Business Inflation Exposure and Bank Lending*

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Abstract

We examine how banks adjust lending to business borrowers affected by high inflation, using U.S. credit registry data and information on input and producer price inflation. Our difference-in-difference approach reveals that firms with low inflation pass-through (those less able to pass input price increases to customers) face reduced access to bank loans and higher credit spreads during high inflation periods. Banks more exposed to such firms further curtail lending and increase spreads, particularly to low pass-through borrowers, indicating a negative effect of inflation on bank loan supply. This reduction in loan supply leads to real effects, with firms in low pass-through industries borrowing from highly exposed banks experiencing lower profitability. Our findings demonstrate the significant impact of inflation on bank lending and its subsequent effects on business performance.

Keywords: Inflation, cost pass-through, bank lending, borrower risk.
JEL Codes: E31, G21, L16

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1 Introduction

The elevated inflation levels between 2021 and 2024 affected banks' and borrowers' balance sheets through various channels with potential economic and financial implications. The most recent focus has been on the consequences to banks from changes in the value of their securities portfolios and deposit funding resulting from the high interest rates associated with inflationary pressures. However, less attention has been paid to a parallel preexisting channel, in which high inflation indirectly affects banks through the deterioration of the credit quality and profitability of their borrowers, amid their limited ability to pass through input price inflation to output prices, which is the focus of this paper. For borrowers that are better able to pass input price inflation to output prices (i.e., "high inflation pass-through" borrowers), the elevated inflation likely helps their profit margins (Bräuning *et al.*, 2023), ability to repay loans, and access to bank credit. The opposite is the case for "low inflation pass-through" borrowers, for whom inflation squeezes profit margins and erodes their debt repayment capacity.

Through its effect on borrowers' creditworthiness, inflation also affects banks differently through their exposures to borrowers from high and low pass-through industries. Banks with higher exposures to borrowers in high pass-through industries likely benefit from more resilient credit quality in their loan portfolios after higher inflation materializes. In contrast, banks more highly exposed to borrowers in low pass-through industries are likely to experience a deterioration in their credit portfolios given their borrowers' lower profitability, which may lead banks to curtail their supply of credit. The directional effect on the supply of credit of this type of banks' exposure to inflation will depend on how they adjust their loan portfolios conditional on their lending specialization (Blickle *et al.*, 2023; Giannetti and Saidi, 2018; Cortés and Strahan, 2017). Banks can either move their loan exposures away from riskier firms (Bidder *et al.*, 2021), or continue lending to sectors where they are exposed to limit potential credit losses (Agarwal *et al.*, 2020). This adjustment may also depend on the permanence of the shock, as transitory sectoral shocks may be easier for banks to withstand

compared to more permanent shocks.

Given these considerations, we formulate three research hypotheses. First, firms in low pass-through industries may pose greater risks to banks, and given these firms' lower profits and higher default risk, they have lower access to credit and encounter higher credit costs. Second, banks with greater exposure to low pass-through firms cut lending even more to such firms. Third, firms relying on banks with high exposures to inflation through low inflation pass-through borrowers perform worse than comparable firms.

Our findings validate these hypotheses. First, firms in low pass-through industries experience slower growth in loan commitments and higher loan spreads in the high inflation period. The results are largely driven by firms that, on an ex-ante basis, have non-investment grade credit ratings in 2018-2019. The mix of slower loan growth and higher spreads is consistent with a reduction in the supply of bank credit to firms in low pass-through industries.

Second, we test whether banks exposed to low pass-through borrowers curtail their supply of credit to all borrowers or only to those in low pass-through industries. We find that banks with higher ex-ante exposures to borrowers in low pass-through industries reduce lending by more to such firms—and increase credit spreads by more to all firms—during the period of high inflation that started in 2021. The results hold in the presence of borrower-time fixed effects that control for credit demand like in Khwaja and Mian (2008). The results are robust to controlling for the effect of tighter monetary policy on banks' credit supply, reflected by banks' valuation losses on security portfolios and exposure to interest rate risk through fixed rate loans, which are distinct from banks' exposures to high inflation through low pass-through borrowers. We also find that the mechanism driving the lower supply of credit is related to banks' balance sheet constraints that become more binding when high inflation erodes the asset quality of loans portfolios. Banks with higher exposures to low pass-through firms deemed these firms riskier and experienced higher delinquency rates from these borrowers. The interaction between lower asset quality and lower capital ratios pushes banks to reduce credit especially to low pass-through firms.

Third, firms with low inflation pass-through (i.e., negatively impacted by inflation) that receive loans from banks with high exposure to inflation (i.e., to low pass-through borrowers) experience relatively lower returns on assets, lower interest coverage ratios, have worse ratings, and higher utilization rates for lines of credit in the high inflation period. The finding suggests that the reduced supply of loans by banks with higher exposure to inflation generates real effects, as firms that are negatively impacted by inflation suffer lower profitability and reduced creditworthiness.

We use data from the Federal Reserve's credit registry (Y-14Q H.1. schedule) for bank loans to businesses, which we merge with U.S. Bureau of Labor Statistics (BLS) data on Input Price Index (IPI) and Producer Price Index (PPI) inflation available at the 3-digit NAICS level. The combined dataset allows us to *distinguish between borrowers in high vs. low inflation pass-through industries*—i.e., borrowers which benefited or suffered from inflation, respectively—according to whether the difference between the year-over-year PPI inflation and IPI inflation was positive or negative, respectively, on average during the high-inflation period in our sample (2021:Q1-2023:Q2). Following this approach, we define "inflation pass-through" as the difference between PPI inflation than IPI inflation at the industry level. We also *distinguish between banks with high vs. low exposures to borrowers in low pass-through industries* , according to whether the weighted average of the pass-through of each bank' commercial and industrial (C&I) borrowers was negative or positive, respectively, during the high-inflation period. The weights are based on banks' ex-ante commitments to borrowers from each industry averaged over 2018-2019. Thus, banks with high exposures to low pass-through borrowers are those with high loan concentrations to borrowers in industries that suffer from inflation, i.e., with limited ability of passing input price increases onto output prices.

We use a simple difference-in-difference approach that allows us to observe differences in bank lending between the low and high inflation periods (2018:Q1-2020:Q4 and 2021:Q1-2023:Q2) and between borrowers in high and low inflation pass-through industries, respec-

tively. First, we regress loan commitments (in log levels and growth) and loan spreads (in levels) averaged at the bank-borrower pair level on indicator variables for borrowers in low inflation pass-through industries and for quarters covering the high inflation period, as well as interactions between the two. We control for firm and bank characteristics in the presence of firm, bank, and time fixed effects. Second, we regress the same loan outcomes on a measure of banks' exposure to low pass-through borrowers (which is industry-specific depending on each borrower's industry), the indicator variable for firms' low inflation pass-through status, and interactions between the two and an indicator variable for the high inflation period (2021:Q1-2023:Q2); we still control for bank characteristics, while additionally deploying bank fixed effects, bank-borrower fixed effects, and borrower-time fixed effects to control for demand like in Khwaja and Mian (2008). Third, to asses real effects, we collapse the dataset at the firm level, and regress firms' economic outcomes on their low pass-through status, their banks' average exposure to high inflation, the high inflation period indicator variable, banks and firm controls, in the presence of bank and firm fixed effects.

Our results are subject to several important caveats. First, high inflation affects banks and firms through several other channels, in addition to the pass-through of cost inflation onto output prices, which we do not address in this paper. For instance, leveraged borrowers often benefit as high inflation reduces the real value of their debt, as shown in Brunnermeier *et al.* (2023). Our channel works in parallel and may offset the beneficial impact of inflation through this debt-inflation channel, especially for firms in low pass-through industries for which high inflation erodes profit margins.

Second, our paper attempts to disentangle the effects of high inflation from those of the related tightening of monetary policy on bank lending, while both could weaken firms' and banks' balance sheets simultaneously. For instance, a higher reliance on fixed interest rates at a time of rising interest rates may help borrowers and hurt lenders. Similarly, higher interest rates may reduce the value of banks' security portfolios and prompt bank deposit outflows to higher-yield investment opportunities that lower banks' ability to finance loans. However,

borrowing firms' ability to pass through input price inflation to output prices is likely not correlated with their leverage or reliance on variable rate loans; and banks' exposure to inflation through low pass-through borrowers is likely not correlated with their interest rate risk and the quality of their loan portfolios, which allows us to disentangle the effect of high inflation from that of confounding factors on bank lending to business borrowers.

