Inflation and floating-rate loans: Evidence from the euro-area

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Abstract

We provide novel evidence on how monetary policy affects inflation through the floating rate channel. Using euro-area corporate loan data from 2021 to 2023, we find that the short-run impact of monetary tightening on inflation is 50% smaller in markets dominated by floating-rate loans. Firms with floating-rate loans keep prices elevated to offset higher borrowing costs, thereby reducing the effectiveness of monetary policy tightening. This effect is stronger in concentrated, high mark-up markets, where firms can more easily pass on higher prices to their customers, as well as in markets with highly leveraged or illiquid firms. Since firms with floating-rate loans face an increase in their financial burden, their loan terms are more frequently renegotiated, often resulting in reduced spreads and a shift from floating to fixed rates. The varying prevalence of floating-rate loans helps explain the heterogeneity in monetary policy transmission within the euro-area, as floating rate contracts are more prevalent in peripheral countries, whereas fixed rates contracts are more common in core countries.

Keywords: Monetary policy transmission, Inflation, Floating-rate loans, Market power

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1 Introduction

A tightening of monetary policy rates is widely acknowledged as a key tool against inflation. Conventional macroeconomic models suggest that inflation will slow in response to an increase in policy rates due to a reduction in aggregate demand caused by higher borrowing costs (Bernanke and Gertler, 1989; Kashyap et al., 1993). When it comes to firms, this thinking suggests that higher funding costs affect aggregate demand and inflation via a reduction in firm investments. However, the idea that funding costs can also affect inflation via firms' price setting is generally overlooked.[1] When marginal costs depend on funding costs, firms may find it optimal to increase prices, sacrificing future market shares in order to boost current cash flows (Chevalier and Scharfstein, 1996; Gilchrist et al., 2017).

We provide novel micro-level evidence on a cost channel of monetary policy using data on floating-rate loans from euro-area corporations. Notably, the transmission of monetary policy rates is limited in the presence of debt contracts that are rigid or fixed in nominal terms, such as fixed-rate loans. Having a floating-rate loan implies a direct and immediate impact of a policy tightening on firms' funding costs, even in the absence of any credit market frictions. In fact, even a financially unconstrained firm which borrows at the risk-free rate will experience an increase in funding costs when it borrows through floating-rate loans. Differently from bank lending channels (e. g., Kashyap and Stein, 2000; Jiménez et al., 2012), this mechanism, which we dub the "floating-rate channel", works via existing loans and does not require changes in the supply of new loans.

Studying the different margins of monetary policy transmission between variable and fixed-rate loans is typically difficult due to data limitations, particularly when focusing on US firms. In fact, bank debt of US firms is primarily floating-rate (Vickery, 2008; Ippolito et al., 2018) and often comes in the form of credit lines. Since most credit lines have a maturity of one year or less, interest rates are unlikely to shift enough before the line is renegotiated.

[1] A notable exception in this respect is Barth and Ramey (2002), who propose a "cost channel" of monetary policy, arguing that, when marginal costs depend on the real interest rate (Beaudry et al., 2024), firms may increase prices to boost current cash flows.

To address this issue, we leverage on comprehensive data from AnaCredit, the euro-area credit register which is available from September 2018. This loan-level database contains a rich set of loan characteristics, including an indicator for floating or fixed-rate loans, along with loan interest rates and the renegotiation of loan terms.

We first provide some novel stylized facts about corporate loans in the euro-area. In contrast to their US counterparts, European firms have a unique mix of bank debt structures, encompassing both floating and fixed-rate loans for both term loans and credit lines.[2] Moreover, there are substantial differences across countries: similarly to households (Badarinza et al., 2016), firms in Germany and France typically use fixed-rate loans, whereas Italian, Spanish, and Portuguese corporations rely more on floating-rate loans. A variance decomposition shows that cross-country variation matters almost as much as cross-firms variation in explaining whether loans are fixed or floating, and cross-bank variation is more important. These country and bank-level differences highlight the potentially large differences in monetary policy transmission through floating-rate loans in the euro-area.

Our empirical approach utilizes a Difference-in-Differences (DiD) methodology at varying levels of aggregation (loan, firm, or market), where we interact changes in the policy rate with exposure to floating-rate loans as of the first half of 2021. The key identification assumption is that as of early 2021, firms were not anticipating significant rises in inflation and interest rates. At that time, the prolonged period of negative interest rates and the low aggregate demand following Covid-19 had kept inflation concerns low in the euro area. While the choice between a floating or a fixed-rate loan depends on a number of factors at both the bank and firm level, our methodology does not require random assignment of treatment. Instead, it only requires that inflation trends in floating-rate and fixed-rate markets would have been parallel in the absence of policy rate changes. In this regard, we control for a wide range of time-varying shocks with an extensive set of country and industry-time fixed effects.

[2]On the other hand, US firms rely more on corporate bonds, which is largely fixed-rate.

We study the evolution of inflation between 2021 and 2023 using Eurostat 's monthly growth in CPI across euro-area markets , i.e. 2-digit industry-country pairs (Acharya et al., 2024). The DiD setting in this case analyzes the inflation impact of the ex-ante share of floating-rate loans at the market level interacted with the change in the policy rate. In this specification, we control for a large variety of time-varying shocks using country-month, industry-month and country-industry fixed effects. After testing for parallel pre-trends in CPI between floating-rate and fixed-rate markets, we find that tighter monetary policy lowers inflation by 50% less in markets dominated by floating-rate loans which we define as markets in which the share of floating-rate loans is 90%, thus representing the top quintile, compared to markets where fixed-rate loans are more common (with a 30% share of floating-rate loans, in the bottom quintile). In other words, raising rates to fight inflation is more effective in markets dominated by fixed-rate loans.

We then test how the transmission of monetary policy to inflation via floating-rate loans varies by characteristics of the market. First, we expect stronger effects in markets where firms have more pricing power and can pass on their higher funding costs. Intuitively, a floating-rate firm in a competitive market cannot afford to increase prices, as it would otherwise lose all its customers. A floating-rate firm in a less competitive market can decide to increase prices to maintain cash flows. We calculate market power using either the Herfindahl-Hirschman concentration Index (HHI) on turnover shares or EBIT/Sales, a proxy for mark-ups (De Loecker et al., 2020). Second, in line with findings in Gilchrist et al. (2017) and Drechsler et al. (2023), the effects should be more pronounced in the presence of financial frictions, as financially constrained firms may increase their prices after a liquidity shock. Accordingly, we find that inflation is higher after a monetary tightening in high concentration or high mark-ups markets and where firms have smaller cash buffers or have higher leverage, i.e., when they are more dependent on external finance and financing costs are a larger share of total costs (Drechsler et al., 2023).

The floating-rate channel of monetary policy works through an increase in firms' cost of

funding. Using loan-level data from AnaCredit, we find that interest rates at the firm-bank level increase markedly following the increase in monetary policy rates when firms have floating-rate loans. Specifically, we find that for a 100 basis points (bps) increase in the monetary policy rate, loan interest rates increase by 70 bps if a firm borrows exclusively through floating-rate loans and by 9 bps when it borrows through fixed-rate loans only.[3] A dynamic specification shows that interest rates were identical across the two groups of loans before the rate hike and widen only after the rate hike in August 2022.

Because firms with more floating-rate loans face higher interest payments, they are also more likely to renegotiate loan terms after the rate hike.[4] Specifically, we find that a firm fully reliant on floating-rate in a particular bank relationship is 50% more likely to renegotiate its loan terms one year after the first rate hike compared to a firm with fixed-rate loans. Additionally, we analyze which loan terms are adjusted in the renegotiation after the rate hike. We observe that firms with floating-rate loans tend to secure lower spreads on these loans and are more likely to convert to fixed-rate terms, with no significant changes in loan maturity or volume. Finally, although floating-rate firms raise their mark-ups, they do not see a significant increase in profitability, as higher interest payments offset the additional cash flow from increased sales. These findings support the hypothesis that floating-rate firms face a notably higher financial burden due to increased interest payments, prompting adjustments in their financing strategies.

We contribute to several strands of the literature. In macroeconomics, there is a "price puzzle" of monetary policy, namely the fact that prices increase rather than decrease after a monetary tightening (Sims, 1992), at least in the short-run. To explain the puzzle, Barth and Ramey (2002) proposed the existence of a cost channel of monetary policy. When firms need to borrow to finance their working capital, an increase in borrowing costs impacts their marginal costs and hence may lead firms with pricing power to increase prices. Existing

[3]The small effect for fixed-rate loans suggests that the adjustment to monetary policy rates is gradual, occurring only when firms secure new fixed-rate loans as their existing ones mature.

[4]The data do not indicate whether the borrower or the bank initiates renegotiation, but they do show which loans are renegotiated and what terms change.

evidence in favor of this channel is mostly based on aggregate VAR (Christiano et al., 2005; Ravenna and Walsh, 2006). We provide the first evidence on the cost channel using micro-data in a well-identified setting.

The examination of how firms' own expectations and pricing strategies react to monetary policy tightening in the presence of financial constraints is an important component of overall inflation dynamics (Gilchrist et al., 2017; Coibion et al., 2020). Recent studies have explored the inflationary effects of credit crunches, yielding mixed results. On one side, Kim (2020) and Lenzu et al. (2023) find that firms in the US and Belgium, respectively, lower prices in response to a credit contraction. These firms use price reductions as a means of internal financing, liquidating inventory to increase cash reserves while avoiding cuts in other expenditures. On the other hand, Drechsler et al. (2023) show that monetary policy tightening under Regulation Q triggered credit crunches that prompted firms to raise prices, particularly those reliant on external finance to cover production costs when financial constraints became binding.[5] Our findings align with those of Drechsler et al. (2023), though our focus differs: instead of examining a negative supply shock, we show that when corporate loan rates are floating, firms may raise prices to preserve cash flows during a tightening cycle. Consistent with Drechsler et al. (2023), we also find that firms with higher leverage, and hence more dependent on external finance, are more likely to increase prices in response to monetary tightening.

Extensive research has analyzed the choice between fixed or floating-rate household mortgages and how this impacts the transmission of monetary policy (Campbell and Cocco, 2003; Di Maggio et al., 2017; Garriga et al., 2017), but relatively less attention has been devoted to understanding how interest rate setting in corporate loans can affect the pass-through of monetary policy. This is surprising in light of the large literature studying the effects of monetary policy on corporate investment (Gertler and Gilchrist, 1994; Ottonello

[5]Renkin and Zullig (2024) find that credit supply shocks lead to higher prices for Danish firms, but the effect depends on the elasticity of market demand in different sectors, potentially reconciling the two sets of results. Firms in high elasticity sectors decrease prices following a negative credit shock.

and Winberry, 2020) and as firms' pricing decisions are first-order to understand overall inflation. Some papers have looked at the role of floating-rate loans for monetary policy transmission, but none has looked at their effect on inflation. Using survey data on small US firms, Vickery (2008) provides descriptive evidence that credit-constrained firms have more fixed-rate loans. Ippolito et al. (2018) analyze how corporate investment respond to monetary policy based on a firm's share of bank debt, which is primarily floating rate debt in US data, as opposed to bond funding.

The mechanism of our floating-rate channel is distinct from the mechanisms at work in the bank lending channel and firm balance sheet channel. According to the bank lending channel, monetary policy affects banks' cost of funds, either because of market power (Drechsler et al., 2017; Wang et al., 2022) or capital requirements (Van den Heuvel, 2002) leading to a lower bank loan supply. The firm balance sheet channel posits that tighter monetary policy erodes firms' cash flows and collateral values, leading to a drop in net worth and, due to information asymmetries in credit markets, reduced access to credit, leading to lower investments (Bernanke and Gertler, 1989; Boivin et al., 2010). The floating-rate channel does not require any credit market friction, as funding costs are directly linked to the risk-free policy rate when firms borrow with floating-rate loans.Additionally, existing channels typically focus on the transmission to investments, not on the direct price impact of a change in funding costs after a change in monetary policy.

2 Data

Our dataset combines several sources of detailed information at the loan-level, firm-level and industry-country–level.

First, we obtain information on non-financial corporations' loans at a monthly frequency from AnaCredit, a confidential database of the European Central Bank. AnaCredit, available from September 2018, harmonized different credit registers across all euro area

countries using a common €25,000 reporting loan threshold. The dataset covers a large set of loan types: overdrafts, trade receivables, financial leases, revolving credit, credit lines and other loans, which are all other loans of a non-revolving nature, including term loans. For our analysis we focus on 'other loans', credit lines and revolving credit, as these three categories make up the vast majority of credit provided in the euro area (Kosekova et al., 2023). AnaCredit also reports the maturity and the contractual interest rates at the loan-level. Importantly for our analysis, it contains information on the type of interest rate setting: floating or fixed.[6] This is a notable novel feature of AnaCredit, as existing credit registry datasets are designed to measure bank risk exposures and thus have granular information on credit volumes, but not on interest rates.[7] AnaCredit also contains information on other loan-level features such as renegotiation and loan arrears. Every quarter banks need to report whether a loan was renegotiated during that quarter, and whether the renegotiation was due to forbearance measures. We merge AnaCredit with borrower balance sheet data from BvD Orbis, a comprehensive firm-level database with both public and private firms. We use Orbis to gather yearly firm-level data on the firms, as well as to calculate bank-industry concentration, leverage and cash buffer measures.

