditions fell relatively more when monetary policy tightened. These findings support our interpretation that the financial conditions of clients and suppliers propagate monetary policy shocks through the ensuing supply chain bottlenecks.

5 Extensions and robustness

5.1 Other measures of financial health

One concern with our empirical approach is that our results are driven by our specific choice of measure for the firms' financial weakness. To address it, we repeat the estimations using the clients' debt to assets ratio as an alternative measure of client financial weakness. Results, contained in Figure A8 in the Appendix, show that our results are not specific to the inverse coverage ratio, but hold when using debt as an alternative measure.

A related concern is that the inverse coverage ratio is a non-linear measure of financial

weakness, as firms with negative cash flows have worse financial health than firms with positive cash flows. In Figure A9 we address this concern by removing observations with negative cash flows. Results are qualitatively similar to our main findings.

5.2 Quantities vs price pass-through

Our sales and purchases variables correspond to the nominal product of quantities times prices, deflated by the CPI. Therefore, the changes in these variables reflect both changes in prices (normalized by the CPI) and changes in quantities. While we do not have precise information about prices, we can create quantity-like measures of sales and purchases by using as deflator the PPI, which captures the prices paid by firms or charged by the suppliers better than the CPI.

In Tables A8 and A9 we repeat the estimates in Tables 2 and 3 but replacing our measures of sales and purchases with quantity-like variables. Specifically, we deflate sales in Table A8 using the industry-level PPI, and in A9 we deflate purchases using the industry-level PPI weighted using the appropriate weights from the input-output matrix. We obtained PPI from the Bureau of Labor Statistics.⁸ The tables show that our estimates are qualitatively unchanged, suggesting that our main results are reflecting changes in quantities rather than price pass-through.

5.3 Materials-heavy industries

Throughout our paper, the proxy for purchases is the sum of cost of goods sold plus inventories. This makes sense for merchandisers and wholesales with a single inventory account. One concern is that this measure might not be adequate for other firms, such as manufacturers, for which the cost of goods sold includes materials and own labor. Figure A10 repeats our estimates for industries where the cost of goods sold is materials-heavy (ratio of capital

⁸We obtained the PPI at the industry level from <https://download.bls.gov/pub/time.series/pd/> for years 1984-2003 and <https://download.bls.gov/pub/time.series/pc/> for 2004 onwards.

expenditures to sales greater than the median). Results are qualitatively similar to our main estimates.

5.4 Clustering

Firms within a given industry could be subject to the same or correlated shocks in a given time period. This could lead to the worry that our standard errors, which are clustered at the firm level, are not sufficiently conservative. To deal with this issue, we cluster the standard errors at the industry by time level. We use 2-digit SIC codes for the clustering, given that our measures of client and supplier financial health are measured at the 4-digit level. Results, contained in Figure A11, preserve significance to this more conservative approach for standard error clustering.

5.5 Standardization

Following common practices in the literature, for ease of the economic interpretation of our results and to facilitate comparison of coefficients across variables with different levels of variation, we have standardized the coefficients in our main estimations using the pooled cross-sectional variation in the inverse coverage ratio (Mitton, 2024). However, this standardization might not be justified in our setting, given that the effective variation that we use to identify the coefficients is determined by the choice of the fixed effects in each specification (Breuer and DeHaan, 2024; Liu and Winegar, 2025). In Tables A13 and A14, we have re-calculated the economic magnitudes of our estimated coefficients in Tables 2 and 3 under three alternative scalings that are consistent with the effective variation used to identify the coefficients: the residual variation net of industry, quarter, and fiscal quarter fixed effects (Panel A, corresponding to specifications 1–3 of Tables 2 and 3); the residual variation net of firm, quarter, and fiscal quarter fixed effects (Panel A, corresponding to specifications 4–6 of Tables 2 and 3); the residual variation net of firm, quarter and fiscal quarter fixed effects and after controlling for supplier and client financial health (Panel C). We find that the

ranking of the importance of firm–, client– and supplier financial health is preserved across the specifications, with slightly lower differences between the partners’ and the firm’s own financial health.

5.6 Second-order effects

A constrained supplier could affect the clients of her firm’s clients by causing delays in input deliveries one link down the supply chain, while constrained clients could affect the suppliers of her suppliers through a reduction in demand that is propagated upstream. Our setting allows us to analyze these higher-order effects along the supply chain by examining whether suppliers’ financial weakness affects firms’ *sales* and whether clients’ financial conditions affect firms’ purchases of inputs. Results reported in Figure A12 in the Appendix show that monetary policy shocks generate statistically significant second-order effects along the supply chain, which are present but somewhat more short-lived than the first-order effects documented in Figure 1. Overall, these findings indicate that monetary policy shocks propagate beyond direct trading partners, consistent with existing evidence on shock transmission in production networks (Hertzel et al., 2008; Acemoglu et al., 2012; Barrot and Sauvagnat, 2016; Carvalho et al., 2021).

5.7 Propagation through trade credit chains

In this section we investigate the role of trade credit in the propagation of monetary shocks, noting that existing theories provide ambiguous predictions about whether trade credit amplifies or mitigates monetary policy transmission: On the one hand, financially constrained firms may attempt to substitute toward trade credit following a monetary tightening, and suppliers may be willing to extend credit to smooth production and sales –especially if they have access to cash or funding from other sources (Biais and Gollier, 1997; Burkart and Ellingsen, 2004; Daripa and Nilsen, 2011; Garcia-Appendini and Montoriol-Garriga, 2013; Adelino et al., 2023). On the other hand, tighter monetary conditions may limit suppli-

ers' ability or willingness to provide trade credit, particularly to financially weak clients (Cuñat, 2007; Wilner, 2000; Titman, 1984; Opler and Titman, 1994; Garcia-Appendini and Montoriol-Garriga, 2020).

We analyze how trade credit provision and use respond to monetary policy shocks as a function of firms' financial health. Results reported in Figure A13 in the Appendix show that firms with financially weak clients provide relatively less trade credit following a monetary tightening, and that firms with financially weak suppliers experience a relative decline in trade credit use.⁹ Overall, these findings provide suggestive evidence that trade credit does not offset monetary policy-induced bottlenecks and may instead contribute to their amplification.

5.8 The zero lower bound

One concern with our baseline estimates is that the effective monetary policy rate reached the zero lower bound (ZLB) following the Great Financial Crisis, during which changes in the Federal Funds rate may not fully capture the stance of monetary policy. To address this issue, we report two robustness exercises in the Appendix: re-estimating our specifications using changes in the 2-year Treasury yield instead of the Federal Funds rate (Figure A14), and excluding the ZLB period (2009:Q1–2016:Q4) from the estimation sample (Figure A15). In both cases, the results remain qualitatively similar to our baseline findings.

6 Conclusions

In this paper, we analyze the role of the supply chain as a channel for the propagation of monetary policy shocks. We show that the health of firms in downstream and upstream sectors is instrumental in transmitting shocks driven by changes in monetary policy. Underlying our findings is a financial accelerator mechanism, in which a tightening of monetary policy leads firms with weak financial health to reduce their supply of products and their demand for

⁹Our measures of trade credit provision (trade credit use) are the ratios of accounts receivable (accounts payable) scaled by total assets. These ratios could reflect operational scaling rather than credit supply or demand.

inputs more sharply than firms with better financial health. These reductions in economic activity lead to supply chain bottlenecks which can affect even financially unconstrained firms. Consistently with the existence of monetary policy-induced bottlenecks, we show that the reduction in economic activity following monetary policy shocks is larger for firms that buy or sell specialized inputs, and that therefore might face difficulties in substituting their business partners.

Our results inform policymakers about an unintended consequence of a monetary policy tightening, i.e., *disruptions in supply chains*. Our findings shed a light on a specific type of cost push, supply chain bottlenecks, that can amplify the transmission of monetary policy. To the extent that supply chains had been stretched by the pandemic and are now under stress by geopolitical developments, our findings suggest that the cost channel of monetary transmission (Barth and Ramey, 2001) may be stronger than usual. Our results also suggest that measuring potential strains in supply chains could be a useful input for data-driven monetary policy decisions.

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7 Tables

Table 1: Summary statistics

Variable	N	mean	p50	sd
Panel A: Firm-level sample				
<i>Dependent variables:</i>				
$\Delta \ln \text{sales}_{i,t+0}$	300,250	0.004	0.008	0.117
$\Delta \ln \text{sales}_{i,t+1}$	292,297	0.011	0.016	0.212
$\Delta \ln \text{sales}_{i,t+4}$	267,780	0.038	0.039	0.416
$\Delta \ln \text{purch}_{i,t+0}$	291,378	0.001	0.006	0.159
$\Delta \ln \text{purch}_{i,t+1}$	282,110	0.006	0.014	0.278
$\Delta \ln \text{purch}_{i,t+4}$	255,437	0.029	0.038	0.509
<i>Firm controls:</i>				
Tobin's Q	300,250	2.753	1.390	7.341
Size	300,250	5.445	5.520	2.529
PPE ratio	300,250	0.322	0.239	0.270
Industry sales growth	300,250	0.962	0.217	2.465
Inverse coverage ratio	300,250	0.113	0.046	1.008
Debt ratio	293,256	0.326	0.235	0.521
<i>Client sector controls:</i>				
Client average Tobin's Q	300,250	3.480	3.180	1.689
Client average size	300,250	5.769	5.621	1.038
Client average PPE ratio	300,250	0.302	0.283	0.117
Client average industry sales growth	300,250	0.732	0.413	1.338
Client average inverse coverage ratio	300,250	0.168	0.160	0.173
Client average debt ratio	300,250	0.349	0.345	0.073
<i>Supplier sector controls:</i>				
Supplier average Tobin's Q	291,378	3.917	3.521	1.671
Supplier average size	291,378	5.522	5.499	0.655
Supplier average PPE ratio	291,378	0.293	0.286	0.089
Supplier average industry sales growth	291,378	0.802	0.499	1.061
Supplier average inverse coverage ratio	291,378	0.146	0.140	0.130
Supplier average debt ratio	291,378	0.337	0.331	0.058
Panel B: Monetary policy variables				
Federal Funds (level)	108	2.970	3.091	2.390
ΔFF (quarterly)	108	-0.098	-0.006	0.382
Surprise (quarterly)	108	-0.040	-0.016	0.062
2-y Treasury rate (level)	108	3.383	3.664	2.317
Δ 2-y Treasury rate (quarterly)	108	-0.132	-0.099	0.351

This table contains summary statistics for the main variables used in this paper. Data in Panel A is at the firm-quarter level and corresponds to non-financial firms in the period 1990:Q1 to 2016:Q4. Information about the firms' clients and suppliers is obtained by computing mean values in each sector level, and calculating weighted average of these values across all sectors buying from or selling to each firm. Weights are obtained from the Input-Output matrices provided by the Bureau of Economic Analysis. Panel B contains the quarterly distribution of the monetary policy variables over the period 1990:Q1 to 2016:Q4. Please refer to Section 2 for more details about the construction of the samples, and to Table A1 for variable definitions.

Table 2: Client financial health and firm sales, $h = 4$

$\Delta \ln \text{ sales}$	(1)	(2)	(3)	(4)	(5)	(6)
Client weakness (x^c)	0.000 (0.001)	0.000 (0.001)	0.002* (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
$x^c \times \Delta r$	-0.299*** (0.056)	-0.280*** (0.056)	-0.235*** (0.056)	-0.255*** (0.054)	-0.220*** (0.055)	-0.267*** (0.051)
Firm weakness (x^f)		0.002* (0.001)	0.002 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)
$x^f \times \Delta r$		-0.066 (0.046)	-0.069 (0.046)	-0.082* (0.043)	-0.072* (0.043)	-0.098** (0.041)
Supplier weakness (x^s)					0.000 (0.001)	0.000 (0.001)
$x^s \times \Delta r$					-0.199*** (0.049)	-0.281*** (0.048)
Observations	267,780	267,780	267,780	266,622	266,622	266,622
R-squared	0.023	0.026	0.027	0.265	0.265	0.267
Firm-level controls		Y	Y	Y	Y	Y
Client-level controls			Y	Y	Y	Y
Supplier-level controls					Y	Y
MP interactions						Y
Year:Quarter FE	Y	Y	Y	Y	Y	Y
Fiscal Quarter FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y			
Firm FE				Y	Y	Y

This table contains coefficient estimates for Equation 1 over a one year horizon ($h = 4$). The sample corresponds to all non-financial, non-government public firms in the US in the period 1990Q1 to 2016Q4. The dependent variable is the difference in the log of firm sales between $t - 1$ and $t + 4$. The coefficient of interest is for the interaction between the quarterly difference in the monetary policy rate (Δr_{t-1}) and lagged clients' financial weakness (x^c). Financial weakness is measured using the inverse coverage ratio. Changes in monetary policy are the quarterly differences in the federal funds rate, scaled by 25. Firm-level control variables are the average yearly growth in sales in the firms' industry, lagged values of Tobin's Q, firm size, debt to assets ratio, and ratio of PPE to total assets. Client and supplier controls are the average industry growth rate and lagged values of average Tobin's Q, average size, and average PPE to assets ratio. Monetary policy (MP) interactions are interactions of Δr_{t-1} with the following firm, supplier and client characteristics: size, property, plant and equipment to assets, Tobin's Q, and industry sales growth. All variables are defined in Table A1 and have been standardized by subtracting their mean and divided by the standard deviation. Coefficients for control variables have been omitted and are reported in Table A4 in the Appendix. Standard errors are reported in parentheses and are clustered at the firm level.

***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 3: Supplier financial health and firm purchases, $h = 4$

$\Delta \ln$ purchases	(1)	(2)	(3)	(4)	(5)	(6)
Supplier weakness (x^s)	0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)	-0.002 (0.001)	-0.002* (0.001)	-0.002* (0.001)
$x^s \times \Delta r$	-0.624*** (0.068)	-0.619*** (0.069)	-0.615*** (0.069)	-0.549*** (0.067)	-0.501*** (0.067)	-0.454*** (0.065)
Firm weakness (x^f)		0.003** (0.001)	0.003** (0.001)	0.002* (0.001)	0.002 (0.001)	0.002 (0.001)
$x^f \times \Delta r$		-0.126** (0.056)	-0.123** (0.056)	-0.117** (0.054)	-0.110** (0.054)	-0.117** (0.051)
Client weakness (x^c)					0.002 (0.001)	0.001 (0.001)
$x^c \times \Delta r$					-0.207*** (0.062)	-0.179*** (0.060)
Observations	255,437	255,437	255,437	254,258	254,258	254,258
R-squared	0.020	0.024	0.025	0.213	0.214	0.215
Firm-level controls		Y	Y	Y	Y	Y
Supplier-level controls			Y	Y	Y	Y
Client-level controls					Y	Y
MP interactions						Y
Year:Quarter FE	Y	Y	Y	Y	Y	Y
Fiscal Quarter FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y			
Firm FE				Y	Y	Y

This table contains coefficient estimates for Equation 1 over a one year horizon ($h = 4$). The sample corresponds to all non-financial, non-government public firms in the US in the period 1990Q1 to 2016Q4. The dependent variable is the quarterly difference in the log of firm purchases between $t - 1$ and $t + 4$. The coefficient of interest is for the interaction between the quarterly difference in the monetary policy rate (Δr_{t-1}) and lagged suppliers' financial weakness (x^s). Financial weakness is measured using the inverse coverage ratio. Changes in monetary policy are the quarterly differences in the federal funds rate, scaled by 25. Firm-level control variables are the average yearly growth in sales in the firms' industry, lagged values of Tobin's Q, firm size, debt to assets ratio, and ratio of PPE to total assets. Supplier and client controls are the average industry growth rate and lagged values of average Tobin's Q, average size, and average PPE to assets ratio. Monetary policy (MP) interactions are interactions of Δr_{t-1} with the following firm, supplier and client characteristics: size, property, plant and equipment to assets, Tobin's Q, and industry sales growth. All variables are defined in Table A1 and have been standardized by subtracting their mean and divided by the standard deviation. Coefficients for control variables have been omitted and are reported in Table A6 in the Appendix. Standard errors are reported in parentheses and are clustered at the firm level.

