The heterogeneous impact of monetary policy announcements on firms' financial outcomes

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Abstract

This study explores the impact of monetary policy surprises on credit usage, credit growth borrowing costs and default probabilities, emphasising key differences across firms based on size, leverage and export orientation. The findings reveal that small and medium-sized enterprises (SMEs) are more vulnerable to monetary policy shocks than larger firms, experiencing sharper declines in borrowing, higher loan interest rates and greater increases in default risk. Additionally, highly leveraged firms exhibit greater sensitivity compared with those with lower leverage. Export-oriented firms, however, demonstrate resilience to monetary shocks, leveraging access to foreign exchange borrowing and diversified revenue streams to mitigate adverse effects. Sectoral analysis identifies the construction sector as the most responsive to monetary policy changes, followed by the services sector. Overall, the study highlights significant variations in firms' reactions to monetary policy shifts, shaped by their size, financial structure, export orientation and sectoral characteristics.

Keywords: monetary policy transmission, monetary policy surprises, credit, firm heterogeneity

JEL Classifications: E12; E24; E52; E58

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1. Introduction

Synchronised monetary policy actions across the global economy have played an important role in containing the inflation surge in the post-pandemic period. This was partly a result of strengthened monetary policy frameworks in many emerging market economies, especially after the onset of the 21st century. Conceptual and empirical studies have identified several key mechanisms by which monetary policy exerts its influence: the demand channel, the credit channel, the exchange rate channel, the expectations channel and the asset price channel. The demand channel highlights how monetary policy affects aggregate demand by influencing consumption and investment decisions. Policy tightening, through higher interest rates, increases borrowing costs for households and firms, discouraging spending and investment while encouraging saving. The credit channel highlights how policy tightening amplifies borrowing constraints, especially for smaller, less liquid firms. Firms with weaker balance sheets face higher borrowing costs and reduced credit access as collateral values decline (Bernanke and Gertler (1995)). The exchange rate channel emphasises the impact of interest rate changes on currency values and trade competitiveness. In open economies, monetary tightening leads to currency appreciation, reducing net exports and aggregate demand, leaving export-oriented firms particularly vulnerable (Obstfeld and Rogoff (2001)). For emerging markets, exchange rate pass-through to consumer prices is another key way in which monetary policy influences inflation (Taylor (2000); Dubravko and Klau (2008)). The expectations channel highlights how monetary policy actions influence the forward-looking decisions of economic agents (Woodford (2003); Galí (2008)). Finally, the asset price channel examines how monetary policy adjustments affect asset prices, wealth, and consequently, spending and investment patterns (Brunnermeier and Sannikov (2014); Adrian and Shin (2010)).

While these channels collectively explain monetary policy's impact, there is an important distinction between its effects on households and firms. Firms, as entities producing value added, are directly influenced by credit, exchange rate and asset price channels in particular. Yet, firms differ in terms of size, financial strength and exposure to external shocks, which can lead to varying responses to monetary policy changes. For example, firms with significant debt obligations may be more vulnerable to borrowing cost increases, while those engaged in international trade are expected to be exposed to sudden exchange rate fluctuations. Thus, to fully capture the impact of monetary policy shocks on the economy, it is essential to consider the heterogeneity across firms and their individual characteristics.

One main concern, on analysing the impact of monetary policy actions on financial outcomes, is the endogeneity of the policy actions. Since monetary policy decisions have been made after observing several macro-financial indicators, the outcomes following policy actions might be highly correlated with these macro indicators. Hence, the pure impact of the monetary policy changes might not be disentangled optimally among several other factors impacting the financial outcomes. For this reason, introducing an exogenous monetary policy variable, representing the unexpected part of the policy changes, might help alleviate these concerns. Monetary policy shocks, often viewed as unexpected changes in policy, provide convenient cases to understand the details of the transmission process empirically. These surprises can amplify or mitigate the intended effects of monetary

policy, influencing consumption, investment and overall economic activity in nuanced ways. Unlike the monetary policy decisions which may have been highly correlated with macro-financial variables and already considered by the economic agents, monetary policy surprises almost fully capture the unexpected part of the monetary policy actions and therefore have a stronger exogeneity.

In this paper, we define monetary policy surprises based on forecast errors from Bloomberg expectations and examine the heterogeneous impact of these on firms.[1] For this analysis, we benefit from multiple administrative databases available at the Central Bank of the Republic of Türkiye (CBRT). The data comprise three key sources: (i) annual balance sheet and income statement data submitted by firms to the Revenue Administration; (ii) monthly firm-bank credit data from the Banking Regulation and Supervision Agency; and (iii) annual employment data from the Social Security Institution. To conduct the study, we integrate these data sets into a unified and comprehensive monthly data set using unique firm identifications (IDs). This process ensures consistency and exclusivity across data sources. The resulting data set enables a detailed examination of how monetary policy surprises heterogeneously affect firms' financial outcomes in Türkiye. Our analysis covers the period January 2017–October 2024.

This study investigates how monetary policy surprises impact non-financial corporates' financial outcomes, specifically credit usage, borrowing cost and default probabilities. These outcomes will be analysed by highlighting significant differences among firms based on their size, leverage and export orientation. Our findings indicate that larger firms exhibit lower sensitivity to monetary shocks compared with small and medium-sized enterprises (SMEs). Following a positive monetary policy surprise – such as a more hawkish decision than anticipated – SMEs reduce their borrowing more significantly than larger firms and face relatively higher borrowing costs. Additionally, the default risk increases more substantially among SMEs compared with larger firms. Highly leveraged firms also demonstrate greater responsiveness to monetary tightening than firms with lower levels of leverage. Our findings suggest that exporters demonstrate greater resilience to unexpected monetary policy tightening, likely due to their access to diversified revenue streams. Additionally, we examine sectoral heterogeneity in response to monetary policy announcements. The results indicate that the construction sector is the most sensitive to monetary policy shifts, followed by the services sector.

This paper integrates conceptual insights with empirical evidence to enhance our understanding of the mechanisms driving firm-level heterogeneity in the transmission of monetary policy surprises. The findings offer valuable implications for policymakers seeking to design targeted interventions that address firm-specific vulnerabilities and strengths. Section 2 describes the data set, presents key descriptive statistics and details the construction of monetary policy surprises. Section 3 analyses the effects of monetary policy surprises on firms' financial outcomes and Section 4 explores how changes in the policy rate influence these outcomes using the identified monetary policy surprises. Finally, Section 5 concludes.

[1] Monetary policy surprises have been similarly analysed and constructed in various studies, including those by Pericoli and Veronese (2015), Pescatori (2018), Grigoli et al (2020), Aruoba et al (2021), Tillmann (2023) and Checo et al (2024).

2. Literature review

This study builds upon and extends the existing literature by emphasising the critical roles of firm characteristics, sectoral differences and financial frictions in shaping the transmission of monetary policy. Previous research highlights that unanticipated credit tightening disproportionately impacts firms with limited access to financial markets, as they face higher borrowing costs and stricter lending standards during restrictive financial conditions. Liquidity levels have been shown to help some firms better withstand monetary policy surprises (Almeida et al 2004), while high leverage or indebtedness amplifies firms' sensitivity to unexpected interest rate changes, exacerbating financial distress (Rajan and Zingales (1998)).

In a similar fashion, firm size emerges as a pivotal determinant of firms' responses to monetary policy shocks. Larger firms are better equipped to endure such shocks due to their diversified revenue streams and broader access to capital markets (Ottonello and Winberry (2020); Caglio et al (2021); Cloyne et al (2023)). Conversely, SMEs encounter greater challenges, given their constrained financing options and heightened vulnerability to liquidity constraints (Jiménez et al (2012); Kashyap et al (1994)). Sectoral differences further shape the transmission of monetary policy, with the construction sector identified as particularly sensitive due to its reliance on long-term credit and its close ties to housing markets (Iacoviello and Neri (2010); Bouakez et al (2011)).

Monetary policy surprises can significantly influence credit growth, default probability and the relationship between credit scores and borrowing costs. When monetary policy tightens unexpectedly, borrowing becomes more expensive, dampening credit growth as firms reduce their reliance on debt. Conversely, unexpected monetary easing can boost credit growth by lowering borrowing costs and encouraging lending activity (Gertler and Karadi (2011)). On the other hand, easing surprises tend to narrow the spread between rates offered to high- and low-credit score borrowers (Bernanke and Gertler (1995)). These relationships illustrate how unanticipated monetary shifts can ripple through the credit market, altering borrowing behaviours and risk pricing.

Focusing on monetary policy surprises, extensive research has demonstrated that unexpected policy actions have a significant impact on economic activity and inflation (Bernanke and Blinder (1992); Christiano et al (1996)). Further, Kuttner (2001) provided an introduction to high-frequency identification and improved the ability to isolate policy surprises. Later studies combined high-frequency surprises with structural value at risk (VaR) models to highlight the role of credit spreads and term premia in amplifying policy effects (Gertler and Karadi (2011); Hanson and Stein (2015)). Recent work also distinguishes pure monetary shocks from information shocks embedded in central bank announcements, which can independently affect markets (Jarociński and Karadi, (2020); Nakamura and Steinsson (2018)).[2] In advanced economies, previous research has consistently found that monetary policy exerts significant effects on firms, with the extent and nature of these effects varying across different contexts.

[2] For additional insights and complementary analyses, see Peek et al (1999), Faust et al (2004), Romer and Romer (2000), Gürkaynak et al (2005), Gürkaynak and Wright (2013), Altavilla et al (2019), Bauer and Swanson (2020), as well as Swanson (2021).

For example, studies on US firms (Ippolito et al (2018); Ozdagli (2018); Ottonello and Winberry (2020); Caglio et al (2021); Deng and Fang (2022); Gürkaynak et al (2022); Jungherr et al (2022); Cloyne et al (2023); Jeenas (2023); Anderson and Cesa-Bianchi (2024)) and euro area firms (Durante et al (2022); Ferrando et al (2022)) show that monetary policy surprises –often identified through high-frequency event study methods – produce heterogeneous outcomes.[3] These outcomes are strongly dependent on firm-specific characteristics, such as size, leverage, liquidity and sectoral exposure, suggesting that financial frictions and firm structure play crucial roles in shaping monetary transmission. This heterogeneity highlights the importance of firm dynamics in understanding the broader economic impact of monetary policy.