Second, we obtain Consumer Price Index (CPI) growth from Eurostat. The raw data contains consumer prices at the five-digit Classification of Individual Consumption According to Purpose (COICOP) product category level. Since the AnaCredit borrowers' information are at the industry level, we use COICOP-NACE linking tables to obtain CPI growth at the (2-digit) industry-country level, calculating a weighted CPI growth average of all COICOP categories that are related to a 2-digit NACE industry. The basis for the construction of the linking tables is made of consumption allocation tables, which provide information on how household expenditures on a particular COICOP category are allocated to various

[6] A third type, called "mixed rate" contains loans which have both a fixed and a variable interest rate over their life. For example, a loan where for limited periods of time both fixed and variable interest rates interchange can be classified as a mixed interest rate loan. These are only a small fraction of total loans, approximately 3%. In our empirical analysis, we conservatively consider mixed rates as non-floating.

[7] Even in countries where credit registers report some information on loan interest rates, such as Italy and Portugal, the distinction between floating and fixed-rate at the loan level is not measured precisely.

NACE industries (see Figure A1 for an example). Crucially, this procedure thus focuses solely on the final consumption by households, and links changes in the consumer prices measured at the COICOP level to the industries that sell these goods and services directly to households (Acharya et al., 2024). Figure 1 confirms that our inflation measure, when aggregated from the market-level CPI, aligns with recent market developments and the Harmonized Index of Consumer Prices (HICP) for the euro-area: inflation rose from around 1% in early 2021 to around 10% in the second half of 2022, before declining rapidly as the ECB increased the Deposit Facility Rate (DFR) from -0.5% in July 2022 to 4% by September 2023.

2.1 Summary statistics and stylized facts

In contrast to their US counterparts, European firms have a unique mix of bank debt structures, encompassing both floating and fixed-rate loans. Table 1 shows summary statistics for our sample. In Panel A, we report loan-level characteristics for all loans in December 2021. Approximately 24% of outstanding loans have a floating rate. However, as we describe below, these loans account for about 60% of the total loan volume, as their average amounts tend to be larger than those of fixed-rate loans (see Table A1 in the Online Appendix for a breakdown between floating-rate and fixed-rate loans). As of December 2021, interest rates on corporate loans were at 2%, and average loan maturity is about 8 years. The firm 1-year average probability of default (PD) is 6.8%, although the average hides significant heterogeneity: half of the firms in the sample have a PD of less than 1%. Additionally, about three quarters of the loans are term loans and are collateralized.[8] Finally, over 80% of floating-rate loans use the EURIBOR (3M, 6M or 12M) as a reference rate and interest rates reset within the year (see Figure A2 and A3 in the Online Appendix).

[8]As we show in Table A1 in the Online Appendix, the distribution across loan types and maturity is similar for floating-rate and fixed-rate loans: 72% (73%) of floating-rate (fixed-rate) loans are term loans, 27% (28%) are credit lines, and both have an average maturity of around 8 years. Floating-rate loans are slightly more likely to be collateralized (79% vs. 71%) and borrowers with floating-rate loans are on average assigned a higher probability of default (9.5% vs. 6.3%).

As shown in Panel A of Figure 2 there are substantial differences in the incidence of floating-rate loans across countries: for example, firms in Germany and France typically use fixed-rate loans (70% of total loan volumes), whereas Italian corporations rely more on floating-rate loans (60% of total loan volumes). This country ranking is similar to what has been shown in the context of household mortgages (e.g., Badarinza et al., 2016). This has a significant impact on the transmission of monetary policy across euro-area countries, which have not been explored for corporate loans. Panel B of Figure 2 shows that there is also significant variation across industries in the use of floating-rate loans. For example, firms involved in wholesale trade activities (NACE code 45) obtain more than 80% of credit in the form of floating-rate loans, while in services, such as healthcare (NACE code 86), the share is less than 30%. See A2 in Appendix for a list of all industries in our sample.

For the first part of our analysis, we aggregate the loan-level data to the country-industry level (using either two-digit NACE codes or a combination of multiple two-digit NACE codes[9]), in order to be able to match it with the CPI data. Our final sample consists of 13,944 industry-country (i.e, market) monthly observations from 16 euro-area countries and 43 industries (encompassing 63 two-digit NACE industries) from July 2021 to July 2023.[10] Summary statistics for this sample can be found in Panel B of Table 1. Average inflation has been approximately 6.53% over the sample period, but there is considerable variation across different markets. Some markets saw inflation rates as high as 24%, while others experienced decreases in price levels. Similarly, while about 60% of loan volumes across Euro-area markets are comprised of floating-rate loans, the proportions vary widely. Some have as little as 3% in floating-rate loans, while others rely entirely on them. The deposit facility rate, the main ECB monetary policy tool, has been increased from 0 to 4%

[9] In some cases, the COICOP-NACE linking tables do not provide an exact two-digit NACE code match, but rather a match to a group of NACE codes. For example, we can calculate CPI for the category "Manufacturing of food, beverages and tobacco", which corresponds to the NACE two-digit industries 10, 11 and 12, but not for each of them separately

[10] The 16 countries in the sample are: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovenia, and Spain. The inflation data is incomplete for Greece, Ireland and Slovakia. Croatia is also excluded from the sample given that it adopted the euro in January 2023.

over the sample period.

In the second part of our analysis, we aggregate the loan-level data at the bank-firm level. The sample consists of more than 110 million bank-firm-month observations and covers 3,570 banks and 3.9 million firms from 19 euro-area countries. Summary statistics can be found in Panel C of Table 1. Given that many of the firms are small, the average bank-firm exposure is approximately €660,000, with a median of €110,000. Over the sample period, average interest rates across various loan types hover around 2.19%. Notably, the share of floating-rate loans at the bank-firm level is 25%, significantly lower than at the market level, indicating that floating-rate loans are more common among larger firms, which constitute a greater portion of loan volumes. Lastly, loans typically have maturities ranging from 7 to 9 years.

3 Empirical strategy and results

Our empirical strategy relies on a DiD model, in which we study the evolution of the inflation rate across euro-area markets. Identification is obtained by comparing changes in CPI growth before and after changes in the Deposit Facility Rate (DFR), which provides the time-series variation, across markets with a different incidence of floating-rate loans, and which provide cross-sectional variation. Importantly, since changes in the DFR affect all countries and industries in the euro-area simultaneously, we do not incur in the canonical problems associated with staggered DiD designs (Baker et al., 2022).

The choice between floating-rate or fixed-rate loans is influenced by several factors at both the borrower and bank levels. To formally assess which factors affect the choice of floating-rate loans, we conduct a variance decomposition, regressing the share of floating-rate loans in bank-firm relationships as of July 2022 on various fixed effects, as shown in Table 2.[11] A borrowing firm's industry (63 industries) explains less than 2% of variation

[11]We limit the sample to firms with multiple bank relationships, as (among other factors) we want to assess the extent to which firm-specific variation affects the choice between floating-rate and fixed-rate loans.

in the share of floating rate, while the country of the headquarters (19 countries) explains almost 30%. Firm-specific fixed effects (631,982 firms) explain 36% of the variation, only slightly more than country factors. This underlines the importance of country-specific factors in the choice of rate setting: firms located in Germany or France most likely obtain fixed-rate loans, while those in Italy and Portugal are more likely to be offered floating-rate loans. This is remarkable given that no regulation prevents German or French banks from offering floating-rate loans. The evidence points to country-specific cultural factors and path-dependence playing a key role in explaining rate setting.[12] Because of these differences, we will not use country-level variation in our empirical analysis, but rather within country-industry (i.e., market) differences. Finally, bank-specific factors (2,593) explain around 45% of the variation.

In our baseline specification, we estimate the following regression equation:

$$\Delta CPI_{ict} = \beta ShareFloat_{ic} \times \Delta DFR_t + \alpha' X_{ict} + \delta_{ic} + \eta_{it} + \gamma_{ct} + \epsilon_{ijt}, \quad (1)$$

where the subscript ic denotes a market, i.e., a combination of 2-digit NACE industry i and country c, and t a month, from July 2021 to July 2023. The dependent variable ΔCPI_{ict} is the year-on-year CPI growth rate for market ic in month t constructed from COICOP product categories as described in Section 2.

$ShareFloat_{ic}$ is the ratio of floating-rate loans over total in market ic during the first six months of 2021. We use predetermined values before our event window, and one year before the first rate hike, to avoid simultaneity bias. Our identification assumption is that, as of the first half 2021, firms did not expect inflation and hence interest rates to increase significantly in the near future. In fact, the prolonged negative interest rate period in the aftermath of Covid-19 had not made inflation a pressing concern in the euro-area. We

[12]The causes of the cross-country heterogeneity have not been fully determined, but likely reasons include government policies, path dependence, sources of mortgage funding, and past inflation experiences (Campbell and Cocco, 2003; Cenzon and Szabó, 2024). Countries also differ in terms of prepayment penalties, costs of refinancing, recourse, the frequency of variable-rate resets, and reference rates (Badarinza et al., 2016).

confirm this when we test for parallel pre-trends in the dynamic specification below.

ΔDFR_t is the year-on-year change in DFR (the euro-area policy rate) in month t, i.e., the current DFR in month t minus the DFR in month $t-12$. We use a 12-month change to account for the long and variable lags of monetary policy on inflation and real economic activity (Friedman, 1961). We also add market-level controls (X_{ict}) like energy costs and other aggregate macro controls such as GDP growth and the euro-area inflation rate (HICP). Crucially, in more saturated specifications we include market (δ_{ic}), industry-month (η_{it}), and country-month (γ_{ct}) fixed effects, which absorb the aggregate macro controls. These fixed effects help us rule out confounding demand factors that are industry- and country-specific and may also be affected by monetary policy changes. Standard errors are clustered at the market level. Given our narrow event window, one year before and one year after the rate hikes, market characteristics such as the overall economic, financial dependence and market structure can be considered time-invariant.

3.1 Floating-rate Channel of Monetary Policy: Baseline results

Our main results are presented in Table A3. In column (1), we find that a 100 basis points (bps) year-on-year increase in the DFR is associated with a contemporaneous 34 bps decrease in the annualized inflation rate. Column (2) adds an interaction term for the share of floating-rate loans, showing a larger effect in markets with only fixed-rate loans (-64 bps) but a 0.5 bps reduction for every 1 percentage point increase in the floating-rate loan share. This means that in a market with a median share of floating-rate loans ($ShareFloat_{ic}$=61), the impact of the policy rate on inflation is 48% smaller (-0.64+0.005*61=-0.335) compared to a market with only fixed-rate loans. After controlling for time-varying shocks at the country and industry levels with country×month and industry×month fixed effects in column (3), which absorb the coefficient of the policy rate, together with energy costs in column (4), the interaction term grows larger. The estimates suggest that in a market with a median share of floating-rate loans the effect of the policy rate on inflation is almost zero.

Finally, in column (5) we confirm that the results hold if we compare markets with above the median dependence on floating-rate loans.

Given the long and variable lags of monetary policy, an alternative way to interpret our results is by using local projections, following Jordà (2005). Figure 3 presents the impulse response functions (IRFs) for a 100 bps policy rate increase on inflation over a 12-month horizon. Panel A shows that in the average market, the effect peaks around month 8, with inflation dropping by about 150 bps. In Panel B, we incorporate the estimated interaction term from column (4) of Table A3 and simulate IRFs for two hypothetical markets, one with a bottom (30%) and one with a top quintle (90%) share of floating-rate loans. The results highlight a striking difference in the response of inflation to the same increase in the policy rate: in markets dominated by floating-rate loans, inflation declines by 53 bps in the first six months compared to 94 bps in fixed-rate markets. This means that, in the short-run, the impact of monetary policy tightening is at least 50% smaller in markets dominated by floating-rate loans. Although the IRFs almost converge by month 12, the inflation decreases are still 25% smaller in floating-rate markets.

These results highlight the significant heterogeneity in the transmission of monetary policy across euro-area markets (e.g., Ciccarelli et al., 2013). For context, the average share of floating-rate loans in German or French markets in the first half of 2021 was 24%, compared to 41% in Spain, 60% in Italy and up to 80% in Portugal. Our estimates therefore suggest that the effectiveness of monetary policy in curbing inflation is 25-50% smaller in the periphery (Italy, Spain and Portugal) compared to core countries (France and Germany).