***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 4: Aggregate effects.

	Sales	Purch
Panel A: $h = 4$		
Client health	0.368	0.225
Supplier health	0.452	0.587
Own firm health	0.180	0.189
Panel B: $h = 12$		
Client health	0.201	0.225
Supplier health	0.356	0.643
Own firm health	0.443	0.131

This table summarizes the aggregate fraction in decline in economic activity explained by clients', suppliers' and own firm's financial health four quarters (Panel A) or 12 quarters (Panel B) following a 25 bps tightening of monetary policy. For each sector, the fractions are calculated by estimating the predicted decline in sales or purchases (coefficients $\hat{\beta}_c$, $\hat{\beta}_s$ and $\hat{\beta}_f$ in column 9 of Tables 2 and 3, respectively) for firms with one standard deviation larger inverse coverage ratio relative to the average in their sector. The aggregate effect is calculated by weighing the fractions in each sector using the IO weights of each sector as fraction of total activity. We define sectors at the 2-digit SIC code level and use the distribution of financial health across sectors in Table A2. Fractions are estimated by dividing the predicted coefficient for the client, supplier or the firm by the sum of the three coefficients.

Table 5: Summary statistics for paired samples.

Variable	N	mean	p50	sd
<i>Client leverage sample:</i>				
$\Delta \ln \text{sales}_{ij}$	26,133	0.042	0.036	0.521
Client Tobin's Q	20,860	1.879	1.436	1.676
Client size	26,133	9.352	9.882	1.670
Client PPE ratio	26,115	0.346	0.301	0.226
Client industry growth	26,132	0.942	0.166	2.987
Client debt ratio	26,103	0.274	0.263	0.178
Client inverse coverage ratio	26,133	0.161	0.110	0.341
<i>Supplier leverage sample:</i>				
$\Delta \ln \text{purch}_{ik}$	25,228	0.038	0.035	0.513
Supplier Tobin's Q	21,919	2.073	1.460	2.288
Supplier size	25,223	5.314	5.235	2.151
Supplier PPE ratio	25,220	0.281	0.196	0.247
Supplier industry growth	25,227	1.298	0.281	3.456
Supplier debt ratio	25,151	0.265	0.215	0.307
Supplier inverse coverage ratio	25,228	0.128	0.077	0.611

This table contains summary statistics for the paired samples used in estimations of Equations 2 and 3. Data is from the Customer Segment Files in Compustat. Information in this sample corresponds to actual client-supplier relationships; client and supplier variables are constructed from balance sheet information obtained from Compustat. The client leverage sample corresponds to supplier-client pairs where the supplier firm reports a firm in Compustat as an important client. The supplier leverage sample corresponds to client-supplier pairs where the client is reported by the supplier to be an important client, and the supplier belongs to an industry supplying large fractions of input to the client. Please refer to Section 4.3 for more details about the construction of the samples, and to Table A1 for variable definitions.

Table 6: Client health and monetary bottlenecks. Paired client sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. All observations.									
Client weakness $\times \Delta r$	-0.506** (0.235)	-0.474** (0.222)	-0.193 (0.292)	-0.662** (0.270)	-0.838** (0.365)	-0.634 (0.466)	-0.681** (0.281)	-0.971** (0.420)	-0.772* (0.377)
Client weakness	-0.007 (0.005)	-0.004 (0.005)	-0.000 (0.005)	-0.003 (0.004)	-0.003 (0.004)	-0.001 (0.006)	-0.002 (0.006)	-0.007 (0.008)	-0.007 (0.008)
Observations	26,133	20,506	16,479	19,927	14,738	11,619	12,200	8,251	6,651
R-squared	0.056	0.144	0.154	0.385	0.463	0.464	0.591	0.643	0.643
Panel B. Firms selling specialized goods.									
Client weakness $\times \Delta r$	-1.019** (0.422)	-1.186*** (0.414)	-0.951** (0.451)	-1.225*** (0.389)	-1.305*** (0.401)	-1.083* (0.551)	-0.810 (0.553)	-1.368* (0.674)	-1.114* (0.590)
Client weakness	-0.009 (0.009)	-0.011 (0.008)	-0.008 (0.008)	-0.003 (0.009)	-0.005 (0.007)	-0.003 (0.009)	0.008 (0.009)	-0.004 (0.014)	-0.004 (0.015)
Observations	10,998	8,813	7,315	8,925	6,754	5,567	5,557	3,923	3,221
R-squared	0.047	0.150	0.158	0.376	0.472	0.472	0.579	0.645	0.642

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Table 6 – Continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel C. Firms selling standardized goods.									
Client weakness $\times \Delta r$	0.230 (0.374)	0.501 (0.404)	0.730 (0.510)	-0.091 (0.538)	-0.267 (0.651)	0.042 (0.706)	-0.331 (0.301)	-0.057 (0.554)	0.026 (0.533)
Client weakness	-0.010 (0.008)	-0.004 (0.007)	-0.001 (0.008)	-0.009 (0.008)	-0.009 (0.008)	-0.004 (0.009)	-0.012** (0.005)	-0.013* (0.007)	-0.011 (0.008)
Observations	12,515	9,602	7,393	9,218	6,670	4,947	5,508	3,560	2,769
R-squared	0.042	0.124	0.134	0.366	0.433	0.436	0.586	0.625	0.629
Client controls		Y	Y		Y	Y		Y	Y
Interactions			Y			Y			Y
Industry $\times$ year FE	Y	Y	Y						
Industry $\times$ size $\times$ age $\times$ year FE				Y	Y	Y			
Firm $\times$ year FE							Y	Y	Y

This table contains coefficient estimates and their standard errors (in parenthesis) for coefficient β_c in Equation 2. The dependent variable is $\Delta \ln \text{sales}_{ijt}$, or sales from firm i to client j in year t . The main independent variables are: the yearly difference in the monetary policy rate Δr , the client's (inverse) coverage ratio (lagged one year and standardized), and the interaction between these two variables. Changes in monetary policy are the yearly differences in the federal funds rate and have been scaled by 25. Estimations include industry times year fixed effects (columns 1 to 3), firm industry $\times$ size group $\times$ age group $\times$ year fixed effects (columns 4 to 6), and firm $\times$ year fixed effects (columns 7 to 9). Columns 2, 4, 5, 6, 7 and 8 include controls for the client's industry growth rate and lagged values of client's Tobin's Q , size, and PPE; client monopoly and supplier monopoly power; additionally, in columns 3, 6 and 9 all controls are interacted with Δr . The sample in Panel A corresponds to non-financial, non-government public firms in the US and their most important clients as reported in the Compustat Segment files for years 1990 through 2015. In Panels B and C, estimates are calculated separately for firms in industries selling specialized goods (Panel B) or standardized goods (Panel C). The measure for specialized goods follows the industry classification in Rauch (1999). Standard errors are clustered at the supplier, client, and year level (three-way clustering).

***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 7: Supplier health and monetary bottlenecks. Paired supplier sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: All observations (unweighted).									
Supplier weakness $\times \Delta r$	0.214 (0.242)	0.237 (0.314)	0.243 (0.325)	0.414 (0.263)	0.490 (0.299)	0.265 (0.307)	0.168 (0.286)	0.486 (0.297)	0.223 (0.312)
Supplier weakness	-0.000 (0.005)	0.003 (0.005)	-0.000 (0.006)	0.001 (0.006)	0.002 (0.006)	-0.001 (0.007)	-0.001 (0.006)	0.003 (0.006)	0.001 (0.006)
Observations	25,228	19,958	15,793	22,683	17,883	14,052	20,215	15,779	12,482
R-squared	0.067	0.155	0.162	0.137	0.218	0.221	0.242	0.315	0.316
Panel B: All observations (weighted using I-O matrix).									
Supplier weakness $\times \Delta r$	-1.706*** (0.560)	-1.823 (1.490)	-2.583 (1.617)	-0.703 (1.463)	-1.069 (2.345)	-0.890 (2.657)	0.013 (0.983)	0.237 (1.192)	-0.691 (1.442)
Supplier weakness	0.004 (0.014)	0.012 (0.019)	0.037 (0.027)	0.010 (0.021)	0.027 (0.026)	0.053* (0.030)	-0.006 (0.014)	-0.002 (0.014)	-0.004 (0.021)
Observations	21,076	16,501	13,302	18,813	14,679	11,775	16,628	12,813	10,365
R-squared	0.299	0.398	0.458	0.433	0.551	0.575	0.630	0.717	0.726
Panel C: Suppliers selling specialized goods (weighted using I-O matrix).									
Supplier weakness $\times \Delta r$	-3.614 (2.144)	-4.761* (2.771)	-5.070* (2.623)	-2.526 (2.188)	-1.848 (2.635)	-3.091 (3.346)	-1.223 (2.131)	0.057 (1.523)	-0.834 (2.375)
Supplier weakness	0.028 (0.035)	0.059 (0.040)	0.070* (0.034)	0.047 (0.039)	0.090** (0.043)	0.082* (0.046)	0.009 (0.035)	0.024 (0.028)	0.020 (0.034)
Observations	8,159	6,762	5,599	7,105	5,842	4,834	6,255	5,058	4,199
R-squared	0.385	0.490	0.527	0.468	0.592	0.607	0.607	0.703	0.698

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Table 7 – Continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel D: Suppliers selling standardized goods (weighted using I-O matrix).									
Supplier weakness $\times \Delta r$	-2.233 (1.567)	-3.155 (2.775)	-5.295 (4.304)	-1.154 (2.396)	-2.473 (3.585)	-2.135 (3.415)	0.412 (0.736)	-0.120 (1.247)	-1.863 (2.160)
Supplier weakness	-0.013 (0.012)	-0.002 (0.009)	0.013 (0.027)	-0.009 (0.018)	0.010 (0.026)	0.036 (0.034)	0.011 (0.012)	0.018 (0.018)	-0.007 (0.019)
Observations	10,588	7,906	6,105	9,259	6,906	5,291	7,781	5,784	4,480
R-squared	0.350	0.425	0.555	0.492	0.595	0.673	0.664	0.738	0.793
Supplier controls		Y	Y		Y	Y		Y	Y
Interactions			Y			Y			Y
Industry $\times$ year FE	Y	Y	Y						
Industry $\times$ size $\times$ age $\times$ year FE				Y	Y	Y			
Firm $\times$ year FE							Y	Y	Y

This table contains coefficient estimates and standard errors (in parenthesis) for β_s in Equation 3. The dependent variable is $\Delta \ln \text{purch}_{ikt}$, or purchases by firm i from supplier k in year t . The main independent variables are: the yearly difference in the monetary policy rate, the supplier's (inverse) coverage ratio (lagged one year and standardized), and the interaction between these two variables. Changes in monetary policy are the yearly differences in the federal funds rate, scaled by 25. Estimations include industry times year fixed effects (columns 1 to 3), firm industry $\times$ size group $\times$ age group $\times$ year fixed effects (columns 4 to 6), and firm $\times$ year fixed effects (columns 7 to 9). Columns 2, 4, 5, 6, 7 and 8 include controls for the client's industry growth rate and lagged values of client's Tobin's Q , size, and PPE; client monopsony and supplier monopoly power; additionally, in columns 3, 6 and 9 all controls are interacted with Δr . The sample in Panels A and B consists of non-financial, non-government public US firms and their suppliers such that firms are reported to be important clients of the suppliers and suppliers disclose the names of their clients in the Compustat Segment files between years 1990 through 2015. In Panels C and D, estimates are calculated separately for suppliers in industries selling specialized goods (Panel C) or standardized goods (Panel D). The measure for specialized goods follows the industry classification in Rauch (1999). Estimations in Panels B, C and D weigh each supplier observation with the fraction of inputs purchased by the firm from suppliers in that sector. Standard errors are clustered at the supplier, client, and year level (three-way clustering).

***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table 8: Real estate shocks to clients and suppliers. Paired sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Client sample. $\Delta \ln \text{sales}_{ijt}$									
Cl. weakness $\times \Delta r \times \text{RE shock}$	-2.431 (1.452)	-2.271* (1.105)	-1.762 (1.668)	-1.135 (1.225)	-1.696 (1.280)	0.267 (1.843)	-2.322*** (0.670)	-2.821*** (0.478)	-2.326*** (0.791)
Client RE shock $\times \Delta r$	-0.679 (1.082)	-0.269 (1.278)	0.461 (1.526)	-0.993 (1.107)	0.029 (1.126)	0.601 (2.309)	-1.473 (1.243)	-1.622 (1.552)	-1.389 (2.301)
Cl. weakness $\times \text{RE shock}$	-0.040* (0.021)	-0.030 (0.020)	-0.031 (0.028)	-0.032 (0.022)	-0.027 (0.024)	-0.009 (0.023)	-0.026* (0.014)	-0.013 (0.014)	-0.007 (0.018)
Client RE shock	-0.013 (0.018)	-0.005 (0.017)	-0.002 (0.020)	-0.019 (0.024)	0.002 (0.027)	0.022 (0.040)	-0.033 (0.023)	-0.015 (0.027)	-0.004 (0.037)
Client weakness $\times \Delta r$	-0.549** (0.253)	-0.479 (0.289)	-0.328 (0.398)	-0.828*** (0.233)	-0.705* (0.358)	-0.593 (0.449)	-0.867*** (0.298)	-1.019* (0.497)	-0.965** (0.380)
Client weakness	-0.009 (0.006)	-0.006 (0.006)	-0.003 (0.006)	-0.003 (0.004)	-0.002 (0.005)	-0.001 (0.007)	-0.003 (0.006)	-0.009 (0.009)	-0.012 (0.010)
Supplier controls		Y	Y		Y	Y		Y	Y
Interactions			Y			Y			Y
Industry $\times \text{year FE}$	Y	Y	Y						
Industry $\times \text{size} \times \text{age} \times \text{year FE}$				Y	Y	Y	Y	Y	Y
Firm $\times \text{year FE}$									
Observations	22,207	17,741	14,179	16,225	12,233	9,551	9,236	6,564	5,237
R-squared	0.059	0.145	0.158	0.399	0.469	0.481	0.590	0.641	0.646