Third, while the BLS data allow us to measure the de-facto pass-through of input price inflation on output process at the 3-digit NAICS industry level, the pass-through may vary across firms within each industry depending on firm characteristics such as market power. Robustness analysis that drops the largest firms in each industry reinforces our results.

2 Literature

Our paper is related to several streams of the literature. First, several papers study the impact of high inflation on bank intermediation. Agarwal and Baron (2024) show that the unexpected rise in U.S. inflation in the 1970s prompted banks with higher exposures to inflation to reduce the supply of lending by more than other banks, with the effect occurring through multiple channels (e.g., bank net worth, loan misallocation, and deposit outflows). The net worth effect refers to the reduction in bank lending due to banks' lower equity values, because a higher prevalence of long-term fixed rate loans resulted in lower net interest margins; the loan misallocation effect refers to banks' shifting away from long-term loans and toward inflation-protected assets; and the deposit outflows effect occurred as banks subject to regulatory ceilings on deposit rates suffered higher deposit outflows. While also focusing on a net worth-like channel, our paper uses a different bank inflation exposure measure: we focus on banks' exposures to industries whose profitability and creditworthiness were negatively affected by inflation, rather than exposure to state-level reserve requirements for Federal Reserve nonmember banks, which required these banks to hold non-interest bearing reserves. For a more recent period, Boyd *et al.* (2001) show that at low-to-moderate rates of

inflation, there is a strong negative association between inflation and lending by the financial sector to the private sector.

Looking at financial crises, Jiménez *et al.* (2022) study the paths of monetary policy and inflation around these types of events. They find a common pattern for monetary policy rates around these extreme events, that is, a low period of policy rates is followed by an increase in rates which are associated with the triggering of financial stress. In contrast, the do not find an common pattern in the behavior of inflation around financial crises. In our paper, we document that even controlling for banks' exposures to monetary policy rate changes, we observe an adjustment in bank lending albeit not to the level of triggering a financial crisis.

Second, our paper is related to the literature that studies the effect of inflation on business borrowers' balance sheets. Focusing on the debt-inflation channel through firms, Brunnermeier *et al.* (2023) show that the German inflation of 1919-1923 reduced the real debt burdens for levered borrowers, while decreasing the incidence of their bankruptcy and increasing their equity values and employment. While we also focus on the heterogeneous effect of inflation on business borrowers, we differentiate across firms according to their ability to pass-through inflation rather than according to their leverage. Furthermore, we highlight a potentially negative effect of high inflation on business borrowers' balance sheets, which is separate from and works in the opposite direction of the debt-inflation channel, since the limited ability to pass through input price inflation erodes borrowers' profitability and ability to repay loans. In this sense, our paper is more closely related to Coibion *et al.* (2020), which shows that firms' higher inflation expectations lead them to raise prices, increase demand for credit, reduce employment and capital. However, we focus on the heterogeneity in firms' ability to raise prices in the face of high inflation, and on the resulting effect on their access to bank credit, rather than their demand for credit.

Third, our paper is also related to recent literature that studies the determinants of firms' ability and willingness to pass input price inflation onto output prices. For instance, Bräuning

et al. (2023) show that that the increase in industry concentration in the United States over the past two decades explains a large part of the increase in the pass-through of cost shocks into prices, thus amplifying the inflationary pressure from supply-chain disruptions and a tight labor market. While our papers are complementary, we do not take a stance on why firms in various industries have encountered higher input price inflation since 2021 (i.e., supply chain disruptions, labor market shortages, energy price pressures, etc.) or on why they differ in their ability to pass-through input price inflation to output prices (market concentration, regulation, etc.). Instead, we examine the effects of firms' de-facto pass through of input price inflation on their access to bank credit and their cost of borrowing.

Related, Core *et al.* (2025) explore the connection between floating-rate loans, monetary polcy, and inflation. The study finds that rate increases lead to higher costs for borrowers reliant on floating-rate loans. As these costs increase, borrowers have less incentive to lower their prices as financial conditions tighten, reducing the transmission of monetary policy. In contrast to this paper, which focuses on consumer prices, we focus on the markup between input costs and producer prices. We take this markup as given and explore how banks' exposures to industries with different markups affect these banks' credit supply.

3 Data

We measure input and output price inflation as the year-over-year change in the Inputs to Industry Price Indexes (IPI) and the Producer Price Indexes (PPI) levels, with monthly data provided by the Bureau of Labor Statistics at the 3-digit NAICS level and averaged into quarters.[1] The IPI data are available mostly from December 2018 to present, and allow us to measure the average change in prices for both domestically produced and imported inputs, while it excludes capital investment and labor.

As shown in Figure 1 (panel a), both the PPI inflation (in blue) and the IPI inflation (in

[1]See Producer Price Indexes, The U.S. Bureau of Labor Statistics, "PPI Databases" and "A new BLS satellite series: inputs to industry price indexes".

red) picked up in 2021, with the IPI initially exceeding the PPI (in red and blue, respectively). The PPI subsequently caught up, as firms in some industries eventually passed-though IPI inflation pressures into PPI inflation, boosting their profit margins. In Figure 1 (panel b), both IPI and PPI inflation have varied substantially across industries. The summary of high and low inflation pass-through industries is in the Appendix Table A1.

[Figure 1 about here]

We define the high vs. low inflation pass-through industries according to whether the difference between PPI inflation and IPI inflation averaged for the high-inflation period (2021:Q1-2023:Q1) is positive or negative, as shown in Figure 2. Industries with positive pass-through on average have had higher PPI inflation than IPI inflation, i.e., they are relatively better able to pass through the input price increases into output prices. On the contrary, industries with negative pass-through were less able to transfer input price increases onto output prices charged to customers.

[Figure 2 about here]

We measure bank lending, loan spreads, and firm characteristics from the Federal Reserve Y-14Q H.1. schedule on C&I loans, which we merge with the BLS data at the 3-digit NAICS industry and quarter level. As shown in Table 1, there is considerable variation in the number of high/low pass-through industries and the volume of loans corresponding to each industry in recent years.

[Table 1 about here]

Figure 3 shows "binscatter" least squares regression of the year-over-year growth rates of existing bank loans to firms on indicator variables for the borrowers' high and low inflation pass-through industries, as well as bank fixed effects and firm controls during 2019:Q4-2023:Q1. It shows that on average, the growth rates of existing loans did not differ notably

across borrowing firms in high and low pass-through industries in the low inflation period (before 2021:Q1). However, the growth of loans to firms in high-pass through industries was higher than for firms in low pass-through industries in the high inflation period (starting in 2021:Q1). The pattern is consistent with our hypothesis that firms that benefited from inflation were better able to retain access to bank credit that firms in low-inflation industries. Importantly, the regression analysis in the following sections will disentangle for the roles of supply and demand in driving these patterns.

[Figure 3 about here]

4 Results

4.1 Firms' exposure to inflation and access to bank credit

To test our hypotheses, we use a standard difference-in-difference approach. We start by assessing whether firms with low pass-through of input price inflation into output prices experience different lending conditions after the increase in inflation in 2021.

Our first regression specification is as follows:

$$\begin{aligned} Y_{fbt} = {} & \beta_1 \, Low\ pass\ through_f + \beta_2 \, Low\ pass\ through_f \times Post\ 2021_t + \\ & + \beta_3 \, Firm\ controls_{ft} + \beta_4 \, Firm\ controls_{ft} \times Post\ 2021_t + \\ & + \beta_3 \, Bank\ controls_{bt} + \beta_4 \, Bank\ controls_{bt} \times Post\ 2021_t + \\ & + \delta_{ft} + \gamma_b + \gamma_{bf} + \epsilon_{fbt}, \end{aligned} \tag{1}$$

where f denotes a firm, b is a bank, and t is a year-quarter for the sample period from 2018:Q1 to 2023:Q2. The dependent variable measures the year-over-year growth in existing loan commitments (in percentage points), or alternatively, the level of loan spreads (in percentage points) averaged at the bank-firm pair level. Among the explanatory variables, $Low\ pass\ through_f$ equals one for firms in industries in which the inflation pass-through

defined as the differential between the producer price index (PPI) inflation and the input price index (IPI) inflation is negative, i.e., $PPI\ inflation - IPI\ inflation < 0$, and zero otherwise. $Post\ 2021_t$ is an indicator variable equal to unit for the sample period of high inflation starting in 2021:Q1 and zero otherwise. We control for firm characteristics such as sales growth, the prevalence of secured loans, and cash holdings in total assets; and bank characteristics such as the four-quarter lagged CET1 capital ratio, the share of core deposits in total assets, and return on assets. In addition, we deploy fixed effects for firms, banks, and year-quarter, and cluster the standard errors at the industry-time level.