3.2 Parallel trends assumption

Our main identification assumption is that of parallel trends - i.e., that inflation would have followed similar trends in floating-rate or fixed-rate markets in the absence of changes in the policy rate. We provide a formal test of this assumption by estimating a dynamic version of Eqn (1), where we replace ΔDFR_t with monthly time dummies D_t. The coefficients on

the interaction terms with $ShareFloat_{ic}$ thus estimate the change in the dependent variable relative to the omitted baseline period (July 2022, the month before the first rate hike). This allows us to also visually inspect and test when the break takes place.

Figure 4 presents the estimated coefficients along with 90% confidence intervals. Prior to July 2022, inflation rates in markets with varying shares of floating-rate loans were similar, as indicated by coefficients close to zero and statistically insignificant. However, starting in July 2022, markets with a higher share of floating-rate loans saw significantly higher inflation rates. By June 2023, the difference in inflation between a market fully reliant on floating-rate loans and one with only fixed-rate loans reached 4 percentage points. These findings support the validity of our identification strategy and underscore the importance of the floating-rate channel in monetary policy transmission.

3.3 The floating-rate channel of monetary policy: Heterogeneity

Next we study how the floating-rate channel of monetary policy varies by characteristics of the market.

First of all, we expect the channel to be stronger in less competitive markets, where firms have greater pricing power. In competitive markets, having a floating-rate loan should not significantly affect pricing decisions, as these firms cannot increase prices without losing all their customers to fixed-rate firms. If prices in competitive markets are close to marginal costs, floating-rate firms will have to bear the losses coming from the increased cost of funding. In contrast, in less competitive markets, floating-rate firms can afford to raise prices following a rate hike. Although they may lose some market share to fixed-rate firms, by raising prices they can preserve cash flows in the short-run.

Second, the effects should be more pronounced in the presence of financial frictions. Financially constrained firms experiencing a liquidity shock may increase their prices, sacrificing future sales to maintain current cash-flows Gilchrist et al. (2017). For example, this may happen when firms have higher leverage, and therefore financing costs coming

from higher interest payments are a larger share of total costs, or when they have small cash buffers to absorb cost increases.

Table 4 shows results of these heterogeneity tests using sample median splits for Eqn (1). First, we investigate whether market power matters, using two different proxies: market concentration (i.e., HHI) based on sales' shares and a proxy for mark-ups (i.e., EBIT/Sales) similar to De Loecker et al. (2020). We then measure financial constraints using leverage (i.e, Debt/assets) and cash buffers (i.e., cash/Assets). In columns (1) and (2), we show that after the policy rate increase, inflation rises more in markets with a higher share of floating-rate debt, but only when these markets are highly concentrated. The effect in markets above the median Herfindahl-Hirschman Index (HHI) is 60% larger than the baseline estimate (column 4 of Table A3), indicating that high-concentration markets drive the results in the full sample. Limiting the analysis to markets with below-median HHI, we find that the interaction term's coefficient is small and insignificant. A similar, albeit weaker, pattern emerges when we substitute mark-ups for market concentration as the measure of market power (columns 3 and 4).

Additionally, we find that the effects are more pronounced in markets where financial constraints are tighter. Columns (3) and (4) show that the inflationary impact is significant only in markets with higher ex-ante firm leverage, where interest expenses constitute a larger portion of total costs, making rate increases more likely to induce firms to raise prices. In columns (5) and (6), we further document that the DFR's impact on inflation is stronger in sectors with lower cash buffers. This evidence aligns with findings by Gilchrist et al. (2017), indicating that liquidity-constrained firms are more likely to increase or maintain prices in response to rate hikes.

We test for parallel trends in our heterogeneity analyses by running a dynamic DiD specification for each sample median split. Figure 5 shows effects for low and high-concentration markets. Not only do we confirm the insights from Table 4, namely that a rate tightening is less effective in floating-rate markets only when these have high

concentration, but we also find no difference in CPI growth before the initial rate hike. Figures A5, A6 and A7 in the Online Appendix display a similar pattern for mark-ups, cash buffers and leverage, respectively

Overall, this evidence points towards the importance of the floating rate channel of monetary policy as a cost channel. In fact, it materializes only in markets where firms are able to pass through the increase in their funding costs to their customers, and where these costs are more relevant and more likely to push firms towards financial distress. This evidence also help us rule out demand-based confounding factors which would not be dependent on firms' characteristics in the market.

3.4 Upstream Producer Prices

A potential challenge we face in our empirical methodology is that firms with floating-rate firms could experience systematically different shocks compared to fixed-rate firms. While including industry-month and country-month fixed effects helps alleviate this concern, there is still a possibility that floating-rate firms experience distinct time-varying market shocks. For example, if these firms have rising input costs during a rate tightening, they may raise prices due to increased non-financial costs. Our proposed floating-rate channel centers on an increase in firms' financial costs, not operating input costs — though both could theoretically play a role. To test this, we re-estimate Eqn. (1) using the growth in the upstream producer price index (PPI) as the dependent variable. This variable is measured at the market level, weighting the PPI of a market's upstream suppliers, where the weights are constructed using the share of inputs provided by a given upstream market.

Table 5 presents our results. In column (1), we find that the rate tightening reduces inflation in upstream PPI too, and not just CPI-inflation. When we add the interaction with the share of floating-rate loans in column (2), we find that floating rate markets do not experience different PPI growth in their upstream markets compared to fixed-rate markets. If anything the interaction term is slightly negative, suggesting that floating-rate firms

may even face lower input prices, indicating some upstream market power. This pattern holds when we saturate the regression with country-time and industry-time fixed effects, together with energy costs.

In summary, our results indicate that floating-rate firms increase consumer prices due to higher financial expenses from rate hikes, rather than input cost shocks or other market-level fluctuations.

4 Floating-rate channel: Loan and firm-level analysis

In this section, we investigate the effect of having floating-rate loans on loan terms at the bank-firm level. We estimate the following regression equation:

$$Y_{fbt} = \beta ShareFloat_{fb} \times \Delta DFR_t + \alpha X_{ft-1} + \delta_{ict} + \gamma_{bt} + \epsilon_{fbt}, \quad (2)$$

where the dependent variable Y_{fbt} is either the contractual interest rate between firm f and bank b, which define a bank-firm relationship fb, in month t (weighted average of all loan rate in the relationship) or a dummy equal to one if at least one loan in relationship fb is renegotiated, zero otherwise. Panel C of Table 1 shows that average interest rates were around 2.2% over the sample period (i.e., from July 2021 to July 2023) and about 1% of loans were renegotiated.

$ShareFloat_{fb}$ is the ratio of floating-rate loans in the relationship between firm f and bank b to total loans of firm f during the first six months of 2021. Panel C of Table 1 shows that about 25% of firm-bank credit is floating. ΔDFR_t is the year-on-year change in DFR (the euro-area policy rate) in month t, i.e., the current DFR in month t minus the DFR in month $t-12$. We also add lagged firm-level controls (X_{ft-1}) like the log of the firm's total assets. Importantly, in the firm-bank panel, we include market-month (δ_{ict}) fixed effect, which absorb all time-varying country-industry shocks, and bank-month (γ_{bt}) fixed effects, which absorb any supply-side shock from the bank side. Standard errors are clustered at

the market level.

4.1 Interest rates

Table 6 shows the estimates for Eqn. (2) where the dependent variable is the average monthly interest rate at the firm-bank level. We find that firms with a larger share of floating-rate loans face significantly higher interest rates following an increase in the DFR. Column (1) of Table 6 shows that for a 100 bps increase in the policy rate, the cost of credit for a firm that borrows exclusively through floating-rate loans goes up by 70 basis points (0.0937+0.609). Given an average interest rate of 2.2 percentage points (Table 1, Panel C), this means that firms fully relying on floating-rate loans experiences an increase in their funding costs of around 32% relative to the mean. Conversely, firms borrowing through fixed-rate loans see an increase in loan rates of only 9 bps, or 4.5%. Importantly, progressively saturating the regression with month, market-month and bank-month fixed effects in columns (2)-(4) does not affect the results.

Additionally, Figure 6 shows that the cost of credit for firms more exposed to floating-rate loans increases exactly in August 2022, right after the first rate hike by the ECB in July. Importantly, there was no difference in interest rates between floating-rate or fixed-rate firms before July 2022, as the DFR was flat and negative, which is reassuring regarding the parallel trend assumption. By the end of the hiking cycle, the policy rate reaches 4% and the difference between floating and fixed-rate loans widens to 2%, in line with a pass-through elasticity of about 0.5.

This test confirms the presence of an immediate and large increase in funding costs for firms with floating rate loans after rate hikes, even when we control for supply-side factors through bank-time fixed effect. Monetary policy increases the cost of funding significantly more for firms more exposed to floating-rate loans, and in turn these firms pass on these higher costs to consumer by raising prices, especially if they have higher market power, thus slowing down the decrease in inflation.

4.2 Loan renegotiation

Next, we study whether firms with floating-rate loans are more likely to renegotiate specific terms of their existing loans. While the data do not identify whether the firm or the bank initiated the renegotiation, they do show whether loans are renegotiated and which terms are changed. This analysis sheds light on the significance of the increase of the financial burden for the firm and its effect on corporate finance policies.

We estimate Eqn. (2) where the dependent variable is a dummy equal to one if the loan in relationship fb is renegotiated at a quarterly frequency. We show that a higher share floating-rate loans is associated with a higher likelihood of a renegotiation in the bank-firm relationships. Column (1) of Table 7 shows that the probability of renegotiating after a 100 bps increase in DFR goes up by 20 bps for a firm fully reliant on floating-rate loans. Notably, this is a large effect: since the unconditional probability of renegotiation in sample is 1% (Panel A of Table 1), a 100 bps increase in the DFR increases the likelihood of renegotiation by 20% for a firm fully reliant on floating-rate loans. Columns (2)-(6) further show that these estimates do not qualitatively change when saturating the specification with quarter, market-quarter, and firm- and bank-quarter fixed effects.

Importantly, as it was the case for interest rates, Figure 7 shows that the effect takes place only from the third quarter of 2022, following the first hike in July 2022. By the end of the sample period (June 2023), the probability that a firm fully dependent on floating-rate loans renegotiates its loan terms is 0.5% higher, i.e., a floating-rate firm is 50% more likely to renegotiate its loan terms compared to a firm that only relies on fixed-rate loans.

Lastly, we examine which loan terms were renegotiated for floating-rate loans from July 2021 until July 2023. The regression specification at the loan-level is as follows:

$$y_{lbcit} = \beta Post_{\mathrm{t}} + \delta_{cbi} + \epsilon_{lt}, \tag{3}$$

where l indicates a loan, b a bank, c a country, i an industry and t a quarter. The dependent

variable y_{lbcit} is a dummy equal to one if: the loan spread was reduced, the loan switched from being floating-rate to fixed rate, the maturity of the loan was reduced or the committed amount of the loan was reduced. *Post* is a dummy equal to one after July 2022, zero otherwise. For this analysis, we restrict the sample to floating-rate loans that were renegotiated during the sample period, comparing those renegotiated before and after the July 2022 first rate hike. Standard errors are clustered at the bank level.

Table 8 reports the results for Eqn. (3). Following the rate hikes, renegotiations are significantly more likely to involve a decrease in the spread over the benchmark rate (e.g., Euribor) and a switch from a floating- to a fixed-rate. Conversely, we find no evidence that firms obtain longer maturities or larger exposures.

Overall, these results point towards the relevance of the increase in the funding costs for firms more exposed to floating-rate loans: not only do they pay more on their loans, but they are more likely to take necessary steps to mitigate the adverse effects of monetary policy. It further suggests that many firms did not expect inflation and interest rates to increase after Covid-19, as those with floating-rate loans switched to fixed-rate after the rate hikes, altering their funding structures.

4.3 Firm-level outcomes

In this section, we study outcomes at the firm-level. Specifically, we want to understand whether firms with a higher share of floating-rate loans raise prices above and beyond their increase in funding cost, potentially improving their profitability.

To this end, we use data from Orbis for euro-area firms from 2020 to 2023.[13] Because of the lack of firm-level output prices, we use EBIT over sales as a proxy of firm-level mark-ups (De Loecker et al., 2020). Furthermore, we consider return on asset (ROA) as a measure of profitability, and the average interest paid (calculate as the interest expenses over total financial debt) as a proxy for funding cost. We then regress the yearly outcomes

[13]At the time of writing, Orbis data for 2023 is available only for a small sub-sample of firms.

on the change in DFR and its interaction with the share of floating-rate loans of the firm as of 2021.

Table 9 reports the estimates of this specification. Column (1) shows that, conditionally on firm fixed effects and time-varying firm-level controls (e.g., the log of total assets), firms have lower mark-ups following an increase in the monetary policy rate. This is consistent with the overall decrease in CPI following a rate tightening. However, when we add the interaction with the share of floating-rate loans in column (2), we find that this effect is almost entirely offset for firms fully exposed to floating-rate loans.