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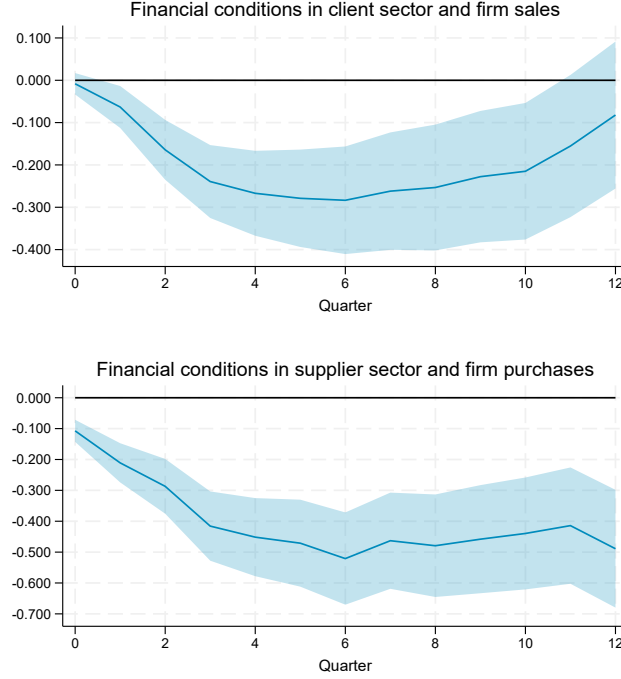
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel B: Supplier sample (weighted using I-O matrix). $\Delta \ln \text{purch}_{ikt}$									
Supp. weakness $\times \Delta r \times$ RE shock	-3.281 (2.900)	-9.450** (4.289)	-10.006** (4.252)	-3.414 (4.075)	-10.618** (4.770)	-9.300** (4.496)	-0.700 (2.432)	-2.590 (2.531)	-2.136 (2.286)
Supplier RE shock $\times \Delta r$	-1.080 (4.288)	-1.389 (4.698)	-0.934 (6.075)	-1.175 (4.171)	-3.265 (5.577)	-3.184 (6.960)	0.182 (1.580)	2.358 (1.441)	1.844 (3.293)
Supp. weakness $\times$ RE shock	0.071 (0.052)	0.052 (0.072)	0.042 (0.064)	0.090 (0.085)	0.015 (0.073)	0.027 (0.065)	0.031 (0.042)	0.019 (0.047)	0.040 (0.061)
Supplier RE shock	-0.004 (0.042)	0.002 (0.056)	0.027 (0.054)	0.016 (0.054)	0.025 (0.055)	0.015 (0.070)	-0.038 (0.079)	0.039 (0.078)	0.049 (0.087)
Supplier weakness $\times \Delta r$	-0.076 (1.215)	-0.174 (1.267)	-1.418 (1.061)	0.177 (1.428)	-0.437 (1.358)	-1.951 (1.965)	-1.669 (1.148)	-1.208 (1.064)	-1.773 (1.090)
Supplier weakness	0.014 (0.030)	0.023 (0.036)	0.034 (0.041)	0.038 (0.039)	0.050 (0.042)	0.046 (0.046)	-0.006 (0.039)	-0.019 (0.033)	-0.028 (0.042)
Client controls		Y	Y		Y	Y		Y	Y
Interactions			Y			Y			Y
Industry $\times$ year FE	Y	Y	Y						
Industry $\times$ size $\times$ age $\times$ year FE				Y	Y	Y			
Firm $\times$ year FE							Y	Y	Y
Observations	13,118	10,793	8,661	11,516	9,477	7,564	9,847	7,973	6,383
R-squared	0.335	0.474	0.542	0.400	0.552	0.588	0.650	0.721	0.734

The dependent variable in Panel A is $\Delta \ln \text{sales}_{ijt}$, or sales by firm i to client j in year t . The dependent variable in Panel B is $\Delta \ln \text{purch}_{ikt}$, or purchases by firm i from supplier k in year t . The main independent variables are: the yearly difference in the monetary policy rate (scaled by 25), the supplier's (inverse) coverage ratio (lagged one year and standardized), a dummy taking the value one if the client or supplier is exposed to a real estate shock, and the interaction between these three variables. Changes in monetary policy are the yearly differences in the federal funds rate, scaled by 25. Client (supplier) RE shock is a dummy taking the variable one if the client (supplier) has a larger than median exposure to real estate and real

estate prices are falling. Estimations include industry times year fixed effects (columns 1 and 2), firm industry $\times$ size group $\times$ age group $\times$ year fixed effects (columns 3 and 4), and firm $\times$ year fixed effects (columns 5 and 6). Even-numbered columns include controls for the client's industry growth rate and lagged values of client's Tobin's Q, size, and PPE; client monopoly and supplier monopoly power. The sample in Panels A and B consists of non-financial, non-government public US firms and their suppliers such that firms are reported to be important clients of the suppliers and suppliers disclose the names of their clients in the Compustat Segment files between years 1990 through 2015. In Panels C and D, estimates are calculated separately for suppliers in industries selling specialized goods (Panel C) or standardized goods (Panel D). The measure for specialized goods follows the industry classification in Rauch (1999). Estimations in Panels B, C and D weigh each supplier observation with the fraction of inputs purchased by the firm from suppliers in that sector.

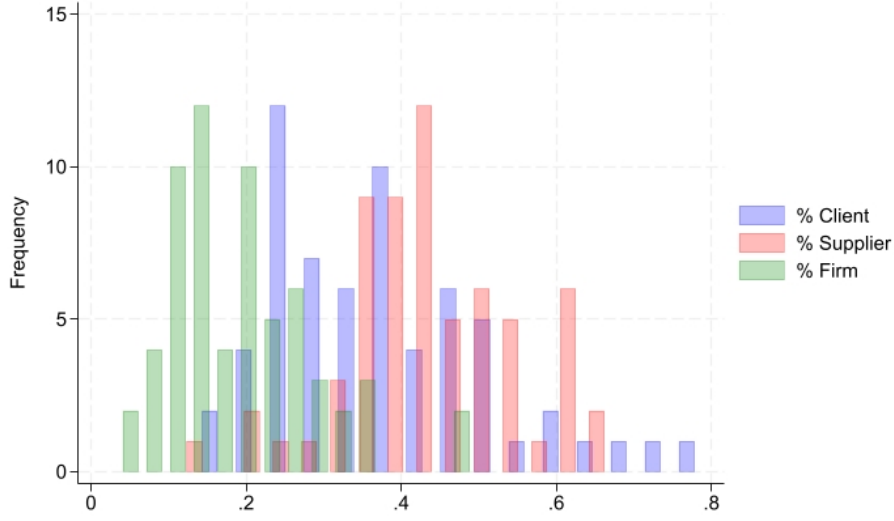
***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Figure 1: Dynamics of bottlenecks induced by monetary policy.

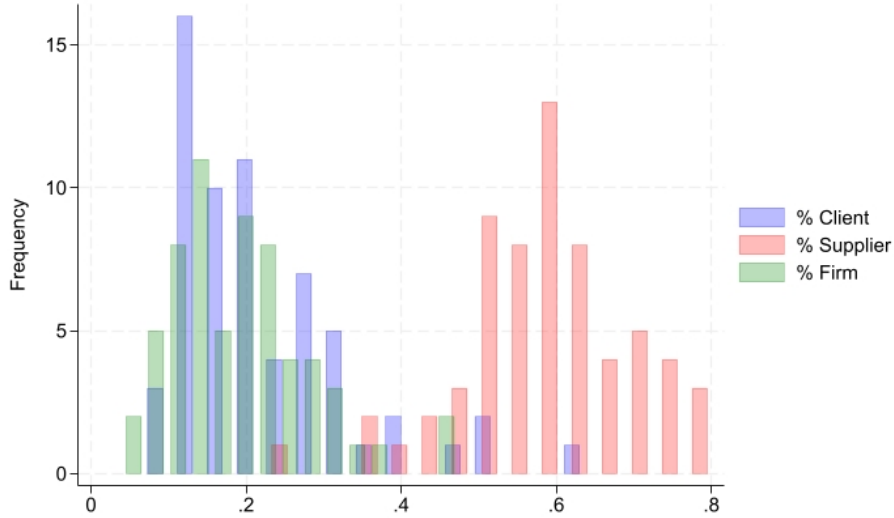


This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h). Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points.

Figure 2: Fractions of decline in sales and purchases attributable to partners' and own firm financial health after monetary tightening ($h = 4$)



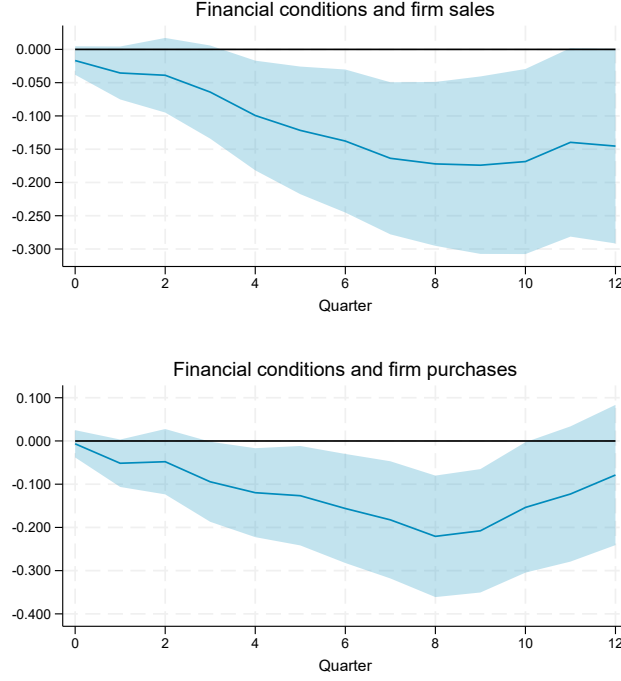
(a) Sales



(b) Purchases

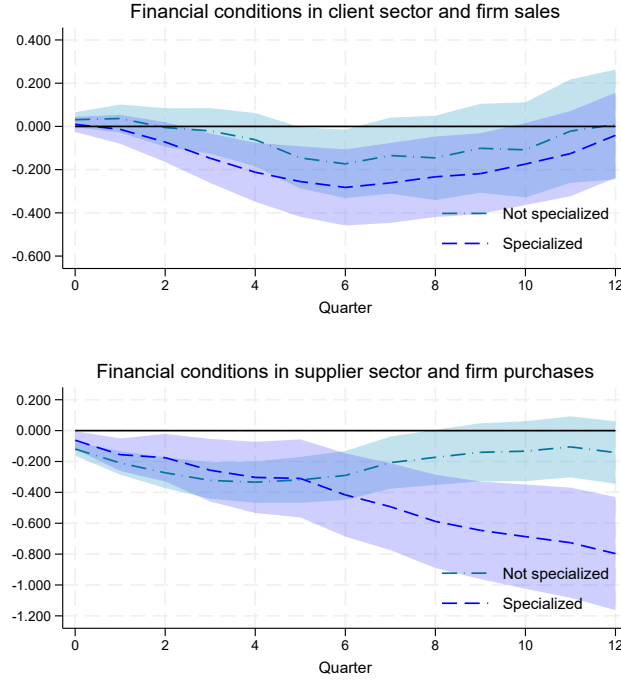
This figure shows the distribution of the fractions of the decline in sales (Panel a) or purchases (Panel b) attributable to the clients' (blue bars), suppliers' (red bars), and own firm's financial health (green bars) across different sectors four quarters after a 25 bps tightening of monetary policy. The fractions are calculated by estimating the predicted decline in sales or purchases in each sector (coefficients $\hat{\beta}_c$, $\hat{\beta}_s$ and $\hat{\beta}_f$ in column 9 of Tables 2 and 3, respectively) for firms with one standard deviation larger inverse coverage ratio relative to the average in their sector. We define sectors at the 2-digit SIC code level and use the distribution of financial health across sectors in Table A2. Fractions are estimated by dividing the predicted coefficient for the client, supplier or the firm by the sum of the three coefficients.

Figure 3: The balance sheet channel of transmission.



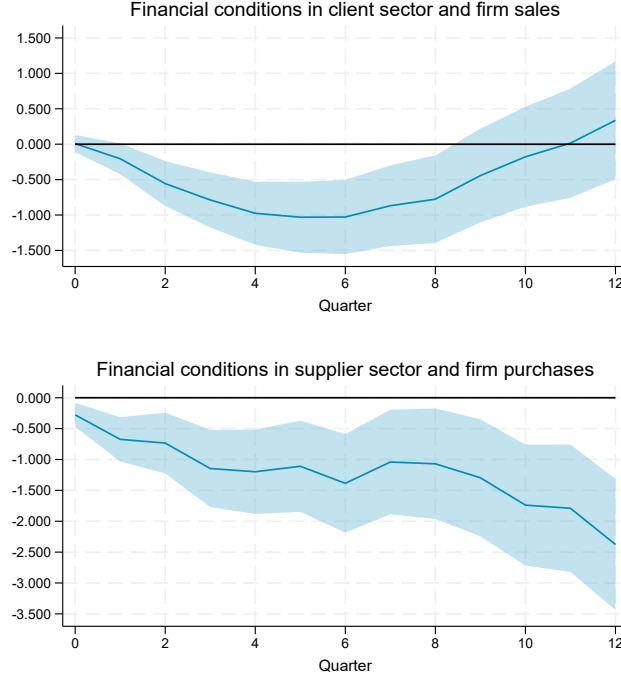
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms β_f^h in Equation 1, using changes in the Federal Funds rate as the measure of changes in the policy rate. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel focuses on firm sales; the dependent variable is $\Delta \ln \text{sale}_{i,t+h}$, $h \in \{0, \dots, 12\}$. The lower panel focuses on firm purchases; the dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$.

Figure 4: Specialized goods and monetary policy-induced bottlenecks.



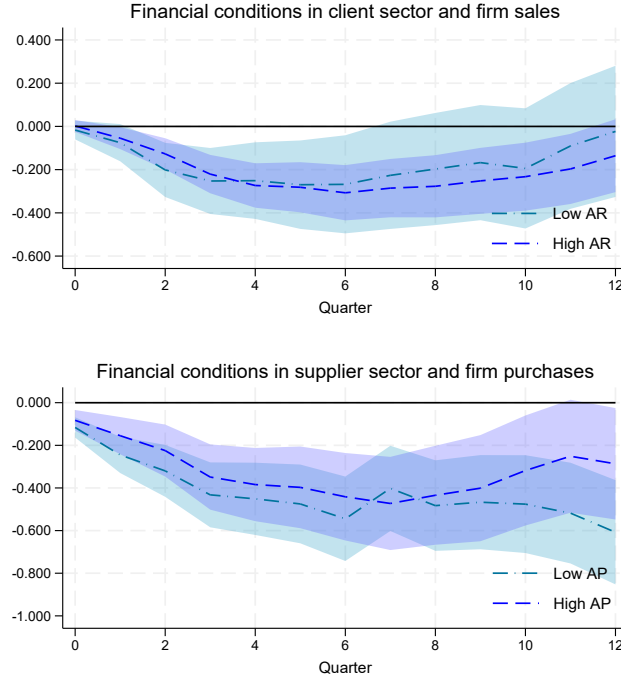
The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). Coefficients are estimated separately for firms selling specialized (dark shading) or non-specialized (light shading) goods. The definition of specialized goods follows the industry classification in Rauch (1999). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h). Coefficients are estimated separately for firms buying from a larger than the median fraction of suppliers in industries producing specialized (dark shading) or non-specialized (light shading) goods.

Figure 5: Dynamics of bottlenecks induced by monetary policy. Policy surprises.



This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1, using monetary policy surprises as the measure of changes in the policy rate. Coefficients are standardized to represent the effect of a 25bps point higher monetary policy surprise when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h).

Figure 6: Monetary policy-induced bottlenecks and the use of trade credit.