In Tables 2 and 3, the coefficient of interest is β_2 for the interaction $Low\ pass\ through_f \times Post\ 2021_t$. The results show firms with low inflation pass-through experienced lower growth in loan commitments and higher loan spreads in the high inflation period. The results are driven by firms that ex-ante had non-investment grade status in 2018/2019, measured before the COVID-19 pandemic and the period of high inflation starting in 2021. In Table 2, column (2), the results show that non-investment grade firms in low pass-through industries encountered a 0.867 percent lower growth in loan commitments during the high inflation period, which is economically significant relative to the sample mean of 1.22 percent loan growth during the sample period. Similarly, in Table 3, column (2), non-investment grade firms in low pass-through industries encountered 20 basis points higher loan spreads in the high inflation period, which is economically significant relative to the sample average of 1.65 percent in loan spreads.

[Table 2 around here]

[Table 3 around here]

The mix of slower loan growth and higher loan spreads (i.e., a reduction in quantities coinciding with an increase in prices) is consistent with a reduction in the supply of bank credit to firms in low pass-through industries during the high inflation period. To strengthen the interpretation of these results as a supply effect, the next sub-section will deploy bank-

borrower fixed effects while studying the effect of bank-level exposures to inflation through low pass-through borrowers.

Importantly, the results are not driven by pre-existing trends in the riskiness of low pass-through firms. The low pass-through firms—which experienced an erosion in profit margins and reduced access to bank loans due to limited pass through of input price inflation to output prices after 2021:Q1—were less risky before the high inflation episode, as shown by their better credit ratings and larger asset size measured ex-ante (Figure 4, panels a and b).

[Figure 4 around here]

In addition to loan growth and loan spreads, we also examine the impact of firms' exposure to inflation and their loan utilization rates (as a fraction of existing commitments), the prevalence of collateralized loans, and the nature of collateral. In the Appendix Table A.2, the results show that low inflation pass-through firms increased their loan utilization rate during the high inflation period. The results are stronger for small, non-investment grate firms. The increased utilization rate that coincided with the reduction in loan commitments highlights the contrast between the demand for and the supply of bank credit for low pass-through firms during high inflation.

In Appendix Table A.3, the results also show that low inflation pass-through, non-investment grade firms were more likely to post collateral in the high inflation period, mostly in the form of cash and marketable securities rather than fixed assets and real estate, which is also consistent with reduced supply through tighter lending terms during high inflation.

4.2 Banks' and firms' exposure to inflation and the supply of credit

To test our second hypothesis, whether banks more exposed to inflation through low pass-through borrowers curtail their lending by more in the high inflation period, we need to first

define a measure of bank exposure to these types of borrowers. We measure banks' exposure to inflation through their low pass-through borrowers for a firm from industry i as follows:

$$Bank\ Inflation\ Exposure_{bi} = -\sum_{j \neq i} \underbrace{\frac{Commitment_{bj}}{Commitment_b}}_{\text{Pre-inflation period 2018-19}} \underbrace{\overline{(PPI\ inflation_j - IPI\ inflation_j)}}_{\text{Inflation period 2021-onward}}, \tag{2}$$

were the first term ($\frac{Commitment_{bj}}{Commitment_b}$) is the average share of bank b's loan commitments to industry j in the bank's total commitments measured over 2018-2019; the second term ($\overline{PPI\ inflation_j - IPI\ inflation_j}$) is the average pass-through in each industry j to which the bank is exposured, measured during the high inflation period (2021:Q1-2023:Q2). The summation excludes the bank's exposure to each borrower's own industry i, an approach which is meant to alleviate any potential concerns about this measure capturing changes in the demand for credit arising from industries where a bank is specialized (Giannetti and Saidi, 2018). Thus, a bank's exposure to inflation depends on the average inflation pass-through of all industries in its loan portfolio (other than the borrower's own industry) weighted by the ex-ante shares of loan commitments to these industries. The negative sign ensures that banks with larger loan portfolio shares committed to firms in low pass-through industries (i.e., low $\overline{PPI\ inflation_i - IPI\ inflation_i}$) have higher values for $Bank\ Inflation\ Exposure_{bm}$.

We use the following difference-in-difference regression specification to examine the effect of banks' exposure to inflation on their supply of credit and credit terms to firms:

$$\begin{aligned} Y_{fbt} = {} & \beta_1\ Bank\ Inflation\ Exposure_{bi} \times Post\ 2021_t + \\ & + \beta_2\ Bank\ Inflation\ Exposure_{bi} + \\ & + \beta_3\ Bank\ controls_{bt} + \beta_4\ Bank\ controls_{bt} \times Post\ 2021_t + \delta_{ft} + \gamma_b + \theta_{bf} + \epsilon_{fbt}, \end{aligned} \tag{3}$$

where the dependent variable is, in alternative specifications, the log-level of average loan commitments, the cumulative growth of average loan commitments, or the average loan spread from bank b to borrowing firm f in year-quarter t, with the credit registry data aggre-

gated at the bank-borrower pair level.[2] Among explanatory variables, $Bank\ Inflation\ Exposure_{bi}$ measures bank b's exposure to low inflation pass-through, which depends on the distribution of its loan portfolio across all industries other borrower f's industry i, as defined above. We control for time-varying bank characteristics such as the four-quarter lagged CET1 capital ratio, the share of core deposits in total assets, and return on assets. Importantly, we include firm-time fixed effects to control for firm-level demand, thus omitting time-varying firm characteristics from the set of explanatory variables, and also include bank and bank-firm fixed effects.

In addition, to examine whether the effect of banks' exposure to inflation on their supply of credit and credit terms differed across low and high inflation pass-through firms in the high-inflation period, we use a modified version of specification (4) by adding a triple interaction with borrowing firms' inflation pass-through status:

$$\begin{aligned} Y_{fbt} = {} & \beta_1\ Bank\ Inflation\ Exposure_{bi} \times Post\ 2021_t + \\ & + \beta_2\ Bank\ Inflation\ Exposure_{bi} \times Post\ 2021_t \times Low\ pass\ through_f + \\ & + \beta_3\ Low\ pass\ through_f \times Post\ 2021_t + \beta_4\ Low\ pass\ through_f \times Bank\ Inflation\ Exposure_{bi} + \\ & + \beta_5\ Bank\ Inflation\ Exposure_{bi} + \beta_6\ Low\ pass\ through_f + \\ & + \beta_7\ Bank\ controls_{bt} + \beta_8\ Bank\ controls_{bt} \times Post\ 2021_t + \delta_{ft} + \gamma_b + \theta_{bf} + \epsilon_{fbt}, \end{aligned} \tag{4}$$

in which $Low\ pass\ through_f$ for firm f and $Post\ 2021_t$ for year-quarter t are as defined as in section 4.1.

In Table 4, the coefficients of interest are β_1 and β_2 for the double and triple interactions $Bank\ Inflation\ Exposure_{bi} \times Post\ 2021_t$ and $Bank\ Inflation\ Exposure_{bi} \times Low\ pass\ through_f \times Post\ 2021_t$, respectively. The results in columns (1), (3), and (5) suggest that banks with high exposure to inflation reduced loan commitments and increased

[2]The cumulative growth of average loan commitments is measured relative to the start date of each bank-firm relation in the Y-14Q panel.

loan spreads by more in the high inflation period. In columns (2) and (4), the results with the added triple interaction suggest that banks with high exposure to inflation reduced loan commitments mostly to firms in low pass-through industries, rather than to all firms. However, as seen in column (6), the exposed banks increased loan spreads to all firms, and especially to firms in low pass-through industries in the high inflation period. In all specifications, the bank fixed effects capture firm-level demand, i.e., the same low pass-through firm received lower loan commitments and paid higher spreads to a bank with higher inflation exposure than to a bank with lower inflation exposure.[3]

[Table 4 around here]

We run a battery of robustness checks to bolster our main results. First, in Table 5, the results hold for firms of all sizes within each industry, showing that our main findings are not driven exclusively by the larger firms with pricing power, and thus the industry-level pass-through measure is also relevant for the smaller firms within each industry.

