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Abstract

Since July 2022, European Central Bank (ECB) increased its interest rates for the first time in eleven years to bring inflation back to target. This has huge implication on the credit decision for firms, especially the small and medium enterprises (SME), instrumental in supporting employment, innovation and income. Using ECB's 'Survey on Access to Finance of Enterprises' (SAFE) from 2015 to 2023, this paper assesses if the ECB's monetary policy tightening bears any relationship with SME's substituting away from bank credit towards alternative sources of finance. Our results show that contractionary monetary policy shocks were positively associated with the likelihood of SME's substituting away from bank credit. We find this behaviour across SMEs with larger turnover, employee size, age, as well as credit-quality; indicating a much stronger reliance and stickiness to bank credit for relatively smaller, younger, and riskier firms despite increases in the cost of credit following contractionary monetary policy shocks.

Keywords: European Central Bank (ECB), monetary policy tightening, SME credit demand, firm bank credit substitution, firm financing behaviour and adaptability.
JEL codes: D22, E50, E51, E52, E58.

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1 Introduction

Following the COVID-19 pandemic, global economies have witnessed headwinds such as supply chain bottlenecks, pent up demand and the war in Ukraine - each contributing to the return of inflation to levels not seen since the 1980s. In response (in an almost synchronized manner) central banks such as the Federal Reserve (Fed), European Central Bank (ECB) and Bank of England have tightened monetary policy by increasing interest rates, aiming to return inflation to target levels. For instance, the ECB has increased its interest rates ten times since June 2022 - with an accumulated increase to around 4.75 percent in the marginal lending facility. This was one of the largest steps in the past eleven years, from the previous crisis to bring inflation close to its price stability target.

This contractionary monetary policy stance (in addition to reducing inflation) has financial stability implications for non-financial corporations -especially small and medium enterprises (SMEs). SMEs play a significant role in their economies and are considered pivotal in supporting employment, innovation and income (EC, 2022). In Europe, SMEs are highly reliant on bank credit for survival and growth (Gerlach-Kristen et al., 2015; Ferrando et al., 2014), often unable to borrow in the corporate bond market or raise capital in the stock market (Bougheas et al., 2006; Kashyap and Stein, 1994). Further, SMEs often face challenges in accessing bank loans, particularly during periods of economic uncertainty or policy tightening. As a result, alternative sources of SME finance can be utilised - including (among others) internal resources, grants and subsidies, overdrafts and trade credit. Understanding how SME credit demand conditions evolved during the recent monetary policy tightening provides valuable insights into the resilience of small businesses and their ability to adapt to the changing economic conditions and policy environments. In this regard, understanding the credit demand behaviour of these firms is important for policymakers (especially when it arises as an externality of other macroeconomic policy objectives).

This research assesses the relationship between the ECB's monetary policy tightening since July 2022 and SME credit demand behaviour. In particular, this paper investigates SME substitution behaviour away from bank borrowing towards alternative sources of financing, including (but not limited to) retained earnings, trade credit, grants and subsidies, leasing and factoring. Additionally, we exploit the heterogeneity in bank credit substitution during monetary policy contraction across firm characteristics such as turnover, income/profit generation in the past six months, firm-size, firm-age, and finally credit risk of a firm. Finally, we explore the heterogeneity in bank credit substitution during monetary policy contraction across the core and periphery EU countries[1]. In a monetary tightening environment, the existence of a credit substitution effect highlights the adaptability of SMEs in maintaining access to credit. The shift from traditional banking to alternative sources of finance could provide financial innovation and growth opportunities for some SMEs, while it could also expose SMEs to new vulnerabilities such as high default risks and regulatory

[1]Here we follow the country classification in Campos and Macchiarelli (2021). See Section 4.3 for more details.

challenges. Hence, it is crucial to investigate whether SMEs substituted away from bank credit during the recent monetary hike.

We employ bi-annual firm-level data derived from ECB 'Survey on Access to Finance of Enterprises' (SAFE) from 2015 to 2023 covering over 137,000 SME observations. Our analysis focuses on SMEs in twelve euro-area countries: Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, The Netherlands, Portugal, and Slovakia, with the sample period from April 2015 to March 2023. We exclude the waves 2020H1-2021H1 pertaining to the COVID-19 pandemic due to uncertainty with regards to firm decision-making as well as multitude of fiscal policies implemented during that period[2]. The data used in this study provides rich empirical context in investigating policy changes and economic events in the past decade.

Our identification strategy relies on the availability of alternative sources of financing available to SMEs (including internal profits, trade credit etc.) recorded in the SAFE dataset. Availability of alternative financing options serves as an opportunity for firms to substitute away from bank credit during monetary policy shocks. We exploit this information in SAFE to create a measure of bank credit substitution and employ a linear probability model to assess its relationship with the ECB's monetary policy tightening since July 2022. Here, to capture the effects of monetary policy, we follow Nakamura and Steinsson (2018) and calculate the first principle component of changes in the yields of risk-free rates (where their maturities range from one month to ten years) to capture monetary policy shocks during small time windows around the ECB Governing Council meetings. However, as robustness, we employ an alternative indicator of monetary policy taking the change in average 12-month maturity Euro Interbank Offered Rate (Euribor) between wave 't' and 't-1' of the SAFE survey.

The results of this study are threefold. First, we find a positive and statistically significant relationship between contractionary monetary policy shocks and the likelihood of firms to substitute bank credit for alternative sources of financing. Second, our results are heterogeneous to various firm-level characteristics as the likelihood of bank credit substitution increases with respect to annual turnover, firm's income/profits, age, size as well as their credit-quality. Third, we show that different firm-level characteristics determine the probability of bank credit substitution in core versus periphery countries. In particular, we find that core countries are sensitive to turnover and firm-age, while periphery countries have varied responses with regards to different categories of turnover, company size and credit-quality.

The findings of this study contribute to our understanding of how SME financing behaviour determines transmission of changes in the interest rates, liquidity conditions and policy regimes to the real economy. We make three key contributions to the existing literature. First, we contribute to the existing literature on the use of alternative sources of finance for SMEs during monetary changes. The shift away from bank credit and towards internal sources, grants, trade credit, among

[2]We also start in 2015 to avoid overhang from the Great Financial Crisis and eurozone debt crisis.

others have implications for financial stability and macroeconomic growth, especially during the changing monetary policy environment and stringent capital requirements. To the best of our knowledge, this is the first euro-area study to investigate the credit demand substitution away from bank credit towards alternative sources of finance at the turning of the monetary policy cycle. Second, this paper considers heterogeneous effects of monetary policy on firms. By examining how different types of firms; based on size, turnover, profitability and age, respond to monetary policy changes, we address the complexity in transmission mechanism of monetary policy across different firm-types. Moreover, we add to this exploration by focusing on firms' risk profile through a credit-quality measure. We construct this measure following a methodology similar to Calabrese et al. (2021),[3] using firms' view about their debt-to-assets ratio and income and profit generation.[4] Third, our results add to the evidence base contributing the design and evaluation of future policy measures. By understanding how SMEs respond to monetary policy changes, policymakers can tailor interventions to better support SME access to finance and mitigate risks to financial stability.

Our research also has important implications for policymakers. First, the importance of SMEs in economic activity and their dependence on bank credit is critical in understanding the transmission of monetary policy to the real economy. Second, assessment of firm's credit conditions and financing behaviour following monetary policy changes is crucial from the standpoint of financial stability. Fluctuations in SME credit demand can signal changes in business sentiment, investment behavior, and financial health, which may have implications for overall financial stability and resilience in the banking sector. Third, since ECB continues to use conventional monetary policy rates against inflationary pressures; our findings confirm the effectiveness of these tools as being relevant in shaping the credit demand behaviour of SMEs.

The remainder of the paper is structured as follows. Section 2 outlines the related literature and hypotheses development. Section 3 provides details on the dataset we employ, the construction of our monetary policy indicator, as well as descriptive statistics for all the variables employed in the study, followed by the empirical methodology adopted for this study. We report the effects of monetary policy tightening on credit demand substitution for SMEs in Section 4. Section 5 concludes.

2 Literature Review and Hypotheses Development

SMEs role in growth and development is crucial for many countries in Europe as they serve as an engine of economic growth, innovation, and job creation (Mol-Gómez-Vázquez et al., 2022). At the same time, access to credit is vital for SMEs to fund their operations, invest in opportunities and innovate. While a considerable number of SMEs lack direct access to capital markets

[3] Calabrese et al. (2021) use subjective measures of firm risk such as the firms' view of their own capital and credit history in the context of financial fragmentation.

[4] We discuss the credit-quality measure in detail in Section 3.1.

(Bougheas et al., 2006; Kashyap and Stein, 1994), they tend to be more reliant on bank credit than larger enterprises (Hoffmann et al., 2022; Bongini et al., 2021; Peydró et al., 2021). The access to funding for businesses is even more crucial during periods of tight monetary policy when bank credit becomes more expensive and less accessible. Monetary policy tightening, often characterized by central banks raising interest rates or reducing liquidity, can lead to tighter lending conditions for businesses seeking traditional bank credit (Kashyap and Stein, 2000). Higher borrowing costs and stricter lending standards imposed by banks can constrain credit availability, especially for SMEs with limited collateral or credit history (Bernanke and Gertler, 1995).

The literature on access to finance and monetary policy generally focuses on the supply side through banks' lending behaviour and health of their balance sheets, which is broadly described via the bank lending channel (BLC). It suggests that monetary policy is transmitted to the real economy through changes in the level and composition of bank credit (Bernanke and Blinder, 1988; Bernanke and Gertler, 1989; Bernanke et al., 1992). Given that firms in Europe are relatively bank dependent, on the demand-side; the access to finance is also dependent on firm-level decision process (Anastasiou and Giannoulakis, 2022). We address this by focusing on the impact of monetary policy on the firm financing decisions using a micro firm-based survey designed to capture credit demand. Our paper also relates to the financial frictions literature, which links the constraints of firm financing to asymmetric information, in turn determined by firm characteristics such as age, size and ownership structure (Fazzari et al., 1987; Kirschenmann, 2016).