The current study contributes to this growing body of work by exploring the impact of monetary policy shocks on a rich set of firm outcomes in an emerging market economy. We apply these insights to the Turkish context, which is marked by heightened macroeconomic volatility and unique market dynamics, and examine how firm-specific characteristics and sectoral heterogeneity interact with monetary policy.

3. Data

3.1. Firm-level data sets

Our analysis relies on three key administrative databases provided to the CBRT by relevant institutions: (i) annual balance sheet and income statement data submitted by firms to the Revenue Administration; (ii) monthly firm-bank credit data from the Banking Regulation and Supervision Agency; and (iii) annual employment data from the Social Security Institution. To conduct the study, we integrate these data sets into a unified and comprehensive monthly data set using unique firm IDs. This process ensures consistency and exclusivity across data sources. Our analysis covers the period January 2017–October 2024.

The Revenue Administration provides the CBRT with annual balance sheets and income statements for all firms operating in Türkiye that are liable to pay corporate income tax. These records, prepared in accordance with Türkiye's Tax Procedure Law, pertain exclusively to private non-financial firms. The data set includes incorporated firms, such as limited companies, which are required to submit financial statements under the corporate income tax regime. In contrast, unlimited firms, such as sole proprietorships operating under the personal income tax regime, are only obligated to report if they exceed specified size thresholds. In addition, firm-level annual

[3] Gaiotti and Generale (2002) show that monetary policy disproportionately affects smaller, less liquid Italian firms with limited collateral. Similarly, Albrizio et al (2023) find that in Spain, firms with high marginal revenue product of capital exhibit the strongest response to monetary easing, highlighting the role of financial frictions. Bougheas et al (2006) report that small, young and risky UK firms are more sensitive to tight monetary conditions, while Bahaj et al (2022) examine employment effects in a broad UK sample. Aruoba et al (2021) use monetary policy surprises in Chile in a Bayesian VaR framework to estimate policy impacts.

employment data, provided by the Social Security Institution, allow us to determine firm size and track employment growth over the years.[4]

The final data source is the administrative bank-firm loan level data provided by the Banking Regulation and Supervision Agency and made available to the CBRT. This data set includes detailed firm-bank level information, such as loan interest rates, maturity, amount, credit scores and currency denomination. Additionally, these data capture default events, defined as loan payments overdue by 90 days or more, which are classified as non-performing loans (NPLs). The analysis excludes non-performing loans and non-cash loans, focusing solely on active cash loans.[5] Furthermore, we limit the examination to Turkish lira-denominated flow loans, excluding foreign currency loans. To ensure robustness, we apply a 1% winsorisation on credit amounts and interest rates, controlling for variations at the NACE Rev 2 sector level in each year.

We exclude firm-year observations with inconsistent values, such as negative employment, total assets or net sales, ensuring that the sample consists of economically active firms only. In this sample, firm characteristics derived from balance sheet data and employment vary annually, while other variables fluctuate on a monthly basis. To reduce the potential influence of outliers, we apply a 1% winsorisation to all firm-level variables each year.

3.2. Defining monetary policy shock

We derive monetary policy surprises from financial analysts' predictions gathered by Bloomberg.[6] A crucial requirement for employing analysts' forecasts to identify monetary policy shocks is that these predictions must account for all relevant information available up to the time of the monetary policy committee (MPC) meeting. Traditional professional forecaster surveys often fall short in this regard, as they typically collect analysts' projections at a fixed point in time, sometimes days or weeks before the meeting.[7] This timing gap can result in forecasts that fail to reflect new information – such as sudden economic events or data releases – emerging between the submission date and the policy meeting. Consequently, central banks' responses to these developments may involve endogeneity, undermining the proper identification of monetary policy shocks.

In contrast, Bloomberg enables analysts to submit and revise their policy rate forecasts at any time before the MPC meeting. This flexibility allows analysts to consider the impact of critical data releases or economic developments that could influence policy decisions. Additionally, analysts can update their projections in response to new financial or economic shocks, even on the day of the meeting. Their motivation to provide accurate forecasts is strengthened by the visibility of their

[4] Employees who are employed on the basis of a service contract in accordance with Article 4/a of the Social Security Law No 5510.

[5] When analysing credit market outcomes, we exclude NPLs from the data set. However, when focusing on default events, we reintroduce firm-bank credit observations involving NPLs into the analysis.

[6] Pescatori (2018) and Aruoba et al (2021) adopt a similar methology for constructing monetary policy surprises.

[7] Examples of professional forecaster surveys include the CBRT Market Participants Survey, Blue Chip Financial Forecasts, Consensus Economics and ECB Survey of Professional Forecasters.

company's name to Bloomberg users and the platform's practice of ranking top forecasters.[8]

A monetary policy surprise for a policy meeting at time t is defined as follows:

$$MP_t = i_t^{TR} - E[i_t^{TR}|I_t] \quad (1)$$

where i_t^{TR} represents the announced monetary policy rate decided during the monetary policy meeting at time t, and $E[i_t^{TR}|I_t]$ denotes the mean expectation of respondents in the Bloomberg survey regarding the monetary policy decision at time t, collected immediately prior to each meeting, conditional on the information available just before the release.

We employ an orthogonalisation procedure to ensure the validity and exogeneity of monetary policy surprises, building on the methodology of Bauer and Swanson (2023).[9] Specifically, we regress the initial surprises – derived from forecast errors – on a comprehensive set of macroeconomic and financial variables publicly available before the monetary policy announcement:

$$MP_t = \alpha + \beta news_t + \varepsilon_t \quad (2)$$

where $news_t$ is a vector that includes forward-looking expectations, real economic indicators, price dynamics and financial market conditions. Each variable is expressed as the change between its value one month before and the latest data release available prior to the monetary policy meeting. To capture price dynamics, we include three key indicators: changes in headline inflation and one-year and two-year-ahead inflation expectations.[10] For real economic activity, the vector comprises the capacity utilisation ratio, changes in the industrial production growth rate, the one-year-ahead expected GDP growth rate and the unemployment rate. To account for financial market conditions, we include the percentage change in the exchange rate (measured in Turkish lira against the US dollar), its one-year-ahead expected level and stock market prices. This comprehensive selection of variables provides a robust framework for analysing the broad economic and financial factors shaping monetary policy expectations. The residuals from this regression represent the orthogonalised monetary policy surprises, $MPS_t = \varepsilon_t$, isolating the unexpected component of policy changes that is independent of pre-existing market information or central bank responses to macroeconomic conditions.

[8] Bloomberg publicly shares participants' forecasts, attributing them either to the institution alone or to a combination of the institution and the individual researcher. This transparency allows market participants to evaluate the reliability and track record of each contributor. According to Bloomberg experts, most large organisations prefer to display only their institutional name. This choice reflects an effort to maintain a continuous and coherent forecast history, which is essential for accurately tracking performance over time. This historical record becomes a critical input for Bloomberg's ranking system, which evaluates institutions based on the precision of their forecasts.

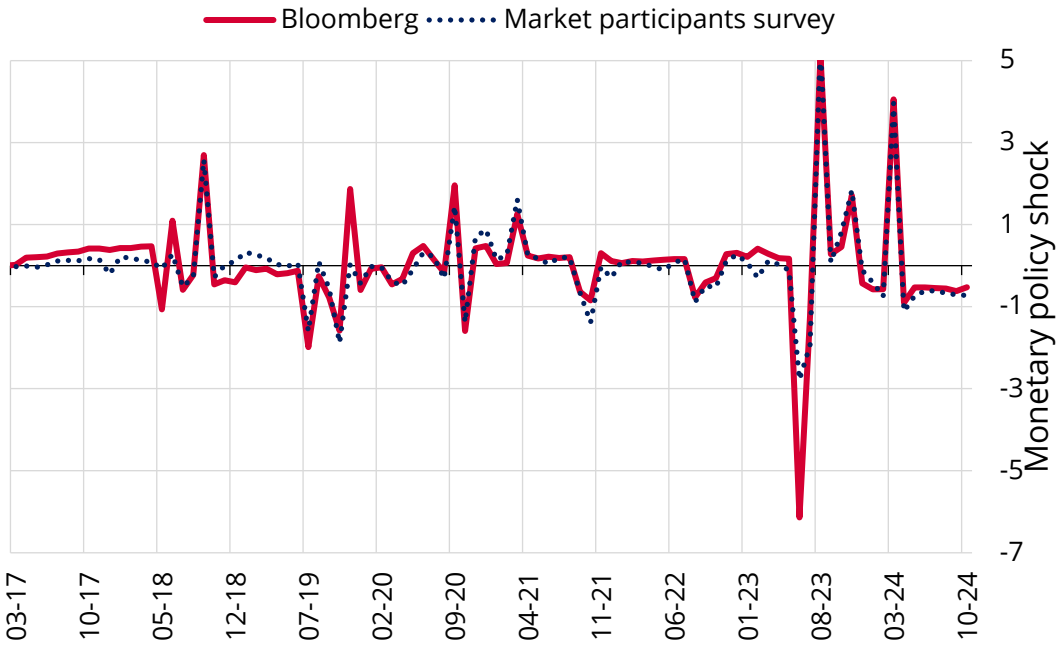
[9] Under the full-information rational expectations (FIRE) assumption, forecast errors should be unpredictable using publicly observable information available at the time the forecasts are made.

[10] Expectations are sourced from the Market Participants Survey conducted by the CBRT, which gathers insights into both short- and long-term expectations for key macroeconomic indicators. These include consumer inflation, exchange rates, the current account balance, GDP growth and interest rates, providing a comprehensive outlook on market sentiment and economic projections.

This approach mitigates two key issues: first, the potential bias introduced by private information held by central banks that could influence market expectations, and second, the predictable components of policy decisions arising from observable economic conditions. By eliminating these endogenous elements, the orthogonalisation process ensures that the surprises reflect true, unexpected monetary policy shifts.