This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client financial weakness and the monetary policy rate (β_c^h). Estimations have been performed separately for firms that provide more than the median amounts of trade credit, measured through the ratio of accounts receivable to assets (High AR) and less than the median amounts of trade credit (low AR). The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h). Estimations have been performed separately for firms that use more than the median amounts of trade credit, measured through the ratio of accounts payable to assets (High AP) and less than the median amounts of trade credit (low AP).

Appendix

Table A1: Variable definitions

Variable	Definition
$\Delta \ln \text{sales}_{i,t+h}$ annual sales _{<i>t</i>}	$\ln \text{annual sales}_{i,t+h} - \ln \text{annual sales}_{i,t-1}$ $\sum_{s=0}^3 \text{sales}_{t-s} / \text{CPI}_t$, where sales are the quarterly sales (Source: Compustat variable SALEQ; seasonally adjusted CPI from FRED)
$\Delta \ln \text{purch}_{i,t+h}$ annual purchases _{<i>t</i>}	$\ln \text{annual purchases}_{i,t+h} - \ln \text{annual purchases}_{i,t-1}$ $\sum_{s=0}^3 \text{purchases}_{t-s} / \text{CPI}_t$, where purchases is defined as the quarterly change in inventories plus the cost of goods sold (Source: Compustat INVTQ and COGSQ; seasonally adjusted CPI from FRED)
Δr_t Surprise _{<i>t</i>}	Fed Funds Rate _{<i>t</i>} – Fed Funds Rate _{<i>t-1</i>} (Source: FRED) Sum of all surprise changes in the federal funds target rate between <i>t</i> – 1 and <i>t</i> (Source: provided by Refet Gürkaynak)
Inverse coverage ratio Debt ratio	Interest expenses/EBIT (Compustat XINTQ/(OIBDPQ – DPQ)) Debt in current liabilities plus long-term debt, divided by total assets (Compustat (DLCQ + DLTTQ) / ATQ)
Tobin's Q	Total assets plus market value of equity minus book value of equity divided by total assets (Compustat {ATQ + CSHOQ × PRCCQ – [ATQ – (LTQ + PSTKLQ) + TXDITQC]}/ATQ)
Size PPE ratio	Natural logarithm of real assets (Compustat $\ln(\text{ATQ}/\text{CPI})$; CPI from FRED) Ratio of property, plant, and equipment to total assets (Compustat PPENTQ and ATQ)
Sales growth	Ratio of the quarterly difference in sales between <i>t</i> – 1 and <i>t</i> to lagged sales (Compustat SALEQ)
Industry growth	Average sales growth for firms in the same 3-digit SIC industry code
Client average <i>Z</i>	$\sum w_k x_k$, where <i>k</i> are all industries buying from the firm, <i>x_k</i> is the equally-weighted average value of <i>Z</i> (winsorized at the 1 and 99 percent levels) of all firms in the (4-digit SIC-code) downstream industry, and <i>w_k</i> are sales from the sector of the firm to each downstream industry, divided by total sales of the sector (obtained from the BEA)
Supplier average <i>Z</i>	$\sum w_k x_k$, where <i>k</i> are all industries selling to the firm, <i>x_k</i> is the equally-weighted average value of <i>Z</i> (winsorized at the 1 and 99 percent levels) of all firms in the (4-digit SIC-code) upstream industry, and <i>w_k</i> are input purchases by the sector of the firm from each upstream industry, divided by total input purchases of the sector (obtained from the BEA)
ΔAR_{t+h} ΔAP_{t+h}	Accounts receivable _{<i>t+h</i>} – Accounts receivable _{<i>t-1</i>} (RECTRQ), scaled by lagged assets (ATQ). If variable RECTRQ is missing, we use variable RECTQ Accounts payable _{<i>t+h</i>} – Accounts payable _{<i>t-1</i>} (APQ), scaled by lagged assets (ATQ).
$\Delta \ln \text{sales}_{ijt}$	$\ln \text{sales}_{ijt} - \ln \text{sales}_{ijt-1}$, where sales _{<i>ij</i>} are sales from firm <i>i</i> to client <i>j</i> (Compustat Segment Files variable SALECS)

Table A2: Illustration of sector variation in financial health

SIC code	Panel A		Panel B		Panel C	
	Inverse coverage ratio		Client inv. coverage		Supp. inv. coverage	
	μ	σ	μ	σ	μ	σ
01	0.039	1.235	0.160	0.136	0.114	0.192
02	0.081	1.069	0.139	0.250	0.129	0.250
07	0.097	0.831	0.267	0.389	0.120	0.046
08	0.136	1.223	0.164	0.242	0.046	0.300
09	0.065	2.688	0.171	0.122	0.193	0.118
10	0.077	0.679	0.134	0.144	0.121	0.085
12	0.098	1.495	0.206	0.217	0.087	0.390
13	0.040	1.123	0.103	0.156	0.092	0.092
14	0.036	0.843	0.208	0.336	0.143	0.070
15	0.223	1.479	0.214	0.143	0.157	0.096
16	0.141	0.916	0.151	0.110	0.161	0.088
17	0.117	1.012	0.154	0.117	0.143	0.095
20	0.154	0.873	0.216	0.165	0.163	0.329
21	0.119	0.325	0.135	0.350	0.183	0.150
22	0.236	1.416	0.230	0.200	0.236	0.191
23	0.130	1.062	0.226	0.110	0.199	0.221
24	0.092	1.202	0.220	0.293	0.159	0.192
25	0.124	0.745	0.204	0.572	0.203	0.138
26	0.265	1.316	0.279	0.161	0.219	0.170
27	0.227	0.947	0.181	0.184	0.187	0.085
28	0.005	0.722	0.176	0.185	0.107	0.100
29	0.039	0.846	0.196	0.097	0.041	0.133
30	0.183	1.121	0.192	0.096	0.257	0.192
31	0.049	0.977	0.272	0.357	0.151	0.161
32	0.144	0.955	0.213	0.283	0.149	0.132
33	0.143	1.141	0.163	0.147	0.102	0.263
34	0.179	0.964	0.178	0.166	0.183	0.132
35	0.073	0.806	0.126	0.184	0.143	0.107
36	0.033	0.875	0.122	0.138	0.122	0.103
37	0.128	0.879	0.133	0.248	0.176	0.145
38	0.018	0.710	0.185	0.147	0.139	0.081
39	0.036	1.091	0.170	0.281	0.180	0.163
40	0.298	0.553	0.183	0.121	0.209	0.157
41	0.246	1.067	0.147	0.067	0.180	0.093
42	0.179	1.003	0.169	0.070	0.178	0.096
44	0.320	1.219	0.058	0.087	0.126	0.082
45	0.224	1.180	0.176	0.042	0.142	0.140
46	0.272	0.735	0.010	0.139	0.081	0.073
47	0.114	0.967	0.180	0.045	0.161	0.060
48	0.187	1.356	0.224	0.304	0.153	0.159
49	0.325	1.089	0.211	0.077	0.097	0.133
50	0.171	1.037	0.183	0.054	0.195	0.075
51	0.168	1.081	0.160	0.082	0.178	0.076
52	0.037	1.126	0.191	0.057	0.204	0.081
53	0.144	1.016	0.186	0.056	0.215	0.128
54	0.202	0.982	0.222	0.102	0.199	0.079
55	0.237	0.992	0.175	0.049	0.178	0.088

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Table A2 – *Continued from previous page*

SIC code	Panel A Inverse coverage ratio		Panel B Client inv. coverage		Panel C Supp. inv. coverage	
	μ	σ	μ	σ	μ	σ
56	0.069	0.712	0.184	0.053	0.192	0.077
57	0.066	0.913	0.187	0.057	0.197	0.083
58	0.158	1.150	0.177	0.098	0.184	0.074
59	0.081	1.225	0.163	0.131	0.193	0.102
70	0.369	1.777	0.166	0.044	0.181	0.070
72	0.270	0.897	0.198	0.067	0.190	0.066
73	0.016	0.901	0.122	0.080	0.131	0.079
75	0.297	1.246	0.188	0.054	0.180	0.081
76	0.046	1.686	0.229	0.067	0.186	0.067
78	0.091	1.277	0.137	0.252	0.069	0.191
79	0.201	1.358	0.230	0.211	0.146	0.108
80	0.190	1.011	0.300	0.270	0.156	0.072
81	0.012	0.182	0.168	0.043	0.161	0.064
82	0.048	0.816	0.153	0.083	0.174	0.068
83	0.586	1.910	0.160	0.085	0.216	0.074
87	0.086	0.778	0.152	0.082	0.152	0.060
Total	0.090	0.980	0.164	0.172	0.139	0.130

This table illustrates the industry variation in financial health, by showing the average (μ) and standard deviation (σ) of the financial weakness of firms (Panel A), their clients (Panel B), and their suppliers (Panel C). Financial weakness is measured as the inverse coverage ratio (see Table A1 for variable definitions). To calculate client and supplier average health, we use the weights given by the input-output matrices (see Table A3 for an illustration).

We note that the variation in supplier and client financial health is driven mostly by differences in sector-level financial health, and not by the linkages. To verify this claim, in an unreported analysis we recreate the above table in two different scenarios: (i) using the actual average financial health in each sector, but eliminating variation in linkages by assuming firms buy and sell equal amounts from the suppliers and clients with which they are related in the extensive margin, and (ii) using the actual average financial health in each sector, but eliminating all possible variation in the linkages by assuming that all firms buy and sell equal amounts from all sectors in the economy. The within-sector variation is reduced in both scenarios for all sectors (excepting very few); however, there is still a considerable amount of within-sector variation in client and supplier health across all sectors even in the second (more extreme) scenario. In contrast, if we keep the true linkages but kill the variation across sectors' financial health by assuming equal financial health for all sectors, there is no remaining within-sector variation in client and supplier health.

Notice that the values in the above table are based on 2-digit SIC industry codes for illustration purposes only; in the paper the average financial health of industries is calculated for industries defined at the 4-digit SIC code level.

Table A3: Examples of client and supplier linkages

SIC code	Panel A					Panel B				
	Fractions sold to clients					Fraction purchased from suppliers				
	017	131	206	262	394	017	131	206	262	394
01	0.011	0.000	0.000	0.000	0.000	0.028	0.000	0.235	0.000	0.000
02	0.000	0.000	0.004	0.000	0.000	0.005	0.000	0.003	0.000	0.000
07	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
08	0.000	0.000	0.000	0.000	0.000	0.333	0.000	0.002	0.078	0.011
09	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.001	0.000	0.000	0.065	0.006	0.032	0.000
13	0.000	0.082	0.000	0.000	0.000	0.000	0.494	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.012	0.000
15	0.000	0.000	0.000	0.008	0.016	0.031	0.060	0.005	0.008	0.002
16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20	0.975	0.000	0.658	0.003	0.000	0.000	0.000	0.303	0.014	0.000
21	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.034	0.112
23	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.002
24	0.000	0.000	0.000	0.000	0.000	0.024	0.000	0.002	0.054	0.028
25	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26	0.000	0.000	0.000	0.443	0.000	0.026	0.000	0.115	0.219	0.090
27	0.000	0.000	0.000	0.301	0.000	0.001	0.000	0.000	0.000	0.000
28	0.000	0.015	0.000	0.015	0.000	0.171	0.067	0.028	0.126	0.094
29	0.000	0.743	0.000	0.002	0.000	0.087	0.022	0.019	0.033	0.014
30	0.000	0.000	0.000	0.022	0.000	0.005	0.000	0.075	0.005	0.007
31	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.015
32	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.012	0.004	0.004
33	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.082
34	0.000	0.000	0.000	0.001	0.000	0.008	0.014	0.006	0.040	0.037
35	0.000	0.000	0.000	0.011	0.000	0.017	0.038	0.004	0.034	0.035
36	0.000	0.000	0.000	0.004	0.000	0.005	0.000	0.004	0.013	0.014
37	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.001
38	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000
39	0.000	0.000	0.000	0.000	0.288	0.000	0.000	0.000	0.000	0.102
40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
41	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000	0.002
42	0.000	0.000	0.000	0.001	0.000	0.014	0.000	0.001	0.003	0.010
43	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
44	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
45	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.006
46	0.000	0.008	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000
47	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.004
48	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.002	0.002	0.009
49	0.000	0.148	0.000	0.000	0.000	0.057	0.029	0.036	0.132	0.016
51	0.000	0.000	0.000	0.009	0.004	0.011	0.001	0.031	0.028	0.017
53	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	0.011	0.000	0.097	0.002	0.004	0.000	0.000	0.000	0.000	0.000
55	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000	0.000
58	0.002	0.000	0.188	0.031	0.030	0.002	0.000	0.001	0.003	0.008
59	0.000	0.000	0.005	0.008	0.007	0.000	0.000	0.000	0.000	0.000

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Table A3 – *Continued from previous page*

SIC code	Panel A					Panel B				
	Fractions sold to clients					Fraction purchased from suppliers				
	017	131	206	262	394	017	131	206	262	394
60	0.000	0.000	0.000	0.008	0.001	0.027	0.005	0.007	0.003	0.008
61	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.000	0.000	0.001
62	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.021
63	0.000	0.000	0.000	0.000	0.000	0.053	0.002	0.003	0.000	0.003
64	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.002	0.000	0.001
65	0.000	0.000	0.000	0.004	0.000	0.019	0.002	0.002	0.001	0.004
67	0.000	0.000	0.000	0.000	0.000	0.003	0.014	0.002	0.005	0.020
70	0.000	0.000	0.004	0.026	0.002	0.000	0.000	0.000	0.001	0.003
72	0.000	0.000	0.000	0.008	0.001	0.000	0.000	0.000	0.002	0.001
73	0.000	0.000	0.000	0.026	0.004	0.011	0.006	0.024	0.026	0.095
75	0.000	0.000	0.000	0.001	0.000	0.027	0.032	0.004	0.005	0.002
76	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.004	0.007	0.003
78	0.000	0.000	0.001	0.003	0.000	0.000	0.000	0.000	0.000	0.000
79	0.000	0.000	0.010	0.003	0.099	0.001	0.000	0.000	0.001	0.002
80	0.000	0.001	0.006	0.014	0.059	0.000	0.000	0.000	0.000	0.000
81	0.000	0.000	0.000	0.001	0.001	0.004	0.022	0.002	0.002	0.010
82	0.001	0.000	0.017	0.003	0.072	0.001	0.000	0.000	0.000	0.000
83	0.000	0.000	0.005	0.001	0.404	0.000	0.000	0.000	0.000	0.000
84	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
86	0.000	0.000	0.001	0.003	0.000	0.001	0.000	0.000	0.000	0.001
87	0.000	0.001	0.001	0.014	0.002	0.007	0.096	0.055	0.065	0.102
88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
89	0.000	0.000	0.000	0.001	0.001	0.000	0.004	0.004	0.006	0.003

This table contains stylized examples of the client-supplier linkages of five 3-digit-level SIC code industries: Fruits and nuts (SIC code 017), Crude petroleum and natural gas (SIC code 131), Sugar and confectionery products (SIC code 206), Paper mills (SIC code 262) and Dolls, toys, games, sporting and athletic (SIC code 394). Panel A contains the fraction of total output of the industry indicated in the column sold to each 2-digit SIC-code industry indicated in each row. For example, the Fruits and nuts industry (code 017) sells 1.1% of its total production to industry 01 (Agricultural production - crops), 97.5% to industry 20 (Food and kindred products), and so on. Panel B contains the fraction of total inputs required by the industry indicated in the column purchased from each 2-digit SIC-code industry indicated in each row. For example, the Sugar and confectionery products industry (code 206) purchases 23.4% of its total inputs from industry 01 (Agricultural production - crops), 30.3% from industry 20 (Food and kindred products), and so on. Fractions of output sold (inputs purchased) are calculated using the Input-Output matrices of the Bureau of Economic Analysis (BEA).