[Table 5 around here]

Second, in Table 6, we find similar results for firms in high and low concentration industries. The finding alleviates concerns of omitted variable bias, whereby high industry concentration could boost both pass-through and firms' access to bank loans.

[Table 6 around here]

Third, in Table 7, we find similar results for firms in low and high tangibility industries. The findings addresses concerns about a different type of omitted variable bias, whereby high industry tangibility could affect both pass-through and access to bank loans: On one hand, high industry tangibility could imply a greater need to update physical capital and hence

[3]While the measure of $Bank\ Inflation\ Exposure_{bi}$ is constant over time (i.e., it is computed as the average pass-through in 2021-2023 weighted with pre-inflation commitments from 2018-19), it is industry-specific (as it drops the borrower's own industry), which allows to identify the bank fixed effects.

greater exposure to input price inflation, which could affect the degree of pass-through. At the same time, high industry tangibility could also imply a greater availability of collateral for bank loans.

[Table 7 around here]

Fourth, Table 8 suggests the results for loan amounts are mostly driven by banks' and firms' exposure to high input price inflation (panel B). Meanwhile, the results for spreads are driven by banks' and firms' exposure to either high input price or low output price inflation.

[Table 8 around here]

Fifth, Table 9 shows results for the specifications in equations 3 and 4, estimated separately for credit lines and term loans. The results suggest that banks with higher exposures to inflation cut lending in the form of both credit lines and terms loans (columns 1 and 3), specifically to low pass-through firms (columns 2 and 4). The magnitude of coefficient estimates suggests that banks cut credit to low pass-through firms by more for term loans than for credit lines (columns 2 and 4, comparing the triple interaction coefficients across panels a and b), possibly reflecting the fact that term loans are more likely to remain on banks' balance sheets. In columns 5 and 6, the results suggest that banks with higher exposures to inflation increased loan spreads for credit lines (but not term loans) to all firms, by more to the low than to the high pass-through firms.

[Table 9 around here]

Finally, Table 10 tests the robustness of previous results from Table 4 to adding controls for the effects of monetary policy tightening on bank credit and terms. Using specification 4, we add measures for banks' $Security\ Loss\ Exposure_b$ and $Fixed\ Rate\ Loan\ Exposure_b$, both in levels and interacted with $Post\ 2021_t$ and $Low\ pass\ through_f$. We compute $Security\ Loss\ Exposure_b$ as the difference between the fair value and the amortized cost of

each banks' security holdings normalized by the amortized cost, measured over 2018-2020. Similarly, $Fixed\ Rate\ Loan\ Exposure_b$ measured the banks' average share of fixed rate loans in total loan commitments over 2018-2020. Both measures capture banks' interest rate risk and the possible impact of monetary policy tightening during 2022-2023 on banks. A more negative value for $Security\ Loss\ Exposure_b$ suggests valuation losses during the earlier monetary tightening episode that peaked in 2018, which would be indicative for the valuation losses in 2022-2023 to the extent that the cross-sectional variation in the size of banks' security portfolios was preserved over time. A higher value for $Fixed\ Rate\ Loan\ Exposure_b$ reflects interest rate risk for banks, as their net interest income would sufffer during monetary tightening due to the slow repricing of fixed rate loan portfolios.

The main results remain robust to the addition of controls for the effects of monetary policy. In Table 10, the results confirm that banks cut loan commitments to low pass-through firms (columns 1-6) and increased loan spreads to all firms (columns 7-9). At the same time, the coefficients on the controls for monetary policy effects are intuitive. For instance, for $Security\ Loss\ Exposure_b \times Post$ 2021, the positive coefficient on commitments and negative coefficient on spreads suggest that banks with potential valuation losses on their security portfolios cut loan commitments and increased spreads by more.

[Table 10 around here]

4.3 Mechanisms

A key question that follows up from these results, is what mechanism leads banks to decrease credit to affected borrowers. The most straightforward explanation is that low-pass through borrowers become riskier as inflation increases, and that this risk becomes more important for banks that are more materially exposed to them. In this section, we explore this mechanism and the role that capital constrains may play in amplifying the shock to these borrowers for exposed banks.

In Table 11, we present results from a specification similar to equation 4, but where we use various measures for borrowers' riskiness as dependent variables. In particular, we use information on banks internal measures of probabilities of defaults and ratings, and a couple of measures of loan performance (e.g., past due loans relative to total loans and allowances for loan losses relative to total loans).

The results in the table show that banks exposed to inflation experienced a more pronounced deterioration in asset quality, especially for their loans to low pass-through firms, as shown by higher probabilities of default and worse credit ratings for these firms. This deterioration may have forced these banks to curtail lending to these borrowers and request higher compensation for their risk.

[Table 11 around here]

Next we explore whether banks with lower capital ratios adjusted their credit supply more, as a result of a deterioration of their borrower's creditworthiness. On the one hand, banks with low capital focused on managing risks may move away from riskier borrowers to minimize any potential losses. On the other hand, pulling credit from these borrowers may create unintended consequences, as these borrowers may have to default as a result of their poor performance. In Table 12, we proceed to test this conjectures by estimating a version of equation 4, but adding a quadruple interaction term with an indicator variable equal to 1 if a bank has a "low" capital ratio prior to the surge in inflation in 2022.

We find that bank with low capital ratios reduce their lending to low pass-thorough firms by more than banks with hiher capital ratios. This suggests that more capital constrained banks were less able to sustain a deterioration in asset quality coming from these borrowers, which force them to cut loan commitments by more.

[Table 12 around here]

4.4 Real effects

To examine the potential for real effects arising from the reduction in loan commitments by banks with high inflation exposure, we collapse the panel dataset by taking averages at the firm level. We use a regression specification with the triple interactions from equation 4, in section 4.2, in which the $Average\ Bank\ Inflation\ Exposure_f$ measure becomes firm specific by taking the weighted average of banks' exposures to inflation across all banks with loan commitments to a given firm f, using the size of existing loan commitments as weights. We include firm and bank controls (with the latter computed as a weighted average across all banks for a given firm f). We also include firm and time fixed effects.

In alternative specifications, the dependent variable captures time-varying firm characteristics such as loan utilization, interest coverage ratios, credit ratings (higher values show a worse credit rating), return on assets, cash holdings (normalized by assets), leverage (debt/assets), and capital expenditures (normalized by assets).

The results in Table 13 suggest that the reduction in loan supply suffered by low pass-through firms relying on banks with high inflation exposure resulted in real effects. Thus, firms with low inflation pass-through borrowing from banks with high exposure to inflation had a higher utilized amounts on credit lines, experienced lower interest coverage ratios, and worse credit ratings in the high inflation period. They also suffered from lower profitability as reflected by return on assets and invested less, suggesting that the reduction in credit by banks exposed to inflation had real effects on the low pass-through firms.

[Table 13 around here]

5 Conclusions

We find that firms and banks' exposures to inflation have affected bank lending during the high inflation period since 2021 through a novel channel. Riskier firms with higher exposure to inflation experience reduced access to bank credit and higher credit spreads in the high

inflation period. Furthermore, we find that banks' exposure to inflation further exacerbates the effect of high inflation on lending volumes and spreads to firms in low-inflation pass through industries, as banks with higher exposure to inflation curtailed lending and increased spreads to such firms by more, which is consistent with a supply effect. Finally, we find that the reduction in loan supply results in real effects, as firms with low inflation pass-through borrowing from banks with high exposure to inflation experienced a deterioration in their financial results, lower profitability, and lower investment.