Orthogonalised monetary policy surprises

Graph 1



4. Stylised facts

In this section, we provide some facts on heterogeneity in the transmission of monetary policy shocks across different groups of firms within the Turkish economy. Non-financial firms are classified into various categories based on their size, export status and leverage characteristics. The outcome variables that represent the degree of monetary transmission are primarily related to access to finance, the cost of borrowing and credit risk. Therefore, this paper aims to investigate the differential impact of monetary policy shocks on Turkish lira loan growth, loan interest rates and default rates among groups of non-financial firms. The firm groups are classified according to the following criteria:

- **firm size**: SMEs vs large firms;
- **export status**: firms with non-zero export revenues vs others; and
- **leverage**: firms with a debt-to-asset ratio higher than the median of their NACE Rev 2 sector vs firms with a lower debt-to-asset ratio than the median.

This analysis covers the period 2017–24, with a particular focus on the monetary policy tightening episodes during this time frame. According to our framework on orthogonalised monetary policy surprises, the primary tightening episodes occurred between September 2018 and July 2019 and again from June 2023 until end-2024. While these episodes differ in their context, they provide useful insights into the differential effects of monetary policy on firm-level financial outcomes.

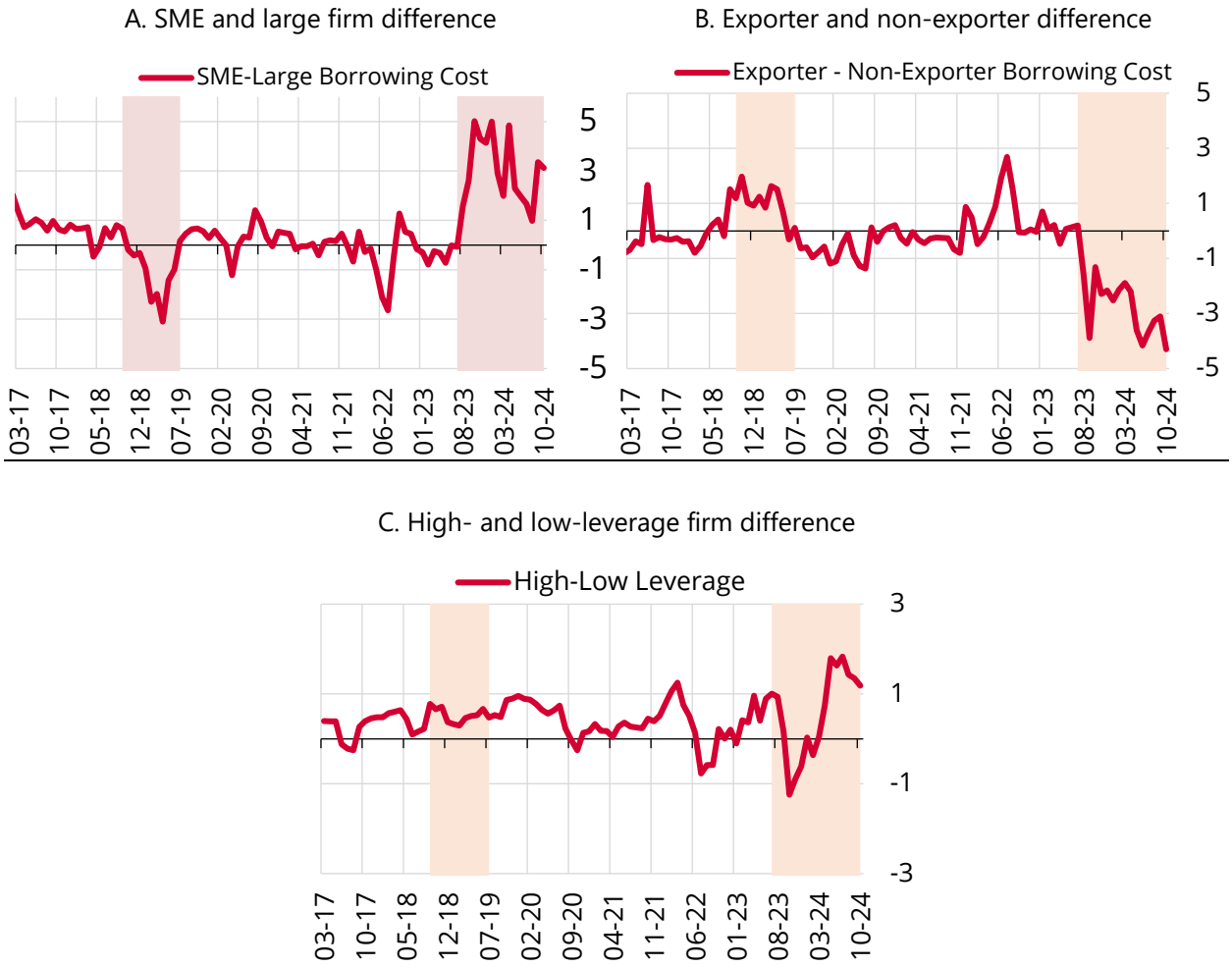
We expect that the immediate impact of monetary policy shocks on firms will manifest through changes in their borrowing costs, as lenders typically adjust loan interest rates in response to central bank actions. Normally, when the central bank raises the policy rate, short-term loan rates increase immediately, while long-term loan rates may be adjusted based on lenders' expectations. Consequently, the overall impact of policy tightening on average loan rates is expected to be upward. However, the extent of transmission on borrowing costs may vary among firms depending on their size, operations and balance sheet structure.

4.1. Heterogeneity in borrowing costs

SMEs are generally expected to face higher borrowing costs due to their higher credit risks and greater likelihood of default compared with larger firms (Beck et al (2008); Fama and French (2005)). However, this expectation may not always materialise, since some factors such as government support, business dynamics and macroeconomic conditions can also influence borrowing costs. For example, governments or public banks often provide SMEs with subsidised loans to offset their disadvantages in terms of collateral and borrowing costs.

In the context of Türkiye, loan rates for SMEs and large firms have been relatively close, except during periods of monetary tightening (Graph 2). During the 2018–19 tightening, even though loan rates increased for all firms, SMEs experienced relatively favourable borrowing terms compared with large firms. The monetary policy tightening during this period, which began in September 2018, followed a sharp depreciation of the Turkish lira against foreign currencies in August 2018. This depreciation caused financial distress for highly foreign exchange (FX)-indebted firms, which were primarily large corporates. As a result, the overall probability of default rose more significantly for large firms than for SMEs, leading to more favourable loan pricing for SMEs. Additionally, public banks provided subsidised loans and credit guarantees to SMEs, as private banks implemented credit rationing due to expectations of rising defaults. These factors led to a heterogeneous impact on borrowing costs, with SMEs benefiting more than large firms.

Loan interest rates by firm size, exporter status and leverage (In percent) Graph 2



The graph presents the differences in borrowing costs (%) across heterogeneous groups. Graph 2.A shows the average difference between SME loan rates and large firm loan rates. Graph 2.B presents the average difference between exporter loan rates and non-exporter loan rates. Finally, Graph 2.C highlights the borrowing cost difference between firms above the 50th percentile and those below the 50th percentile based on their debt-to-asset ratio.

However, during the recent tightening episode that began in June 2023, SMEs appear to have been at a disadvantage in terms of borrowing costs. The main driver of this tightening was not a major financial market shock, but rather persistently high inflation, which affected both firm groups to a similar degree. Moreover, public banks were less active in subsidising SME loans during this period, in contrast to the 2018–19 episode. As a result, in the current tightening case, SMEs saw a larger increase in borrowing costs compared with large firms.

Exporters also represent a group that is expected to access loans at lower rates when the economy tightens. In Türkiye, we observe a heterogeneous transmission of monetary policy impacts on borrowing costs for exporters and non-exporters. However, the direction of this heterogeneity differs across the two tightening episodes under consideration.

In 2018, exporters, who generally have significant amounts of FX-denominated debt, saw their overall balance sheet risks increase, prompting banks to raise loan prices. Furthermore, public banks primarily supported firms serving the domestic market due to contracting domestic demand, meaning exporters did not benefit from subsidised loans during this period. Consequently, exporters faced higher borrowing costs compared with non-exporters. In contrast, during the 2023 tightening episode, exporters benefited from more favourable loan conditions. With the real appreciation of the Turkish lira as part of disinflation policies, the government and public banks provided loan subsidies to exporters to mitigate the negative impacts of exchange rate valuation on export activities. As a result, exporters experienced less severe borrowing cost increases compared with non-exporters in this period.

Highly leveraged firms generally face higher borrowing costs due to their increased exposure to financial risk (Hennessy and Whited (2007)). During the 2018–19 period, there was no significant change in the gap between the borrowing costs of highly leveraged and low-leverage firms compared with the pre-tightening period. However, during the 2023–24 tightening, we observe a marked increase in this gap. The primary factor behind this heterogeneity is the implementation of macroprudential credit growth limits on Turkish lira (TL) commercial loans by the banking sector. With banks subject to upper limits on their monthly commercial loan growth rates, they tend to prioritise lending to firms with lower leverage and greater liquidity. As a result, banks have reduced interest rates for these less leveraged firms in order to entice them to use TL loans.

4.2. Heterogeneity in loan access

This section explores the differential access to loans among various firm groups during tightening periods in the Turkish economy. Loan access is measured as the share of TL loans held by a particular group relative to aggregate TL loans. An increase in the share of loans held by a group suggests a relative advantage (or less disadvantage) in loan access compared with other groups.

With regard to firm size, we do not observe a significant differentiation in loan market share between SMEs and large firms during the major tightening periods. During the 2018–19 tightening, despite receiving subsidised loans with better terms, SMEs were unable to increase their share of the loan market. In the most recent tightening episode, SMEs maintained a strong position in TL loans, despite higher borrowing costs. Similarly, while exporters faced higher borrowing costs in 2018–19, they maintained a share of almost 20% of TL-denominated commercial loans. However, in the current tightening period (2023–24), exporters' borrowing costs have decreased, but their share of TL loans has declined substantially.