Importantly, columns (3) and (4) of Table 9 show that, following the rate hikes, firms become less profitable on average, but this effect does not differ for firms with more floating-rate loans - i.e., these latter firms do not become more profitable or decrease profitability less. In fact, columns 5 and 6 report that, while all firms experience on average an increase in the interest paid, firms fully reliant on floating-rate loans experience an increase in interest paid that is around 50% higher.

Overall, the results in this section confirm the takeaways from previous sections - i.e. monetary policy decreases inflation. Furthermore, they also suggest that, while firms more reliant on floating-rate loans increase prices, they do so to mostly compensate for the larger increase in funding costs they face. Therefore, we find no evidence of "greedflation" or that firms that are forced to raise prices also increase in profitability.

5 Conclusion

In this paper, we provide novel evidence on a new channel through which monetary policy impacts inflation. We find that when firms borrow using floating-rate - rather than fixed-rate - loans, they increase prices to offset higher borrowing costs after rate hikes. This channel hampers the effectiveness of monetary policy. In the euro-area periphery (Italy, Portugal and Spain) where floating-rate loans are more common than in the core (France

and Germany), the effectiveness of monetary policy in curbing inflation is 25-50% lower.

The role of loan interest rate resets is currently missing in discussions on monetary policy, yet our findings suggest it is a crucial consideration for central bankers aiming to control inflation. This is especially relevant in countries and sectors where floating-rate loans dominate. One effective approach could be to foster greater competition in product markets. In competitive markets, we find no difference in the pricing response of floating-rate firms. These firms cannot increase prices without risking a complete loss in their market shares, meaning they bear the financial impact of rate hikes. Conversely, when floating-rate firms have market power, they are able to pass higher costs onto consumers, preserving cash flow despite some loss to fixed-rate competitors. This difference highlights how competition policy could support the inflationary goals of monetary tightening.

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Figure 1: Inflation and the Deposit Facility Rate

The figure plots the evolution of the averaged year-over-year CPI growth over all 583 markets (i.e., country-industry pairs) in our sample, the Harmonized Index of Consumer Prices (HICP) from Eurostat and the ECB Deposit Facility Rate (DFR) between January 2021 and June 2024

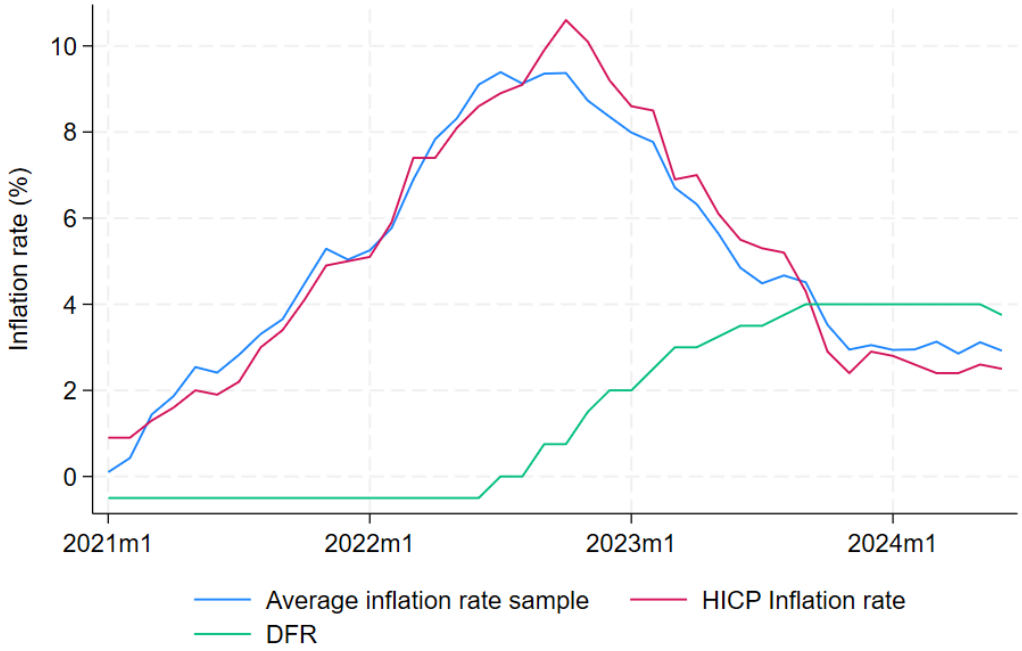
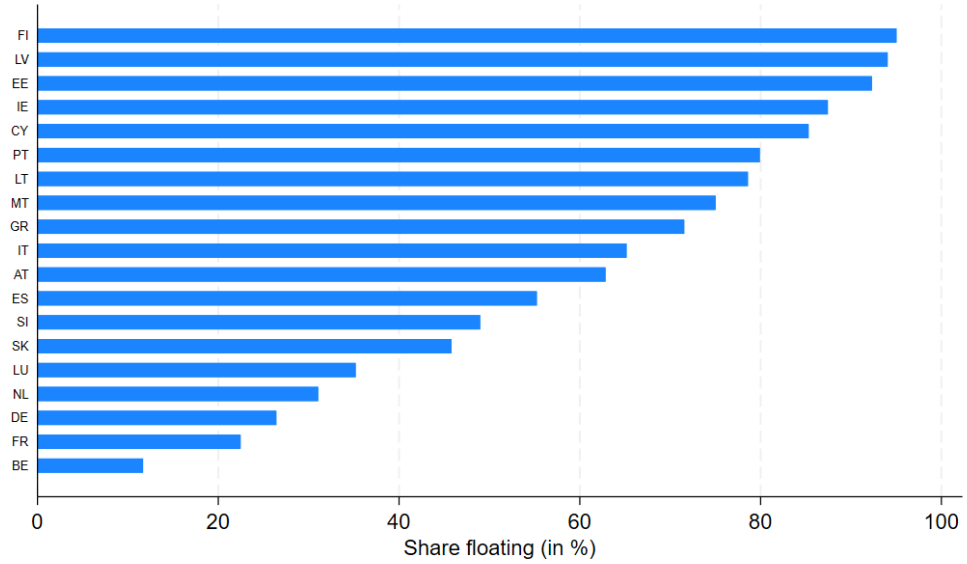


Figure 2: Fixed and floating-rate loans: Country and Sector heterogeneity in 2021

This figure shows the share of floating-rate loans across euro-area countries (Panel A) and industries (Panel B).

Panel A. By Country



Panel B. By Sector

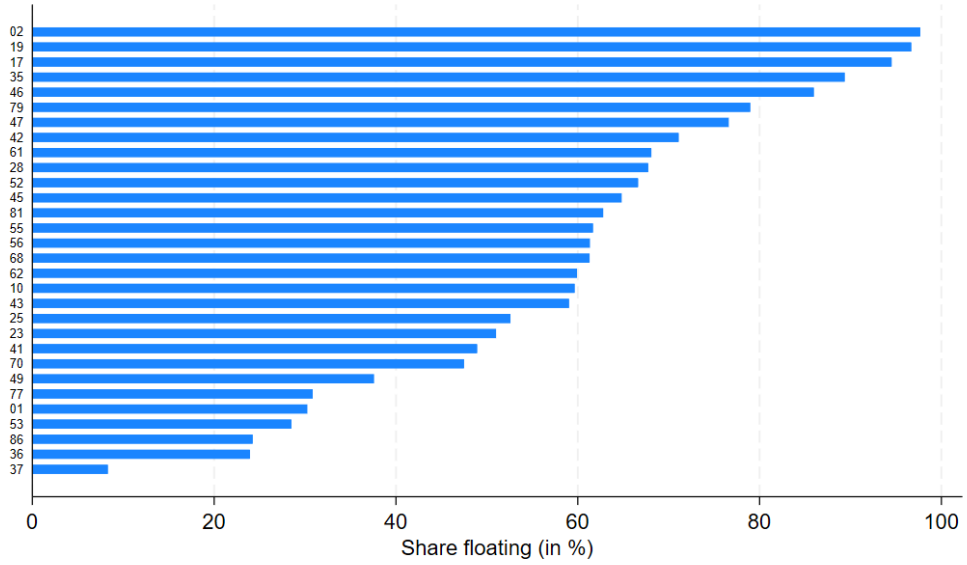
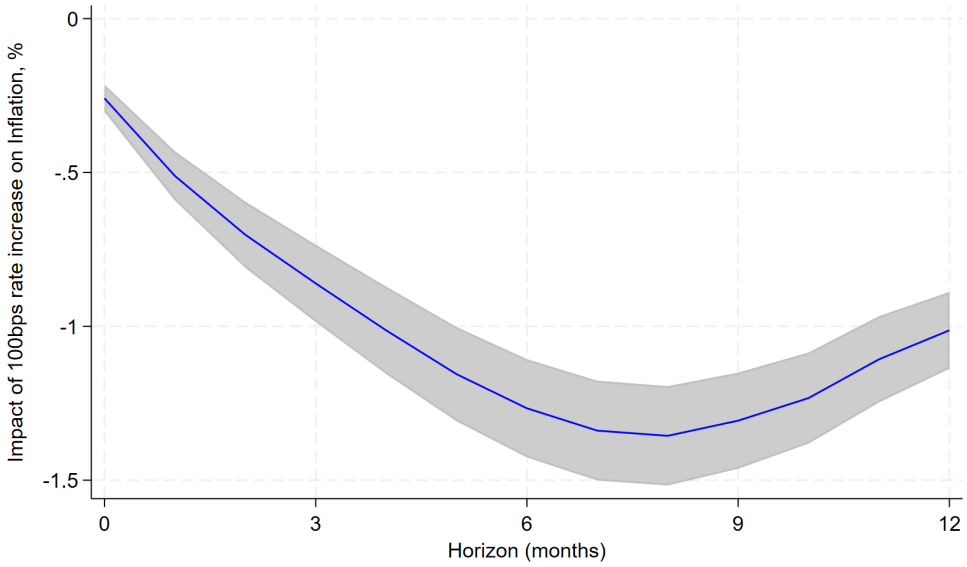


Figure 3: The Impact of Monetary Policy on Inflation: Floating and Fixed-rate Markets

This figure shows the impulse response functions by local projection (Jordà, 2005) for a 100bps increase in the deposit rate facility (DFR) on inflation (CPI growth) using a 12-month horizon and controlling for lagged inflation. We plot the impulse response function for the average market (Baseline - Panel A) and for markets with a low (20^{th} pct.=30%) vs. high (80^{th} pct.=90%) share of floating-rate loans (Panel B) using the estimates from column (4) of Table A3. The sample consists of monthly observations at the market level from July 2021 until July 2023. Shaded areas represent 95% confidence bans.

Panel A. Baseline



Panel B. Floating vs. Fixed-rate Markets

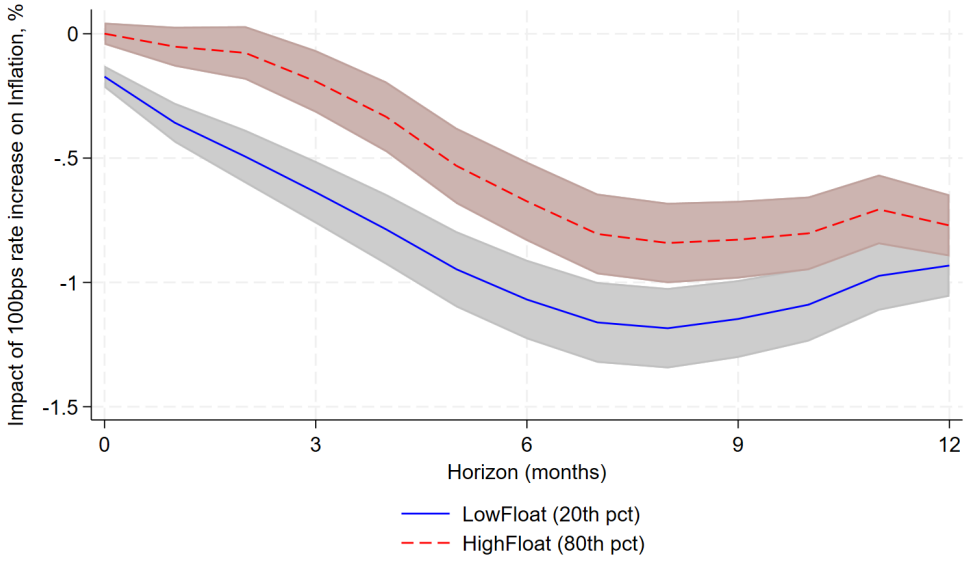


Figure 4: Dynamic DiD

The figure shows the monthly β coefficients and 90% confidence intervals for the following regression specification:

$$y_{ict} = \sum_{t=July2021}^{t=July2023} \beta_t \times ShareFloat_{\text{ic}} \times D_t + \beta_2 X_{ict} + \delta_{ic} + \eta_{it} + \gamma_{ct} + \epsilon_{ict}, \quad (4)$$

with July 2022 as the omitted period. The sample consists of monthly observations at the market level from July 2021 until July 2023. The subscript i indicates an industry (2-digit NACE level), c a country, and t a month. The dependent variable y_{ict} is the monthly annualized inflation rate. $ShareFloat_{ic}$ is the ratio of floating-rate loans over total during the first 6 months of 2021 in market ic. D_t is a dummy equal to 1 in month t, 0 otherwise. X_{ict} denotes market-level controls such as energy costs, as well as market (δ_{ic}), industry-month (η_{it}), and country-month (γ_{ct}) fixed effects. Standard errors are clustered at the market level.