With high interest rates on bank loans, businesses can substitute bank credit for alternative sources of finance including trade credit from suppliers or negotiate extended payment terms (Petersen and Rajan, 1997). Previous studies on the substitution effect between bank loans and alternative sources points back to Meltzer (1960) that investigate the relationship between mercantile (inter-firm) credit availability, monetary policy and firm-size. The findings shed light on how changes in monetary policy affect mercantile credit access, particularly for small and large firms, where the latter experience a reduction in mercantile credit, while the former face a less profound effect.

Similar to Meltzer (1960), Schwartz (1974) extends on the theory and investigates the prevalence of trade credit among firms during changing monetary conditions. Particularly, they find that during contractionary monetary policy, firms with lower financing costs will increase their bank borrowing in order to extend trade credit to firms with higher financing costs. Similarly, Nilsen (2002) employs financial reports data on U.S. manufacturing firms and shows that changes in bank lending conditions impact firms' reliance on trade credit as an alternative financing mechanism. The effect is amplified for smaller and financially constrained businesses exhibiting greater reliance on trade credit compared to their larger counterparts. Additionally, Yang (2011) provides evidence on the relationship between bank and trade credit during varying monetary conditions. The findings suggest that during periods of monetary tightening, firms substitute bank credit with trade credit, while during monetary easing both sources of finance act as complements to each

other.

More recently, Bottero and Conti (2023) use the thick modelling approach (Granger and Jeon, 2004) to investigate the transmission of ECB's recent monetary policy hike cycle starting in July 2022, to the cost of credit for non-financial Italian firms. The findings suggest that borrower riskiness is a key determinant in explaining the dynamics of lending rates to NFCs. Jude et al. (2024) assesses and compares the monetary policy tightening during 2022-23 and its transmission to financing conditions in the U.S. and euro-area. They find that aggregate demand for credit for firms remain rather resilient suggesting financing conditions in the economy to be less responsive to policy rates.

In light of the above discussion, we formulate the following hypothesis:

Hypothesis 1: *During periods of monetary policy tightening, SMEs exhibit a greater probability to substitute away from bank credit towards alternative sources of finance.*

This hypothesis captures the potential substitution between bank credit and alternative sources of finance during monetary policy shocks. We argue that as the ECB implement monetary tightening measures starting July 2022, the cost of borrowing for SMEs increase. In response, SMEs are likely to seek alternative financing options including internal sources, grants/subsidies, credit line/credit card, trade credit, among others. These alternative sources can provide SMEs with relatively cheaper options. Hence, we expect that SMEs will increasingly turn to alternative financing channels to meet their funding needs during periods of monetary policy tightening, aiming to alleviate the constraints posed by higher borrowing costs and maintain their financial resilience.

SMEs' financing decisions during periods of monetary policy tightening are shaped by firm characteristics including size, age, turnover and credit risk (Burlon et al., 2019) as well as legal form (Mol-Gómez-Vázquez et al., 2019). For instance, smaller and younger SMEs may not have access to diverse funding options and may be credit constrained (Berger and Udell, 1998; Bernanke and Gertler, 1996). On the other hand, older firms due to their established banking relationships may reduce the probability of being bank credit constrained (De Jonghe et al., 2020). Further, SMEs operating in energy-intensive industries might face high costs of energy, which may lower the debt servicing capacities of these companies and therefore make them riskier from the perspective of banks (Lane, 2023). In light of this, we formulate the following hypothesis:

Hypothesis 2: *During periods of monetary policy tightening, SME substitution behaviour varies with firm heterogeneity including firm-size, age, income, turnover, and credit risk.*

This hypothesis tests if the substitution behaviour of SMEs during monetary policy tightening depends upon heterogeneity across firm characteristics, emphasizing the importance of considering diverse factors in understanding SME financing dynamics. Our research is most closely linked to existing literature considering SMEs' financing behaviour (Holton et al., 2014; Moro et al., 2017; Bańkowska et al., 2020; Roux and Savignac, 2024), the relationship between bank

constraints and alternative finance (Casey and O'Toole, 2014), and the role of monetary policy (Ferrando et al., 2019).

3 Data and Methodology

3.1 SAFE Dataset

We employ micro-level firm data from the EU/ECB's 'Survey on the Access to Finance of Enterprises' (SAFE), which is collected on behalf of the European Commission's Directorate General for Enterprise and Industry and the ECB. The sample covers non-financial firms and provides detailed information on each respondent firm's characteristics including size, age, ownership structure as well as recent developments in their financing conditions, needs and access to finance.[5] The data is collected on a semi-annual basis, where first round for any given year is collected from April to September and the second round collected from October to March (for the next year). Since our focus is on SMEs, we omit observation for firms with more than 250 employees. The period under study for our analysis ranges from April 2015 to March 2023, i.e., waves 13 to 29 of SAFE, excluding waves 23-25 pertaining to COVID-19 period from 2020H1-2021H1.

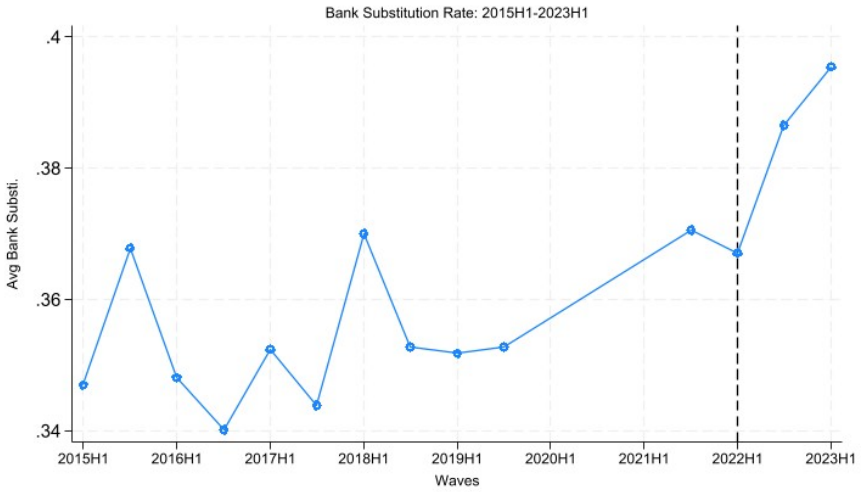
Our sample contains only non-financial corporations across manufacturing, construction, trade and services sector. We include firms from twelve euro-area countries: Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, The Netherlands, Portugal, and Slovakia in order to have countries that report in every wave. The choice of the sample period assists in comparing credit demand substitution behaviour of firms for the two monetary policy regimes as the period 2015H1-2021H2 relates to expansionary monetary policy, while 2022H2-2023H1, we capture periods of contractionary monetary policy.

We use SAFE to construct our key dependent variable, that captures firm's bank credit substitution towards alternative sources of finance. This is a dummy variable that equals one (and zero otherwise) if a firm (in the last 6 months) does not use bank credit nor applies for the bank credit, despite bank credit declared as relevant by the firm; instead uses one (or more) alternative sources of financing including: internal resources, grants/subsidies, overdraft/credit line/credit card, trade credit, other minor sources (factoring, debt security, equity investment). Using this criterion, we identify over 73,000 SMEs from April 2015- March 2023.

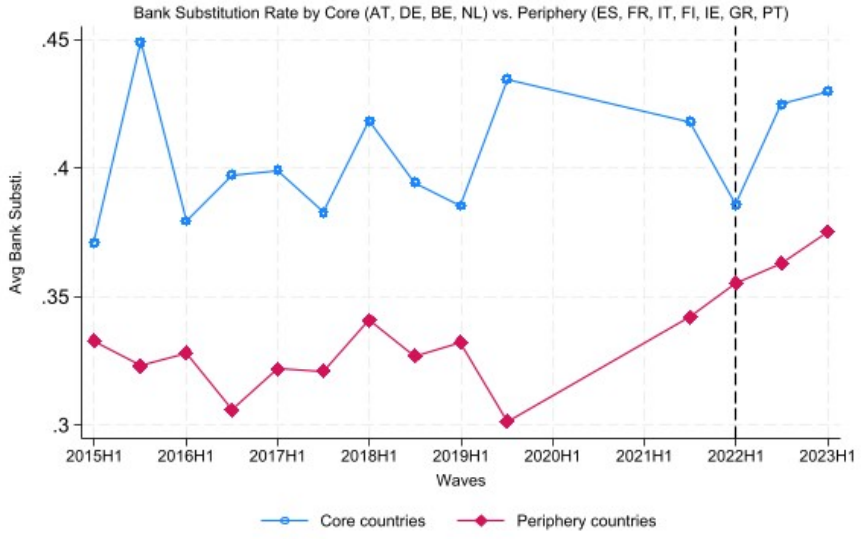
Figure 1 shows changes in average bank credit substitution for firms in period 2015H1-2023H1. Specifically, Figure 1a employs the full sample of firms in our data, while Figure 1b depicts the bank credit substitution in core (Austria, Germany, Belgium, The Netherlands) and periphery (Spain, France, Italy, Finland, Greece, Ireland, Portugal) countries, following Campos and Macchiarelli (2021). There is a clear divergence in average bank credit substitution rate beginning

[5]It is to be noted that most of the information on SAFE is qualitative, and so, all firm-level variables are categorical.

Figure 1: Bank Credit Substitution



(a) Full Sample: Bank Credit Substitution increasing post Mon Pol. announcements



(b) Core vs. Periphery: Bank Credit Substitution more across Core but rate of increase higher across Periphery

2022H1 relative to earlier periods, increasing from 36% to just under 40%. Moreover, as indicated in Figure 1b, bank credit substitution increased for both core and periphery countries. However, the rate of increase was higher for the periphery countries, while the average level of credit substitution remains high for core countries across all periods.