Loan share by firm size, exporter status and leverage, (In percent) Graph 3

The graph depicts the loan shares (%) across heterogeneous groups, with the total loan share within each group summing to 100. Panel A illustrates the TL loan share of SMEs within total TL loans. Panel B presents the TL loan share of exporters and Panel C highlights the TL loan share of highly leveraged firms within total TL loans.

The seemingly paradoxical relationship between loan pricing and credit access during both tightening episodes is largely driven by loan supply and demand dynamics. In 2018–19, banks were less willing to lend to large firms and exporters due to their significant exposure to currency risks, which explains the higher loan rates for these groups. However, in response to rising currency risks, large firms and exporters preferred TL loans for financing their operations and reducing their FX debt burden. In contrast, during the recent tightening period, the exchange rate market has remained relatively stable and TL loan rates have been extremely high (hovering above 50% annually). As a result, large firms and exporters have switched to FX loans, despite the relatively cheaper pricing of TL loans for large firms and exporters. These findings suggest that the heterogeneity in credit access during tightening periods is strongly linked to both loan supply and demand dynamics.

Finally, it is observed that highly leveraged firms demonstrated greater loan growth rate (or less contraction in their loan usage) during both tightening episodes,

as their share of total TL loans increased following the start of tightening. This is also very much related to demand dynamics since highly indebted firms are usually less liquid and need external finance to maintain their business. However, low-leverage firms might postpone their use of external finance when financial conditions tighten, as they have liquid assets to finance their working capital. Additionally, highly leveraged firms are more exposed to interest rate changes as they need to reprice a larger amount of debt when interest rates change. Henceforth, during tightening periods both their existing debts and accrued interest amounts increase more than less leveraged firms.

4.3. Heterogeneity in credit risk

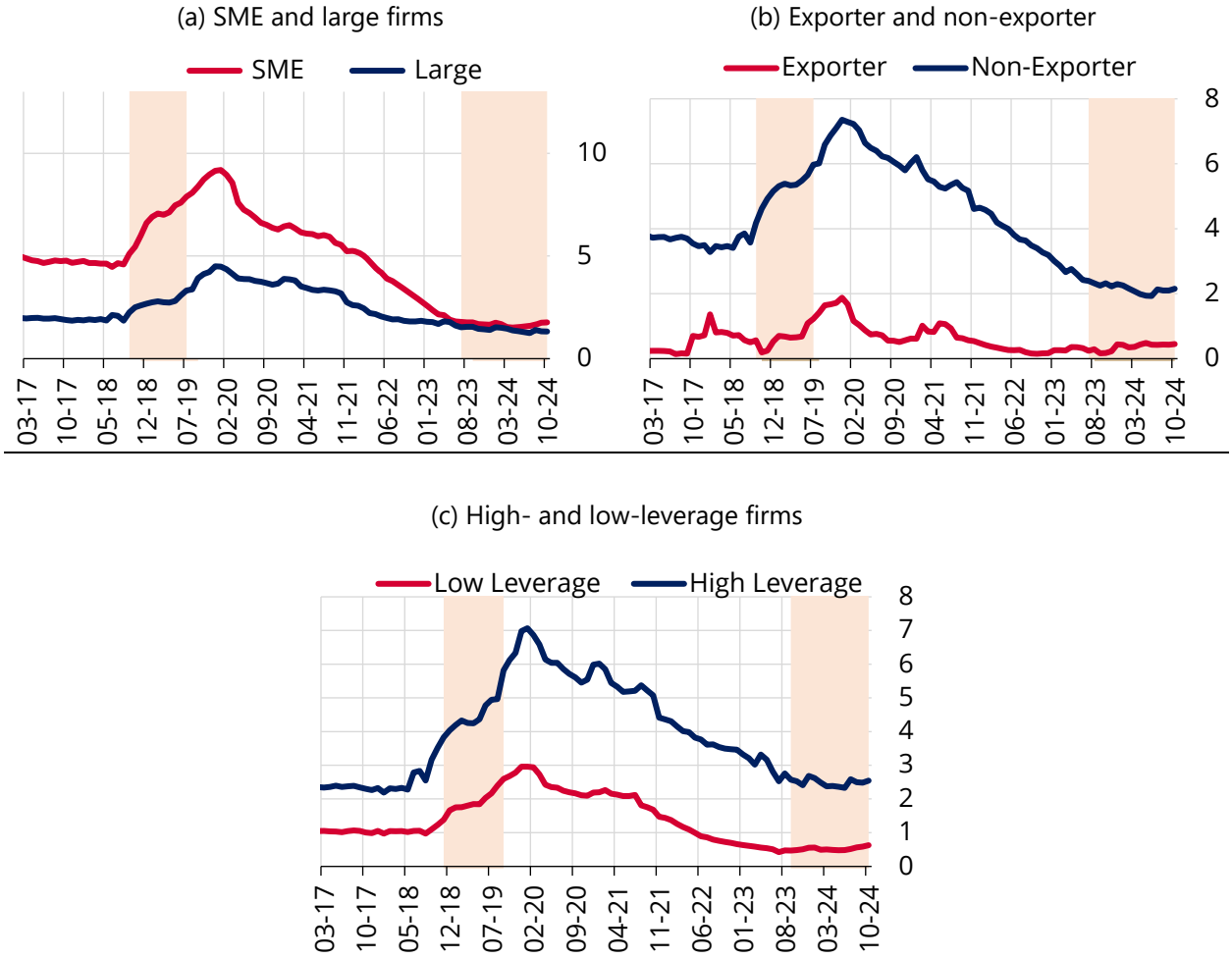
The credit risk outlook of firms is another channel through which monetary policy changes affect non-financial firms. During periods of tightening financial conditions and economic slowdowns, squeezed profits and rising interest burdens generally worsen firms' credit risk outlooks, leading to higher default rates and further tightening of credit conditions for riskier firms. This credit risk channel may operate heterogeneously across firms.

Typically, smaller firms are more vulnerable to tightening financial conditions, as observed during both the 2018–19 and 2023–24 tightening periods. SMEs experienced higher default rates (measured by non-performing loan (NPL) ratios) in both episodes. In 2018–19, despite significant FX risks for large firms, the increase in their NPL ratios was relatively limited, as banks were reluctant to classify the loans of large firms as NPLs due to the potential loss in banking books. In response, several banking groups introduced large loan restructuring programmes aiming to extend the maturity of existing FX debt for large corporates and alleviate their debt burdens. In contrast, SMEs were more likely to default, as restructuring SME loans provided limited benefits to banks.

In contrast to the 2018–19 period, firms entered the recent tightening stage with a strong credit risk outlook and exceptionally low NPL ratios. Although SMEs' NPL ratios have slightly increased, they remain well below historical averages. Exporters also experienced less severe impacts on their credit risk outlooks. In 2018–19, exporters' NPL ratios increased due to their large FX debts, but the increase was less pronounced compared with non-exporters. During the 2023–24 period, both exporters and non-exporters maintained relatively stable credit risk outlooks, largely due to liquidity buffers accumulated during the negative real interest rate environment of 2021–22.

Lastly, highly leveraged firms exhibit default rates significantly higher than those of lower-leveraged firms. In the earlier tightening episode, the pace of defaults increased more rapidly for highly leveraged firms. However, in the current period, the overall credit risk outlook has remained benign for all groups.

Non-performing loan (NPL) ratio by firm size, exporter status and leverage (Percent) Graph 4



The graph illustrates the non-performing TL-denominated loan shares within total TL-denominated loans for each group. Graph 4.A compares the NPL shares between SMEs and large firms. Graph 4.B presents the NPL shares for exporters and non-exporters, while Graph 4.C highlights the NPL shares for highly leveraged firms versus low- leverage firms.

This section examined the heterogeneity in the transmission of tight monetary policy across various financial outcomes for firms. The findings suggest that the degree of heterogeneity in the transmission of monetary policy changes in Türkiye is influenced by macro-financial dynamics and prevailing initial conditions. Overall, the descriptive analysis of firms' financial outcomes reveals mixed results regarding the extent of heterogeneity in monetary policy transmission. For instance, during the 2018–19 tightening period, large firms and exporters experienced higher loan growth and loan rates compared with SMEs and non-exporters. In contrast, the opposite trend was observed during the 2023–24 period. While default rates were more pronounced among SMEs during the earlier tightening, they are now comparable to those of larger firms. To isolate the pure impact of monetary policy changes on firms, a robust empirical framework is needed that accounts for the endogeneity of monetary policy decisions and the role of initial macro-financial conditions in shaping monetary policy transmission. The following sections provide an empirical analysis to

assess the heterogeneous impact of monetary policy changes on firms' credit conditions and default rates.

5. Empirical framework and results

Monetary policy surprises can have significant effects on firm-level credit market outcomes, but these effects are not uniform across all firms. Firms differ in terms of size, financial strength and exposure to external shocks, which can lead to varying responses to unexpected changes in monetary policy. These policy surprises can influence key credit market variables, such as credit amount, credit score and the risk of default. Thus, to fully capture the transmission of monetary policy, it is essential to consider the heterogeneity across firms and their individual characteristics. To empirically examine these effects, we estimate the following regression at the firm-bank level:

$$y_{ibt} = \beta MP_{t-1} + \Gamma X_{iT-1} + \theta Z_t + \alpha_i + \phi_b + \delta_{st} + \varepsilon_{it} \quad (3)$$

where y_{ibt} represents the credit market outcomes for firm i from bank b at year-month t. These outcomes include key measures such as the credit amount, credit growth, borrowing cost and the likelihood of default. The variable MP_{t-1} represents the monetary policy surprises in month (t–1), which are constructed by calculating forecast errors from anticipated monetary policy decisions. We control for annual firm-level characteristics such as controls to capture variations in firm size, financial health and potential constraints that may influence their response to monetary policy. Specifically, we include net sales, leverage, age and return on assets (the net profit to total assets ratio) values in the previous year (T–1). To further control for monthly macroeconomic conditions, we include a vector Z_t, which consists of key national-level variables. This vector includes Türkiye's monthly unemployment rate, the percentage change in the dollar exchange rate and annual inflation, all of which reflect the broader economic environment affecting firms' financial outcomes. In addition to these controls, we account for unobserved heterogeneity at various levels by including firm fixed effects (α_i), bank fixed effects (ϕ_b) and sector-year-quarter fixed effects ($\delta_{s\tau}$). Bank fixed effects capture differences in lending practices, risk preferences and liquidity constraints across banks. Sector-year-quarter fixed effects ensure that we control for time-varying shocks specific to certain industries, such as demand fluctuations or regulatory changes.[11]

[11] We do not include sector-year-month fixed effects in our regression model, as doing so would introduce multicollinearity with our main regressor, policy change, which is measured at a monthly frequency. Instead, we control for sector-year-quarter fixed effects, which allow us to account for time-varying sector-specific shocks at a broader temporal level without compromising the model's ability to estimate the effects of monthly policy changes. To capture monthly variations in macroeconomic conditions that could influence firms' financial outcomes, we include key monthly macroeconomic controls such as Türkiye's unemployment rate, percentage changes in the dollar exchange rate and inflation. This approach ensures that our model remains robust while addressing potential confounding effects from both sectoral trends and high-frequency macroeconomic fluctuations.