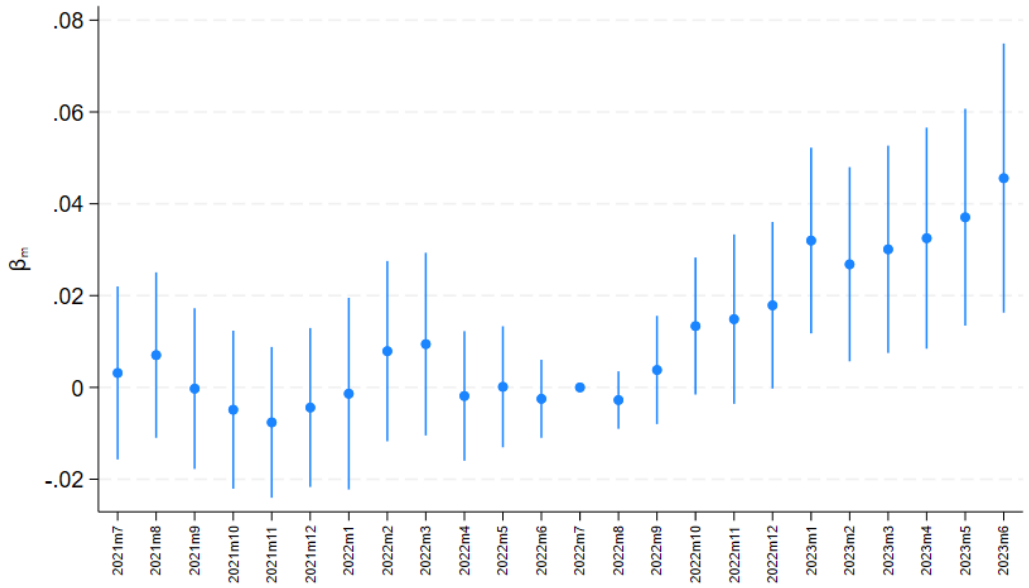
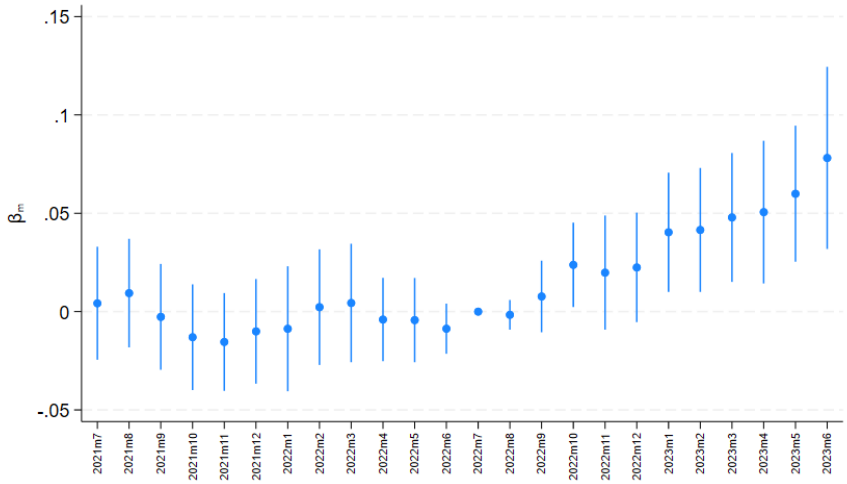


Figure 5: Dynamic DID: High vs. Low Concentration

The figure shows the monthly β coefficients and 90% confidence intervals when estimating equation (5) from Figure 4 in two sub-samples: markets with an above the median concentration as measured by the HHI in Panel A and markets with a below the median concentration in Panel B.

Panel A. High concentration



Panel B. Low concentration

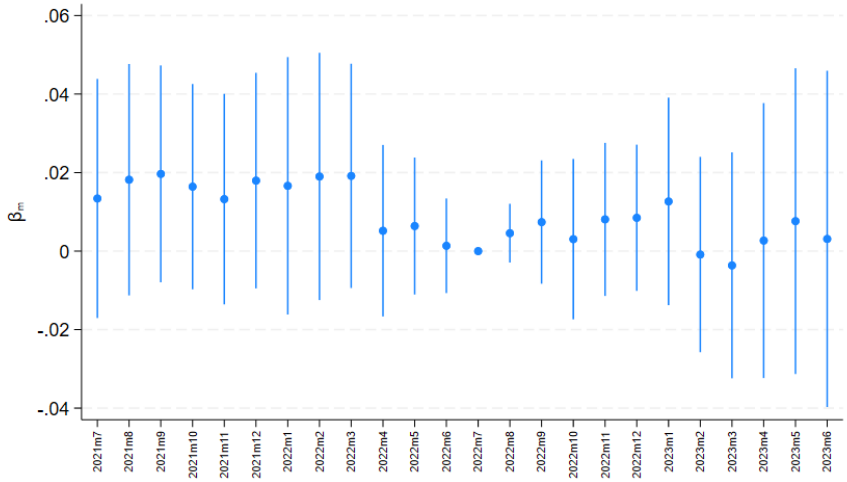


Figure 6: Dynamic DiD - Interest Rates

The sample consists of monthly observations at the firm-bank level from July 2021 until July 2023. The figure shows the monthly β coefficients and 90% confidence intervals for the following regression specification:

$$y_{fbt} = \sum_{t=July2021}^{t=July2023} \beta_t \times ShareFloat_{fb} \times D_t + \delta_{ict} + \gamma_{bt} + \epsilon_{fbt},$$

with July 2022 as the omitted period. The subscript i indicates an industry (2-digit NACE level), c a country (euro-area countries), and t a month. The dependent variable y_{fbt} is the monthly average interest rate on credit by bank b to firm f in month t (in %). D_t is a dummy equal to 1 in month t, 0 otherwise. $ShareFloat_{fb}$ is the ratio of floating-rate loans over total loans during the first 6 months of 2021 for firm f with bank b. δ_{ict} and γ_{bt} are market-month and bank-month fixed effects. Standard errors are clustered at the market-month level.

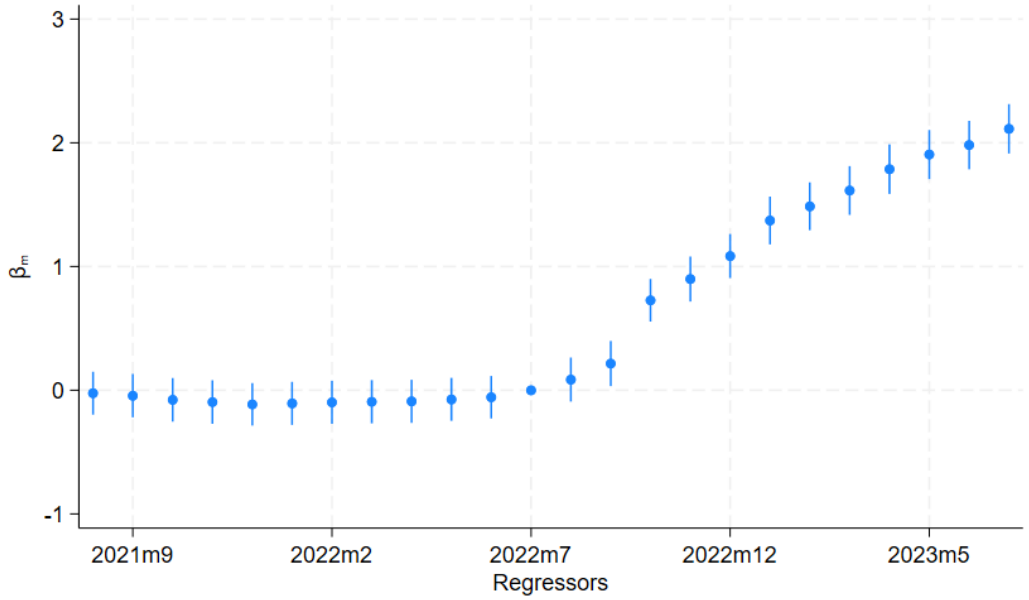


Figure 7: Dynamic DiD - Renegotiation

The figure shows the quarterly β coefficients and 90% confidence intervals for the following regression specification:

$$y_{fbt} = \sum_{t=2021Q2}^{t=2023Q2} \beta_t \times ShareFloat_{\text{fb}} \times D_{\text{t}} + \delta_{ict} + \gamma_{bt} + \epsilon_{ijt}, \tag{5}$$

with 2022Q2 as the omitted period. The sample consists of quarterly observations at the firm-bank level from the second quarter of 2021 until the last quater of 2023. The subscript i indicates an industry (2-digit NACE level), c a country (euro-area countries), and t a quarter. The dependent variable y_{fbt} is a dummy equal to 1 if one of the loans by bank b to firm f was renegotiated in quarter t.D_t is a dummy equal to 1 in month t. $ShareFloat_{fb}$ is the ratio of floating-rate loans over total loans during the first 6 months of 2021 for firm f with bank b. δ_{ict} and γ_{bt} are market-quarter and bank-quarter fixed effects. Standard errors are clustered at the market-quarter level.

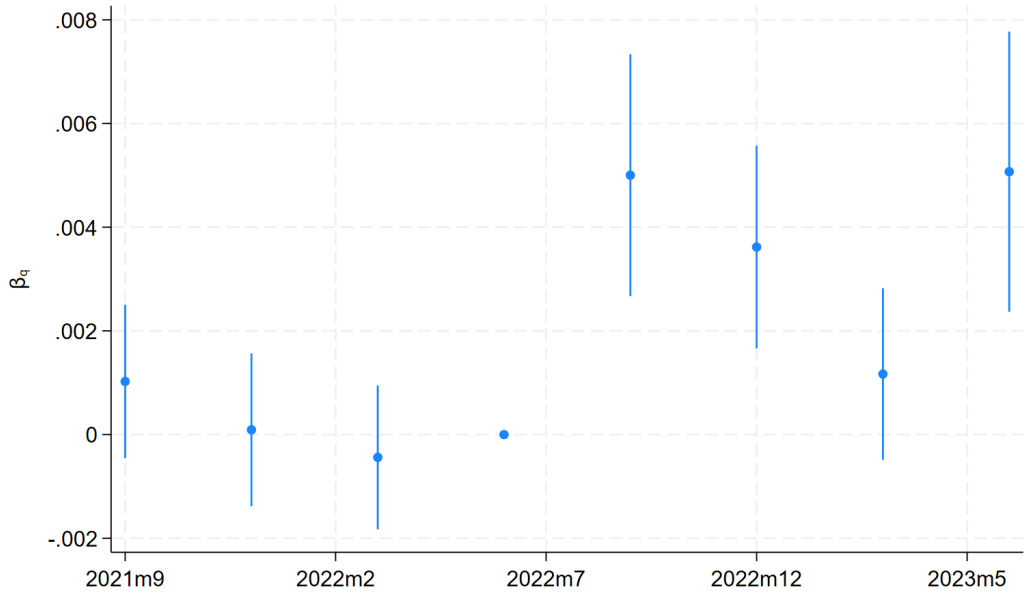


Table 1: Summary Statistics

The sample in Panel A consists all outstanding term loans and credit lines in December 2021. All variables are observed at the loan level. Firm PD is the 1-year probability of default on the firm's loans. The sample in Panel B consists of monthly observations at the market level from July 2021 until July 2023. A market is defined as a country-industry combination, with industry defined at the 2-digit NACE level. *Inflation rate* is the year-over-year percentage change in the market-level Harmonised Index of Consumer Prices (HICP), taken from Eurostat. Δ *Deposit Facility Rate* is the year-over-year change in the ECB's Deposit Facility Rate. *Share of floating rate* is the ratio of the total amount of floating-rate loans over the total amount of loans during the first 6 months of 2021, calculated using AnaCredit data. *Post* is a dummy equal to one after July 2022. *HHI* is the Herfindahl-Hirschman-Index of a market in 2021, calculated using firm-level turnover data from Orbis. *Cash ratio* is the ratio of cash over total assets, *Leverage ratio* is defined as debt over total assets. Both are calculated using 2021 Orbis data. *Energy cost* is calculated using a country-level CPI index for energy and the total energy use in a market, collected from Eurostat. The sample in Panel C consists of monthly observations at the bank-firm level from July 2021 until July 2023.