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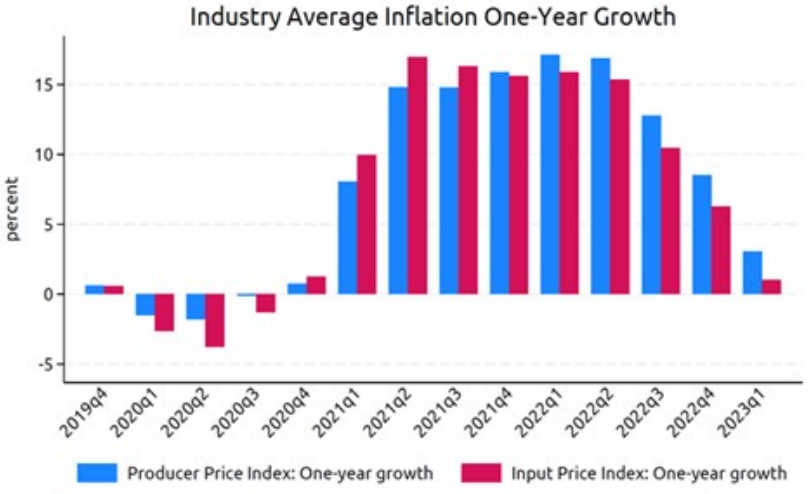
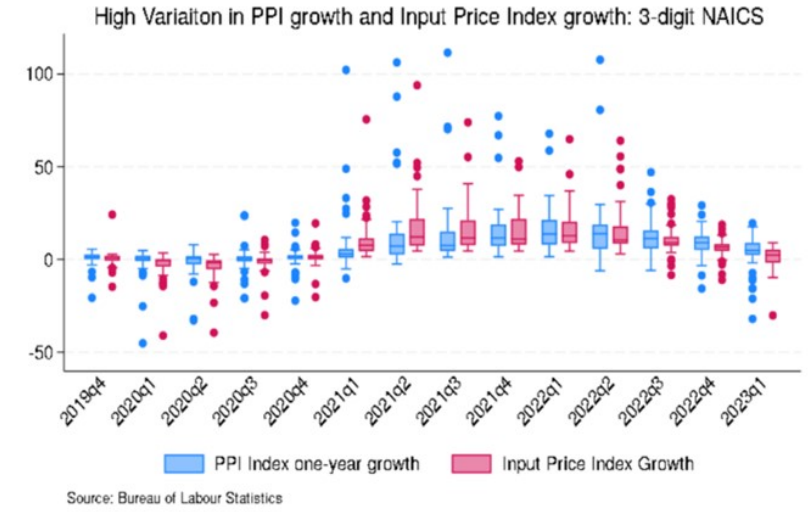
A Figures and Tables

Figure 1: Input Price and Producer Price Inflation across Industries

Panel (a)

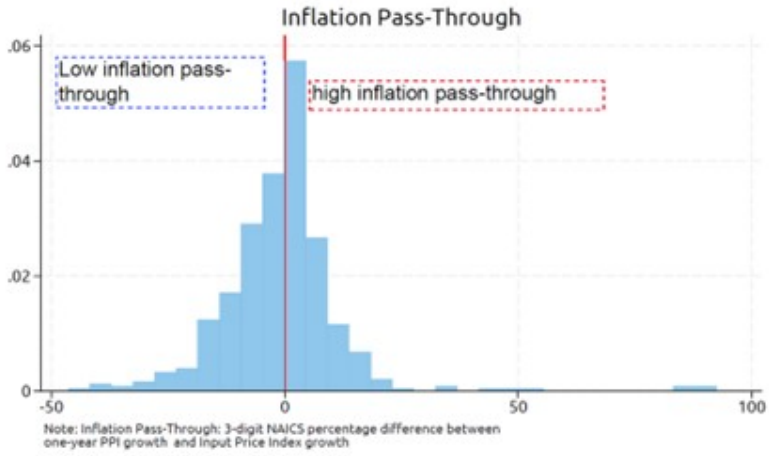


Panel (b)



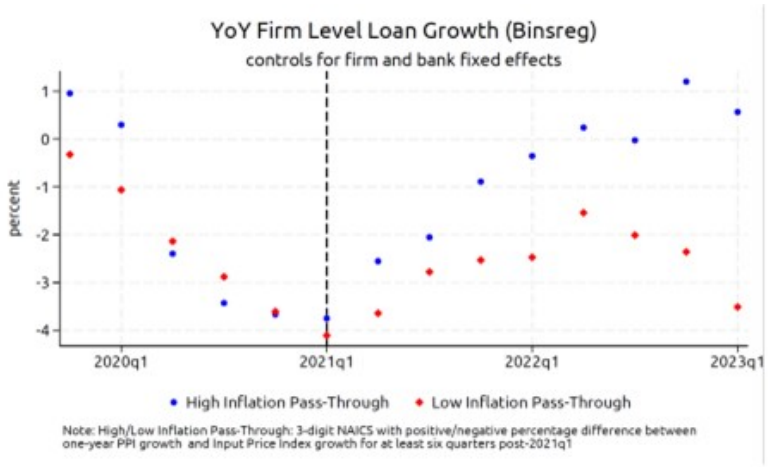
Note: We measure input and output price inflation as the year-over-year change in the Inputs to Industry Price Indexes (IPI) and the Producer Price Indexes (PPI) levels, with monthly data provided by the Bureau of Labor Statistics at the 3-digit NAICS level and averaged into quarters. Both the PPI inflation (in blue) and the IPI inflation (in red) picked up in 2021, with the IPI initially exceeding the PPI (in red and blue, respectively). The PPI subsequently caught up, as firms in some industries eventually passed-though IPI inflation pressures into PPI inflation. In Figure 1 (panel b), both IPI and PPI inflation have varied substantially across industries.

Figure 2: The distribution of inflation pass-through across industries



Note: We define high vs. low inflation pass-through industries according to whether the difference between PPI inflation and IPI inflation averaged for the high-inflation period (2021:Q1-2023:Q1) is positive or negative. Industries with positive pass-through on average have had higher PPI inflation than IPI inflation, i.e., they were better able to pass-through the input price increases into output prices. On the contrary, industries with negative pass-through were less able to transfer input price increases onto output prices charged to customers.

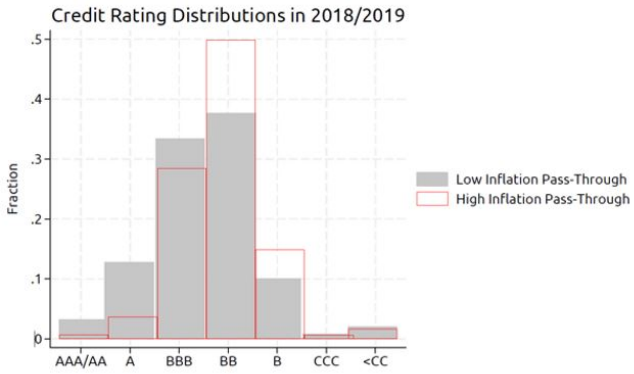
Figure 3: Inflation pass-through and the growth of loan commitments



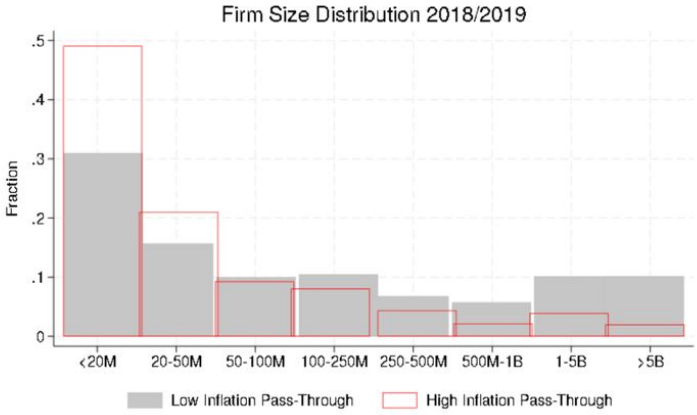
Note: Note: The figure shows "binscatter" least squares regression of year-over-year growth rates in existing bank loan commitments on indicator variables for borrowers' high and low inflation pass-through industries, as well as bank fixed effects and firm controls during 2019:Q4-2023:Q1. It shows that on average, the growth loan commitments did not differ notably across borrowing firms in high and low pass-through industries in the low inflation period (before 2021:Q1). However, the growth of loan commitments to firms in high-pass through industries was higher than for firms in low pass-through industries in the high inflation period (starting in 2021:Q1).

Figure 4: Firm characteristics and inflation pass-through

Panel (a) Credit ratings



Panel (b) Asset size



Note: The chart shows that low pass-through firms—which experienced an erosion in profit margins and reduced access to bank loans due to limited pass through of input price inflation to output prices after 2021:Q1—were less risky before the high inflation episode, as shown by their better credit ratings and larger asset size measured on average during 2018-2019 from Y-14Q Schedule H.1 data.

Table 1: High/low inflation pass-through industries and lending volumes

Note: This table shows the total volumes of loan commitments from the Federal Reserve Y-14Q schedule H.1 on C&I loans, which we merge with the BLS data on IPI and PPI inflation at the 3-digit NAICS industry and quarter level. As shown in the table, there was considerable variation in the number of high/low pass-through industries and the volume of loans corresponding to each industry in recent years.