The regression results presented in Table 1 demonstrate the heterogeneous effects of monetary policy on various firm-level outcomes, emphasising differences across firm size, leverage and export status. The analysis reveals that large firms are significantly less sensitive to monetary policy shocks compared with SMEs. Specifically, large firms experience a smaller rise in borrowing costs, smaller decline in loan usage and face a lower probability of default in response to monetary tightening compared with SMEs. In contrast, SMEs show greater vulnerability, with pronounced reductions in credit availability and a higher likelihood of default following monetary policy surprises. This disparity aligns with existing literature, which highlights the role of firm size in shaping the transmission of monetary policy through the credit channel (Caglio et al (2021); Elena et al (2022); Cloyne et al (2023)).

Heterogeneous effects of monetary policy shocks on firms' financial outcomes

Table 1

	(1) All sample	(2) Large firms	(3) SMEs	(4) High leverage	(5) Low leverage	(6) Exporter	(7) Non-exporter
Panel A: Borrowing cost							
MP_{t-1}	0.825***	0.799***	0.833***	0.864***	0.741***	0.802***	0.827***
	(0.0074)	(0.0162)	(0.0078)	(0.0125)	(0.0121)	(0.0114)	(0.0073)
R-squared	0.86	0.77	0.87	0.85	0.86	0.82	0.88
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel B: Flow credit							
MP_{t-1}	–0.017***	–0.014**	–0.018***	–0.021***	–0.016***	–0.014**	–0.017***
	(0.0048)	(0.0126)	(0.0047)	(0.0074)	(0.0069)	(0.0119)	(0.0051)
R-squared	0.16	0.11	0.14	0.15	0.17	0.12	0.15
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel C: Monthly outstanding credit growth							
MP_{t-1}	–0.021***	–0.018***	–0.021***	–0.023***	–0.020***	–0.019***	–0.022***
	(0.0001)	(0.0049)	(0.0001)	(0.0003)	(0.0003)	(0.0052)	(0.0002)
R-squared	0.16	0.12	0.16	0.15	0.15	0.13	0.16
Observations	14,454,768	104,753	14,350,015	7,123,819	7,330,949	2,392,874	12,061,894
Panel D: Default							
MP_{t-1}	0.006***	0.004***	0.007***	0.011***	0.003***	0.004***	0.006***
	(0.0008)	(0.0045)	(0.0009)	(0.0014)	(0.0011)	(0.0030)	(0.0009)
	0.17	0.15	0.17	0.19	0.14	0.16	0.18
	15,695,201	61,185	15,634,016	7,866,829	7,828,372	2,505,546	13,189,655
Firm FE	✓	✓	✓	✓	✓	✓	✓
Sector x quarter FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Macroeconomic controls	✓	✓	✓	✓	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as $log(r_{ibt})$; in Panel B, it is the logarithm of the flow credit amount, $log(credit_{ibt})$, for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as $(log(credit_{it}) - log(credit_{it-1})$; and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. Monetary policy surprises (MP_{t-1}) are represented by orthogonalised monetary policy surprises at year-month (t−1), derived from Bloomberg forecast errors. Firms are categorised as SMEs if they have fewer than 250 employees; otherwise, they are classified as large. Firms are identified as highly leveraged if their leverage ratio exceeds the sector-year median within the same sector. Additionally, firms are considered exporters if they have engaged in export activities for at least one year. Standard errors, clustered by firm, in parenthesis. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

Monetary policy surprises and sectoral variations in firms' financial outcomes Table 2

	(1) Industry	(2) Services	(3) Construction
Panel A: Borrowing cost			
MP_{t-1}	0.802***	0.830***	0.860***
	(0.0056)	(0.0078)	(0.0112)
R-squared	0.86	0.87	0.86
Observations	2,596,747	5,878,831	1,237,116
Panel B: Flow credit			
MP_{t-1}	–0.014***	–0.019***	–0.022***
	(0.0091)	(0.0060)	(0.0151)
R-squared	0.18	0.14	0.17
Observations	2,596,747	5,878,831	1,237,116
Panel C: Monthly outstanding credit growth			
MP_{t-1}	–0.018***	–0.020***	–0.023***
	(0.0004)	(0.0002)	(0.0007)
R-squared	0.15	0.17	0.15
Observations	2,781,632	9,591,771	1,859,480
Panel D: Default			
MP_{t-1}	0.005***	0.006***	0.008***
	(0.0015)	(0.0011)	(0.0034)
R-squared	0.12	0.17	0.12
Observations	3,014,051	10,370,042	2,076,265
Firm FE	✓	✓	✓
Sector x quarter FE	✓	✓	✓
Firm controls	✓	✓	✓
Macroeconomic controls	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as $log(r_{ibt})$; in Panel B, it is the logarithm of the flow credit amount, $log(credit_{ibt})$, for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as $(log(credit_{it}) - log(credit_{it-1})$; and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences, and liquidity constraints across banks. Monetary policy surprises (MP_{t-1}) are represented by orthogonalised monetary policy surprises at year-month (t−1), derived from Bloomberg forecast errors. Standard errors, clustered by firm, in parenthesis. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

The lower sensitivity of large firms can be attributed to their stronger financial positions, more diversified revenue streams and greater access to capital markets, which collectively enhance their resilience to macroeconomic shocks. Large firms are also often perceived as less risky by financial institutions, resulting in more favourable

credit conditions even during periods of monetary tightening. In contrast, SMEs typically have limited financing options, higher reliance on bank credit and greater exposure to liquidity constraints, making them more vulnerable to changes in interest rates and credit conditions (Jiménez et al (2012)).

Additionally, firms with high leverage or a lack of export orientation exhibit greater sensitivity to monetary policy shocks, reflecting their heightened dependence on domestic credit markets and susceptibility to rising borrowing costs. These findings underscore the critical role of firm-specific characteristics in determining the transmission and impact of monetary policy, highlighting the disproportionate effects on financially constrained and less diversified firms.[12]

Table 2 highlights the heterogeneous effects of monetary policy transmission across different sectors, reflecting the distinct characteristics and channels through which monetary policy impacts them. The construction sector emerges as the most sensitive to monetary tightening, with activity contracting significantly due to its reliance on long-term financing and its direct linkage to the housing market. Rising interest rates increase borrowing costs, reducing mortgage demand and subsequently dampening construction activity, a pattern extensively documented by Iacoviello and Neri (2010), Boukez et al (2011) and Singh et al (2022). The procyclical nature of construction further amplifies its sensitivity, as tighter monetary policy curtails housing and commercial projects during periods of economic contraction. In contrast, the industrial sector shows the lowest responsiveness to monetary policy. This can be attributed to its access to diverse financing sources, including equity markets and retained earnings, which buffer the sector against interest rate hikes (Gertler and Gilchrist (1994)). Additionally, the long-term planning and capital intensity of industrial investments reduce their immediate sensitivity to short-term monetary policy changes. For export-oriented industries, external demand plays a critical role, often offsetting the domestic effects of monetary policy, as noted by Bernanke and Gertler (1995). The services sector exhibits an intermediate level of responsiveness, driven by its dependence on consumer spending and labour-intensive operations. Monetary policy indirectly affects this sector by influencing disposable income, credit availability and employment levels. These findings underscore the significance of the credit channel, the interest rate channel and demand elasticity in explaining the sectoral variation in monetary policy transmission.

[12] Results based on raw monetary policy surprises, derived from Bloomberg forecast errors and the Market Participants Survey, are presented in Appendix B.

6. Further evidence on causality

In the previous section, we demonstrated the heterogeneous effects of monetary policy surprises on firms' financial outcomes, highlighting how unexpected policy shocks influence borrowing behaviour across different firm types and relationships. Building on this analysis, we now shift our focus to examining the causal effect of central bank policy target changes on firms' financial outcomes. Unlike surprises, which isolate the unanticipated component of monetary policy, policy target changes reflect the central bank's broader and systematic adjustments in monetary stance, encompassing both anticipated and unanticipated elements. This perspective allows us to explore how firms respond to the overall monetary policy framework, including its direct and indirect channels, such as credit allocation, leverage adjustments and financial stability.

To identify the causal effect, we use monetary policy surprises as instruments for policy target changes. This instrumental variable approach isolates the exogenous component of policy rate adjustments, ensuring that our estimates are not confounded by the central bank's systematic response to macroeconomic conditions. By doing so, we aim to provide robust causal estimates that reflect the independent influence of monetary policy on firms' financial outcomes. Furthermore, to account for the timing of policy transmission, we estimate the following regression at the firm-bank level, using a one-period lag for policy target changes:

$$y_{ibt} = \beta PolicyChange_{t-1} + \Gamma X_{iT-1} + \theta Z_t + \alpha_i + \phi_b + \delta_{st} + \varepsilon_{it} \qquad (4)$$

where y_{ibt} represents the financial outcomes of firm i borrowing from bank b at time t. $PolicyChange_{t-1}$ denotes the central bank's policy target change in the prior period (t–1), which allows us to capture the lagged effects of policy adjustments as firms and banks typically respond after observing and processing policy announcements.[13] As in the previous section, we control for annual firm-level characteristics to capture variations in firm size, financial health and constraints influencing their response to monetary policy. Specifically, we include net sales, leverage, age and return on assets (net profit to total assets) from the previous year. To account for monthly macroeconomic conditions, we include a vector Z_t comprising Türkiye's monthly unemployment rate, the percentage change in the dollar exchange rate and annual inflation, reflecting the broader economic environment. Additionally, we address unobserved heterogeneity by including firm fixed effects (α_i), bank fixed effects (ϕ_b) and sector-year-quarter fixed effects (δ_{st}).