Table 1: Summary Statistics

	2015H1-2019H2		**2021H2-2023H1**	
	N	Mean	N	Mean
Bank Substitution	53,666	0.35	19,627	0.38
Annual Turnover				
1: <= €500k	96,247	0.30	37,253	0.28
2: >€500k &<= €1M	96,247	0.15	37,253	0.15
3: >€1M & <= €2M	96,247	0.14	37,253	0.15
4: >€2M & <= €10M	96,247	0.24	37,253	0.23
5: >€10M & <= €50M	96,247	0.15	37,253	0.15
6: >€50M	96,247	0.03	37,253	0.03
Firm Age				
1: <2 years	98,914	0.01	38,255	0.01
2: >=2 &<5 years	98,914	0.04	38,255	0.04
3: >=5 &<10 years	98,914	0.10	38,255	0.07
4: >=10 years	98,914	0.84	38,255	0.88
Company Size				
1: Micro (1-9 employees)	99,033	0.46	38,287	0.45
2: Small (10-49 employees)	99,033	0.30	38,287	0.31
3: Medium (50-249 employees)	99,033	0.24	38,287	0.24
Income/Profits				
1: Decreased/Remain Unchanged	96,736	0.70	37,197	0.76
2: Increased	96,736	0.30	37,197	0.24
Labour Cost				
1: Decreased/Remain Unchanged	98,327	0.46	38,037	0.28
2: Increased	98,327	0.54	38,037	0.72
Fixed Investments				
1: Decreased/Remain Unchanged	95,299	0.72	35,830	0.75
2: Increased	95,299	0.28	35,830	0.25
Bank Financing Conditions				
1: Will Deteriorate/Remain Unchanged	57,467	0.78	21,177	0.89
2: Will Improve	57,467	0.22	21,177	0.11
Expected Loan Availability				
1: Will Deteriorate/Remain Unchanged	58,696	0.78	21,773	0.89
2: Will Improve	58,696	0.22	21,773	0.11
Credit Quality				
1: V. Safe/Safe	84,943	0.33	31,260	0.26
2: Moderate	84,943	0.38	31,260	0.36
3: Risk/ H. Risk	84,943	0.27	31,260	0.38

We present summary statistics for all the variables employed in the study in Table 1, splitting the sample in two time-periods, first between 2015H1 and 2019H2 (pre-COVID19), while the second sub-sample range from 2021H2 to 2023H1 (post-COVID19).[6] Table 1 highlights an increase in

[6]The summary statistics uses sample weights provided in the data-set.

average bank credit substitution from 35% to 38% between the two periods.

The composition of firms with regards to age and size is quite homogeneous across the two sample periods, with majority firms reported as more than 10 years old (84% and 88% pre and post-COVID19 respectively) with micro-size (around 45% in both periods), followed by small-size firms (30% in both periods). With respect to turnover in past six months, we find that the composition of firms is quite consistent across the two sample periods, with majority firms reporting turnover of less than €500,000 (around 30%), followed by turnover in the range of €2-€10 million (around 24%). Moreover, compared to pre-COVID19 period, a larger proportion of firms (76% vs. 70%) report a 'fall' or 'no change' in income or profits as well as their fixed investment (75% vs. 72%). Additionally, there is a significant increase in firms reporting an increase in their labour-cost (54% vs. 72%) across the two sample periods. In terms of the future expectations for loan availability and bank financing conditions (next 6 months), we find quite similar composition of firms within these two categories. However, there is a sharp fall in the proportion of firms expecting improvement in financing conditions between pre and post-COVID19 periods (11% compared to 22%).

Finally, as mentioned earlier, we use Calabrese et al. (2021) methodology to construct a measure of firm credit-quality using information on income/profits and debt to asset ratio reported in the SAFE. We create three categories of firm quality- *very risky/risky, moderate, safe/very safe*. Here, risky firms are the ones where either income/profit remain unchanged/decreased (in past 6 months) and debt-to-assets ratio increased; or a second scenario where income/profit generation decreased and debt to assets ratio remained unchanged. In contrast, we define safe firms as the ones where income/profits increased or remained unchanged (past 6 months) and debt to assets ratio decreased or remained unchanged. Finally, moderate firms are constructed based on either of the three following scenarios. First, when both their income/profit generation and debt to assets ratio increased. Second, when both income/profit generation and debt to assets decreased. Third, when income/profit and debt to assets stayed the same in the past 6 months. We find that majority firms are 'moderate' risk (around 37% in both periods); however, the composition of risky firms increased from 27% to 38% between pre and post COVID-19 periods. This deterioration in firm credit-quality, along with an increased proportion of firms reporting a decline in profits and fixed investments as well as an increase in their labour cost, to some degree reflects multi-fold issues and difficulties faced by SMEs as a result of global events such as the COVID-19 pandemic, Ukraine war, and rising inflation.

3.2 Monetary Policy Shocks

Monetary policy shocks, the key explanatory variable, are derived from the first principal component of the Overnight Index Swap (OIS) rate change at different maturities in a small window

around ECB governing council meetings.[7] This methodology follows the seminal work of Nakamura and Steinsson (2018), which has been applied to the euro area by Jung and Uhlig (2019), Jarociński (2022) and Ferrando and Grazzini (2023). Specifically, using the Euro-Area Monetary Policy Event-Study Database (EA-MPD) of Altavilla et al. (2019), the first principal component of the 1-,3-, 6-month and 1-, 2-, 5-, 10-year OIS rate change[8] (in the 10 minute windows before the press release and after the press conference[9]) is constructed. The combination of both short and long-term OIS rate change maturities ensures both conventional and unconventional monetary policy measures are encapsulated in the monetary policy shocks - this is a key point raised by both Jung and Uhlig (2019) and Ferrando and Grazzini (2023) who highlight that different monetary dimensions affect different segments of the yield curve. Jung and Uhlig (2019) also highlight other advantages of this methodology - including, no model selection issues, no generated-regressor problems and no issue with vintage of data used. Following Ferrando and Grazzini (2023), this principal component is rescaled such that it has a one unit impact on the 3-month OIS rate change.[10]

The first principal component needs to be further decomposed to separate out pure monetary policy shocks from central bank information shocks - where the former are actual changes in monetary policy, while the latter captures information on the state of the economy revealed in either the press conference or press release. Each shock differs in its impact on financial markets. Following methodologies established in Jung and Uhlig (2019), Jarociński (2022) and Ferrando and Grazzini (2023), pure monetary shocks are defined as being negatively correlated with stock market returns (in the same narrow window as OIS rate changes) - in this case STOXX50, also available from the EA-MPD. This is in line with standard asset pricing models. Thus where the first principal component is positively correlated with stock market returns this does not reflect monetary policy shocks - but rather central bank information shocks or economic news. Specifically, the first principal component is decomposed per Equation 1;

$$\Gamma_{\tilde{t}} = \begin{cases} MP_{\tilde{t}} & \text{if corr}(\Gamma_{\tilde{t}}, s_{\tilde{t}}) \leq 0 \\ \Omega_{\tilde{t}} & \text{if corr}(\Gamma_{\tilde{t}}, s_{\tilde{t}}) > 0 \end{cases} \tag{1}$$

where for ECB governing council meeting date $\tilde{t}$, $\Gamma_{\tilde{t}}$ is the first principal component of the OIS rate changes at the specified maturities, $MP_{\tilde{t}}$ is the pure monetary policy shock, $\Omega_{\tilde{t}}$ is the central bank information shock and $s_{\tilde{t}}$ is the euro STOXX50E index change in the relevant window in

[7] To be clear, in this approach changes in the interest rate around these short windows results from the unexpected component of the council meetings.

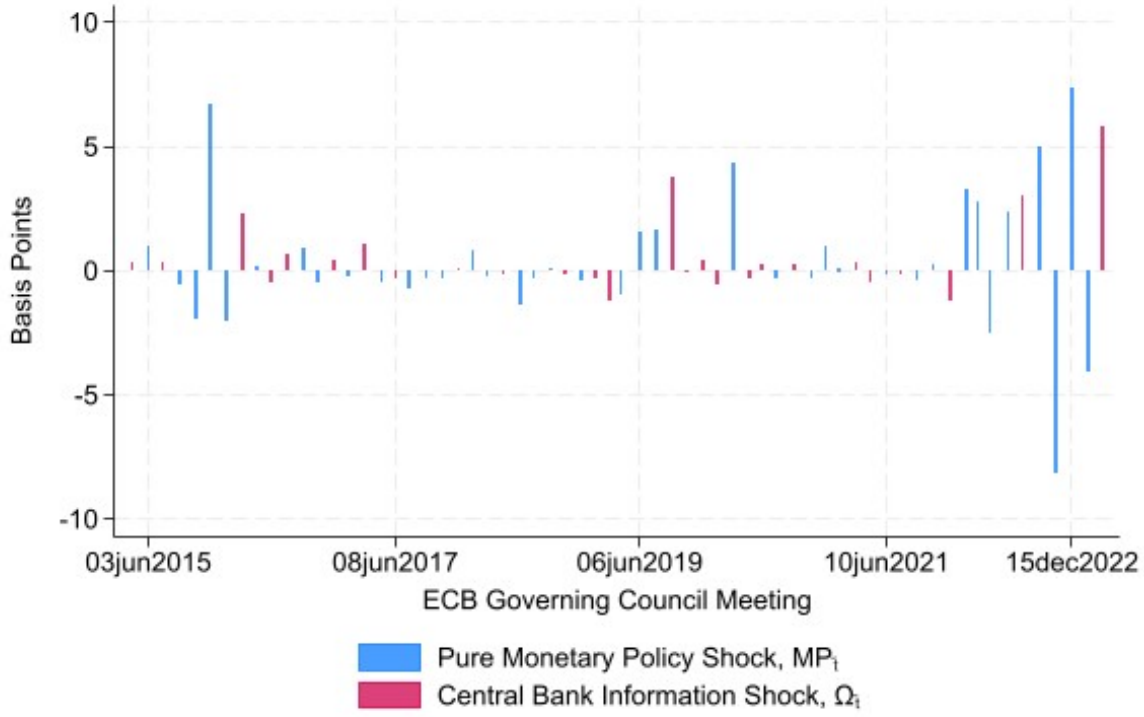
[8] As in Jung and Uhlig (2019), this set ignores shorter-term "timing" surprises.

[9] Pre-July 2022 the press release window is 13:25-13:35 and the press conference window is 15:40-15:50. From July 21 2022 onwards, the press release window is 13:55-14:05 and the press conference window is 15:55-16:05.