	(1)	(2)	(3)	(4)
		Total volume of commitments (USD bn)		
	Number of industries	**2018:Q1**	**2021:Q1**	**2023:Q1**
Industries with inflation data	40	1,078	1,262	1,362
High pass-though industries	21	512	605	667
Low pass-though industries	19	566	657	694
All industries		1,730	2,071	2,192

Table 2: Firms' exposure to inflation and firm-bank growth in loan commitments

Notes: The table shows results from difference-in-difference regressions like in equation (1), while differentiating across borrowers in low and high inflation pass-through industries across low and high inflation periods (2018:Q1-2020:Q4 and 2021:Q1-2023:Q2, respectively). We regress the growth in loan commitments (year over year, in percentage points) averaged at the bank-borrower pair level on an indicator variable for borrowers in low inflation pass-through industries ("Low Pass-through Firm"), both in levels and interacted with an indicator variable for quarters covering the high inflation period ("Post 2021"). We control for firm and bank characteristics, and deploy firm-time, bank, and bank-time fixed effects. Standard errors are clustered at the industry-time level in all specifications. For the sample splits by investment grade (IG) and non-IG ratings, the credit ratings represent 2018-2019 firm-level averages. Significance: *** 1%, **5%, *10%.

	(1)	(2)	(3)
Dependent variable:	**Firm-bank loan growth**		
	All firms	**Non-IG firms**	**IG firms**
Low Pass-through Firm	-0.146	-0.146	-0.345
	(0.409)	(0.509)	(0.520)
Low Pass-through Firm × Post 2021	-0.543*	-0.867**	0.292
	(0.328)	(0.387)	(0.362)
Observations	539,236	358,762	180,474
R-squared	0.16	0.17	0.13
Bank controls	Yes	Yes	Yes
Bank controls × Post 2021	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Firm controls × Post 2021	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes
FE bank	Yes	Yes	Yes
FE bank × time	Yes	Yes	Yes

Table 3: Firms' exposure to inflation and firm-bank loan spread changes

Notes: The table shows results from difference-in-difference regressions like in equation (1), while differentiating across borrowers in low and high inflation pass-through industries across low and high inflation periods (2018:Q1-2020:Q4 and 2021:Q1-2023:Q2, respectively). We regress the level of loan spreads (in percentage points) averaged at the bank-borrower pair level on an indicator variable for borrowers in low inflation pass-through industries ("Low Pass-through Firm"), both in levels and interacted with an indicator variable for quarters covering the high inflation period ("Post 2021"). We control for firm and bank characteristics, and deploy firm-time, bank, and bank-time fixed effects. Standard errors are clustered at the industry-time level in all specifications. For the sample splits by investment grade (IG) and non-IG ratings, the credit ratings represent 2018-2019 firm-level averages. Significance: *** 1%, **5%, *10%.

	(1)	(2)	(3)
Dependent variable:		**Firm-bank loan spread**	
	All firms	**Non-IG firms**	**IG firms**
Low Pass-through Firm	-0.050***	-0.087***	0.015
	(0.018)	(0.022)	(0.017)
Low Pass-through Firm × Post 2021	0.154***	0.205***	0.074***
	(0.026)	(0.028)	(0.026)
Observations	465,926	303,928	161,998
R-squared	0.68	0.64	0.68
Bank controls	Yes	Yes	Yes
Bank controls × Post 2021	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes
Firm controls × Post 2021	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes
FE bank	Yes	Yes	Yes
FE bank × time	Yes	Yes	Yes

Table 4: Firms' and banks' exposure to inflation: effect on loan commitments and spreads

Notes: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2). The dataset is collapsed at the bank-borrower pair level. The cumulative growth of loan commitments is computed relative to the first quarter of each bank-firm relation. Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	**log(Commitments)**		**gr(Commitments)**		**Loan Spreads**	
Bank Inflation Exposure × Post 2021	-0.011***	0.004	-0.017***	0.003	0.029***	0.013**
	(0.002)	(0.003)	(0.004)	(0.006)	(0.005)	(0.007)
Bank Inflation Exposure × Post 2021		-0.026***		-0.034***		0.030***
× Low Pass-through Firm		(0.004)		(0.007)		(0.009)
Uninsured Deposits Ratio	-0.205***	-0.204***	-0.307***	-0.306***	-0.480***	-0.481***
	(0.038)	(0.038)	(0.067)	(0.067)	(0.064)	(0.063)
Uninsured Deposits Ratio × Post 2021	-0.061**	-0.064**	-0.074*	-0.079*	0.320***	0.322***
	(0.026)	(0.026)	(0.045)	(0.045)	(0.042)	(0.042)
CET1 Ratio (4 lags)	0.004**	0.003**	0.005	0.004	-0.044***	-0.044***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
CET1 Ratio × Post 2021	-0.007***	-0.006***	-0.015***	-0.015***	0.054***	0.053***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)
ROA (4 lags)	0.002	0.001	-0.003	-0.004	0.011*	0.011*
	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)	(0.006)
"ROA × Post 2021 "	0.004	0.005	0.016***	0.017***	-0.027***	-0.028***
	(0.004)	(0.004)	(0.006)	(0.006)	(0.007)	(0.007)
Log(Assets)	0.168***	0.168***	0.335***	0.334***	0.066***	0.065***
	(0.015)	(0.015)	(0.030)	(0.030)	(0.017)	(0.017)
Log(Assets) × Post 2021	-0.005**	-0.005***	-0.004	-0.004	-0.033***	-0.033***
	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	327,093	327,093	327,098	327,098	248,906	248,906
R-squared	0.95	0.95	0.83	0.83	0.90	0.90
Bank controls ## Post 2021	Yes	Yes	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes	Yes	Yes
FE bank × firm	Yes	Yes	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Firms' and banks' exposure to inflation: effect on loan commitments and spreads, by firm size within industries

Notes: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2). The dataset is collapsed at the bank-borrower pair level, and the results are split by firm size within each industry. The cumulative growth of loan commitments is computed relative to the first quarter of each bank-firm relation. Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

	(1)	(2)	(3)	(4)	(5)	(6)
	Top 25 asset size firms			**Bottom 75 asset size firms**		
Dependent variable:	**log(Comm)**	**gr(Comm)**	**Spread**	**log(Comm)**	**gr(Comm)**	**Spread**
Bank Inflation Exposure × Post 2021	-0.016**	-0.043***	0.051***	0.015***	0.031***	-0.001
	(0.006)	(0.011)	(0.008)	(0.004)	(0.008)	(0.007)
Bank Inflation Exposure × Post 2021	-0.022**	-0.013	0.029**	-0.035***	-0.063***	0.030***
× Low Pass-through Firm	(0.009)	(0.017)	(0.011)	(0.005)	(0.009)	(0.010)
Observations	66,316	66,317	54,739	200,729	200,733	159,750
R-squared	0.92	0.81	0.85	0.95	0.85	0.91
Bank controls ## Post 2021	Yes	Yes	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes	Yes	Yes
FE bank × firm	Yes	Yes	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: Firms' and banks' exposure to inflation: effect on loan commitments and spreads, by industry concentration

Notes: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2). The dataset is collapsed at the bank-borrower pair level, and the results are split by industry concentration. The cumulative growth of loan commitments is computed relative to the first quarter of each bank-firm relation. Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

	(1)	(2)	(3)	(4)	(5)	(6)
	High HHI industries			**Low HHI industries**		
Dependent variable:	**log(Comm)**	**gr(Comm)**	**Spread**	**log(Comm)**	**gr(Comm)**	**Spread**
Bank Inflation Exposure × Post 2021	-0.002	-0.002	0.043***	0.010**	0.011	-0.011
	(0.005)	(0.009)	(0.009)	(0.005)	(0.008)	(0.009)
Bank Inflation Exposure × Post 2021	-0.019***	-0.029**	0.003	-0.032***	-0.046***	0.056***
× Low Pass-through Firm	(0.006)	(0.012)	(0.013)	(0.006)	(0.010)	(0.012)
Observations	160,326	160,331	130,036	147,425	147,425	104,815
R-squared	0.95	0.83	0.91	0.95	0.83	0.88
Bank controls ## Post 2021	Yes	Yes	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes	Yes	Yes
FE bank × firm	Yes	Yes	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: Firms' and banks' exposure to inflation: effect on loan commitments and spreads, by industry tangibility

Notes: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2). The dataset is collapsed at the bank-borrower pair level, and the results are split by industry tangibility. The cumulative growth of loan commitments is computed relative to the first quarter of each bank-firm relation. Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