Using as reference the average values of financial health by industry contained in Table A2, the average health of the clients of sector 017 would be calculated as $0.011 \times 0.039 + 0.975 \times 0.154 + 0.011 \times 0.202 + \dots$. Similarly, the average health of the suppliers of sector 017 would be calculated as $0.28 \times 0.039 + 0.333 \times 0.136 + 0.005 \times 0.036 + \dots$. Note that these examples based on 3- and 2-digit SIC codes serve for illustration purposes only; in the paper the weights assigned to the financial health of each sector are calculated at the 4-digit SIC level.

Table A4: Client financial health and firm sales, $h = 4$. Complete table.

$\Delta \ln \text{ sales}$	(1)	(2)	(3)	(4)	(5)	(6)
Client weakness (x^c)	0.000 (0.001)	0.000 (0.001)	0.002* (0.001)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)
$x^c \times \Delta r$	-0.299*** (0.056)	-0.280*** (0.056)	-0.235*** (0.056)	-0.255*** (0.054)	-0.220*** (0.055)	-0.267*** (0.051)
Firm weakness (x^f)		0.002* (0.001)	0.002 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)
$x^f \times \Delta r$		-0.066 (0.046)	-0.069 (0.046)	-0.082* (0.043)	-0.072* (0.043)	-0.098** (0.041)
Supplier weakness (x^s)					0.000 (0.001)	0.000 (0.001)
$x^s \times \Delta r$					-0.199*** (0.049)	-0.281*** (0.048)
Industry growth		0.006*** (0.001)	0.004*** (0.001)	0.002 (0.001)	0.003** (0.001)	0.001 (0.001)
Tobin Q		0.019*** (0.003)	0.018*** (0.003)	0.022*** (0.005)	0.022*** (0.005)	0.022*** (0.005)
Size		0.016*** (0.002)	0.016*** (0.002)	-0.194*** (0.010)	-0.193*** (0.010)	-0.193*** (0.010)
PPE ratio		0.011*** (0.003)	0.012*** (0.003)	-0.004 (0.007)	-0.004 (0.007)	-0.004 (0.007)
Client Industry growth			0.009*** (0.001)	0.008*** (0.001)	0.009*** (0.001)	0.010*** (0.001)
Client Tobin Q			0.012*** (0.002)	0.008*** (0.002)	0.007*** (0.002)	0.008*** (0.002)
Client Size			0.011** (0.005)	-0.011 (0.009)	-0.013 (0.009)	-0.009 (0.009)
Client PPE ratio			-0.004 (0.004)	-0.041*** (0.010)	-0.035*** (0.010)	-0.041*** (0.010)
Supplier Industry growth					-0.001 (0.001)	-0.003*** (0.001)
Supplier Tobin Q					-0.001 (0.002)	0.001 (0.002)
Supplier Size					0.003 (0.007)	0.008 (0.007)
Supplier PPE ratio					-0.029*** (0.009)	-0.029*** (0.009)
Industry growth $\times \Delta r$						-0.082 (0.078)
Cl. Industry growth $\times \Delta r$						0.063 (0.057)
Supp Industry growth $\times \Delta r$						-0.218*** (0.076)
Tobin Q $\times \Delta r$						0.079 (0.209)
Cl. Tobin Q $\times \Delta r$						0.309** (0.130)

Continued on next page

Table A4 – *Continued from previous page*

	(1)	(2)	(3)	(4)	(5)	(6)
Supp Tobin Q $\times \Delta r$						0.512*** (0.126)
Size $\times \Delta r$						0.074 (0.097)
Cl. Size $\times \Delta r$						0.850*** (0.128)
Supp Size $\times \Delta r$						0.337*** (0.105)
PPE ratio $\times \Delta r$						-0.033 (0.100)
Cl. PPE ratio $\times \Delta r$						0.129 (0.116)
Supp PPE ratio $\times \Delta r$						0.213** (0.094)
Constant	0.039*** (0.002)	0.039*** (0.002)	0.039*** (0.002)	0.039*** (0.001)	0.039*** (0.001)	0.038*** (0.001)
Observations	267,780	267,780	267,780	266,622	266,622	266,622
R-squared	0.023	0.026	0.027	0.265	0.265	0.267
Year:Quarter FE	Y	Y	Y	Y	Y	Y
Fiscal Quarter FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y			
Firm FE				Y	Y	Y

This table presents the complete coefficient estimates corresponding to Table 2.

Table A5: Dynamic estimations: Client bottlenecks.

	(0)	(1)	(2)	(3)	(4)	(6)	(8)	(10)	(12)
Client coverage ratio (x^c)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)	-0.001 (0.002)	0.001 (0.002)
$x^c \times \Delta r$	-0.008 (0.013)	-0.063** (0.025)	-0.164*** (0.036)	-0.239*** (0.044)	-0.267*** (0.051)	-0.283*** (0.065)	-0.253*** (0.076)	-0.215*** (0.082)	-0.082 (0.089)
Supplier coverage ratio (x^s)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.003** (0.001)	-0.005*** (0.001)
$x^s \times \Delta r$	-0.053*** (0.012)	-0.139*** (0.023)	-0.218*** (0.034)	-0.271*** (0.042)	-0.281*** (0.048)	-0.243*** (0.060)	-0.172** (0.069)	-0.090 (0.076)	-0.127 (0.079)
Firm coverage ratio (x^f)	0.001*** (0.000)	0.002*** (0.000)	0.002*** (0.001)	0.001 (0.001)	-0.000 (0.001)	0.000 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.002)
$x^f \times \Delta r$	-0.017 (0.011)	-0.035* (0.020)	-0.039 (0.029)	-0.064* (0.036)	-0.098** (0.041)	-0.138** (0.055)	-0.172*** (0.063)	-0.169** (0.071)	-0.145* (0.075)
Observations	299,101	291,111	283,230	275,996	266,622	248,324	232,295	217,105	203,460
R-squared	0.176	0.197	0.216	0.239	0.267	0.319	0.368	0.411	0.453

This table contains coefficient estimates and their standard errors (in parenthesis) for Equation 1 for $h \in \{0, 1, 2, 3, 4, 6, 8, 10, 12\}$. The sample corresponds to all non-financial, non-government public firms in the US in the period 1990Q1 to 2016Q4. The dependent variable is the difference in the log of firm sales between $t - 1$ and $t + 4$. The coefficient of interest is for the interaction between the quarterly difference in the monetary policy rate (Δr_{t-1}) and lagged clients' financial weakness (x^c). Financial weakness is measured using the inverse coverage ratio. Changes in monetary policy are the quarterly differences in the federal funds rate, scaled by 25. Firm-level control variables are the average yearly growth in sales in the firms' industry, lagged values of Tobin's Q, firm size, debt to assets ratio, and ratio of PPE to total assets. Client and supplier controls are the average industry growth rate and lagged values of average Tobin's Q, average size, and average PPE to assets ratio. Monetary policy (MP) interactions are interactions of Δr_{t-1} with the following firm, supplier and client characteristics: size, property, plant and equipment to assets, Tobin's Q, and industry sales growth. All variables are defined in Table A1 and have been standardized by subtracting their mean and divided by the standard deviation. Standard errors are reported in parentheses and are clustered at the firm level. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table A6: Supplier financial health and firm purchases, $h = 4$. Complete table.

$\Delta \ln \text{ purch}$	(1)	(2)	(3)	(4)	(5)	(6)
Supplier weakness (x^s)	0.000 (0.001)	-0.000 (0.001)	0.000 (0.001)	-0.002 (0.001)	-0.002* (0.001)	-0.002* (0.001)
$x^s \times \Delta r$	-0.624*** (0.068)	-0.619*** (0.069)	-0.615*** (0.069)	-0.549*** (0.067)	-0.501*** (0.067)	-0.454*** (0.065)
Firm weakness (x^f)		0.003** (0.001)	0.003** (0.001)	0.002* (0.001)	0.002 (0.001)	0.002 (0.001)
$x^f \times \Delta r$		-0.126** (0.056)	-0.123** (0.056)	-0.117** (0.054)	-0.110** (0.054)	-0.117** (0.051)
Client weakness (x^c)					0.002 (0.001)	0.001 (0.001)
$x^c \times \Delta r$					-0.207*** (0.062)	-0.179*** (0.060)
Industry growth		0.016*** (0.002)	0.017*** (0.002)	0.015*** (0.002)	0.014*** (0.002)	0.016*** (0.002)
Tobin Q		0.008** (0.003)	0.008** (0.003)	0.019*** (0.006)	0.019*** (0.006)	0.019*** (0.006)
Size		0.028*** (0.002)	0.028*** (0.002)	-0.118*** (0.012)	-0.119*** (0.012)	-0.119*** (0.012)
PPE ratio		0.022*** (0.003)	0.023*** (0.003)	0.033*** (0.008)	0.036*** (0.008)	0.034*** (0.008)
Supplier Industry growth			-0.009*** (0.002)	-0.007*** (0.002)	-0.007*** (0.002)	-0.008*** (0.002)
Supplier Tobin Q			0.012*** (0.003)	0.011*** (0.003)	0.010*** (0.003)	0.012*** (0.003)
Supplier Size			-0.006* (0.003)	0.006 (0.007)	0.003 (0.007)	0.000 (0.007)
Supplier PPE ratio			-0.004 (0.003)	-0.016 (0.010)	0.007 (0.010)	0.004 (0.010)
Client Industry growth					-0.000 (0.002)	-0.005** (0.002)
Client Tobin Q					0.004 (0.003)	0.003 (0.003)
Client Size					-0.008 (0.011)	-0.010 (0.011)
Client PPE ratio					-0.128*** (0.013)	-0.125*** (0.013)
Industry growth $\times \Delta r$						0.206** (0.093)
Cl. Industry growth $\times \Delta r$						-0.322*** (0.083)
Supp Industry growth $\times \Delta r$						-0.173** (0.086)
Tobin Q $\times \Delta r$						0.041 (0.202)
Cl. Tobin Q $\times \Delta r$						0.194

Continued on next page

Table A6 – *Continued from previous page*

	(1)	(2)	(3)	(4)	(5)	(6)
						(0.144)
Supp Tobin Q $\times \Delta r$						0.650***
						(0.149)
Size $\times \Delta r$						0.166
						(0.128)
Cl. Size $\times \Delta r$						-0.040
						(0.154)
Supp Size $\times \Delta r$						-0.166
						(0.142)
PPE ratio $\times \Delta r$						-0.318**
						(0.138)
Cl. PPE ratio $\times \Delta r$						-0.173
						(0.141)
Supp PPE ratio $\times \Delta r$						0.392***
						(0.112)
Constant	0.029*** (0.002)	0.029*** (0.002)	0.029*** (0.002)	0.029*** (0.001)	0.029*** (0.001)	0.027*** (0.001)
Observations	255,437	255,437	255,437	254,258	254,258	254,258
R-squared	0.020	0.024	0.025	0.213	0.214	0.215
Year:Quarter FE	Y	Y	Y	Y	Y	Y
Fiscal Quarter FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y			
Firm FE				Y	Y	Y

This table presents the complete coefficient estimates corresponding to Table 3.

Table A7: Dynamic estimations: Supplier bottlenecks.

	(0)	(1)	(2)	(3)	(4)	(6)	(8)	(10)	(12)
Client coverage ratio (x^c)	0.000 (0.000)	0.001 (0.001)	0.002* (0.001)	0.002** (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.002)	0.000 (0.002)	0.002 (0.002)
$x^c \times \Delta r$	0.003 (0.018)	-0.014 (0.032)	-0.063 (0.045)	-0.112** (0.054)	-0.179*** (0.060)	-0.287*** (0.074)	-0.253*** (0.082)	-0.317*** (0.089)	-0.176* (0.094)
Supplier coverage ratio (x^s)	-0.001*** (0.000)	-0.001* (0.001)	-0.002** (0.001)	-0.002* (0.001)	-0.002* (0.001)	-0.001 (0.001)	0.000 (0.001)	-0.002 (0.002)	-0.004** (0.002)
$x^s \times \Delta r$	-0.107*** (0.018)	-0.211*** (0.032)	-0.287*** (0.045)	-0.416*** (0.057)	-0.454*** (0.065)	-0.521*** (0.076)	-0.479*** (0.085)	-0.440*** (0.092)	-0.489*** (0.097)
Firm coverage ratio (x^f)	0.001*** (0.000)	0.002*** (0.001)	0.002*** (0.001)	0.002* (0.001)	0.002 (0.001)	0.001 (0.001)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
$x^f \times \Delta r$	-0.007 (0.016)	-0.052* (0.028)	-0.048 (0.039)	-0.094** (0.047)	-0.117** (0.051)	-0.156** (0.064)	-0.221*** (0.072)	-0.154** (0.077)	-0.079 (0.083)
Observations	290,189	280,846	271,925	263,615	254,258	235,870	219,993	205,144	191,882
R-squared	0.120	0.145	0.169	0.191	0.215	0.269	0.318	0.365	0.404

This table contains coefficient estimates for Equation 1 for $h \in \{0, 1, 2, 3, 4, 6, 8, 10, 12\}$. The sample corresponds to all non-financial, non-government public firms in the US in the period 1990Q1 to 2016Q4. The dependent variable is the difference in the log of firm purchases between $t - 1$ and $t + 4$. The coefficient of interest is for the interaction between the quarterly difference in the monetary policy rate (Δr_{t-1}) and lagged suppliers' weakness (x^s). Financial weakness is measured using the inverse coverage ratio. Changes in monetary policy are the quarterly differences in the federal funds rate, scaled by 25. Firm-level control variables are the average yearly growth in sales in the firms' industry, lagged values of Tobin's Q , firm size, debt to assets ratio, and ratio of PPE to total assets. Client and supplier controls are the average industry growth rate and lagged values of average Tobin's Q , average size, and average PPE to assets ratio. Monetary policy (MP) interactions are interactions of Δr_{t-1} with the following firm, supplier and client characteristics: size, property, plant and equipment to assets, Tobin's Q , and industry sales growth. All variables are defined in Table A1 and have been standardized by subtracting their mean and divided by the standard deviation. Standard errors are reported in parentheses and are clustered at the firm level. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table A8: Client bottlenecks. Sales deflated using industry PPI

	(1)	(2)	(3)	(4)	(5)	(6)
Client weakness (x^c)	0.005*** (0.001)	0.004*** (0.001)	0.005*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
$x^c \times \Delta r$	-0.176*** (0.051)	-0.169*** (0.050)	-0.141*** (0.050)	-0.122*** (0.046)	-0.117** (0.046)	-0.101** (0.044)
Firm weakness (x^f)		0.002** (0.001)	0.002** (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
$x^f \times \Delta r$		-0.089** (0.044)	-0.091** (0.044)	-0.071* (0.038)	-0.068* (0.038)	-0.075** (0.038)
Supplier weakness (x^s)					-0.001 (0.001)	-0.000 (0.001)
$x^s \times \Delta r$					-0.066 (0.044)	-0.087** (0.043)
Observations	188,369	188,369	188,369	187,477	187,477	187,477
R-squared	0.037	0.050	0.051	0.362	0.362	0.363
Firm Controls		Y	Y	Y	Y	Y
Client Controls			Y	Y	Y	Y
Supplier Controls					Y	Y
MP interactions						Y
Year-Qtr FE	Y	Y	Y	Y	Y	Y
Fiscal qtr FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y			
Firm FE				Y	Y	Y

This table contains coefficient estimates for Equation 1 over a one year horizon ($h = 4$). The sample corresponds to all non-financial, non-government public firms in the US in the period 1990Q1 to 2016Q4. The dependent variable is the difference in the log of firm sales between $t-1$ and $t+4$. Sales are deflated using the industry-level PPI. The coefficient of interest is for the interaction between the quarterly difference in the monetary policy rate (Δr_{t-1}) and lagged clients' financial weakness (x^c). Financial weakness is measured using the inverse coverage ratio. Changes in monetary policy are the quarterly differences in the federal funds rate, scaled by 25. Firm-level control variables are the average yearly growth in sales in the firms' industry, lagged values of Tobin's Q, firm size, debt to assets ratio, and ratio of PPE to total assets. Client and supplier controls are the average industry growth rate and lagged values of average Tobin's Q, average size, and average PPE to assets ratio. Monetary policy (MP) interactions are interactions of Δr_{t-1} with the following firm, supplier and client characteristics: size, property, plant and equipment to assets, Tobin's Q, and industry sales growth. Standard errors are reported in parentheses and are clustered at the firm level. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table A9: Supplier bottlenecks. Purchases deflated using IO-weighted PPI.