[10] Since the scale of the first principal component is arbitrary. A similar exercise is performed by Nakamura and Steinsson (2018), Jung and Uhlig (2019), Jarociński (2022) and Ferrando and Grazzini (2023).

percentage points. To be clear, only pure monetary policy shocks (MP_t) are used in the analysis (i.e. $\Omega_{\tilde{t}}$ is not used). Both $MP_{\tilde{t}}$ and $\Omega_{\tilde{t}}$ are depicted in Figure 2 - in order to align with our SAFE sample only council meeting dates from April 15 2015 to March 16 2023 are used. Positive (negative) values of $MP_{\tilde{t}}$ in Figure 2 are contractionary (expansionary) monetary policy shocks. Note $MP_{\tilde{t}}$ is driven by the gap between the governing council decision and what markets expected (i.e. the surprise) - and not by the actual decision itself per se. For example, an increase in the ECB base rate (i.e. a contractionary monetary policy stance) is a contractionary monetary policy shock if the increase in the base rate exceeded priced in market expectations. Conversely, this rate rise is an expansionary monetary policy shock if the increase was lower than priced in market expectations. $MP_{\tilde{t}}$ is aggregated to MP_t, covering the SAFE questionnaire time-frame, using the aggregation method of Jarociński (2022).

Figure 2: Monetary Policy Shocks



3.3 Econometric Specification

We employ a linear probability model for our multivariate analysis, specified in Equation 2.

$$Y_{i,j,t} = \alpha_{i,j,t} + \beta MP_{t-1} + \gamma MP_t + \theta Firm_{i,j,t} + \delta Bank_{j,t} + \phi Econj,t + \pi_{j,t} + \epsilon_{i,j,t} \tag{2}$$

where, $Y_{i,j,t}$ is the bank credit substitution in firm 'i' in country 'j' in wave 't', and MP_t and MP_{t-1} are the contemporaneous and lags for (pure) monetary policy shock aggregated across

all months in each wave 't', respectively. $Firm_{i,j,t}$ are firm-level characteristics in country 'j' in wave 't'. $Bank_{j,t}$ are country-level bank characteristics including the banking sector rate of change in bank lending to NFCs, net interest income (% of total assets) and return on equity (% of total assets) as collected from the ECB Data Portal. Finally, $Econ_{j,t}$ are the macroeconomic indicators such as unemployment rate and inflation (HICP average rate of change) as obtained from Eurostat. We employ country-time fixed effects to control for unobserved variables that evolve over time but are constant across firms.

Additionally, we exploit heterogeneity in bank credit substitution during monetary policy contraction using the specification in Equation 3.

$$Y_{i,j,t} = \alpha_{i,j,t} + \beta MP_{t-1} + \tau MP_{t-1} \times Firm_{i,j,t} + \gamma MP_t + \theta Firm_{i,j,t} + \delta Bank_{j,t} + \phi Econj, t + \pi_{j,t} + \epsilon_{i,j,t} \tag{3}$$

Our main variable of interest is the coefficient on the interaction term 'τ' between monetary policy indicator and firm-level characteristics. The variable $Firmi, j, t$ captures firm characteristics such as annual turnover, income/profit generation (past 6 months), firm-size (micro/small/medium), firm-age (2-5 years, 5-10 years and over 10 years), and the measure for credit risk. Most of the firm-level characteristics that we employ in the study are derived from backward-looking questions that refer to firms' perception in the past six months.

4 Results

This section discusses the impact of monetary tightening on firms' bank credit substitution towards alternative sources of finance. First, we explore the relationship between monetary policy tightening and bank credit substitution. Second, we extend the analysis to explore the role of firm heterogeneity in understanding the above relationship. Third, we present a sub-sample analysis by assessing the relationship between monetary policy tightening and bank credit substitution for SMEs in core vs. periphery countries. Lastly, we report a series of robustness checks for our main results.

4.1 Baseline specification

In the first part, we present results from our baseline regression specification (Equation 2) in Table 2 to shed light on the relationship between bank credit substitution and the monetary policy indicator MP_{t-1}. Across all columns, the dependent variable is a dummy that equals one if a firm substitutes bank credit for alternative sources of finance, and zero otherwise. In specifications 1-5, we include the firm, bank and macro-economic control variables iteratively to assess if the coefficient on our monetary policy indicator MP_{t-1} is robust and not sensitive to inclusion of different covariates. For each specification, we include country-time fixed effects to control for any

unobserved factors that varies across countries over time. The statistically significant coefficient on MP_{t-1} confirms a positive likelihood of a firm to substitute bank credit with alternative source of financing, with a magnitude of around 3%.

Economically, this means that a unit increase in the monetary policy indicator is associated with a 3% higher likelihood of firms to substitute bank credit with alternative sources of financing- *as described earlier in section 3.1*. Given that the MP_{t-1} captures monetary policy tightening, we confirm the role of contractionary monetary policy shocks in firm's decision to alter their financing behaviour. In particular, they move away from bank credit to other alternative sources of financing. The statistical significance of the lagged coefficient further suggests that the substitution effect persists over time, with SMEs continuing to explore alternative funding sources even after initial monetary policy changes. These findings provide robust evidence of a dynamic shift in SME borrowing behaviour in response to monetary tightening, underscoring the importance of understanding how policy impacts vary across different transmission channels.

While bank financing makes up the bulk of debt financing for euro-area firms (Holm-Hadulla et al., 2022), tightening of borrowing conditions lead SMEs to increasingly turn to alternative sources of finance. This credit demand substitution illustrates how SMEs adapt to tighter monetary conditions by allowing them to tap into more diverse and flexible funding options, often with quicker access and tailored solutions that meet their specific needs. This diversification of funding options can encourage financial innovation, lead to more sustainable growth opportunities and insulate SMEs from credit market shocks, as SMEs become less reliant on traditional bank lending and gain access to varied alternative options.

4.2 Heterogeneous response to monetary policy

In order to exploit heterogeneity in bank credit substitution across different firm characteristics, we discuss fully controlled regression results from Equation 3 in Table 3.[11] Here, we exploit the heterogeneity in firms' credit substitution in changing monetary policy environment across their turnover, income/profits, size, age and credit-quality.

We find that as monetary policy contracts, the likelihood of bank credit substitution is higher across high turnover firms, increasing from 0.7% to 1% for turnover €1M-€2M and €50M+ respectively, relative to the base turnover category of €500,000 or less. We infer this result from the positive and statistically significant coefficients on the interaction term of MP_{t-1} and turnover profile in column 2 of Table 3. Higher turnover provides firms with more stable cash flows and profitability, which may increase their attractiveness to non-bank sources of finance such as trade credit, among others (Ferrando and Mulier, 2013). Additionally, we find that relative to micro firms (1-9 employees), the small (10-49 employees) and medium firms (50-249 employees) are

[11]The choice of control variables for each firm characteristic regression equation is based on careful consideration to avoid problem of bad controls, thus eliminating variables acting as colliders or mediators, while keeping only the confounding control variables.

Table 2: Monetary Policy and Bank Credit Substitution

	Bank Subst. (1)	**Bank Subst.** (2)	**Bank Subst.** (3)	**Bank Subst.** (4)	**Bank Subst.** (5)
MP_{t-1}	0.029***	0.031***	0.032***	0.033***	0.029***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
MP_t	0.070***	0.080***	0.080***	0.070***	0.068***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.004)
Turnover 2: >€500k & <=€1M	0.006		0.007	0.002	0.005
	(0.005)		(0.005)	(0.006)	(0.007)
Turnover 3: >€1M & <=€2M	0.005		0.009	0.005	0.008*
	(0.007)		(0.006)	(0.005)	(0.004)
Turnover 4: >€2M & <=€10M	-0.020		-0.013	-0.024**	-0.024**
	(0.011)		(0.009)	(0.009)	(0.009)
Turnover 5: >€10M & <=€50M	-0.041**		-0.035*	-0.045**	-0.042***
	(0.018)		(0.016)	(0.015)	(0.013)
Turnover 6: >€50M	-0.073***		-0.068***	-0.076***	-0.068***
	(0.023)		(0.020)	(0.019)	(0.017)
Income profit ($1{:}\uparrow, 0{:}\downarrow / Same$)		0.014**	0.015**	-0.017***	-0.010*
		(0.006)	(0.006)	(0.004)	(0.005)
Firm size 2: Small		-0.018*	-0.013*	-0.010	-0.006
		(0.009)	(0.006)	(0.007)	(0.006)
Firm Size 3: Medium		-0.039**	-0.010	-0.008	-0.004
		(0.015)	(0.007)	(0.006)	(0.005)
Firm Age 2: 2-5 years	0.015	0.030	0.016	0.009	0.009
	(0.028)	(0.032)	(0.031)	(0.028)	(0.033)
Firm Age 3: 5-10 years	0.049*	0.066*	0.051	0.045*	0.041
	(0.027)	(0.031)	(0.031)	(0.025)	(0.030)
Firm Age 4: Over 10 years	0.033	0.049	0.036	0.028	0.026
	(0.023)	(0.029)	(0.028)	(0.024)	(0.027)
Credit Risk 2: Moderate				0.006	0.012*
				(0.006)	(0.007)
Credit Risk 2: Safe/V.Safe				0.060***	0.068***
				(0.009)	(0.011)
Industry dummy	Yes	Yes	Yes	Yes	Yes
Interest Expense	No	No	No	Yes	Yes
Labour Cost	No	No	No	Yes	Yes
Fixed Investment	No	No	No	Yes	Yes
Bank Financed Conditions (−6 Months)	No	No	No	No	Yes
Expected Bank Financing (+6 Months)	No	No	No	No	Yes
Bank Controls (t)	Yes	Yes	Yes	Yes	Yes
Econ. Controls (t)	Yes	Yes	Yes	Yes	Yes
Country*Wave	Yes	Yes	Yes	Yes	Yes
Observations	67,173	67,003	65,893	57,716	53,789
R-squared	0.022	0.022	0.022	0.034	0.042

Clustered SE on country in parenthesis *** p<0.01 ** p<0.05 * p<0.1.

significantly more likely to substitute bank credit for alternative sources of financing with contractionary monetary policy shocks. We infer this from statistically significant coefficients on the interaction term of MP_{t-1} and firm-size in column 6 of Table 3, such that the likelihood of bank credit substitution ranges from 0.4% to 0.6% for small and medium-sized firms respectively, relative to the base category comprising micro-sized firms. A potential explanation is that SMEs, relative to micro-enterprises, are better able to substitute bank credit with alternative sources due to their stronger asset bases and operational scales. Further, SMEs access to alternative finance is often supported by financial innovations and credit platforms that are typically less accessible to micro-enterprises, which rely heavily on bank credit due to limited financial options (Carbó-Valverde et al., 2009).