To address potential endogeneity in the central bank's policy change, we use monetary policy surprises from the previous month (MP_{t-1}) as an instrument for the policy change. Monetary policy surprises capture the unanticipated component of policy announcements – deviations from market expectations – that are exogenous

[13] The choice of (t–1) as the timing reflects the realistic lag in the transmission of monetary policy to firm-level financial decisions. Firms and banks typically adjust their credit and financial strategies based on policy announcements after observing and processing the changes, making the effects more likely to materialise in the subsequent period. This approach ensures that our estimates capture the causal effect of the policy target changes after firms have had the opportunity to react, avoiding potential simultaneity issues that may arise if contemporaneous policy changes (t) are used.

to macroeconomic conditions. By leveraging this exogeneity, we isolate the causal impact of policy changes on firms' financial outcomes. The use of the previous month's surprises ensures that the instrument aligns temporally with the policy change, reflecting the central bank's immediate adjustments following the unexpected shocks.[14]

Table 3 presents the estimated causal effects of central bank policy rate changes on key firm-level financial outcomes, including credit amount, credit growth, borrowing costs and default probability. The results indicate that a 100 basis point increase in the policy rate leads to a 1.2% reduction in the credit amount, reflecting a significant contraction in firms' access to credit. Additionally, credit growth declines by 0.02 percentage points, suggesting that higher policy rates dampen the pace at which firms can expand their borrowing. Borrowing costs increase by 83 basis points, highlighting the direct pass-through of policy rate hikes to firm-level financing conditions. Finally, the default probability of firms increases by 0.008, indicating that tighter monetary policy raises financial distress risks for borrowers. In other words, the observed rise in default probability aligns with the notion that higher financing costs and reduced credit availability strain firms' ability to meet debt obligations, increasing the likelihood of defaults.

Table 3 further reveals the heterogeneous effects of monetary policy changes on firms' financial outcomes across firm characteristics such as size, leverage and export status. Larger firms are less sensitive to policy rate changes compared with SMEs, reflecting their stronger financial positions and greater access to credit markets. Specifically, a 100 basis point increase in the policy rate results in a 0.8% decline in credit amount for larger firms, while SMEs experience a sharper reduction of 1.3%. Similarly, borrowing costs for larger firms rise by 75.9 basis points, whereas SMEs face a more substantial increase of 83.5 basis points. This disparity highlights the challenges smaller firms face due to their limited collateral, weaker credit histories and greater dependence on bank financing. As monetary policy tightens, credit-constrained SMEs are more likely to face higher interest rates and stricter lending terms, amplifying their financial burden compared with larger firms, which typically have better credit access and diversified financing sources.

[14] Moreover, using the surprises from the prior month aligns with the temporal dynamics of monetary policy transmission. Firms and banks require time to process policy announcements and adjust their behaviours accordingly. By incorporating the previous month's surprises, we account for the lagged effects of monetary policy adjustments, ensuring that the instrument reflects the most relevant exogenous variation for explaining the observed policy changes.

Heterogeneous impact of policy rate change on firms' outstanding credits Table 3

	(1) All sample	(2) Large firms	(3) SMEs	(4) High leverage	(5) Low leverage	(6) Exporter	(7) Non-exporter
Panel A: Borrowing cost							
$PolicyChange_{t-1}$	0.833***	0.759***	0.835***	0.873***	0.813***	0.742***	0.833***
	(0.0026)	(0.0155)	(0.0026)	(0.0035)	(0.0037)	(0.0153)	(0.0028)
R-squared	0.20	0.16	0.20	0.21	0.22	0.18	0.21
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel B: Flow credit							
$PolicyChange_{t-1}$	–0.012***	–0.008**	–0.013***	–0.015***	–0.011***	–0.010**	–0.012***
	(0.0048)	(0.0126)	(0.0047)	(0.0074)	(0.0069)	(0.0119)	(0.0051)
R-squared	0.08	0.11	0.08	0.12	0.12	0.09	0.08
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel C: Monthly outstanding credit growth							
$PolicyChange_{t-1}$	–0.023***	–0.016***	–0.024***	–0.026***	–0.019***	–0.016***	–0.025***
	(0.0003)	(0.0062)	(0.0003)	(0.0007)	(0.0008)	(0.0048)	(0.0005)
R-squared	0.14	0.10	0.15	0.17	0.19	0.12	0.13
Observations	14,454,768	104,753	14,350,015	7,123,819	7,330,949	2,392,874	12,061,894
Panel D: Default							
$PolicyChange_{t-1}$	0.008***	0.006***	0.008***	0.012***	0.007***	0.005***	0.008***
	(0.0014)	(0.0079)	(0.0016)	(0.0024)	(0.0029)	(0.0124)	(0.00015)
R-squared	0.18	0.15	0.18	0.21	0.23	0.16	0.19
Observations	15,695,201	61,185	15,634,016	7,866,829	7,828,372	2,505,546	13,189,655
Firm FE	✓	✓	✓	✓	✓	✓	✓
Sector x quarter FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Macroeconomic controls	✓	✓	✓	✓	✓	✓	✓

[1] This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as log(r_ibt); in Panel B, it is the logarithm of the flow credit amount, log(credit_ibt), for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as (log(credit_it)-log(credit_(it-1)); and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. 〖PolicyChange〗_(t-1) is instrumented by orthogonalised monetary policy surprises (〖MP〗_(t-1)) at year-month (t−1), derived from Bloomberg forecast errors. Firms are categorised as SMEs if they have fewer than 250 employees; otherwise, they are classified as large. Firms are identified as highly leveraged if their leverage ratio exceeds the sector-year median within the same sector. Additionally, firms are considered exporters if they have engaged in export activities for at least one year. Standard errors, clustered by firm, in parenthesis. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

The results also highlight differences based on firms' leverage levels. Highly leveraged firms are more affected by policy changes, with a 100 basis point increase causing a 1.5% reduction in credit amount and a 0.019 percentage point decrease in credit growth. In comparison, low-leverage firms experience a smaller reduction in credit amount (1.1 percentage points) and credit growth (0.016 percentage points). Moreover, borrowing costs for highly leveraged firms increase by 87.3 basis points, compared with an 81.3 basis point increase for their low-leverage counterparts. This indicates that firms with greater financial fragility are disproportionately impacted by tighter monetary conditions. Accordingly, highly leveraged firms, which already have significant existing debt burdens, face disproportionately higher costs and constraints when monetary policy tightens. When policy rates increase, borrowing costs rise for all firms; however, the impact is particularly severe for firms with high leverage. These firms are viewed as riskier by lenders due to their greater probability of financial distress, so banks and other financial institutions impose a higher risk premium on the loans they extend. The sharper rise in borrowing costs amplifies the financial pressure on highly indebted firms. Intuitively, this outcome can be understood through the lens of credit risk and lender behaviour. When monetary conditions tighten, lenders become more cautious and selective, particularly towards firms that already have significant debt obligations. For highly leveraged firms, even small increases in interest rates can translate into substantial additional costs due to their large debt stock, leading to deteriorating financial health. This forces them to either reduce their demand for credit or allocate a larger portion of their cash flows to servicing existing debt, leaving less room for investment and operational spending.

The heightened borrowing costs for highly leveraged firms also signal their vulnerability in times of economic uncertainty. With tighter monetary conditions, their ability to roll over existing debt or secure new loans becomes more expensive and challenging, increasing the likelihood of defaults. Lenders, anticipating this higher risk, further tighten credit terms, creating a feedback loop that exacerbates the financial fragility of these firms. This dynamic highlights how monetary policy can disproportionately affect firms with weaker balance sheets, amplifying financial constraints and limiting their ability to navigate economic shocks.[15]

Finally, the analysis in Table 3 highlights the differences between exporting and non-exporting firms in their response to monetary policy changes. Exporting firms are relatively less affected by tighter monetary conditions, experiencing a 1% decline in credit amount following a 100 basis point increase in policy rates, compared with a 1.2% reduction for non-exporting firms. Similarly, borrowing costs for exporters increase by 74.2 basis points, whereas non-exporters face a sharper rise of 83.3 basis points. This lower sensitivity among exporting firms can be attributed to their diversified revenue streams and access to external markets, which provide a buffer against domestic monetary tightening. Exporters often generate income in foreign currencies, which helps mitigate the impact of rising domestic interest rates on their cash flows. Additionally, their ability to tap into international financing channels may reduce their reliance on domestic credit markets, making them less vulnerable to domestic monetary shocks. By contrast, non-exporting firms are more dependent on

[15] The results based on raw monetary policy surprises, derived from Bloomberg forecast errors, are presented in Appendix C.

local demand and domestic credit, leaving them more exposed to rising borrowing costs and tighter financial conditions.