	Observations	Mean	Std.dev.	1^{st} pct.	Median	99^{th} pct.
Panel A	Loan level (cross-section Dec2021)					
Floating rate dummy	10,915,310	0.239		0	0	1
Loan amount (th. EUR)	10,915,310	197	534	0.339	40.910	4000
Interest rate (%)	10,915,310	2.062	1.710	0	1.620	10.471
Initial loan maturity (days)	10,915,310	2981	2463	57	2191	12447
Firm PD (%)	7,453,408	6.871	20.791	0.030	0.887	100
Collateral dummy	10,915,310	0.726		0	1	1
Term loan dummy	10,915,310	0.727		0	1	1
Credit line dummy	10,915,310	0.273		0	0	1
Renegotiated dummy	10,915,310	0.010		0	0	1
Panel B	Industry level, Jul2021-Jul2023					
Inflation rate (%)	13,944	6.53	6.11	-6.11	4.94	24.78
ShareFloat (%)	13,944	58.98	29.87	2.83	61.00	100.00
Δ Deposit Facility Rate	13,944	1.18	1.45	0.00	0.00	4.00
HHI	13,728	0.19	0.26	0.00	0.07	1.00
Cash ratio	13,728	0.12	0.09	0.01	0.10	0.43
Leverage ratio	13,728	0.56	0.20	0.09	0.56	1.26
Energy cost	11,544	4.00	9.28	0.02	0.92	47.25
Panel C	Bank-firm level, Jul2021-Jul2023					
Loan amount (th. EUR)	110,311,249	660.88	8338.32	3.44	110.45	8831.70
Interest rate (%)	110,311,249	2.19	1.67	0.00	1.75	8.22
Share of floating rate (%)	110,311,249	0.25	0.41	0.00	0.00	1.00
Initial loan maturity (days)	110,311,249	3341.95	2251.78	0.00	2526.03	10974.00
Renegotiation dummy	35,064,673	0.01		0	0	1

Table 2: Floating-rate Determinants: Variance Decomposition

The sample consists of the cross-section of bank-firm relationships in Euro-area as of July 2022 (i.e., right before the first rate hike). The dependent variable is the share of floating-rate debt in the lending relationship ShareFloat_{fb}. In column 1 through 5, several fixed effects are added, starting with the (2-digit) industry and country of the borrowing firm, then the firm, and finally bank. We report the adjusted R-squared from each regression.

	ShareFloat_{fb}				
	(1)	(2)	(3)	(4)	(5)
Adjusted R-sq.	0.0175	0.286	0.363	0.452	0.518
Observations	1578795	1578795	1578275	1578795	1578188
Fixed effect	Industry	Country	Firm	Bank	Firm&Bank

Table 3: Inflation and Floating-rate Loans

The sample consists of monthly market-level (i.e., industry-country pairs) data, from July 2021 until July 2023. $ShareFloat_{ic}$ is the ratio of the total amount of floating-rate loans over the total amount of loans during the first 6 months of 2021 in market *ic*. Δ *DFR* is the year-over-year change in the ECB's Deposit Facility Rate. High Share is a dummy equal to one if the share of floating-rate loans in market *ic* is above the median, zero otherwise. *Energy cost* is calculated using a country-level CPI index for energy and the total energy use in a market. Macro control variables are the euro-area Harmonised Index of Consumer Prices (HICP) and GDP growth. Standard errors clustered at the market level are in parentheses.

	Inflation rate (%)				
	(1)	(2)	(3)	(4)	(5)
Δ DFR	-0.338***	-0.645***			
	(0.0916)	(0.194)			
ShareFloat$_{ic}$ $\times$ Δ DFR		0.0052*	0.0108***	0.0099***	
		(0.0029)	(0.0031)	(0.0032)	
High Share$_{ic}$ $\times$ Δ DFR					0.347**
					(0.165)
Energy cost				0.0414	0.0392
				(0.0466)	(0.0476)
Observations	13,944	13,944	13,920	11,544	11,544
R-squared	0.565	0.566	0.821	0.837	0.836
Macro controls	Y	Y	-	-	-
Country-industry FE	Y	Y	Y	Y	Y
Ind-month FE	N	N	Y	Y	Y
Country-month FE	N	N	Y	Y	Y

Table 4: Heterogeneity: Concentration, Mark-ups, Leverage and Cash Buffers

The sample consists of monthly market-level data, from July 2021 until July 2023. Columns (1), (3), (5) and (7) show results for markets where respectively the HHI based on Sales, a Mark-up proxy (i.e., EBIT/Sales), Leverage ratio (i.e., debt/assets) and Cash Ratio (i.e., cash&liquid assets/assets) in 2021 was below the sample median, and columns (2), (4), (6), and (8) above the median. $ShareFloat_{ic}$ is the ratio of the total amount of floating rate loans over the total amount of loans during the first 6 months of 2021 in market ic. ΔDFR is the year-over-year change in the ECB's Deposit Facility Rate. *Energy cost* is calculated using a country-level CPI index for energy and the total energy use in a market. Standard errors clustered at the market level are in parentheses.

	HHI		Mark-up		Leverage ratio		Cash ratio	
	Low	High	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$ShareFloat_{ic}$	-0.0027	0.0164***	0.00868*	0.0126***	0.0042	0.010**	0.0107**	0.0087*
$\times \Delta$ DFR	(0.0044)	(0.0045)	(0.0050)	(0.0046)	(0.0048)	(0.0044)	(0.0044)	(0.0047)
Observations	5,634	5,670	5,346	5,310	5,748	5,508	5,586	5,628
R-squared	0.893	0.812	0.845	0.872	0.891	0.813	0.873	0.842
Country-Ind FE	Y	Y	Y	Y	Y	Y	Y	Y
Ind-month FE	Y	Y	Y	Y	Y	Y	Y	Y
Country-month FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 5: Upstream Producer Prices and Floating-rate Loans

The sample consists of monthly market-level (i.e., industry-country pairs) data, from July 2021 until July 2023. The dependent variable is the weighted PPI of a market's upstream suppliers, where weights are constructed using the share of inputs provided by a given upstream market. $ShareFloat_{ic}$ is the ratio of the total amount of floating rate loans over the total amount of loans during the first 6 months of 2021 in market ic. Δ *DFR* is the year-over-year change in the ECB's Deposit Facility Rate. *Energy cost* is calculated using a country-level CPI index for energy and the total energy use in a market. Macro control variables are the euro-area Harmonised Index of Producer Prices (PPI) and GDP growth. Standard errors clustered at the market level are in parentheses.

	Weighted PPI Index Growth (%)				
	(1)	(2)	(3)	(4)	(5)
Δ DFR	-0.244***	-0.195***			
	(0.0335)	(0.0544)			
ShareFloat$_{ic}$ $\times$ Δ DFR		-0.0837	-0.109	-0.117	
		(0.0677)	(0.0853)	(0.0921)	
High Share$_{ic}$ $\times$ Δ DFR					-0.0359
					(0.0473)
Energy cost				-0.122	-0.122
				(0.0779)	(0.0780)
Observations	11,405	11,405	11,405	10,480	10,480
R-squared	0.236	0.236	0.708	0.709	0.709
Macro controls	Y	Y	-	-	-
Country-industry FE	Y	Y	Y	Y	Y
Ind-month FE	N	N	Y	Y	Y
Country-month FE	N	N	Y	Y	Y

Table 6: Loan Interest Rates

The sample consists of monthly observations at the firm-bank level from July 2021 until July 2023. The regression specification is as follows:

$$y_{fbt} = \beta ShareFloat_{\text{fb}} \times \Delta DFR_t + \delta_{fb} + \gamma_{bt} + \rho_{ict} + \epsilon_{fbt},$$

where f indicates a firm, b a bank, c a country, i an industry and t a month. The dependent variable y_{fbt} is the monthly average interest rate on credit by bank b to firm f in month t. $ShareFloat_{fb}$ is the ratio of floating rate loans over total during the first 6 months of 2021 for firm f with bank b. Δ *DFR* is the year-over-year change in the ECB's Deposit Facility Rate. Standard errors clustered at the industry-country level are in parentheses.

	Interest rate (%)			
	(1)	(2)	(3)	(4)
Δ DFR	0.0937***			
	(0.0061)			
ShareFloat$_{fb} \times \Delta$ DFR	0.609***	0.609***	0.539***	0.576***
	(0.0092)	(0.0097)	(0.0079)	(0.0082)
Observations	110,253,844	110,253,844	110,252,694	110,238,610
Bank-Firm FE	Y	Y	Y	Y
Month FE	N	Y	-	-
Country-industry-month FE	N	N	Y	Y
Bank-month FE	N	N	N	Y

Table 7: Loan Renegotiation

The sample consists of quarterly observations at the firm-bank level from the third quarter of 2021 until the third quarter of 2023. The regression specification is as follows:

$$y_{fbt} = \beta ShareFloat_{\text{fb}} \times \Delta DFR_t + \delta_{fb} + \gamma_{bt} + \rho_{ict} + \epsilon_{fbt},$$

where f indicates a firm, b a bank and t a quarter. The dependent variable y_{fbt} is a dummy equal to 1 if a loan between bank b and firm f was renegotiated in quarter t. $ShareFloat_{fb}$ is the ratio of floating rate loans over total during the first 6 months of 2021 for firm f with bank b. Δ *DFR* is the year-over-year change in the ECB's Deposit Facility Rate. Standard errors clustered at the industry-country level are in parentheses.

	Renegotiation dummy			
	(1)	(2)	(3)	(4)
Δ DFR	-0.0002			
	(0.0002)			
ShareFloat$_{fb} \times \Delta$ DFR	0.0015***	0.0015***	0.0017***	0.0007***
	(0.0004)	(0.0004)	(0.0005)	(0.0002)
Observations	34,788,710	34,788,710	34,788,341	34,783,863
Bank-Firm FE	Y	Y	Y	Y
Quarter FE	N	Y	-	-
Country-industry-quarter FE	N	N	Y	Y
Bank-quarter FE	N	N	N	Y

Table 8: Loan Terms after Renegotiation

The sample consists of quarterly observations at the loan level for floating-rate loans that were renegotiated from July 2021 until July 2023. The regression specification is as follows:

$$y_{lbcit} = \beta Post_t + \delta_{cbi} + \epsilon_{lt},$$

where l indicates a loan, b a bank, c a country, i an industry and t a quarter. The dependent variable y_{lt} is a dummy equal to 1 if: the loan spread was reduced in column (1); the loan switched from being floating-rate to fixed rate in column (2); the maturity of the loan was reduced in column (3) or the committed amount of the loan was reduced in column (4). *Post* is a dummy equal to one after July 2022, zero otherwise. Standard errors clustered at the bank level are in parenthesis.

	Spread decrease (1)	Float to fixed (2)	Maturity decrease (3)	Loan volume decrease (4)
Post	0.0253**	0.0099***	0.0078	-0.0026
	(0.0111)	(0.0031)	(0.0127)	(0.00251)
Constant	0.120***	0.0039**	0.127***	0.0093***
	(0.0062)	(0.0017)	(0.0069)	(0.0012)
Observations	208,500	224,041	204,773	184,478
R-squared	0.350	0.287	0.796	0.313
Country-industry-bank FE	Y	Y	Y	Y

Table 9: Firm-level Outcomes

The sample consists of yearly observations at the firm level from 2020 until 2023. The regression specification is as follows:

$$y_{ft} = \beta ShareFloat_{\mathrm{f}} \times \Delta DFR_t + \alpha X_{it} + \delta_{ict} + \gamma_f + \epsilon_{ft},$$

where f indicates a firm, and t a year. The dependent variable y_{ft} is either a mark-up proxy (EBIT/Sales), return on assets (ROA) or the average interest paid by the firm on its debt (interest expenses divided by financial debt). $ShareFloat_f$ is the ratio of floating rate loans over total loans during the first 6 months of 2021 for firm f. Δ *DFR* is the year-over-year change in the ECB's Deposit Facility Rate. X_{it} is a vector of firm-level controls, such as the $Ln(total\ assets)_{ft}$. δ_{ict} is an industry-country-year fixed effect, γ_f is a firm fixed effect. Standard errors clustered at the firm level are in parentheses.