Furthermore, we find a similar pattern across firm-age with the likelihood of bank credit substitution towards alternative sources being higher across older firms. This is shown by the coefficient of the interaction term of MP_{t-1} and firms' age-profile in column 8 of Table 3, whereby relative to younger firms (0-2 years), mid-age firms (5-10 years) and older firms (10+ years) are 1% and 0.7% more likely to substitute bank credit for alternative sources respectively. This result may be driven from relatively more stable cash flows and stronger financial ratios across older SMEs, making

them less reliant on traditional bank loans than newer, less established firms (Berger and Udell, 2006). Finally, we also find that firm's credit-quality characterises bank credit substitution during monetary policy contraction. The statistically significant coefficient on the interaction term of MP_{t-1} and credit-quality in column 10 of Table 3 confirms that relative to risky firms, the highest credit-quality firms (safe/v.safe) are 0.3% more likely to substitute bank credit for alternative sources of financing during monetary policy shock. This result is in parallel with Demirgüç-Kunt et al. (2020) that find high credit quality SMEs often have access venture capital and bond markets, which are less influenced by interest rate fluctuations compared to bank lending.

Together, these results confirm the relevance of firms' size, operational capacity, age and credit worthiness as significant predictors of their changing credit behaviour. These firms are able to substitute bank credit by choosing other financing options - most likely to avoid any increase in their interest expenses following contractionary monetary policy shocks. Accordingly, these firms are able to relatively well insulate themselves from interest rate increases following contractionary monetary policy shocks. Alternatively, for relatively smaller, younger, and riskier firms; there is potentially a much stronger reliance and stickiness to bank credit, whereby an outward substitution towards other sources may not be a viable option.[12] In other words, these firms are more exposed to contractionary monetary policy shocks less able to escape their consequences. Understanding these heterogeneous factors helps policymakers and financial institutions recognize that monetary policy tightening does not affect all SMEs equally. Adapting to these differences enables more targeted policy responses and might lead to equitable access to finance, thereby mitigating adverse effects of tighter policy conditions.

[12]We do not find any significant role of firm's income and profits (retained in last 6 months) in bank credit substitution during monetary policy shock (column 4 of Table 3).

Table 3: Monetary Policy and Bank Credit Substitution- Firm-level Heterogeneous Analysis

Turnover		**Income/Profits**		**Size**		**Age (Years)**		**Cr. Quality**	
Var.	**Bank Subst.**	**Var.**	**Bank Subst.**	**Var.**	**Bank Subst.**	**Var.**	**Bank Subst.**	**Var.**	**Bank Subst.**
MP (t-1)	0.026***	MP (t-1)	0.021***	MP (t-1)	0.033***	MP (t-1)	0.011***	MP (t-1)	0.025***
	(0.001)		(0.001)		(0.000)		(0.004)		(0.001)
MP (t)	0.064***	MP (t)	0.051***	MP (t)	0.073***	MP (t)	0.018***	MP (t)	0.055***
	(0.003)		(0.003)		(0.001)		(0.001)		(0.002)
>500k&<=1M	-0.001	Income	0.022***	Medium	-0.009	2-5	0.007	Moderate	0.006
	(0.007)		(0.005)		(0.006)		(0.045)		(0.004)
>1M&<=2M	-0.005	MP(t-1)*(Income)	0.002*	Large	-0.009	5-10	0.037	Safe/V.Safe	0.054***
	(0.003)		(0.001)		(0.006)		(0.034)		(0.010)
>2M&<=10M	-0.039***			**MP(t-1)*Medium**	0.004***	>10	0.018	**MP(t-1)*Moderate**	0.002
	(0.011)				(0.001)		(0.036)		(0.003)
>10M&<=50M	-0.065***			**MP(t-1)*Large**	**0.006*** **	**MP(t-1)*2-5**	**0.009**	**MP(t-1)*Safe/V.Safe**	**0.003****
	(0.015)				**(0.001)**		**(0.011)**		**(0.001)**
>50M	-0.091***					**MP(t-1)*5-10**	**0.012***		
	(0.021)						**(0.006)**		
MP(t-1)*(>500k&<=1M)	**0.002**					**MP(t-1)*>10**	**0.007***		
	(0.001)						**(0.004)**		
MP(t-1)*(>1M&<=2M)	**0.005****								
	(0.002)								
MP(t-1)*(>2M&<=10M)	**0.005***								
	(0.002)								
MP(t-1)*(>10M&<=50M)	**0.007*****								
	(0.002)								
MP(t-1)*(>50M)	**0.010*****								
	(0.002)								
Industry dummy	Yes	Industry dummy	Yes	Industry dummy	Yes	Industry dummy	Yes	Industry dummy	Yes
Firm Controls (t)	Yes	Firm Controls (t)	Yes	Firm Controls (t)	Yes	Firm Controls (t)	Yes	Firm Controls (t)	Yes
Bank Controls (t)	Yes	Bank Controls (t)	Yes	Bank Controls (t)	Yes	Bank Controls (t)	Yes	Bank Controls (t)	Yes
Econ. Controls (t)	Yes	Econ. Controls (t)	Yes	Econ. Controls (t)	Yes	Econ. Controls (t)	Yes	Econ. Controls (t)	Yes
Country*Wave	Yes	Country*Wave	Yes	Country*Wave	Yes	Country*Wave	Yes	Country*Wave	Yes
Constant	-2.297***	Constant	-1.964***	Constant	-2.082***	Constant	-0.957***	Constant	-2.018***
	(0.123)		(0.103)		(0.039)		(0.044)		(0.061)
Observations	54,868	Observations	55,851	Observations	59,450	Observations	57,103	Observations	56,383
R-squared	0.036	R-squared	0.039	R-squared	0.032	R-squared	0.031	R-squared	0.035

Clustered SE on country in parenthesis *** p<0.01 ** p<0.05 * p<0.1.

4.3 Core vs. Periphery country-level analysis

In this sub-section, we discuss bank credit substitution during monetary policy shocks across the core versus periphery countries, following the country classification in Campos and Macchiarelli (2021)[13]. We split our sample size between core and periphery countries to take into account structural differences in financial markets and access to credit across regions. Core countries including Germany, France and the Netherlands generally have more developed financial systems with better access to bank credit and alternative financing sources, while periphery countries Greece, Portugal and Spain often face higher borrowing costs and tighter credit conditions, particularly during economic downturns (Lane, 2012). Our study assists in understanding these dynamics by highlighting uneven effects of monetary policy across euro area and providing insights into how SMEs in different regions adapt to changing credit conditions.

In particular, we focus on the heterogeneity in bank credit substitution across firms' characteristics, as discussed earlier in section 4.2. This helps us in understanding channels through which monetary policy outcomes manifest in firms' credit decisions based on the economic environment that they operate. The coefficient plots for the interaction of MP_{t-1} with firm characteristics such as turnover, size, age and credit-quality in core and periphery countries are shown in Figure 3.[14]

We find both similarity as well as key differences in transmission of monetary policy contraction towards firms' credit decisions in core and periphery countries. First, there is commonality with respect to turnover such that larger turnover firms in both core (blue dots) and periphery (red dots) countries are more likely to substitute bank credit towards alternative sources of finance during monetary policy contraction. This result brings to the fore the relevance of firms' business volume as a strong predictor for credit decisions notwithstanding their location. In terms of key differences, we find that firm-age is a significant predictor of bank credit substitution only in the core countries,[15] while firm-size and credit-quality are significant firm determinants only in the periphery countries.

4.4 Robustness Checks

We perform a series of robustness checks on our main results. First, we employ a different measure of monetary policy indicator taking the change in average 12-month maturity Euro Interbank

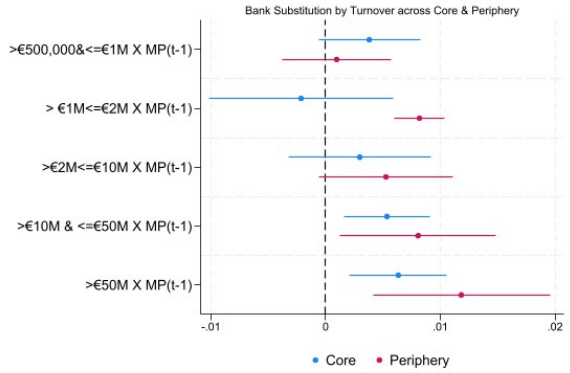
[13] Campos and Macchiarelli (2021) provide new theory based, continuous and dynamic measures of the probability for a country to be classified as a core or periphery. They place countries Finland, Ireland, Norway, Portugal, Switzerland, Sweden, Greece as extended periphery; Denmark, Spain, UK, France, and Italy as intermediate group; while Austria, Belgium, Germany, and the Netherlands as core countries. We follow the same categorisation in this research combining the extended periphery and intermediate countries into a single periphery group. We exclude Norway and Switzerland due to data issues and UK as it is outside the ECB monetary policy decisions.

[14] We plot coefficient plots at 90% confidence interval using the same regression specifications used for results in heterogeneous analysis presented in Section 4.2 across the sub-sample of core and periphery countries.

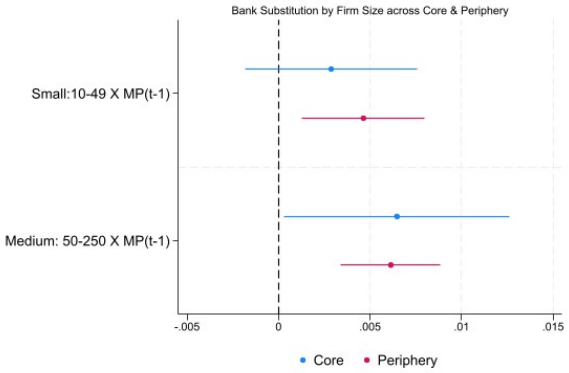
[15] The result on firm-age for core countries is sensitive to the robustness check employed.