	(1)	(2)	(3)	(4)	(5)	(6)
Supplier weakness (x^s)	0.003*** (0.001)	0.002** (0.001)	0.003*** (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
$x^s \times \Delta r$	-0.558*** (0.070)	-0.548*** (0.070)	-0.539*** (0.070)	-0.467*** (0.065)	-0.427*** (0.065)	-0.384*** (0.063)
Firm weakness (x^f)		0.003** (0.001)	0.003** (0.001)	0.002 (0.001)	0.001 (0.001)	0.002 (0.001)
$x^f \times \Delta r$		-0.171*** (0.055)	-0.172*** (0.055)	-0.160*** (0.052)	-0.151*** (0.052)	-0.141*** (0.051)
Client weakness (x^c)					0.003*** (0.001)	0.003** (0.001)
$x^c \times \Delta r$					-0.202*** (0.060)	-0.154*** (0.059)
Observations	183,180	183,180	183,180	182,258	182,258	182,258
R-squared	0.019	0.029	0.030	0.255	0.256	0.257
Firm Controls		Y	Y	Y	Y	Y
Client Controls			Y	Y	Y	Y
Supplier Controls					Y	Y
MP interactions						Y
Year-Qtr FE	Y	Y	Y	Y	Y	Y
Fiscal qtr FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y			
Firm FE				Y	Y	Y

This table contains coefficient estimates for Equation 2 over a one year horizon ($h = 4$). The sample corresponds to all non-financial, non-government public firms in the US in the period 1990Q1 to 2016Q4. The dependent variable is the difference in the log of firm purchases between $t - 1$ and $t + 4$. Purchases are deflated using the industry-level PPI (weighted using IO weights from the input side). The coefficient of interest is for the interaction between the quarterly difference in the monetary policy rate (Δr_{t-1}) and lagged clients' financial weakness (x^c). Financial weakness is measured using the inverse coverage ratio. Changes in monetary policy are the quarterly differences in the federal funds rate, scaled by 25. Firm-level control variables are the average yearly growth in sales in the firms' industry, lagged values of Tobin's Q, firm size, debt to assets ratio, and ratio of PPE to total assets. Client and supplier controls are the average industry growth rate and lagged values of average Tobin's Q, average size, and average PPE to assets ratio. Monetary policy (MP) interactions are interactions of Δr_{t-1} with the following firm, supplier and client characteristics: size, property, plant and equipment to assets, Tobin's Q, and industry sales growth. Standard errors are reported in parentheses and are clustered at the firm level.

***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table A10: Client health and specialized goods. Patents.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. Firms with high patent counts.									
Client weakness $\times \Delta r$	-1.558** (0.670)	-2.019*** (0.642)	-1.709** (0.781)	-1.642* (0.888)	-1.562** (0.645)	-1.475** (0.664)	-0.967 (0.963)	-1.469* (0.849)	-1.444* (0.841)
Observations	5,141	4,081	3,408	3,960	2,936	2,414	2,362	1,643	1,352
R-squared	0.054	0.190	0.202	0.394	0.505	0.516	0.565	0.643	0.647
Panel B. Firms with low patent counts.									
Client weakness $\times \Delta r$	-0.310 (0.205)	-0.201 (0.197)	0.019 (0.302)	-0.518* (0.262)	-0.699* (0.391)	-0.522 (0.486)	-0.644*** (0.113)	-0.819** (0.390)	-0.699 (0.432)
Observations	20,955	16,389	13,041	15,302	11,238	8,714	9,838	6,608	5,299
R-squared	0.063	0.142	0.154	0.408	0.473	0.473	0.599	0.645	0.644
Panel C. Firms with many forward patent citations.									
Client weakness $\times \Delta r$	-1.932*** (0.652)	-2.393*** (0.531)	-1.975** (0.788)	-1.730 (1.050)	-1.545* (0.785)	-0.495 (0.874)	-1.314 (0.946)	-2.007** (0.765)	-1.937** (0.754)
Observations	4,404	3,475	2,915	3,398	2,470	2,040	2,104	1,447	1,206
R-squared	0.055	0.198	0.218	0.398	0.510	0.533	0.556	0.634	0.648
Panel D. Firms with few forward patent citations.									
Client weakness $\times \Delta r$	-0.286 (0.218)	-0.173 (0.213)	0.042 (0.334)	-0.413 (0.310)	-0.569 (0.424)	-0.380 (0.547)	-0.576** (0.219)	-0.735* (0.406)	-0.628 (0.466)
Observations	21,696	16,996	13,534	15,802	11,622	9,005	10,096	6,804	5,445
R-squared	0.063	0.141	0.152	0.408	0.475	0.474	0.600	0.647	0.646
Client controls		Y	Y		Y	Y		Y	Y
Industry $\times$ year FE		Y							
Industry $\times$ size $\times$ age $\times$ year FE				Y	Y	Y			
Firm $\times$ year FE							Y	Y	Y

This table contains coefficient estimates and their standard errors (in parenthesis) for coefficient β_c in Equation 2. The dependent variable is $\Delta \ln \text{sales}_{ijt}$, or sales from firm i to client j in year t . The main independent variables are: the yearly difference in the monetary policy rate, the client's

measure of financial weakness (inverse coverage ratio) (lagged one year and standardized), and the interaction between these two variables. Changes in monetary policy are the yearly differences in the federal funds rate, scaled by 25. Estimations include industry times year fixed effects (columns 1 to 3), firm industry $\times$ size group $\times$ age group $\times$ year fixed effects (columns 4 to 6), and firm $\times$ year fixed effects (columns 7 to 9). Columns 2, 4, 5, 6, 7 and 8 include controls for the client's industry growth rate and lagged values of client's Tobin's Q, size, and PPE; client monopoly and supplier monopoly power; additionally, in columns 3, 6 and 9 all controls are interacted with Δr . The sample in Panels A and B is split into firms in industries with high vs low patent counts, respectively. In Panels C and D the sample is respectively split into firms in industries with many (more than median) vs few (less than median) forward patent citations. The patent measures follow Kogan et al. (2017). Standard errors are clustered at the supplier, client, and year level (three-way clustering). ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table A11: Client-side bottlenecks on paired client sample. Monetary surprises.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A. All observations.									
Client weakness $\times$ Surprise	-3.392* (1.950)	-2.645 (2.276)	-1.358 (2.382)	-3.732* (1.818)	-4.959 (3.188)	-3.796 (3.724)	-5.888*** (1.932)	-8.686** (3.782)	-8.560*** (2.450)
Observations	25,359	19,834	15,987	19,336	14,241	11,269	11,899	8,018	6,488
R-squared	0.057	0.145	0.154	0.387	0.464	0.466	0.594	0.645	0.646
Panel B. Firms selling specialized goods.									
Client weakness $\times$ Surprise	-6.991 (5.460)	-5.376 (4.571)	-4.473 (3.393)	-5.702 (4.391)	-5.249* (2.968)	-5.316 (5.445)	-11.447** (4.677)	-14.497** (5.943)	-12.959** (5.146)
Observations	10,669	8,513	7,081	8,655	6,511	5,375	5,415	3,798	3,130
R-squared	0.049	0.150	0.159	0.378	0.470	0.473	0.579	0.642	0.642
Panel C. Firms selling non-specialized goods.									
Client weakness $\times$ Surprise	0.563 (1.736)	1.364 (1.987)	2.719 (2.737)	-2.211 (.)	-4.739 (5.088)	-0.549 (4.905)	-3.076* (1.613)	-3.270 (3.838)	-3.368 (3.121)
Observations	12,166	9,304	7,199	8,962	6,461	4,821	5,381	3,466	2,709
R-squared	0.042	0.125	0.135	0.367	0.435	0.439	0.593	0.632	0.637
Client controls		Y	Y		Y	Y		Y	Y
Industry $\times$ year FE		Y							
Industry $\times$ size $\times$ age $\times$ year FE			Y		Y	Y			
Firm $\times$ Year FE							Y	Y	Y

This table contains coefficient estimates and their standard errors (in parenthesis) for coefficient β_c in Equation 2. The dependent variable is $\Delta \ln \text{sales}_{i,j,t}$, or sales from firm i to client j in year t . The main independent variables are: monetary policy surprises, the client's measure of financial weakness (inverse coverage ratio) (lagged one year and standardized), and the interaction between these two variables. Monetary policy surprises are scaled by 25. Estimations include industry times year fixed effects (columns 1 to 3), firm industry $\times$ size group $\times$ age group $\times$ year fixed effects (columns 4 to 6), and firm $\times$ year fixed effects (columns 7 to 9). Columns 2, 4, 5, 6, 7 and 8 include controls for the client's industry growth rate and lagged values of client's Tobin's Q , size, and PPE; client monopsony and supplier monopoly power; additionally, in columns 3, 6 and 9 all controls are interacted with the monetary surprises. The sample in Panel A corresponds to non-financial, non-government public firms in the US and their most important clients as reported in the Compustat Segment files for years 1990 through 2015. In Panels B and C, estimates are calculated separately for firms in industries selling specialized goods (Panel B) or standardized goods (Panel C). Standard errors are clustered at the supplier, client, and year level (three-way clustering). ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table A12: Client-side bottlenecks, paired client sample. Financial health = Debt.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Client debt ratio $\times \Delta r$	-0.453 (0.283)	-0.813** (0.328)	-0.723*** (0.237)	-0.530* (0.307)	-0.751* (0.384)	-0.509 (0.408)	-0.269 (0.532)	-0.222 (0.424)	-0.187 (0.573)
Observations	27,247	21,096	16,988	20,973	15,314	12,121	13,009	8,825	7,175
R-squared	0.056	0.145	0.154	0.378	0.459	0.459	0.584	0.639	0.636
Panel B. Firms selling specialized goods.									
Client debt ratio $\times \Delta r$	-1.085** (0.435)	-1.503*** (0.533)	-1.334** (0.616)	-0.878* (0.486)	-0.759 (0.609)	-0.488 (0.600)	-1.186 (1.012)	-0.499 (0.700)	-0.748 (0.985)
Observations	11,338	9,021	7,492	9,253	6,948	5,734	5,810	4,063	3,344
R-squared	0.049	0.153	0.160	0.367	0.469	0.471	0.576	0.644	0.639
Panel C. Firms selling non-specialized goods.									
Client debt ratio $\times \Delta r$	0.154 (0.360)	-0.086 (0.280)	-0.288 (0.244)	-0.377 (0.481)	-0.933 (0.559)	-0.758 (0.868)	-0.020 (0.567)	0.004 (0.922)	0.156 (1.163)
Observations	13,166	9,967	7,708	9,850	7,039	5,269	6,005	3,982	3,158
R-squared	0.042	0.123	0.133	0.359	0.429	0.430	0.576	0.618	0.621
Client controls		Y	Y		Y	Y		Y	Y
Industry $\times$ year FE	Y	Y	Y						
Industry $\times$ size $\times$ age $\times$ year FE				Y	Y	Y			
Firm $\times$ Year FE							Y	Y	Y

This table contains coefficient estimates and their standard errors (in parenthesis) for coefficient β_c in Equation 2. The dependent variable is $\Delta \ln \text{sales}_{ijt}$, or sales from firm i to client j in year t . The main independent variables are: the yearly difference in the monetary policy rate Δr , the client's debt ratio (lagged one year and standardized), and the interaction between these two variables. Changes in monetary policy are the yearly differences in the federal funds rate and have been scaled by 25. Estimations include industry times year fixed effects (columns 1 to 3), firm industry $\times$ size group $\times$ age group $\times$ year fixed effects (columns 4 to 6), and firm $\times$ year fixed effects (columns 7 to 9). Columns 2, 4, 5, 6, 7 and 8 include controls for the client's industry growth rate and lagged values of client's Tobin's Q , size, and PPE; client monopsony and supplier monopoly power; additionally, in columns 3, 6 and 9 all controls are interacted with Δr . The sample in Panel A corresponds to non-financial, non-government public firms in the US and their most important clients as reported in the Compustat Segment files for years 1990 through 2015. In Panels B and C, estimates are calculated separately for firms in industries selling specialized goods (Panel B) or standardized goods (Panel C). The measure for specialized goods follows the industry classification in Rauch (1999). Standard errors are clustered at the supplier, client, and year level (three-way clustering). ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.