	Mark-up proxy		ROA		Interest paid	
	(1)	(2)	(3)	(4)	(5)	(6)
Δ DFR	-0.0016***		-0.0006***		0.202***	
	(0.0002)		(0.0001)		(0.0018)	
ShareFloat$_f$ $\times$ Δ DFR		0.0011**		0.0005		0.099***
		(0.0005)		(0.0003)		(0.0124)
Observations	153,642	141,217	153,641	141,216	141,191	130,591
Firm FE	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y
Country-industry-year FE	N	Y	N	N	Y	Y

Online Appendix

Figure A1: Example of COICOP-CPA transition matrix

This figure shows an example of a COICOP-CPA transition matrix for Austria

CPA x COICOP		01.1 Food	02.2 Tobacco	04.5 Electricity, gas and other fuels	09.3 Other recreational items and equipment, gardens and pets	Total
01	Products of agriculture, hunting and related services	2383080	61651	-	913837	**3358568**
02	Products of forestry, logging and related services	-	-	521557	43503	**565060**
03	Fish and fishing products	123244	-	-	-	**123244**
05-07	Coal a.lignite; crude petroleum a.natural gas; metal ores	-	-	35791	-	**35791**
08-09	Other mining a. quarrying prod.; mining support services	-	-	-	15400	**48336**
10	Food products	13300811	-	-	641128	**15105243**
	Total	**15807135**	**3425510**	**7055310**	**3715785**	**177798703**

Figure A2: Floating-rate Loans: Reference Rate

This figure shows the share of floating rate loans divided by the reference rate. The sample is that of all loans in the Euro-area issued before the rate hike (August 2022).

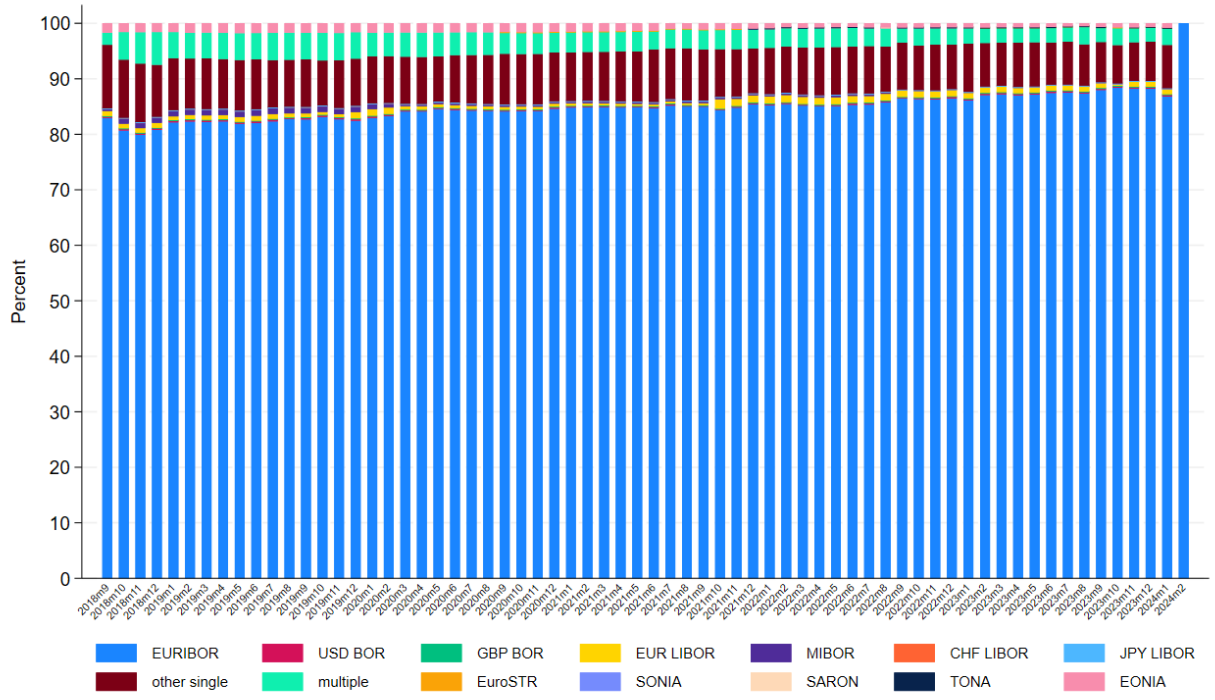


Figure A3: Floating-rate Loans: Reference Rate Maturity

This figure shows the share of floating rate loans divided by the maturity of the reference rate. The sample is that of all loans in the Euro-area issued before the rate hike (August 2022).

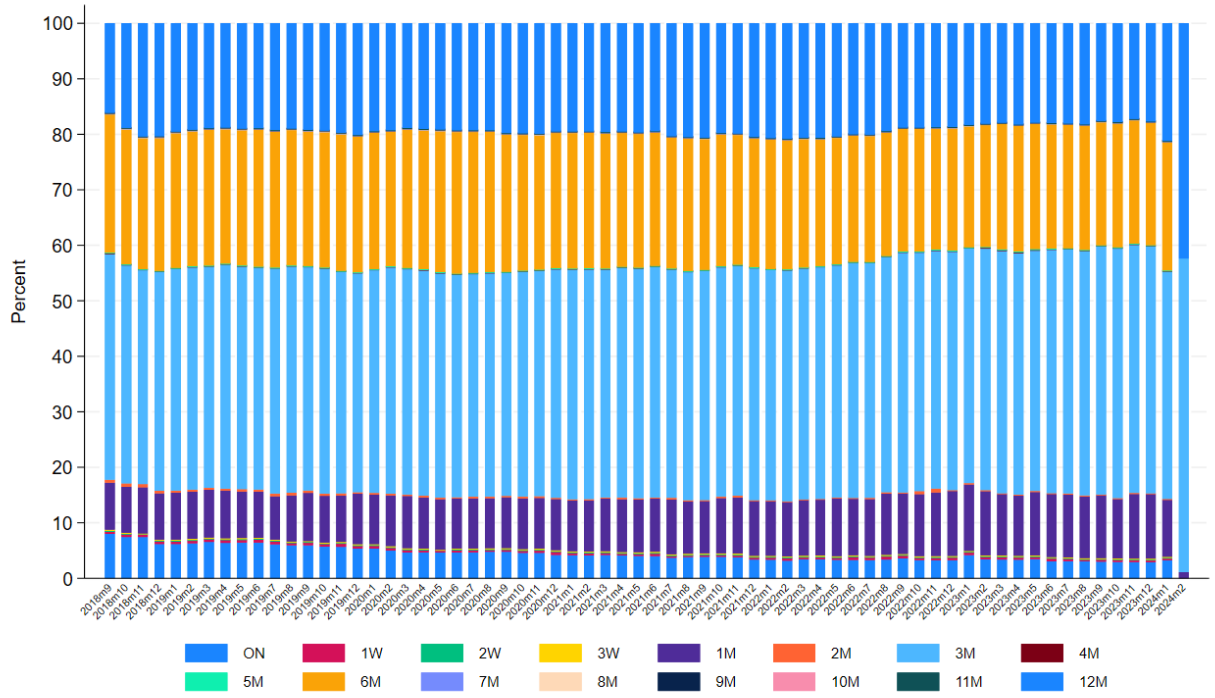
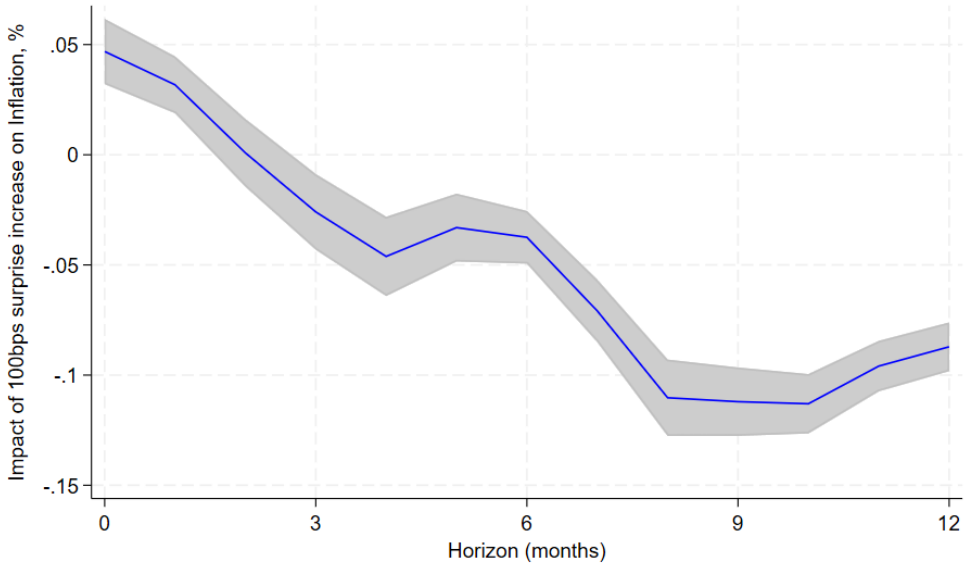


Figure A4: Monetary Policy Surprises and Inflation: Floating and Fixed-rate Markets

This figure shows the impulse response functions by local projection (Jordà, 2005) for a 100bps increase in monetary policy surprise using high-frequency changes from Altavilla et al. (2019) on inflation (CPI growth) using a 12-month horizon. The monetary policy surprise is the change in the median quote of the 1 month Overnight Index Swap (OIS) rate from a 30-minute window before the ECB press release to the median quote in the window 30 after the press conference (Euro Area Monetary Policy event study Database, EA-MPD). We plot the impulse response function for the average market (Baseline - Panel A) and for markets with a low (20^{th} pct.=30%) vs. high (80^{th} pct.=90%) share of floating-rate loans (Panel B) using the estimates from column (4) of Table A3. The sample consists of monthly observations at the market level from July 2021 until July 2023. Shaded areas represent 95% confidence bans.

Panel A. Baseline



Panel B. Floating vs. Fixed-rate Markets

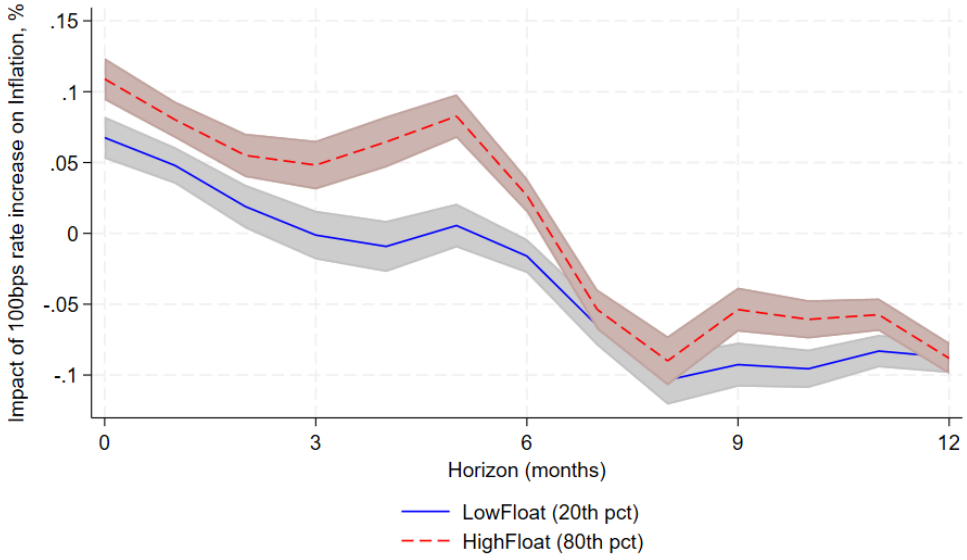
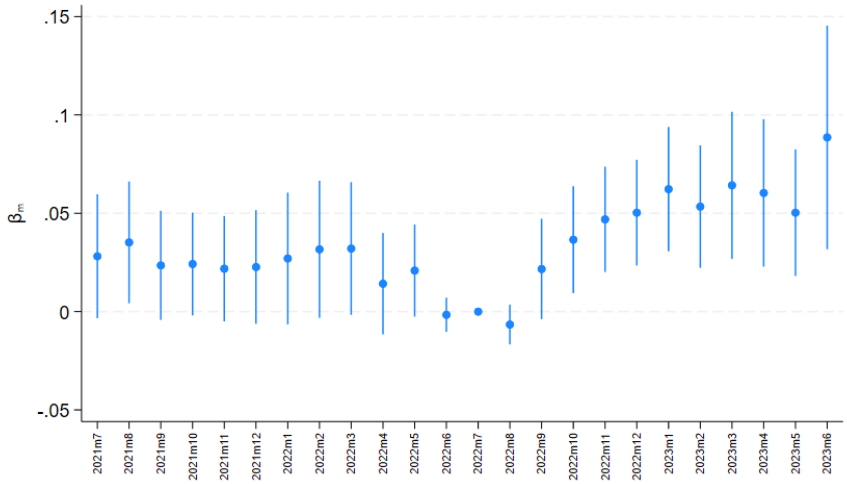


Figure A5: Dynamic DID: High vs. Low Mark-up

The figure shows the monthly β coefficients and 90% confidence intervals when estimating equation (5) from Figure 4 in two sub-samples: markets with an above the median mark-up as measured by EBIT to sales ratio in Panel A and markets with a below the median EBIT to sales ratio in Panel B.