Figure 3: Heterogeneous effects of contractionary monetary policy on bank credit substitution

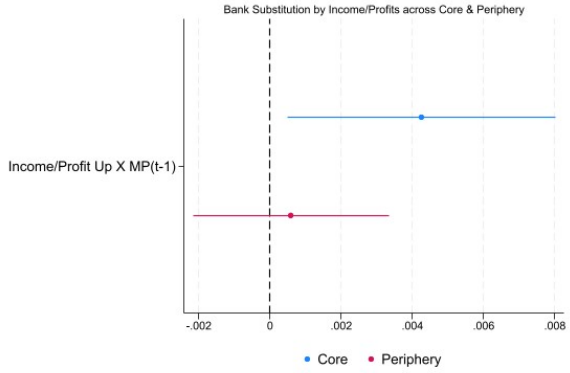
(a) Turnover



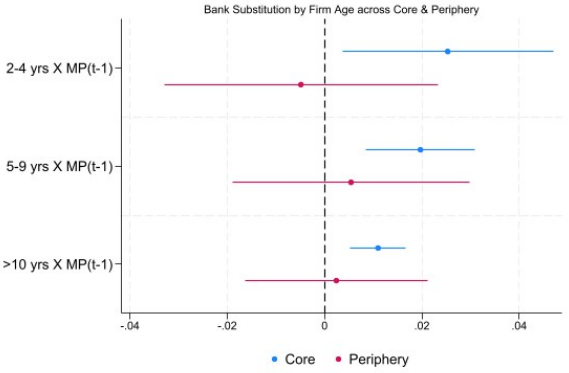
(b) Company Size



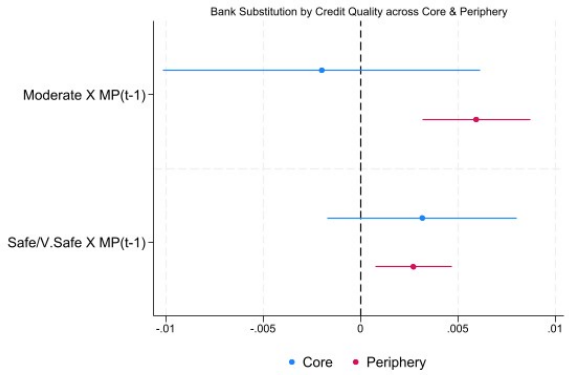
(c) Income/Profits



(d) Firm Age



(e) Credit Risk



Offered Rate (Euribor) between wave 't' and 't-1' of the SAFE survey.[16] We employ Euribor as an alternative indicator for monetary policy as it is used widely as a reference rate across all EU member countries, much in line with El Herradi and Leroy (2022). The results are discussed in Appendix B and are broadly consistent with the main results.

Similar to the baseline result discussed earlier in section 4.1 (Table 2), we find statistically significant positive relationship between monetary policy indicator and firms' bank credit substitution to alternative sources of finance, as shown in Table 4. Moreover, in terms of firm heterogeneity with respect to bank credit substitution and change in monetary policy, as discussed in section 4.2 earlier (Table 3), we re-enforce our main findings with respect to firm turnover, size, and credit-quality with the only exception of firm-age (see Figure 4). Finally, the robustness results resonate our findings on bank credit substitution across the core versus periphery countries, as discussed earlier in Section 4.3 (Figure 3), again with the only exception of our result across firm-age for core countries in the main analysis (see Figure 7).

Table 4: Monetary Policy and Bank Credit Substitution (using change in Euribor 12 month average between 't' and 't-1')

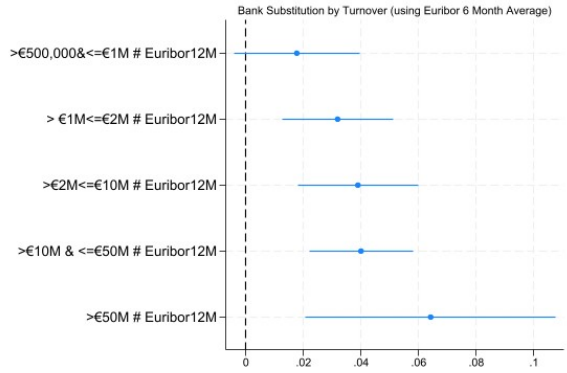
	Bank Subst. (1)	**Bank Subst.** (2)	**Bank Subst.** (3)	**Bank Subst.** (4)	**Bank Subst.** (5)
$\Delta Euribor12M$	0.223***	0.215***	0.230***	0.306***	0.248***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Turnover 2: >€500k & <=€1M	0.006		0.006	0.002	0.005
	(0.01)		(0.01)	(0.01)	(0.01)
Turnover 3: >€1M & <=€2M	0.006		0.009	0.005	0.007
	(0.01)		(0.01)	(0.01)	(0.01)
Turnover 4: >€2M & <=€10M	-0.014		-0.010	-0.021*	-0.022*
	(0.01)		(0.01)	(0.01)	(0.01)
Turnover 5: >€10M & <=€50M	-0.034*		-0.032*	-0.041**	-0.040**
	(0.02)		(0.02)	(0.01)	(0.01)
Turnover 6: >€50M	-0.068**		-0.068***	-0.075***	-0.071***
	(0.02)		(0.02)	(0.02)	(0.02)
Income profit (1:↑, 0 :↓ *Same*)		0.015**	0.016**	-0.019***	-0.011*
		(0.01)	(0.01)	(0.01)	(0.01)
Firm size 2: Small		-0.014	-0.010	-0.007	-0.003
		(0.01)	(0.01)	(0.01)	(0.01)
Firm Size 3: Medium		-0.032*	-0.005	-0.002	0.002
		(0.01)	(0.01)	(0.01)	(0.01)
Firm Age 2: 2-5 years	0.024	0.037	0.026	0.018	0.015
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Firm Age 3: 5-10 years	0.054**	0.069**	0.056*	0.049**	0.042
	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)
Firm Age 4: Over 10 years	0.040	0.054*	0.043	0.035	0.029
	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)
Moderate				0.009*	0.015**
				(0.01)	(0.00)
Safe/V.Safe				0.065***	0.073***
				(0.01)	(0.01)
Constant	-0.905***	-0.763***	-0.807***	-1.257***	-1.407***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Interest Expense	No	No	No	Yes	Yes
Labour Cost	No	No	No	Yes	Yes
Fixed Investment	No	No	No	Yes	Yes
Bank Financed Conditions (−6 Months)	No	No	No	No	Yes
Expected Bank Financing (+6 Months)	No	No	No	No	Yes
Bank Controls (t)	Yes	Yes	Yes	Yes	Yes
Econ. Controls (t)	Yes	Yes	Yes	Yes	Yes
Country*Wave	Yes	Yes	Yes	Yes	Yes
Observations	71837	71617	70442	61447	57202
R Squared	0.022	0.021	0.022	0.033	0.041
Clustered SE on country in parenthesis *** p<0.01 ** p<0.05 * p<0.1.					

Second, we employ an alternative measure of bank credit demand substitution. When seeking

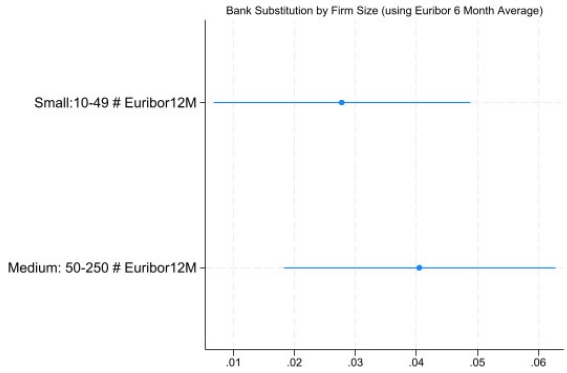
[16]Euribor is based on average interest rates at which European banks borrow funds from each other. Source: Euribor rates.

Figure 4: Heterogeneous effects of contractionary monetary policy on bank credit substitution using change in Euribor 12 month average between 't' and 't-1'

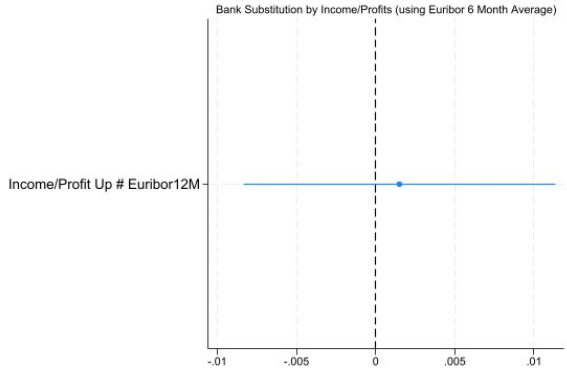
(a) Turnover



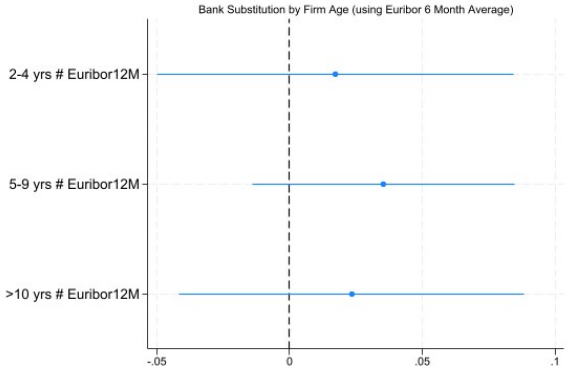
(b) Company Size



(c) Income/Profits



(d) Firm Age



(e) Credit Risk

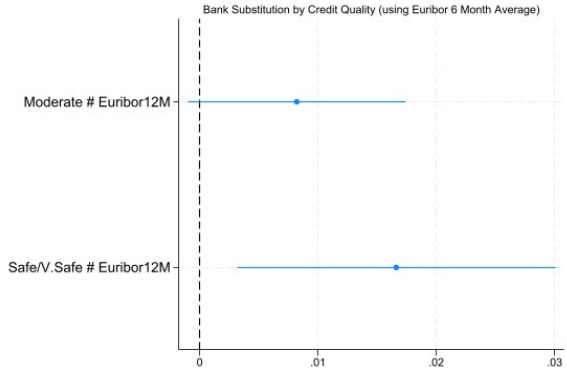


Table 5: Monetary Policy and Bank Credit Substitution (using bank credit substituted towards internal source of finance only)