Policy rate change and sectoral variations in firms' outstanding credits Table 4

	(1) Industry	(2) Services	(3) Construction
Panel A: Borrowing cost			
$PolicyChange_{t-1}$	0.814***	0.849***	0.893***
	(0.0047)	(0.0032)	(0.0072)
R-squared	0.18	0.20	0.21
Observations	2,596,747	5,878,831	1,237,116
Panel B: Flow credit			
$PolicyChange_{t-1}$	–0.010***	–0.013***	–0.018***
	(0.0025)	(0.0053)	(0.0097)
R-squared	0.11	0.10	0.10
Observations	2,596,747	5,878,831	1,237,116
Panel C: Monthly outstanding credit growth			
$PolicyChange_{t-1}$	–0.019***	–0.022***	–0.027***
	(0.0007)	(0.0003)	(0.0009)
R-squared	0.10	0.13	0.08
Observations	2,781,632	9,591,771	1,859,480
Panel D: Default			
$PolicyChange_{t-1}$	0.007***	0.008***	0.011***
	(0.0045)	(0.0016)	(0.0124)
R-squared	0.15	0.19	0.17
Observations	3,014,051	10,370,042	2,076,265
Firm FE	✓	✓	✓
Sector x quarter FE	✓	✓	✓
Firm controls	✓	✓	✓
Macroeconomic controls	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as log(r_ibt); in Panel B, it is the logarithm of the flow credit amount, log(credit_ibt), for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as (log(credit_it)-log(credit_(it-1)); and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. 〖PolicyChange〗_(t-1) is instrumented by orthogonalised monetary policy surprises (〖MP〗_(t-1)) at year-month (t−1), derived from Bloomberg forecast errors. Standard errors, clustered by firm, in parenthesis. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

Table 4 highlights significant sectoral differences in how firms' financial outcomes respond to policy rate changes. A 100 basis point increase in the policy rate

leads to a reduction in credit amounts of 1% for industry firms, 1.3% for service firms and 1.8% for construction firms, while credit growth decreases by 0.019, 0.022 and 0.027 percentage points, respectively. Borrowing costs also rise notably, with the largest increase observed in construction (89.3 basis points), followed by services (84.9 basis points) and industry (81.4 basis points). Default probabilities also increase across all sectors, with construction firms showing the greatest sensitivity.

These findings underscore the particular vulnerability of the construction sector, driven by its reliance on credit-intensive financing and sensitivity to rising interest rates. Higher borrowing costs disproportionately affect construction firms, which lenders perceive as riskier, leading to higher risk premiums and greater financial strain. This dynamic forces these firms to scale back borrowing or allocate more resources to debt servicing, limiting their capacity for investment and operational spending. The cumulative effects of rising borrowing costs, reduced credit access and elevated default probabilities exacerbate financial constraints for construction firms, illustrating how monetary policy changes can unevenly impact sectors with varying levels of credit dependence and financial fragility.

7. Conclusion

This paper examines the heterogeneous effects of monetary policy surprises on firms, with a focus on credit usage, default probability and credit scores. By leveraging rich administrative data from Türkiye, we aim to provide a granular understanding of how monetary policy transmission varies across firms with different characteristics, such as size, leverage and export status, as well as across sectors. We also discuss sectoral heterogeneity, highlighting the differential impacts of monetary policy on the construction, industrial and services sectors, driven by their unique financial structures and economic roles. The study contributes to the growing literature on monetary transmission by emphasising firm-level heterogeneity and providing new insights into the dynamics of credit markets in an emerging market economy context.

Our findings reveal significant heterogeneity in how firms respond to monetary policy shocks. Large firms are less sensitive to monetary policy surprises compared with SMEs. They maintain more stable access to credit, experience smaller declines in credit scores and face lower default probabilities. These results align with existing research, which attributes the resilience of large firms to their diversified revenue streams, stronger financial positions and broader access to capital markets. In contrast, SMEs, characterised by greater financial constraints and limited credit options, are more adversely affected by monetary tightening. Additionally, firms with higher leverage exhibit greater sensitivity to monetary policy, while exporters appear less affected due to their access to diversified external markets.

At the sectoral level, we find that the construction sector is the most responsive to monetary policy shocks, driven by its reliance on long-term financing and its direct link to housing markets. The industrial sector exhibits the lowest responsiveness, owing to its access to alternative financing sources and long-term investment planning. The services sector falls in between, reflecting its dependence on consumer spending and labour-intensive operations.

Overall, this paper underscores the importance of accounting for firm-level and sectoral heterogeneity when analysing monetary policy transmission. These findings have important policy implications, suggesting that a one-size-fits-all approach to monetary policy may overlook significant differences in how firms and sectors respond to policy changes. Future research can build on these insights by exploring additional dimensions of firm heterogeneity and their implications for economic stability and policy design.

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Appendix A: Descriptive statistics

Descriptive statistics

Table A.1

	All sample		Large		SMEs		High leverage		Low leverage		Exporter	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Credit market outcomes												
Flow credit	0.50	0.53	1.39	0.74	0.47	0.51	0.46	0.52	0.53	0.55	0.82	0.63
Borrowing cost (%)	23.29	13.36	20.48	11.98	23.38	13.39	23.59	13.37	22.14	13.34	21.27	13.04
Outstanding credit growth	3.41	31.42	8.94	48.13	3.39	31.37	3.21	32.21	3.59	32.30	5.04	33.86
Default	0.09	0.39	0.08	0.56	0.09	0.39	0.11	0.45	0.07	0.33	0.05	0.36
Balance sheet outcomes												
Net sales (billion TL)	0.11	1.86	1.53	7.91	0.05	0.67	0.08	1.23	0.12	1.86	0.26	2.48
Total assets (billion TL)	0.10	1.01	1.31	4.97	0.04	0.22	0.07	0.75	0.09	1.09	0.21	1.76
Capital (K) (billion TL)	0.02	0.25	0.25	1.14	0.01	0.06	0.01	0.18	0.02	0.24	0.03	0.28
Exports (billion TL)	0.02	0.58	0.29	1.91	0.01	0.36	0.02	0.63	0.03	0.31	0.21	2.06
Number of employees	74.72	526.41	904.47	1245.89	26.46	39.25	47.64	313.16	60.91	569.81	100.81	549.01
Age	14.43	10.31	23.74	14.43	12.68	9.72	11.97	9.57	14.09	10.48	14.13	11.53

The table presents the descriptive statistics for the sample. Flow credits are expressed as the logarithm of the flow of credit, while borrowing cost represents the borrowing costs for flow credits, expressed as percentages. Outstanding credit growth is calculated as the logarithmic difference in outstanding credits. Finally, default is a binary variable that takes a value of one if the outstanding credit is classified as a non-performing loan (NPL) and zero if the credit remains active.

Appendix B: Robustness check for the impact of monetary policy surprises

Heterogeneous effects of monetary policy shocks on firms' financial outcomes

(using raw monetary policy surprises from Bloomberg forecast errors) Table B.1

	(1) All sample	(2) Large firms	(3) SMEs	(4) High leverage	(5) Low leverage	(6) Exporter	(7) Non- exporter
Panel A: Borrowing cost							
MP_{t-1}	0.825***	0.799***	0.833***	0.864***	0.741***	0.802***	0.827***
	(0.0074)	(0.0162)	(0.0078)	(0.0125)	(0.0121)	(0.0114)	(0.0073)
R-squared	0.82	0.74	0.83	0.80	0.81	0.78	0.81
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel B: Flow credit							
MP_{t-1}	–0.014***	–0.010***	–0.015***	–0.022***	–0.012***	–0.013***	–0.015***
	(0.0062)	(0.0101)	(0.0063)	(0.0098)	(0.0094)	(0.0121)	(0.0063)
R-squared	0.14	0.10	0.15	0.17	0.16	0.19	0.15
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel C: Monthly outstanding credit growth							
MP_{t-1}	–0.018***	–0.015***	–0.018***	–0.021***	–0.017***	–0.015***	–0.018***
	(0.0002)	(0.0056)	(0.0002)	(0.0003)	(0.0004)	(0.0062)	(0.0002)
R-squared	0.07	0.04	0.07	0.08	0.06	0.08	0.07
Observations	14,454,768	104,753	14,350,015	7,123,819	7,330,949	2,392,874	12,061,894
Panel D: Default							
MP_{t-1}	0.004***	0.003***	0.004***	0.006***	0.003***	0.001***	0.004***
	(0.0029)	(0.0082)	(0.0031)	(0.0039)	(0.0035)	(0.0069)	(0.0030)
	0.17	0.15	0.17	0.20	0.18	0.24	0.18
	15,695,201	61,185	15,634,016	7,866,829	7,828,372	2,505,546	13,189,655
Firm FE	✓	✓	✓	✓	✓	✓	✓
Sector x quarter FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Macroeconomic controls	✓	✓	✓	✓	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as $log(r_{ibt})$; in Panel B, it is the logarithm of the flow credit amount, $log(credit_{ibt})$, for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as $(log(credit_{it}) - log(credit_{it-1})$; and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. Monetary policy surprises (MP_{t-1}) are represented by monetary policy surprises at year-month (t−1), derived from Bloomberg forecast errors. Firms are categorised as SMEs if they have fewer than 250 employees; otherwise, they are classified as large. Firms are identified as highly leveraged if their leverage ratio exceeds the sector-year median within the same sector. Additionally, firms are considered exporters if they have engaged in export activities for at least one year. Standard errors, clustered by firm, in parenthesis. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

Monetary policy surprises and sectoral variations in firms' financial outcomes

(using raw monetary policy surprises from Bloomberg forecast errors) Table B.2

	(1) Industry	(2) Services	(3) Construction
Panel A: Borrowing cost			
MP_{t-1}	0.802***	0.830***	0.860***
	(0.0056)	(0.0078)	(0.0112)
R-squared	0.79	0.82	0.81
Observations	2,596,747	5,878,831	1,237,116
Panel B: Flow credit			
MP_{t-1}	–0.010***	–0.013***	–0.018***
	(0.0025)	(0.0053)	(0.0097)
R-squared	0.11	0.10	0.10
Observations	2,596,747	5,878,831	1,237,116
Panel C: Monthly outstanding credit growth			
MP_{t-1}	–0.016***	–0.018***	–0.020***
	(0.0003)	(0.0002)	(0.0006)
R-squared	0.06	0.07	0.07
Observations	2,781,632	9,591,771	1,859,480
Panel D: Default			
MP_{t-1}	0.002***	0.002***	0.005***
	(0.0024)	(0.0031)	(0.0054)
R-squared	0.12	0.20	0.15
Observations	3,014,051	10,370,042	2,076,265
Firm FE	✓	✓	✓
Sector x quarter FE	✓	✓	✓
Firm controls	✓	✓	✓
Macroeconomic controls	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as log(r_ibt); in Panel B, it is the logarithm of the flow credit amount, log(credit_ibt), for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as (log(credit_it)-log(credit_(it-1)); and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. Monetary policy surprises (〖MP〗_(t-1)) are represented by monetary policy surprises at year-month (t−1), derived from Bloomberg forecast errors. Standard errors, clustered by firm, in parenthesis. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