Panel A. High Mark-up



Panel B. Low Mark-up

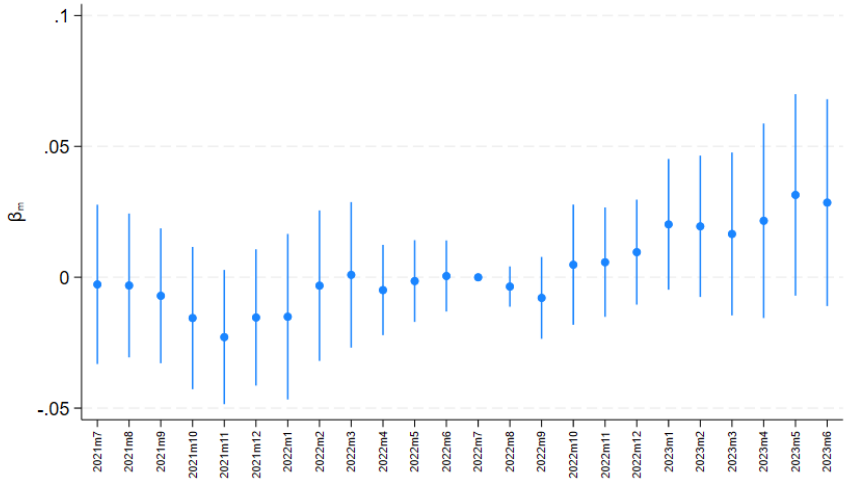
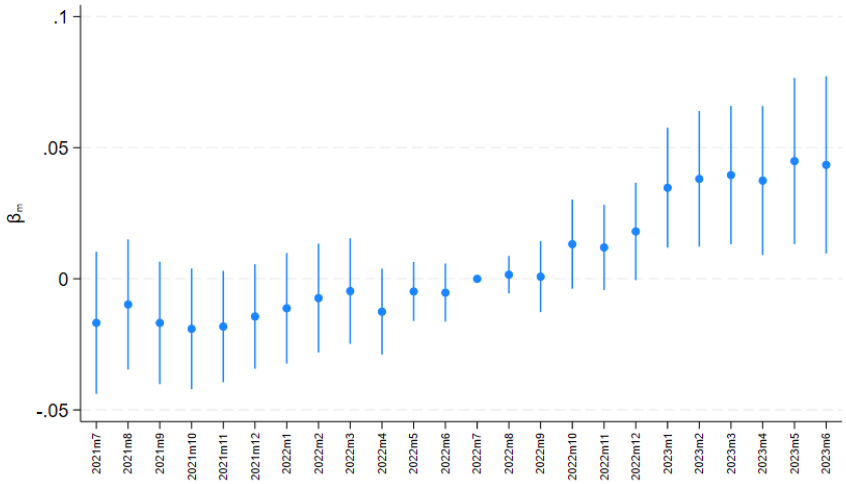


Figure A6: Dynamic DID: High vs. Low Cash Buffers

The figure shows the monthly β coefficients and 90% confidence intervals when estimating equation (5) from Figure 4 in two sub-samples: markets with below the median cash buffers as measured by cash to to assets ratio in Panel A and markets with above the median cash buffers in Panel B.

Panel A. Low Cash Buffers



Panel B. High Cash Buffers

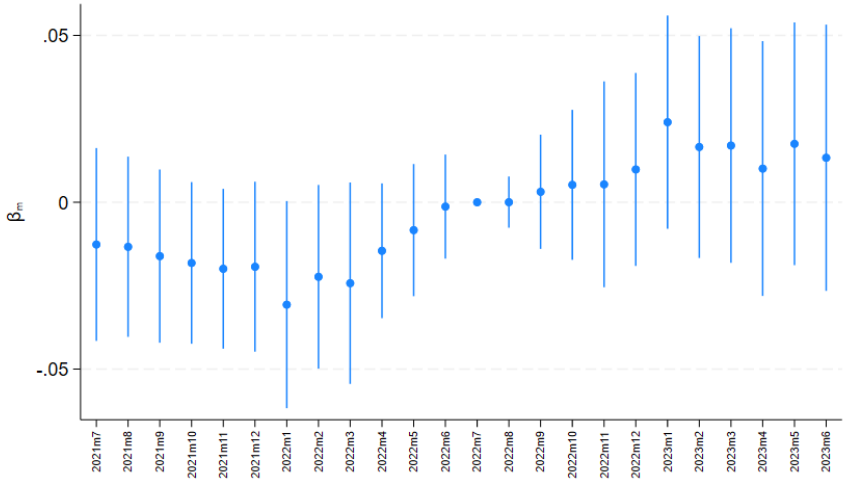
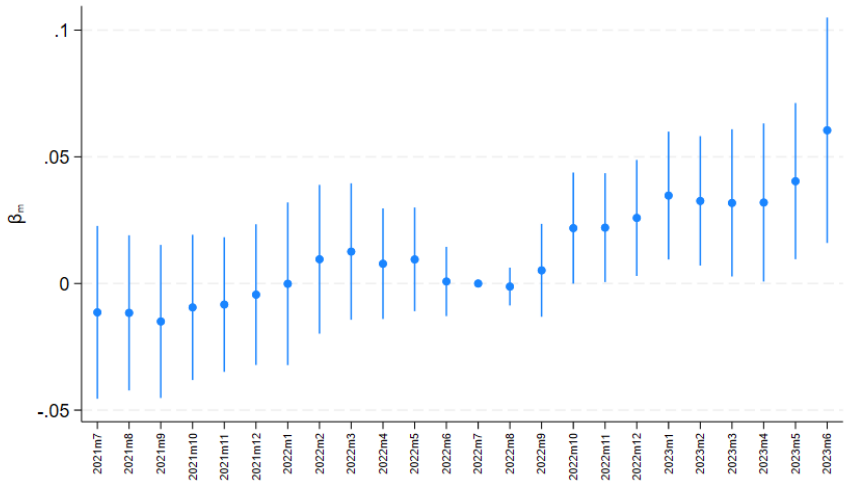


Figure A7: Dynamic DID: High vs. Low Leverage

The figure shows the monthly β coefficients and 90% confidence intervals when estimating equation (5) from Figure 4 in two sub-samples: markets with an above the median leverage as measured by debt to asset ratio in Panel A and markets with a below the median leverage in Panel B.

Panel A. High leverage



Panel B. Low leverage

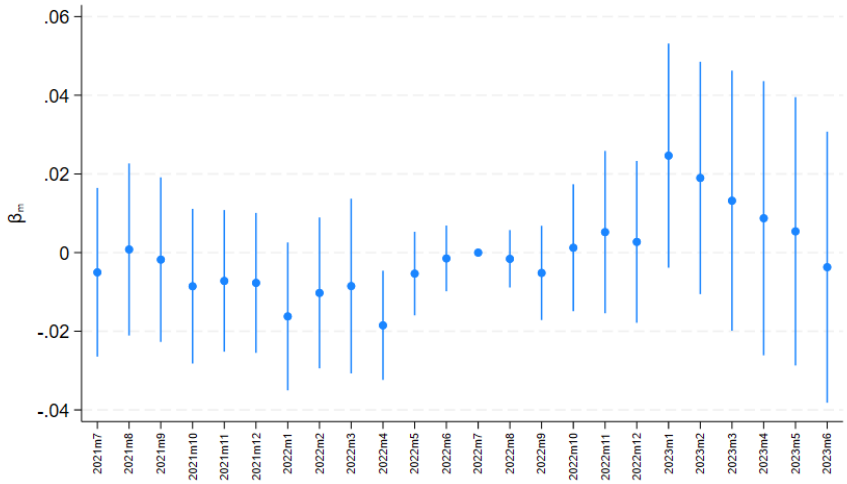


Table A1: Loan-level Summary Statistics: Floating-rate vs. Fixed-rate Loans

The sample in the upper panel consists all outstanding term loans and credit lines in December 2021. All variables are observed at the loan level. Firm PD is the 1-year probability of default on the firm's loans.

	Observations	Mean	Std.dev.	1^{st} pct.	Median	99^{th} pct.
	Floating rate loans					
Loan amount (th. EUR)	2,610,336	270	668	0.270	50	4000
Interest rate (%)	2,610,336	2.307	1.490	0	1.974	7.250
Initial loan maturity (days)	2,610,336	2961	2748	54	2183	12021
Firm PD (%)	1,390,330	9.518	25.049	0.030	1.310	100
Collateral dummy	2,610,336	0.789		0	1	1
Term loan dummy	2,610,336	0.718		0	1	1
Credit line dummy	2,610,336	0.282		0	0	1
Renegotiated dummy	2,610,336	0.012		0	0	1
Euribor dummy	2,610,336	0.823		0	1	1
	Fixed-rate loans					
Loan amount (th. EUR)	8,304,974	174	483	0.409	38.567	3125
Interest rate (%)	8,304,974	1.985	1.767	0	1.510	11.580
Initial loan maturity (days)	8,304,974	2988	2366	65	2191	12606
Firm PD (%)	6,063,078	6.263	19.635	0.030	0.820	100
Collateral dummy	8,304,974	0.706		0	1	1
Term loan dummy	8,304,974	0.729		0	1	1
Credit line dummy	8,304,974	0.271		0	0	1
Renegotiated dummy	8,304,974	0.008		0	0	1

Table A2: Industry List

NACE code	Description
01	Crop and animal production, hunting and related service activities
02	Forestry and logging
05-09	Mining and quarrying
10-12	Manufacturing of food, beverages and tobacco
16	Manufacturing of wood and cork
18	Printing and reproduction of media
19	Manufacture of coke and refined petroleum products
21	Manufacture of basic pharmaceutical products and preparations
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
26	Manufacture of computer, electronic and optical products
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
33	Repair and installation of machinery and equipment
36	Water collection, treatment and supply
37-39	Sewerage, waste collection and waste management activities
41-43	Construction
45	Wholesale and retail trade and repair of motor vehicles
49	Land transport and transport via pipelines
50	Water transport
51	Air transport
52	Warehousing and support activities for transportation
53	Postal and courier activities
55-56	Accommodation and food services
58	Publishing activities
59-60	Motion picture, video, television, programming and broadcasting
61	Telecommunications
62-63	Computer programming, consultancy and related activities; information services
69-70	Legal and accounting activities, management consultancy and head offices
71	Architectural and engineering activities; technical testing and analysis
7475	Other professional, scientific and technical activities, veterinary activities
77	Rental and leasing activities
78	Employment activities
79	Travel agency, tour operator reservation service and related activities
80-82	Security and investigation, services to buildings, office admin and business support
84	Public administration and defence; compulsory social security
85	Education
86	Human health activities
87-88	Residential care, social work without accommodation
90-92	Arts, libraries, musea and other cultural activities
93	Sports activities and amusement and recreation activities
97-98	Activities of households as employers

Table A3: Inflation and Floating-rate Loans: MP surprises

The sample consists of monthly market-level (i.e., industry-country pairs) data, from July 2021 until July 2023. $ShareFloat_{ic}$ is the ratio of the total amount of floating-rate loans over the total amount of loans during the first 6 months of 2021 in market *ic*. MP Surprise is the change in the median quote of the 1 month Overnight Index Swap (OIS) rate from a 30-minute window before the ECB press release to the median quote in the window 30 after the press conference (Altavilla et al. (2019) Euro Area Monetary Policy event study Database, EA-MPD). High Share is a dummy equal to one if the share of floating-rate loans in market *ic* is above the median, zero otherwise. *Energy cost* is calculated using a country-level CPI index for energy and the total energy use in a market. Macro control variables are the euro-area Harmonised Index of Consumer Prices (HICP) and GDP growth. Standard errors clustered at the market level are in parentheses.

	Inflation rate (%)				
	(1)	(2)	(3)	(4)	(5)
MP Surprise	0.0469***	0.0198			
	(0.00755)	(0.0184)			
$\text{ShareFloat}_{ic} \times$ MP Surprise		0.0005*	0.0007**	0.0005*	
		(0.0002)	(0.0003)	(0.0003)	
$\text{High Share}_{ic} \times$ MP Surprise					0.0196
					(0.0175)
LaggedInfl,	0.905***	0.905***			
	(0.0398)	(0.0398)			
Energy cost				0.0353	0.0352
				(0.0484)	(0.0485)
Observations	13,944	13,944	13,920	11,544	11,544
R-squared	0.562	0.567	0.820	0.835	0.835
Macro controls	Y	Y	-	-	-
Country-industry FE	Y	Y	Y	Y	Y
Ind-month FE	N	N	Y	Y	Y
Country-month FE	N	N	Y	Y	Y