	Bank Subst. (1)	**Bank Subst.** (2)	**Bank Subst.** (3)	**Bank Subst.** (4)	**Bank Subst.** (5)
MP_{t-1}	0.010***	0.013***	0.012***	0.009***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
MP_t	0.025***	0.026***	0.031***	0.029***	0.031***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Turnover 2: >€500k & <=€1M	0.008*		0.011**	0.009**	0.009***
	(0.004)		(0.004)	(0.003)	(0.003)
Turnover 3: >€1M & <=€2M	0.002		0.007	0.005	0.005
	(0.004)		(0.005)	(0.004)	(0.004)
Turnover 4: >€2M & <=€10M	0.002		0.012**	0.011**	0.009**
	(0.004)		(0.005)	(0.005)	(0.004)
Turnover 5: >€10M & <=€50M	-0.003		0.009	0.009	0.007
	(0.006)		(0.006)	(0.006)	(0.006)
Turnover 6: >€50M	-0.006		0.008	0.008	0.0078
	(0.006)		(0.007)	(0.006)	(0.006)
Income profit ($1{:}\uparrow, 0{:}\downarrow / Same$)		0.008*	0.007*	-0.008**	-0.007**
		(0.004)	(0.004)	(0.003)	(0.003)
Firm size 2: Small		-0.007***	-0.012***	-0.011***	-0.009***
		(0.002)	(0.003)	(0.002)	(0.002)
Firm Size 3: Medium		-0.011**	-0.016***	-0.015***	-0.012**
		(0.005)	(0.005)	(0.004)	(0.004)
Firm Age 2: 2-5 years	0.017*	0.016	0.016*	0.014*	0.014*
	(0.008)	(0.010)	(0.008)	(0.006)	(0.007)
Firm Age 3: 5-10 years	0.017**	0.018**	0.016**	0.014***	0.011**
	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)
Firm Age 4: Over 10 years	0.015**	0.016**	0.015**	0.013**	0.011*
	(0.005)	(0.007)	(0.005)	(0.005)	(0.005)
Credit Risk 2: Moderate				0.009***	0.009***
				(0.003)	(0.002)
Credit Risk 2: Safe/V.Safe				0.025***	0.026***
				(0.006)	(0.005)
Industry dummy	Yes	Yes	Yes	Yes	Yes
Interest Expense	No	No	No	Yes	Yes
Labour Cost	No	No	No	Yes	Yes
Fixed Investment	No	No	No	Yes	Yes
Bank Financed Conditions (−6 Months)	No	No	No	No	Yes
Expected Bank Financing (+6 Months)	No	No	No	No	Yes
Bank Controls (t)	Yes	Yes	Yes	Yes	Yes
Econ. Controls (t)	Yes	Yes	Yes	Yes	Yes
Country*Wave	Yes	Yes	Yes	Yes	Yes
Observations	67,138	66,968	65,858	57,686	53,762
R-squared	0.012	0.012	0.012	0.016	0.016
Clustered SE on country in parenthesis *** p<0.01 ** p<0.05 * p<0.1.					

alternative financing solutions, one common response by SMEs is to substitute external bank credit with internal sources of finance, such as retained earnings. We present our results in Table 5 and Figure 7 and are qualitatively similar to the ones obtained in our main specifications. SMEs with high turnover, large in size and improved credit quality have more robust financial positions, accumulated profits and greater liquidity, allowing them to rely on internal financing. However, we do not find statistically significant results for income and profit generation and firm age.

It's also suggested that by using internal funds, these firms tend to avoid increased cost and stricter lending standards associated with bank credit during contractionary monetary policy. This allows these firms to maintain financial flexibility without taking on expensive external debt. Hence, for these large, well-established SMEs with high turnover relying on their internal finances becomes an attractive and viable option when external market conditions tighten.

Third, as a robustness test we add sector-wave fixed effects to our main analysis in order to control for any unobserved heterogeneity across different industries and time periods.[17] These fixed

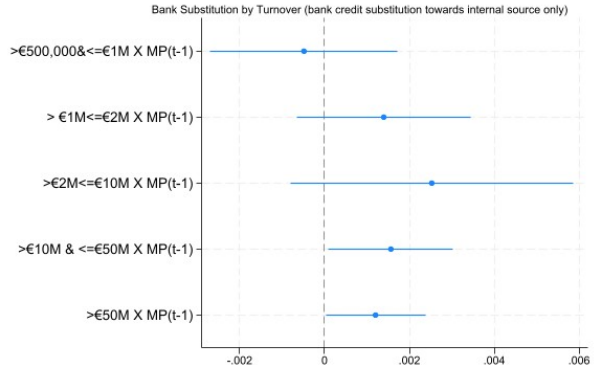
[17]The results for our baseline specification that shows the relationship between bank credit substitution and monetary policy is not reported due to brevity. The results are qualitatively similar to the main

effects could account for any sector-specific shock such as industry-wide demand fluctuations, regulatory changes, or macroeconomic conditions that may vary over time within the same sector. The results are reported in Figure. Introducing the sector-wave fixed effects does not alter our main results. By controlling for these factors the analysis ensures that the observed differences in SME credit demand substitution are not driven by sectoral variations but rather by direct impact of monetary tightening on SMEs' access to credit. The results are reported in Figure 6.

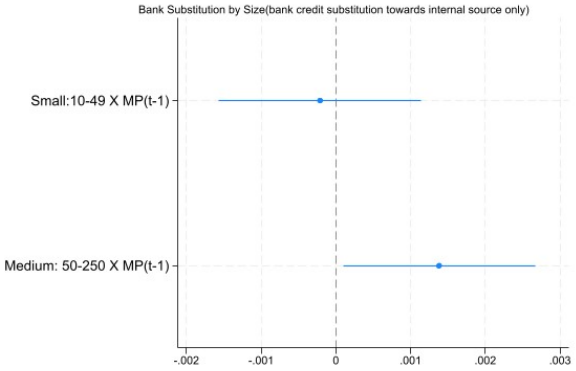
analysis.

Figure 5: Heterogeneous effects of contractionary monetary policy on bank credit substitution using bank credit substituted towards internal source of finance only

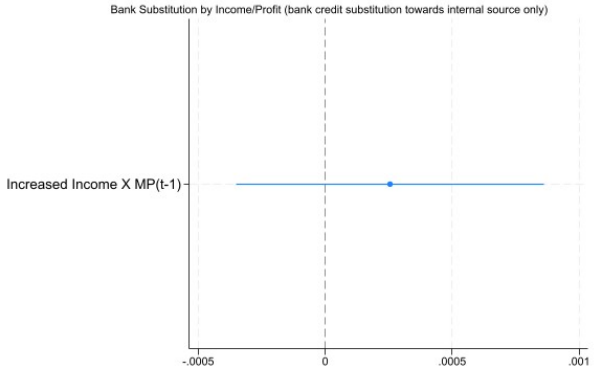
(a) Turnover



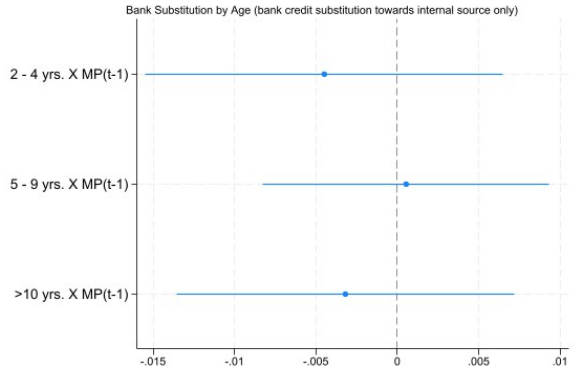
(b) Company Size



(c) Income/Profits



(d) Firm Age



(e) Credit Risk

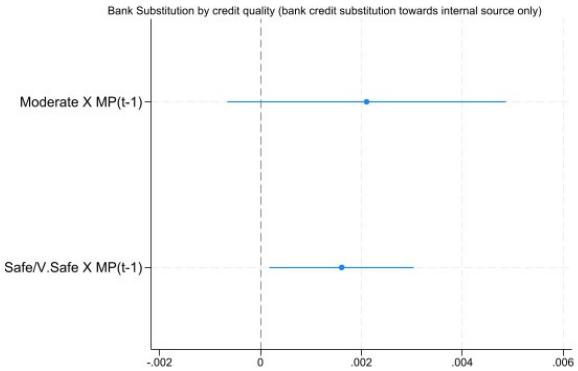
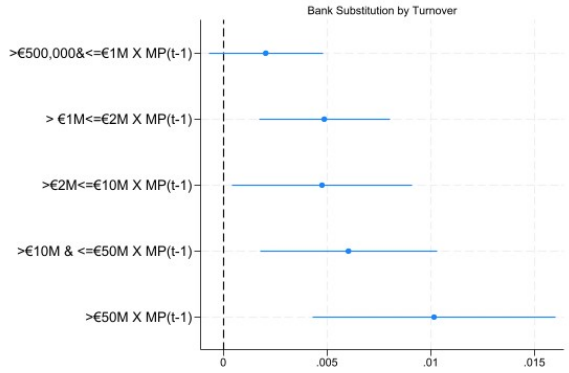
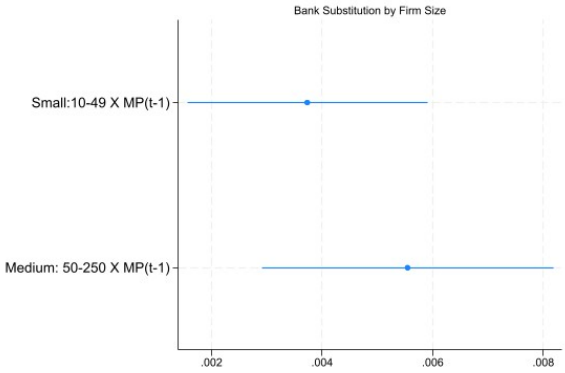


Figure 6: Heterogeneous effects of contractionary monetary policy on bank credit substitution: adding sector-wave fixed effects