Table A13: Client bottlenecks. Different standardizations.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Within industry, time and fiscal quarter						
$x^c \times \Delta r$	-0.276*** (0.052)	-0.259*** (0.052)	-0.217*** (0.052)	-0.235*** (0.050)	-0.203*** (0.051)	-0.246*** (0.047)
$x^f \times \Delta r$		-0.066 (0.046)	-0.069 (0.045)	-0.082* (0.043)	-0.072* (0.043)	-0.097** (0.041)
$x^s \times \Delta r$					-0.177*** (0.043)	-0.249*** (0.043)
Panel B: Within firm, time and fiscal quarter						
$x^c \times \Delta r$	-0.250*** (0.047)	-0.234*** (0.047)	-0.196*** (0.047)	-0.213*** (0.045)	-0.183*** (0.046)	-0.223*** (0.043)
$x^f \times \Delta r$		-0.062 (0.043)	-0.065 (0.043)	-0.077* (0.040)	-0.068* (0.040)	-0.091** (0.039)
$x^s \times \Delta r$					-0.165*** (0.040)	-0.232*** (0.040)
Panel C: Within firm, time and fiscal quarter; net of partners' health						
$x^c \times \Delta r$	-0.247*** (0.046)	-0.232*** (0.046)	-0.194*** (0.046)	-0.211*** (0.045)	-0.182*** (0.045)	-0.221*** (0.042)
$x^f \times \Delta r$		-0.062 (0.043)	-0.065 (0.043)	-0.077* (0.040)	-0.068* (0.040)	-0.091** (0.039)
$x^s \times \Delta r$					-0.163*** (0.040)	-0.230*** (0.040)
Firm Controls		Y	Y	Y	Y	Y
Client Controls			Y	Y	Y	Y
Supplier Controls					Y	Y
MP interactions						Y

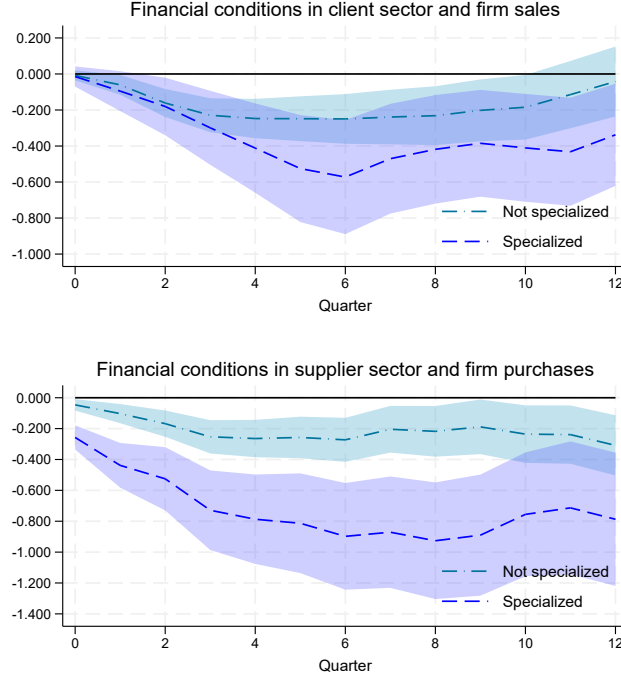
This table contains coefficient estimates for Equation 1 over a one year horizon ($h = 4$). The sample corresponds to all non-financial, non-government public firms in the US in the period 1990Q1 to 2016Q4. The dependent variable is the difference in the log of firm sales between $t - 1$ and $t + 4$. Financial weakness is the inverse coverage ratio. Economic magnitudes correspond to the percentage change in the dependent variable for a 25 bps increase in the monetary policy rate respectively for clients, firms and suppliers with one standard deviation higher inverse coverage ratio. In Panel A, we use the within-industry standard deviation, which is calculated for the residuals of a regression of the inverse coverage ratio on industry fixed effects, quarter fixed effect, and fiscal quarter fixed effects. In Panel B, we use the within-firm standard deviation, which is calculated for the residuals of a regression of the inverse coverage ratio on firm fixed effects, quarter fixed effect, and fiscal quarter fixed effects. In Panel C, we use the within-firm standard deviation net of partners' financial health, which is calculated for the residuals of a regression of the inverse coverage ratio on the partners' financial health, industry fixed effects, quarter fixed effect, and fiscal quarter fixed effects.

Table A14: Supplier bottlenecks. Different standardizations.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Within industry, time and fiscal quarter						
$x^s \times \Delta r$	-0.553*** (0.061)	-0.549*** (0.061)	-0.545*** (0.061)	-0.486*** (0.059)	-0.444*** (0.059)	-0.402*** (0.057)
$x^f \times \Delta r$		-0.125** (0.056)	-0.122** (0.056)	-0.117** (0.053)	-0.110** (0.053)	-0.117** (0.051)
$x^c \times \Delta r$					-0.191*** (0.058)	-0.166*** (0.056)
Panel B: Within firm, time and fiscal quarter						
$x^s \times \Delta r$	-0.514*** (0.056)	-0.511*** (0.057)	-0.507*** (0.057)	-0.452*** (0.055)	-0.413*** (0.055)	-0.374*** (0.053)
$x^f \times \Delta r$		-0.118** (0.052)	-0.115** (0.052)	-0.110** (0.050)	-0.103** (0.050)	-0.110** (0.048)
$x^c \times \Delta r$					-0.173*** (0.052)	-0.149*** (0.050)
Panel C: Within firm, time and fiscal quarter; net of partners' health						
$x^s \times \Delta r$	-0.509*** (0.056)	-0.506*** (0.056)	-0.502*** (0.056)	-0.448*** (0.054)	-0.409*** (0.055)	-0.370*** (0.053)
$x^f \times \Delta r$		-0.117** (0.052)	-0.115** (0.052)	-0.109** (0.050)	-0.103** (0.050)	-0.109** (0.048)
$x^c \times \Delta r$					-0.171*** (0.051)	-0.148*** (0.050)
Firm Controls		Y	Y	Y	Y	Y
Client Controls			Y	Y	Y	Y
Supplier Controls					Y	Y
MP interactions						Y

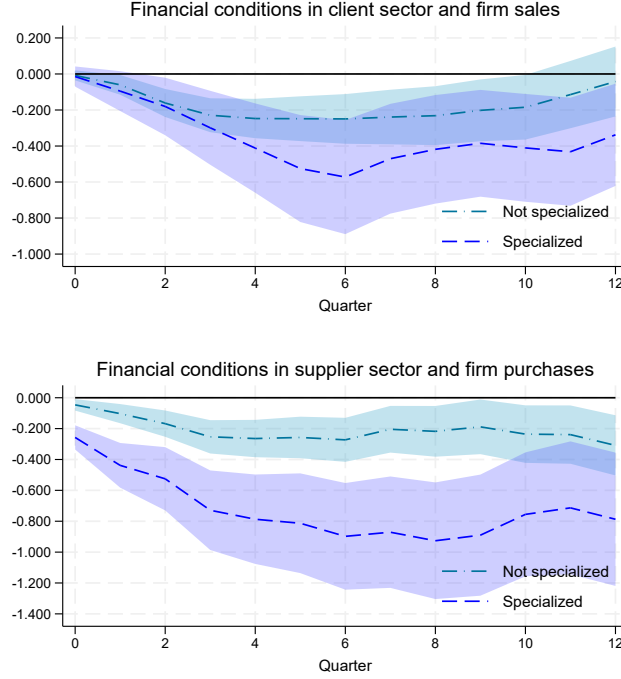
This table contains coefficient estimates for Equation 1 over a one year horizon ($h = 4$). The sample corresponds to all non-financial, non-government public firms in the US in the period 1990Q1 to 2016Q4. The dependent variable is the quarterly difference in the log of firm purchases between $t - 1$ and $t + 4$. Financial weakness is the inverse coverage ratio. Economic magnitudes correspond to the percentage change in the dependent variable for a 25 bps increase in the monetary policy rate respectively for clients, firms and suppliers with one standard deviation higher inverse coverage ratio. In Panel A, we use the within-industry standard deviation, which is calculated for the residuals of a regression of the inverse coverage ratio on industry fixed effects, quarter fixed effect, and fiscal quarter fixed effects. In Panel B, we use the within-firm standard deviation, which is calculated for the residuals of a regression of the inverse coverage ratio on firm fixed effects, quarter fixed effect, and fiscal quarter fixed effects. In Panel C, we use the within-firm standard deviation net of partners' financial health, which is calculated for the residuals of a regression of the inverse coverage ratio on the partners' financial health, industry fixed effects, quarter fixed effect, and fiscal quarter fixed effects.

Figure A1: Patents and monetary policy-induced bottlenecks.



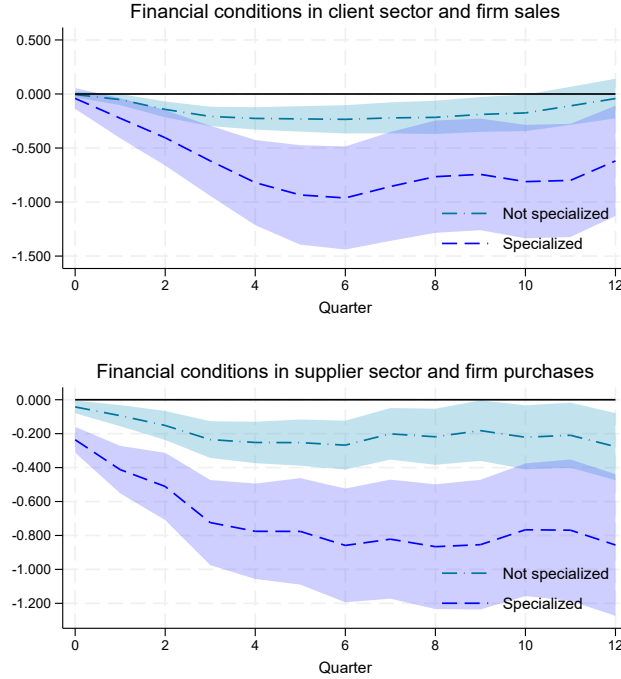
The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). Coefficients are estimated separately for firms in industries filing more (dark shading) or less (light shading) than the median number of patents. Patent counts are from Kogan et al. (2017). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h). Coefficients are estimated separately for firms buying from a larger than the median fraction of suppliers in industries filing many (dark shading) or few (light shading) patents.

Figure A2: Monetary policy-induced bottlenecks: Patent value.



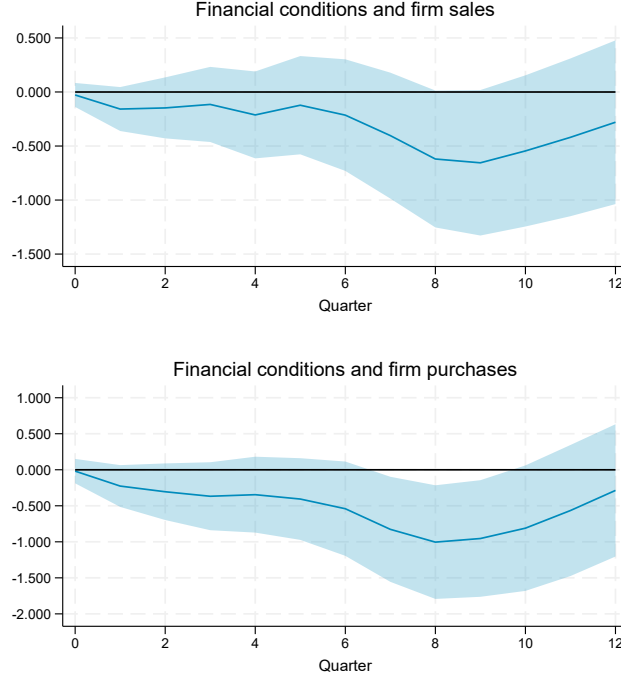
The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy rate when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). Coefficients are estimated separately for firms in industries with more than median (dark shading) or less than median (light shading) value of patents. The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial health and the monetary policy rate (β_s^h). Coefficients are estimated separately for firms buying from a larger than the median fraction of suppliers in industries with high (dark shading) or low (light shading) value of patents. C

Figure A3: Monetary policy-induced bottlenecks: Patent citations.



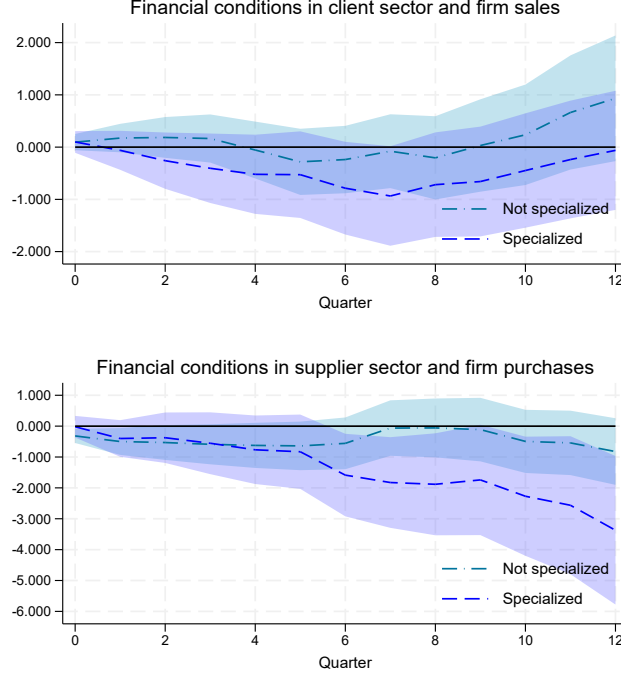
The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy rate when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). Coefficients are estimated separately for firms in industries with more than median (dark shading) or less than median (light shading) patent citations. The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial health and the monetary policy rate (β_s^h). Coefficients are estimated separately for firms buying from a larger than the median fraction of suppliers in industries with high (dark shading) or low (light shading) number of forward patent citations.

Figure A4: The balance sheet channel of transmission. Monetary policy surprises



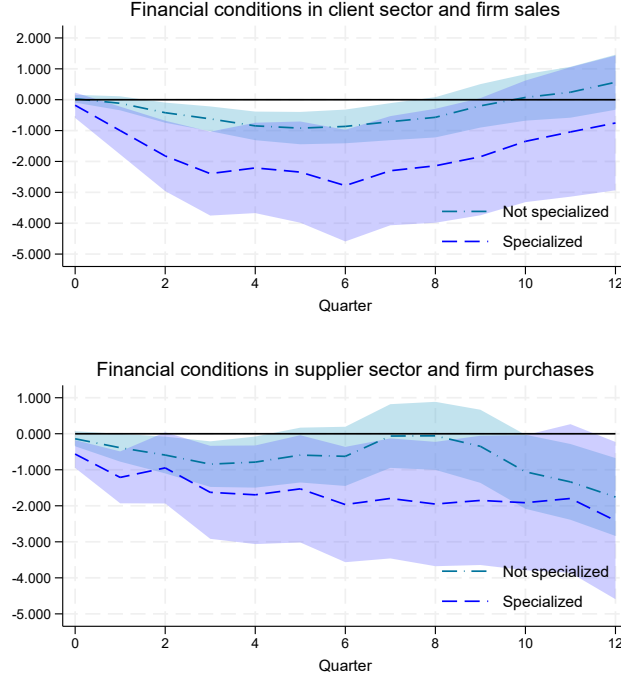
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms β_f^h in Equation 1, using monetary policy surprises (unexpected changes in the Federal Funds rate) as the measure of changes in the policy rate. Coefficients standardized to represent the effect of a 25bps point increase in the monetary policy surprise when financial conditions of clients (suppliers) are one-standard deviation larger than average, scaled by 100. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy surprise (β_s^h).

Figure A5: Monetary policy-induced bottlenecks: Specialized vs differentiated goods. Monetary surprises



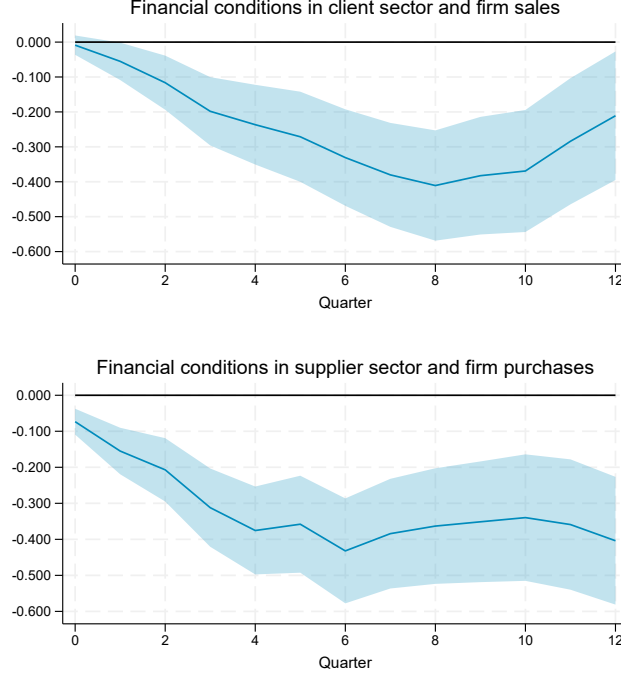
The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2, and using monetary surprises to measure changes in the policy rate. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy surprise when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). Coefficients are estimated separately for firms selling specialized (dark shading) or non-specialized (light shading) goods. The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial health and the monetary policy rate (β_s^h). Coefficients are estimated separately for firms buying from a larger than the median fraction of suppliers in industries producing specialized (dark shading) or non-specialized (light shading) goods.