	(1)	(2)	(3)	(4)	(5)	(6)
	High IK/low tangibility industries			**Low IK/high tangibility industries**		
Dependent variable:	**log(Comm)**	**gr(Comm)**	**Spread**	**log(Comm)**	**gr(Comm)**	**Spread**
Bank Inflation Exposure × Post 2021	0.004	-0.001	0.001	-0.000	0.005	0.034***
	(0.004)	(0.007)	(0.008)	(0.006)	(0.012)	(0.011)
Bank Inflation Exposure × Post 2021	-0.025***	-0.029***	0.033***	-0.023***	-0.037***	0.027*
× Low Pass-through Firm	(0.004)	(0.009)	(0.011)	(0.007)	(0.013)	(0.015)
Observations	184,145	184,146	146,179	142,948	142,952	102,727
R-squared	0.95	0.83	0.89	0.94	0.82	0.91
Bank controls ## Post 2021	Yes	Yes	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes	Yes	Yes
FE bank × firm	Yes	Yes	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: Firms' and banks' exposure to inflation: effect on loan commitments and spreads, IPI vs. PPI inflation

Notes: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low output price inflation industries ("Low PPI Inflation Firms") vs. high input price inflation industries ("High IPI Inflation Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2). The dataset is collapsed at the bank-borrower pair level. The cumulative growth of loan commitments is computed relative to the first quarter of each bank-firm relation. Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
	log(Commitments)		**gr(Commitments)**		**Loan Spreads**	
			Panel A: Low PPI Inflation Firms			
Bank Inflation Exposure × Post 2021	0.001	-0.000	0.001	-0.001	-0.029***	-0.024***
	(0.002)	(0.002)	(0.004)	(0.004)	(0.005)	(0.005)
Bank Inflation Exposure × Post 2021		0.003		0.010		-0.027***
× **Low PPI Inflation Firm**		(0.004)		(0.008)		(0.007)
Observations	262,326	262,326	262,331	262,331	201,939	201,939
R-squared	0.95	0.95	0.84	0.84	0.90	0.90
			Panel B: High IPI Inflation Firms			
Bank Inflation Exposure × Post 2021	-0.005***	0.002	-0.007**	0.002	0.052***	0.058***
	(0.002)	(0.003)	(0.003)	(0.005)	(0.003)	(0.006)
Bank Inflation Exposure × Post 2021		-0.011***		-0.013**		-0.010
× **High IPI Inflation Firm**		(0.004)		(0.006)		(0.007)
Observations	327,093	327,093	327,098	327,098	248,906	248,906
R-squared	0.95	0.95	0.83	0.83	0.90	0.90
Bank controls ## Post 2021	Yes	Yes	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes	Yes	Yes
FE bank × firm	Yes	Yes	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: Firms' and banks' exposure to inflation: effect on loan commitments and spreads, credit lines vs. term loans

Note: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2) like in Table 4. The dataset is collapsed at the bank-borrower pair level, separately for credit lines and term loans. Standard errors are clustered at the industry-time level in all specifications. We control for the same bank characteristics as in Table 4, in levels and interacted with "Post 2021". Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.Significance: *** 1%, **5%, *10%.

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
	log(Commitments)		**Cumulative Growth of Commitments**		**Loan spreads**	
			Panel A: Credit Lines			
Bank Inflation Exposure × Post 2021	-0.015***	-0.009	-0.020**	-0.010	0.063***	0.033***
	(0.004)	(0.006)	(0.008)	(0.014)	(0.008)	(0.011)
Bank Inflation Exposure × Post 2021		-0.014*		-0.024		0.049***
× Low Pass-through Firm		(0.008)		(0.019)		(0.015)
Observations	264,511	243,216	262,510	241,308	205,257	188,708
R-squared	0.96	0.96	0.82	0.82	0.91	0.91
			Panel B: Term Loans			
Bank Inflation Exposure × Post 2021	-0.013	0.030**	-0.050**	0.005	-0.005	-0.009
	(0.012)	(0.014)	(0.023)	(0.027)	(0.013)	(0.022)
Bank Inflation Exposure × Post 2021		-0.067***		-0.089**		0.007
× Low Pass-through Firm		(0.022)		(0.042)		(0.026)
Observations	38,697	37,279	38,697	37,279	23,794	22,726
R-squared	0.96	0.96	0.90	0.90	0.96	0.96
Lower-level interactions and controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls, in levels and interacted w/ Post 2021	Yes	Yes	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes	Yes	Yes
FE bank × firm	Yes	Yes	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes	Yes	Yes

Table 10: Firms' and banks' exposure to inflation: effect on loan commitments and spreads, the role of monetary policy

Note: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2) like in Table 4. The dataset is collapsed at the bank-borrower pair level. We control for the same bank characteristics as in Table 4, in levels and interacted with "Post 2021". To control for the effects of monetary policy tightening, we add banks' "Security Loss Exposure", defined as (fair value-amortized cost)/amortized cost for security holdings, and "Fixed Rate Loan Exposure", defined as the share of fixed rate loans in total loans, both observed during 2018-2020. Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	log(Commitments)			**Cumulative Growth of Commitments**			**Loan spreads**		
Bank Inflation Exposure × Post 2021	0.000	0.002	0.000	-0.005	-0.002	-0.005	0.031***	0.046***	0.049***
	(0.005)	(0.005)	(0.005)	(0.014)	(0.013)	(0.014)	(0.009)	(0.009)	(0.010)
Bank Inflation Exposure × Post 2021	-0.042***	-0.036***	-0.041***	-0.071***	-0.058***	-0.069***	0.031**	0.040***	0.038***
× Low Pass-through Firm	(0.007)	(0.007)	(0.007)	(0.018)	(0.017)	(0.018)	(0.013)	(0.013)	(0.013)
Security Loss Exposure × Post 2021	-0.007		0.092***	-0.016		0.258***	-0.003		-0.037*
	(0.005)		(0.019)	(0.010)		(0.047)	(0.006)		(0.021)
Security Loss Exposure × Post 2021	0.064***		-0.006	0.178***		-0.013	-0.042**		0.015**
× Low Pass-through Firm	(0.018)		(0.005)	(0.044)		(0.010)	(0.020)		(0.006)
Fixed Rate Loan Exposure × Post 2021		-0.000	-0.001		-0.001	-0.003		-0.008***	-0.009***
		(0.001)	(0.001)		(0.002)	(0.002)		(0.002)	(0.002)
Fixed Rate Loan Exposure × Post 2021		0.002**	0.001*		0.003*	0.003*		0.027***	0.028***
× Low Pass-through Firm		(0.001)	(0.001)		(0.002)	(0.002)		(0.002)	(0.002)
Observations	318,584	318,584	318,584	315,967	315,967	315,967	238,556	238,556	238,556
R-squared	0.96	0.96	0.96	0.81	0.81	0.81	0.91	0.91	0.91
Lower-level interactions and controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls, in levels and interacted w/ Post 2021	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE bank × firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 11: Firms' and banks' exposure to inflation: loan performance

Note: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2) like in Table 4. The dataset is collapsed at the bank-borrower pair level. We control for the same bank characteristics as in Table 4, in levels and interacted with "Post 2021". Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

Dependent variable:	(1) **Probability of Default**	(2) **Credit Rating (higher is worse)**
Bank Inflation Exposure × Post 2021	-0.000	0.011**
	(0.000)	(0.005)
Bank Inflation Exposure × Post 2021	0.001**	0.015***
× Low Pass-through Firm	(0.001)	(0.006)
Observations	285,343	328,788
R-squared	0.82	0.92
Bank controls ## Post 2021	Y	Y
FE bank	Y	Y
FE bank × firm	Y	Y
FE firm × time	Y	Y

Table 12: Firms' and banks' exposure to inflation: effect on loan commitments and spreads, the role of bank capital

Note: The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2) like in Table 4. In addition, we further differentiate across banks with high and low capital ratios. The dataset is collapsed at the bank-borrower pair level. We control for the same bank characteristics as in Table 4, in levels and interacted with "Post 2021". Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

	(1)	(2)	(3)
Dependent variable:	**log(Commitments)**	**gr(Commitments)**	**Spreads**
Bank Inflation Exposure × Post 2021	0.065***	-0.034	-0.304***
	(0.022)	(0.042)	(0.048)
Bank Inflation Exposure × Post 2021	-0.148***	-0.125*	-0.120**
× Low Pass-through Firm	(0.037)	(0.070)	(0.056)
Bank Inflation Exposure × Post 2021	-0.009***	-0.007	-0.011***
× Low Pass-through Firm × Low Capital	(0.003)	(0.005)	(0.004)
Observations	327,093	327,098	248,906
R-squared	0.95	0.83	0.90
Lower level interactions	Yes	Yes	Yes
Bank controls ## Post 2021	Yes	Yes	Yes
FE bank	Yes	Yes	Yes
FE bank × firm	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes

Table 13: Firms' and banks' exposure to inflation: real effects on borrowing firms

The table shows results from difference-in-difference regressions like in equation (3) that differentiate across banks according to their exposure to inflation ("Bank Inflation Exposure"), across borrowers from low and high inflation pass-through industries ("Low Pass-through Firm"), and across low and high inflation quarters ("Post 2021" = 0 for 2018:Q1-2020:Q4 and = 1 for 2021:Q1-2023:Q2). The dataset is collapsed at the borrower level, rather than at the bank-borrower pair level like in Table 4, and the sample is restricted to be consistent with the main regression results with firm-time fixed effects in Table 4. Standard errors are clustered at the industry-time level in all specifications. Significance: *** 1%, **5%, *10%.