Heterogeneous effects of monetary policy shocks on firms' financial outcomes

(using raw monetary policy surprises from Market Participants Survey's forecast errors) Table B.3

	(1) All sample	(2) Large firms	(3) SMEs	(4) High leverage	(5) Low leverage	(6) Exporter	(7) Non-exporter
Panel A: Borrowing cost							
MP_{t-1}	1.156***	0.967***	1.159***	1.175***	1.035***	0.985***	1.161***
	(0.0016)	(0.0101)	(0.0016)	(0.0022)	(0.0023)	(0.0068)	(0.0018)
R-squared	0.86	0.77	0.87	0.85	0.86	0.82	0.88
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel B: Flow credit							
MP_{t-1}	–0.025***	–0.018***	–0.026***	–0.029***	–0.024***	–0.020***	–0.027***
	(0.0053)	(0.0098)	(0.0054)	(0.0077)	(0.0081)	(0.0125)	(0.0054)
R-squared	0.15	0.09	0.15	0.16	0.15	0.19	0.15
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel C: Monthly outstanding credit growth							
MP_{t-1}	–0.018***	–0.015***	–0.018***	–0.021***	–0.017***	–0.015***	–0.018***
	(0.0002)	(0.0056)	(0.0002)	(0.0003)	(0.0004)	(0.0062)	(0.0002)
R-squared	0.07	0.04	0.07	0.08	0.06	0.08	0.07
Observations	14,454,768	104,753	14,350,015	7,123,819	7,330,949	2,392,874	12,061,894
Panel D: Default							
MP_{t-1}	0.004***	0.003***	0.004***	0.006***	0.003***	0.001***	0.004***
	(0.0029)	(0.0082)	(0.0031)	(0.0039)	(0.0035)	(0.0069)	(0.0030)
	0.17	0.15	0.17	0.20	0.18	0.24	0.18
	15,695,201	61,185	15,634,016	7,866,829	7,828,372	2,505,546	13,189,655
Firm FE	✓	✓	✓	✓	✓	✓	✓
Sector x quarter FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Macroeconomic controls	✓	✓	✓	✓	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as log(r_ibt); in Panel B, it is the logarithm of the flow credit amount, log(credit_ibt), for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as (log(credit_it)-log(credit_(it-1)); and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. Monetary policy surprises (〖MP〗_(t-1)) are represented by monetary policy surprises at year-month (t−1), derived from Market Participants Survey's forecast errors. Firms are categorised as SMEs if they have fewer than 250 employees; otherwise, they are classified as large. Firms are identified as highly leveraged if their leverage ratio exceeds the sector-year median within the same sector. Additionally, firms are considered exporters if they have engaged in export activities for at least one year. Standard errors, clustered by firm, in parenthesis. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

Monetary policy surprises and sectoral variations in firms' financial outcomes

(using raw monetary policy surprises from Market Participants Survey's forecast errors) Table B.4

	(1) Industry	(2) Services	(3) Construction
Panel A: Borrowing cost			
MP_{t-1}	1.124***	1.181***	1.201***
	(0.0030)	(0.0021)	(0.0045)
R-squared	0.85	0.86	0.85
Observations	2,596,747	5,878,831	1,237,116
Panel B: Flow credit			
MP_{t-1}	–0.020***	–0.024***	–0.028***
	(0.0082)	(0.0055)	(0.0094)
R-squared	0.21	0.16	0.18
Observations	2,596,747	5,878,831	1,237,116
Panel C: Monthly outstanding credit growth			
MP_{t-1}	–0.016***	–0.018***	–0.020***
	(0.0003)	(0.0002)	(0.0006)
R-squared	0.06	0.07	0.07
Observations	2,781,632	9,591,771	1,859,480
Panel D: Default			
MP_{t-1}	0.002***	0.002***	0.005***
	(0.0024)	(0.0031)	(0.0054)
R-squared	0.12	0.20	0.15
Observations	3,014,051	10,370,042	2,076,265
Firm FE	✓	✓	✓
Sector x quarter FE	✓	✓	✓
Firm controls	✓	✓	✓
Macroeconomic controls	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as log(r_ibt); in Panel B, it is the logarithm of the flow credit amount, log(credit_ibt), for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as (log(credit_it)-log(credit_(it-1)); and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. Monetary policy surprises (〖MP〗_(t-1)) are represented by monetary policy surprises at year-month (t−1), derived from Market Participants Survey's forecast errors. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

Appendix C: Robustness check for the causal impact of policy rate

Heterogeneous impact of policy rate change on firms' outstanding credits

(using raw monetary policy surprises from Bloomberg forecast errors) Table C.1

	(1) All sample	(2) Large firms	(3) SMEs	(4) High leverage	(5) Low leverage	(6) Exporter	(7) Non- exporter
Panel A: Borrowing cost							
$PolicyChange_{t-1}$	0.942***	0.913***	0.945***	0.957***	0.918***	0.894***	0.943***
	(0.0032)	(0.0205)	(0.0032)	(0.0044)	(0.0048)	(0.0153)	(0.0033)
R-squared	0.18	0.15	0.19	0.21	0.20	0.16	0.19
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel B: Flow credit							
$PolicyChange_{t-1}$	–0.018***	–0.013***	–0.019***	–0.021***	–0.015***	–0.014**	–0.019***
	(0.0043)	(0.0117)	(0.0044)	(0.0069)	(0.0067)	(0.0108)	(0.0044)
R-squared	0.12	0.11	0.12	0.13	0.13	0.11	0.12
Observations	9,861,811	310,038	9,551,773	4,914,613	4,947,198	552,941	9,308,870
Panel C: Monthly outstanding credit growth							
$PolicyChange_{t-1}$	–0.015***	–0.009**	–0.013***	–0.022***	–0.011***	–0.008**	–0.016***
	(0.0002)	(0.0053)	(0.0002)	(0.0003)	(0.0003)	(0.0016)	(0.0009)
R-squared	0.10	0.14	0.10	0.16	0.18	0.15	0.11
Observations	14,454,768	104,753	14,350,015	7,123,819	7,330,949	2,392,874	12,061,894
Panel D: Default							
$PolicyChange_{t-1}$	0.007***	0.004**	0.007***	0.010***	0.006***	0.004***	0.007***
	(0.0010)	(0.0024)	(0.0010)	(0.0016)	(0.0017)	(0.0014)	(0.0012)
R-squared	0.18	0.15	0.18	0.21	0.23	0.16	0.19
Observations	15,695,201	61,185	15,634,016	7,866,829	7,828,372	2,505,546	13,189,655
Firm FE	✓	✓	✓	✓	✓	✓	✓
Sector x quarter FE	✓	✓	✓	✓	✓	✓	✓
Firm controls	✓	✓	✓	✓	✓	✓	✓
Macroeconomic controls	✓	✓	✓	✓	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as log(r_ibt); in Panel B, it is the logarithm of the flow credit amount, log(credit_ibt), for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as (log(credit_it)-log(credit_(it-1)); and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. 〖PolicyChange〗_(t-1) is instrumented by orthogonalised monetary policy surprises (〖MP〗_(t-1)) at year-month (t−1), derived from Bloomberg forecast errors. Firms are categorised as SMEs if they have fewer than 250 employees; otherwise, they are classified as large. Firms are identified as highly leveraged if their leverage ratio exceeds the sector-year median within the same sector. Additionally, firms are considered exporters if they have engaged in export activities for at least one year. Standard errors, clustered by firm, in parenthesis. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.

Policy rate change and sectoral variations in firms' outstanding credits

Table C.2

	(1) Industry	(2) Services	(3) Construction
Panel A: Borrowing cost			
$PolicyChange_{t-1}$	0.914***	0.940***	1.014***
	(0.0047)	(0.0032)	(0.0072)
R-squared	0.15	0.16	0.18
Observations	2,596,747	5,878,831	1,237,116
Panel B: Flow credit			
$PolicyChange_{t-1}$	–0.015***	–0.017***	–0.023***
	(0.0029)	(0.0045)	(0.0085)
R-squared	0.18	0.21	0.20
Observations	2,596,747	5,878,831	1,237,116
Panel C: Monthly outstanding credit growth			
$PolicyChange_{t-1}$	–0.013***	–0.015***	–0.023***
	(0.0004)	(0.0002)	(0.0005)
R-squared	0.09	0.12	0.07
Observations	2,781,632	9,591,771	1,859,480
Panel D: Default			
$PolicyChange_{t-1}$	0.006***	0.007***	0.010***
	(0.0023)	(0.0012)	(0.0028)
R-squared	0.15	0.19	0.17
Observations	3,014,051	10,370,042	2,076,265
Firm FE	✓	✓	✓
Sector x quarter FE	✓	✓	✓
Firm controls	✓	✓	✓
Macroeconomic controls	✓	✓	✓

This table presents the estimation results for equation (3), with the unit of observation varying across panels. In Panels A and B, the unit of observation is firm-bank-year-month, where the outcomes are derived from flow credits. In Panels C and D, the unit of observation is firm-year-month, focusing on outstanding credits. The dependent variable differs across panels: in Panel A, it is the borrowing cost of loans for firm i from bank b at time t, expressed as log(r_ibt); in Panel B, it is the logarithm of the flow credit amount, log(credit_ibt), for firm i from bank b at time t; in Panel C, it is the monthly logarithmic difference in outstanding credits for firm i at time t, calculated as (log(credit_it)-log(credit_(it-1)); and in Panel D, it is the default probability, defined as one if the credit is in default and zero if the loan is active. Panels A, B and C include only active credits, while Panel D includes both active and non-performing loans (NPLs). Additionally, Panels A and B incorporate bank fixed effects to control for variations in lending practices, risk preferences and liquidity constraints across banks. 〖PolicyChange〗_(t-1) is instrumented by orthogonalised monetary policy surprises (〖MP〗_(t-1)) at year-month (t−1), derived from Bloomberg forecast errors. Sample: 2017M1–2024M10. ***p<0.01, **p<0.05, *p<0.1.