Figure A6: Monetary policy-induced bottlenecks: Patents. Monetary surprises



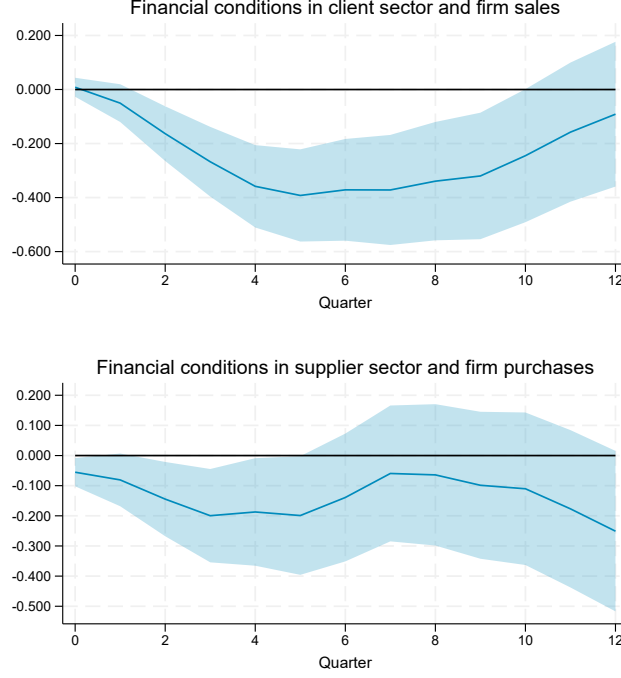
The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2, and using monetary surprises to measure changes in the policy rate. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy surprise when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). Coefficients are estimated separately for firms in industries filing more (dark shading) or less (light shading) than the median number of patents. The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial health and the monetary policy rate (β_s^h). Coefficients are estimated separately for firms buying from a larger than the median fraction of suppliers in industries filing many (dark shading) or few (light shading) patents.

Figure A7: Dynamics of bottlenecks induced by monetary policy. Contemporary monetary policy.



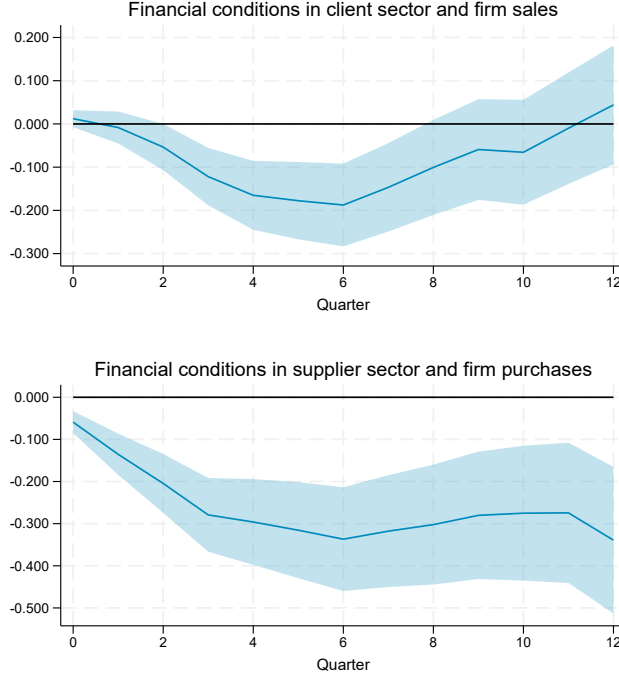
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1, with contemporary changes in the monetary policy (Δr_t). Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy rate when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h).

Figure A8: Dynamics of bottlenecks induced by monetary policy. Debt as measure of financial health



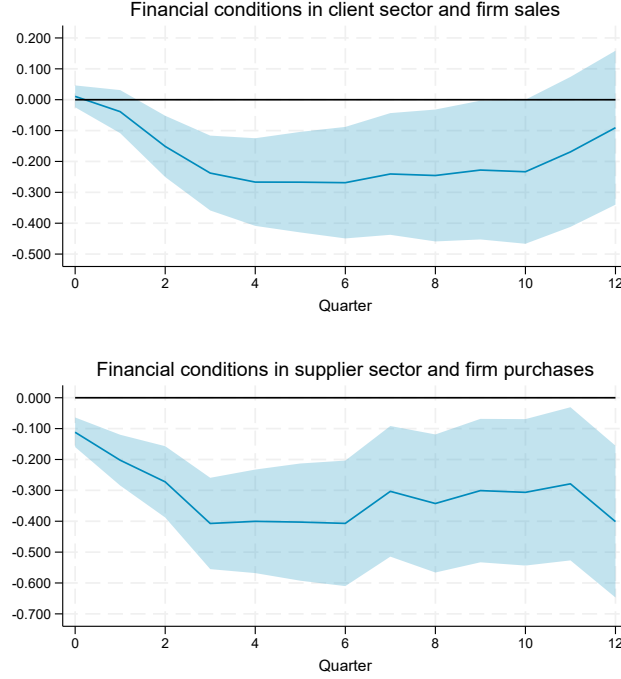
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h). Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. In both panels, financial weakness is measured using the ratio of debt to total assets.

Figure A9: Dynamics of bottlenecks induced by monetary policy. Removing firms with negative cash flows.



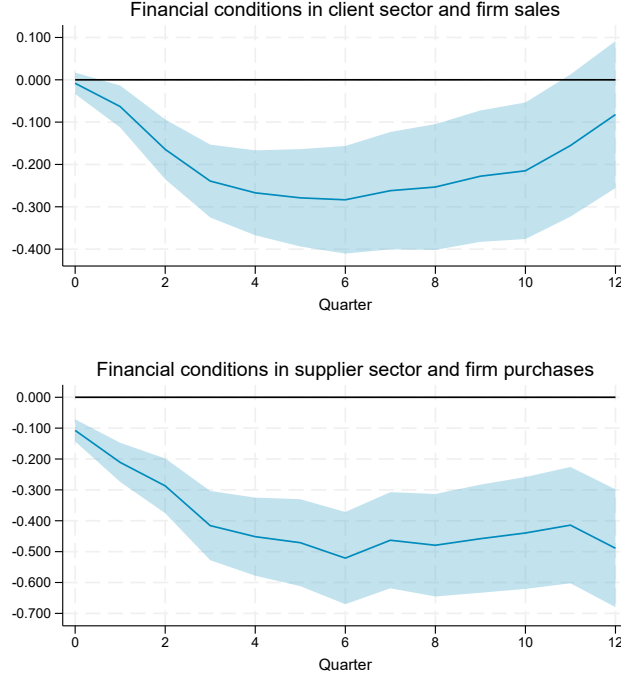
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h). In both panels, firms with negative cash flows have been removed.

Figure A10: Monetary policy bottlenecks in materials-heavy industries.



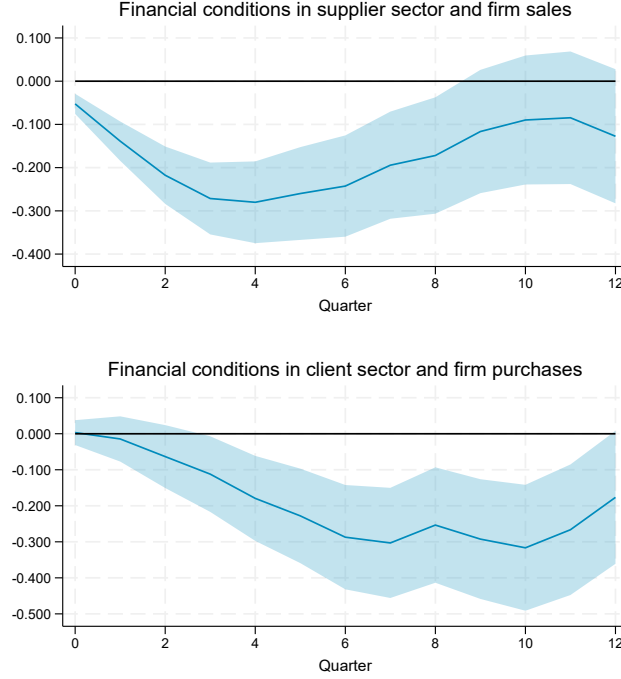
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. The sample is restricted to materials-heavy industries, defined as those industries with the ratio of capital expenditures to sales greater than the median. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h).

Figure A11: Dynamics of bottlenecks induced by monetary policy. Clustering of standard errors at industry-by-time level.



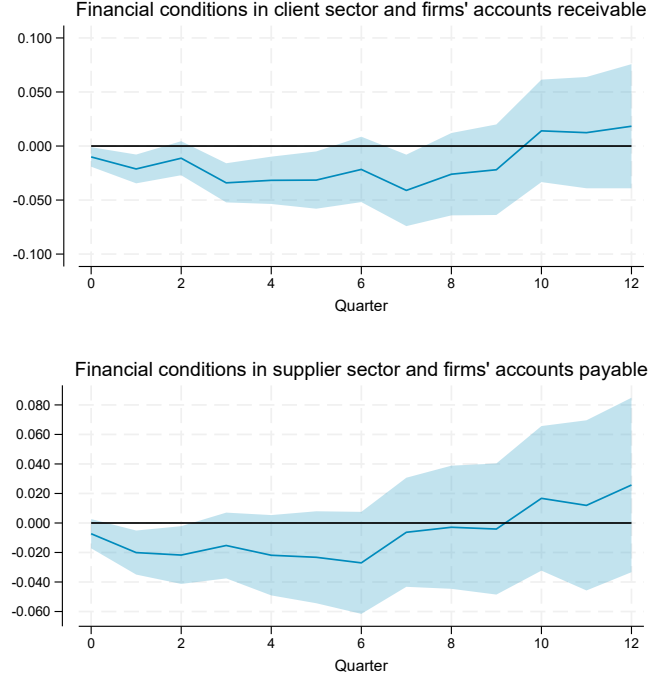
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h). Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. Standard errors are clustered at the industry-by-time level.

Figure A12: Second-order effects of monetary policy bottlenecks.



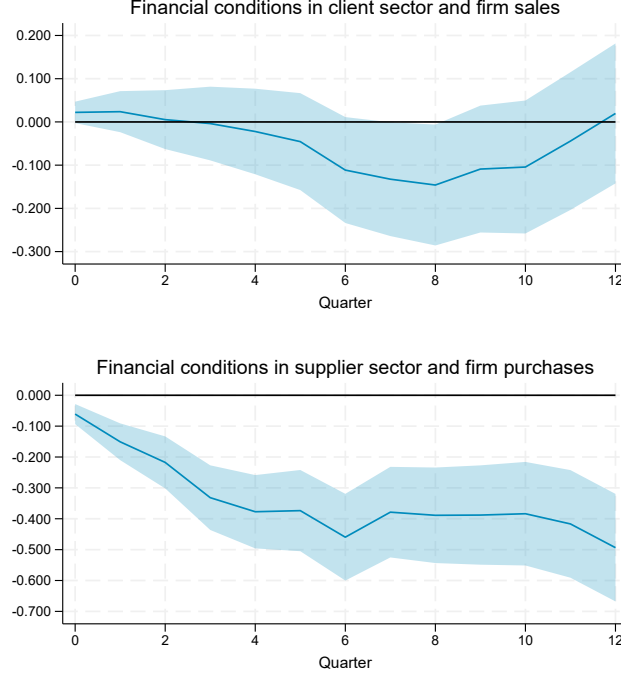
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel illustrates the dynamics of second-order effects of monetary policy-induced bottlenecks operating through constrained suppliers. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial weakness and the monetary policy rate (β_s^h). The lower panel illustrates the dynamics of second-order effects of monetary policy-induced bottlenecks operating through constrained clients. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client financial weakness and the monetary policy rate (β_c^h).

Figure A13: Client and supplier health and trade credit provision.



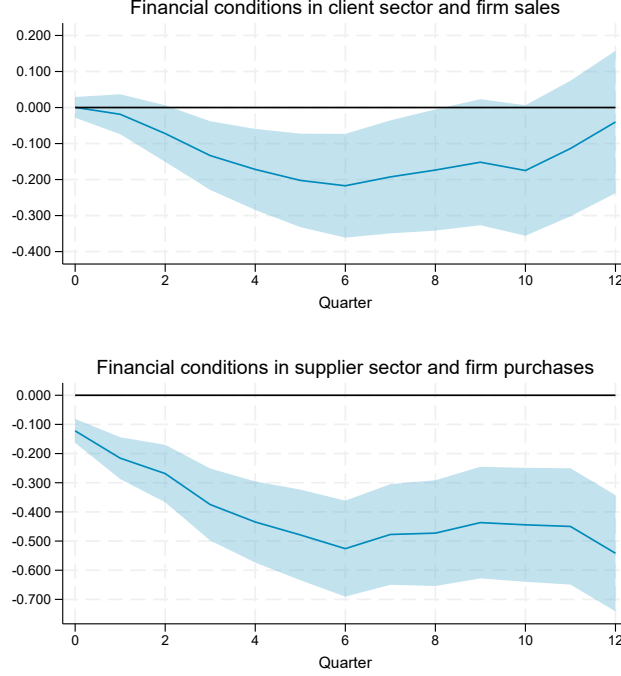
This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. In the upper panel, the dependent variable is ΔAR_{t+h} , the h -quarter difference in accounts receivable divided by lagged assets, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client financial weakness and the monetary policy rate (β_c^h). In the lower panel, the dependent variable is ΔAP_{t+h} , the h -quarter difference in accounts payable divided by lagged assets, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between suppliers' financial weakness and the monetary policy rate (β_s^h).

Figure A14: Monetary policy bottlenecks. Changes in 2-year Treasury bond rates.



This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1, using changes in 2-year Treasury bond rates as the measure of changes in the policy rate. Coefficients are standardized to represent the effect of a 25bps point increase in the 2-year Treasury bond rate when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial health and the monetary policy rate (β_s^h).

Figure A15: Dynamics of monetary policy bottlenecks, Excluding the zero lower bound period.



This figure reports the point estimate and 95% confidence intervals for the coefficient of the interaction terms in Equation 1. Coefficients are standardized to represent the effect of a 25bps point increase in the monetary policy rate when financial conditions of clients (suppliers) are one-standard deviation larger than average, expressed in percentage points. The upper panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained clients, estimated using the same specification as in column 9 of Table 2. The dependent variable is $\Delta \ln \text{sales}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between client weakness and the monetary policy rate (β_c^h). The lower panel illustrates the dynamics of monetary policy-induced bottlenecks operating through constrained suppliers, estimated using the same specification as in column 9 of Table 3. The dependent variable is $\Delta \ln \text{purch}_{i,t+h}$, $h \in \{0, \dots, 12\}$ and the plotted coefficient is the interaction between supplier financial health and the monetary policy rate (β_s^h). The sample excludes all observations in the period 1990:Q1 to 2008:Q4.