Dependent variable:	(1) **ROA**	(2) **ICR**	(3) **Rating**	(4) **log(Utilization)**	(5) **Capex**	(6) **Cash**
Avrg. Bank Inflation Exposure × Post 2021	-0.020***	-0.216**	0.035***	0.012***	0.000	0.001
× Low Pass-through Firm	(0.005)	(0.085)	(0.009)	(0.003)	(0.000)	(0.001)
Low Pass-through Firm × Post 2021	-0.089***	-2.062***	0.188***	0.054***	-0.001***	-0.011***
	(0.009)	(0.166)	(0.023)	(0.009)	(0.000)	(0.002)
Avrg. Bank Inflation Exposure × Post 2021	0.006	0.040	0.003	-0.014***	-0.000	-0.000
	(0.004)	(0.082)	(0.010)	(0.004)	(0.000)	(0.001)
Avrg. Bank Inflation Exposure × Low Pass-through Firm	0.004	-0.039	-0.018	-0.009	-0.003***	-0.004***
	(0.005)	(0.104)	(0.016)	(0.007)	(0.001)	(0.001)
Avrg. Bank Inflation Exposure	0.019***	0.530***	0.073***	0.014**	0.002***	0.006***
	(0.004)	(0.096)	(0.017)	(0.006)	(0.000)	(0.002)
Low Pass-through Firm (dummy)	0.043***	1.208***	-0.042	-0.022**	0.004***	0.003
	(0.011)	(0.278)	(0.028)	(0.009)	(0.001)	(0.002))
Observations	327,619	329,514	329,476	329,549	227,857	329,549
R-squared	0.73	0.68	0.72	0.75	0.62	0.79
Firm controls, in levels and interacted w/ Post 2021	Yes	Yes	Yes	Yes	Yes	Yes
Avrg. bank controls, in levels and interacted w/ Post 2021	Yes	Yes	Yes	Yes	Yes	Yes
FE firm	Yes	Yes	Yes	Yes	Yes	Yes
FE time	Yes	Yes	Yes	Yes	Yes	Yes

Internet Appendix for "Business Inflation Exposure and Bank Lending"

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A-I Appendix Tables and Figures

Table A1: High and low inflation pass-through industries

Notes: The table shows the list of industries with low and high inflation pass-through computed from the BLS data on IPI and PPI inflation at the 3-digit NAICS industry level. Low pass-through industries are those with $Low\ pass\ through_f = 1$, defined as industries with $PPI\ inflation - IPI\ inflation < 0$ on average during 2021-2023, i.e., the difference between the producer price index (PPI) inflation and the input price index (IPI) inflation was negative. The high pass-through industries are those with $Low\ pass\ through_f = 0$, or a positive difference between the PPI and IPI inflation.

NAICS-3	**Low pass-through industries**	**NAICS-3**	**High pass-through industries**
213	Support activities for mining	211	Oil and gas extraction
221	Utilities	212	Mining (except oil and gas)
311	Food manufacturing	313	Textile mills
312	Beverage and tobacco products	316	Leather and allied product manufacturing
314	Textile product mills	321	Wood product manufacturing
315	Apparel manufacturing	322	Paper manufacturing
325	Chemical manufacturing	323	Printing and related support activities
327	Non-metallic mineral products	324	Petroleum and coal products]
333	Machinery manufacturing	326	Plastic and rubber products
334	Computer and electronic product manufacturing	331	Primary metal manufacturing
336	Transportation equipment manufacturing	332	Fabricated metal product manufacturing
339	Miscellaneous manufacturing	335	Electrical equipment, appliance, and components
481	Air transportation	337	Furniture and related product manufacturing
482	Rail transportation	423	Merchant wholesalers, durable goods
484	Truck transportation	424	Merchant wholesalers, non-durable goods
491	Postal service	441	Motor vehicle and parts dealers
492	Couriers and messengers	444	Building material and garden equipment and supplies dealers
517	Telecommunications	445	Food and beverage stores
622	Hospitals	483	Water transportation
		493	Warehousing and storage
		721	Accommodation, including hotels and motels

Table A2: Firms' exposure to inflation vs. firm-bank growth in loan utilization

Notes: The table shows results from difference-in-difference regressions like in equation (1), while differentiating across borrowers in low and high inflation pass-through industries, across low and high inflation periods (2018:Q1-2020:Q4 and 2021:Q1-2023:Q2, respectively). The dependent variable is the utilization rate of loan commitments (in percentage points), while the dataset is aggregated at the bank-borrower pair level. We control for firm and bank characteristics, and deploy firm-time, bank, and bank-time fixed effects. Standard errors are clustered at the industry-time level in all specifications. For the sample splits by investment grade (IG) and non-IG ratings, the credit ratings represent 2018-2019 firm-level averages.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	**Utilization rate (ppt)**						
	All firms	**Non-IG firms**	**IG firms**	**Non-IG firms**		**IG firms**	
				Small firms	**Large firms**	**Small firms**	**Large firms**
Low Pass-through Firm	-0.029***	-0.032***	-0.023***	-0.044***	-0.027***	-0.030	-0.020***
	(0.007)	(0.007)	(0.007)	(0.012)	(0.007)	(0.019)	(0.006)
Low Pass-through Firm × Post 2021	0.065***	0.073**	0.052***	0.073***	0.066***	0.105***	0.038***
	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)	(0.021)	(0.009)
Observations	618,507	354,136	571,985	208,170	0.802	0.633	0.722
R-squared	0.619	0.802	0.633	0.722	0.802	0.633	0.722
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls × Post 2021	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls × Post 2021	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE bank × time	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A3: Firms' exposure to inflation vs. firm-bank prevalence of collateral

Notes: The table shows results from difference-in-difference regressions like in equation (1), while differentiating across borrowers in low and high inflation pass-through industries, across low and high inflation periods (2018:Q1-2020:Q4 and 2021:Q1-2023:Q2, respectively). The dependent variable is the prevalence of secured loans and the prevalence of loans secured with cash collateral (in percentage points), while the dataset is aggregated at the bank-borrower pair level. We control for firm and bank characteristics, and deploy firm-time, bank, and bank-time fixed effects. Standard errors are clustered at the industry-time level in all specifications. For the sample splits by investment grade (IG) and non-IG ratings, the credit ratings represent 2018-2019 firm-level averages.

	(1)	(2)	(3)	(4)
Dependent variable:	**Secured (1/0)**		**Cash collateral (1/0)**	
	Non-IG firms	**IG firms**	**Non-IG firms**	**IG firms**
Low Pass-through Firm	0.024***	0.022***	-0.014**	0.011
	(0.003)	(0.005)	(0.006)	(0.008)
Low Pass-through Firm × Post 2021	0.003***	-0.007**	0.008**	0.005
	(0.001)	(0.002)	(0.004)	(0.004)
Observations	618,507	354,136	571,985	208,170
R-squared	0.619	0.802	0.633	0.722
Bank controls	Yes	Yes	Yes	Yes
Bank controls × Post 2021	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes
Firm controls × Post 2021	Yes	Yes	Yes	Yes
FE firm × time	Yes	Yes	Yes	Yes
FE bank	Yes	Yes	Yes	Yes
FE bank × time	Yes	Yes	Yes	Yes