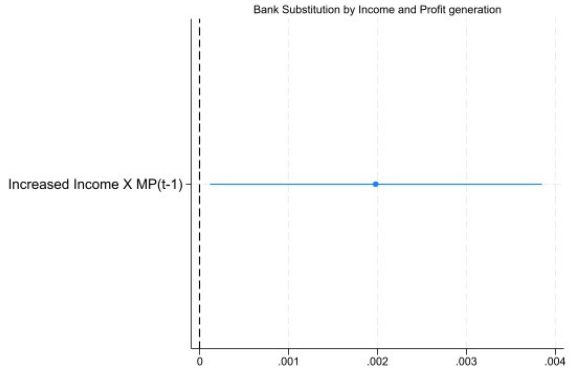
(a) Turnover



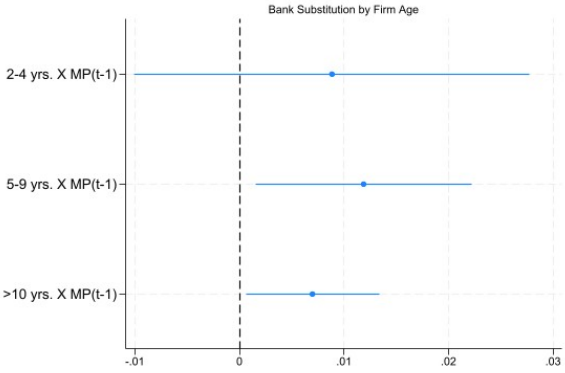
(b) Company Size



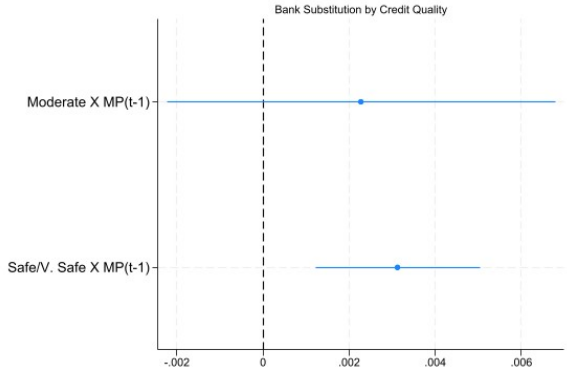
(c) Income/Profits



(d) Firm Age



(e) Credit Risk



5 Conclusion

High interest rates may limit access to bank credit, pushing SMEs to seek alternative sources of finance. Understanding this shift helps policymakers to craft more targeted interventions, ensuring SMEs are able to access affordable financing, even during periods of tight monetary policy. This study, to the best of our knowledge, is the first euro-area assessment of SME bank credit demand substitution in the high-interest rate environment resulting from the successive rounds of monetary policy tightening by the ECB since July 2022. By exploiting SME financing across different instruments, we formally deduce the credit demand relationship with monetary policy and whether this bears any differential effect across any firm specific factors and their location.

The heterogeneous effects of bank credit substitution for SMEs in a monetary tightening environment underscore the diverse responses of small and medium enterprises to rising interest rates. Our findings suggest that larger, older, safer and high annual turnover SMEs are likely to adapt and continue accessing credit, even though bank loans become more expensive. Conversely, smaller, younger and more risky firms face greater challenges in accessing alternative funding. The findings of this research contribute to the assessment of financing-gaps and resilience of SMEs, in the face of a tightening monetary policy environment. Moreover, by focusing on the credit demand of SMEs with context to the euro-area, this study supports a wider policy-objective of assessing the overall monetary policy transmission. Particularly, this research is envisaged to provide evidence on asymmetric transmission of monetary policy across euro-area countries, which indeed has been signaled by the ECB in recent years.

Our study highlights the importance of firm-level factors such as size, age, turnover, credit quality etc in determining how monetary policy impacts borrowing behaviour. The research also assists in recognizing the differences in SMEs and providing recommendations for policymakers to ensure support mechanisms and financial regulations are tailored to varying needs of SMEs, fostering a more resilient and inclusive credit environment. By doing so, the adverse effects of monetary tightening can be mitigated, ensuring that SMEs remain dynamic contributors to economic growth and stability.

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Variables employed: construction and corresponding definitions

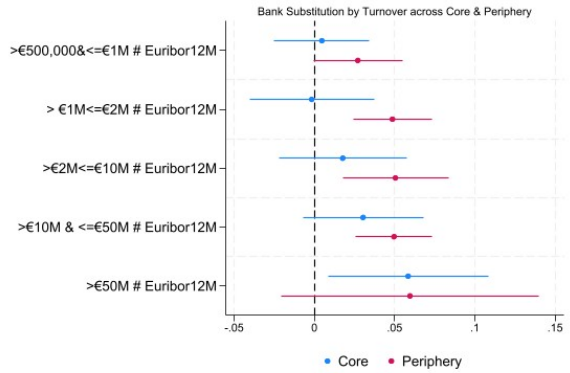
Variable Name	Definition	Data Sources
Dependent variable		
Credit Substitution	Binary variable = 1 if the firm does not use bank credit nor applied in the last 6 months, instead uses one or more alternative sources of finance (internal sources, grants/subsidies, overdrafts/credit line/ credit card, trade credit, factoring, debt security, equity investment)	ECB/EC Survey on the Access to Finance of Enterprises (SAFE)
Firm variables		
Turnover 1: <=€500k	=1 if the firmâs annual turnover is less than €500k, 0 otherwise	ECB/EC SAFE Qd4
Turnover 2: >€500k & <=€1M	=1 if the firmâs annual turnover is greater than €500k and less than €1 million, (mn), 0 otherwise	ECB/EC SAFE Qd4
Turnover 3: >€1M & <=€2M	=1 if the firmâs annual turnover is greater than €1 mn and less than €2 mn, 0 otherwise	ECB/EC SAFE Qd4
Turnover 4: >€2M & <=€10M	=1 if the firmâs annual turnover is greater than €2 mn and less than €10 mn, 0 otherwise	ECB/EC SAFE Qd4
Turnover 5: >€10M & <=€50M	=1 if the firmâs annual turnover is greater than €10 mn and less than €50 mn, 0 otherwise	ECB/EC SAFE Qd4
Turnover 6: >€50M	=1 if the firmâs annual turnover is greater than €50 mn, 0 otherwise	ECB/EC SAFE Qd4
Firm Age 1: less than 2 years	=1 if the firm is less than 2 years old, 0 otherwise	ECB/EC SAFE Qd5
Firm Age 2: between 2 and 5 years	=1 if the firm is more than 2 years old and less than 5 years old, 0 otherwise	ECB/EC SAFE Qd5
Firm Age 3: between 5 and 10 years	=1 if the firm is more than 5 years old and less than 10 years old, 0 otherwise	ECB/EC SAFE Qd5
Firm Age 4: more than 10 years	=1 if the firm is more than 10 years old, 0 otherwise	ECB/EC SAFE Qd5
Firm Size 1: Micro	=1 if the firm has between 1 and 9 employees, 0 otherwise	ECB/EC SAFE Qd1
Firm Size 2: Small	=1 if the firm has between 10 and 49 employees, 0 otherwise	ECB/EC SAFE Qd1
Firm Size 3: Medium	=1 if the firm has between 50 and 249 employees, 0 otherwise	ECB/EC SAFE Qd1
Income/Profits 1: decreased/ remain unchanged	=1 if the firm profits and income decreased or remain unchanged, 0 otherwise	ECB/EC SAFE Q2e
Income/Profits 2: increased	=1 if the firm profits and income increased, 0 otherwise	ECB/EC SAFE Q2e
Credit quality 1: V.Safe/ Safe	=1 if firms' income/profit increased or stayed the same (q2e) and debt-to-asset ratio has decreased or remained the same (q2j)	ECB/EC SAFE Q2e and Q2j
Credit quality 2: Moderate	=1 if firms' income/profit (q2e) and debt-to-asset ratio (q2j) increased OR income/profit (q2e) decreased and debt-to-asset ratio (q2j) decreased OR income/profit (q2e) and debt to asset ratio (q2j) remained unchanged	ECB/EC SAFE Q2e and Q2j
Credit quality 3: Risk/High Risk	=1 if firms' income/profit (q2e) remained unchanged/decreased and debt-to-asset ratio (q2j) increased OR income/profit (q2e) decreased and debt-to-asset ratio (q2j) remained unchanged	ECB/EC SAFE Q2e and Q2j
Labour cost 1: decreased/ remain unchanged	=1 if the firms' labour cost decreased or remain unchanged, 0 otherwise	ECB/EC SAFE Q2b
Labour cost 2: increased	=1 if the firms' labour cost increased, 0 otherwise	ECB/EC SAFE Q2b
Economic variables		
Employment rate	Continuous variable, unemployment rate (share of active population), seasonally adjusted. Quarterly data averaged over half years ending in March and September and expressed as decimals.	Eurostat
Inflation	Continuous variable, measured by HICP monthly data (annual rate of change). Average of monthly inflation rate data over half years ending in March and September and expressed as decimals.	Eurostat
Bank characteristics		
Bank lending to NFCs	Continuous variable, banking sector rate of change in bank lending to NFCs.	ECB Data Portal
Return on Equity	Continuous variable, expressed as percentage	ECB Data Portal

Notes: Table presents data sources and method of construction of variables used in analysis.

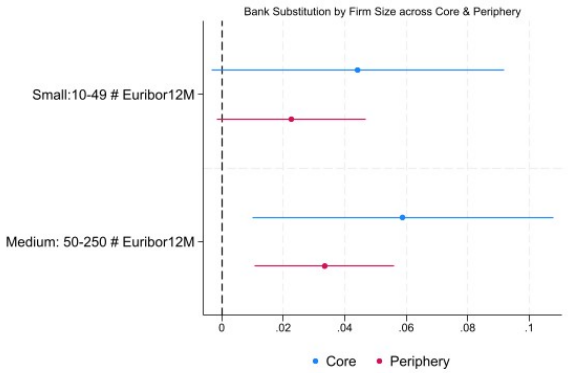
Appendix B: Robustness Results

Figure 7: Heterogeneous effects of contractionary monetary policy on bank credit substitution in Core versus Periphery Countries using change in Euribor 12 month average between 't' and 't-1'

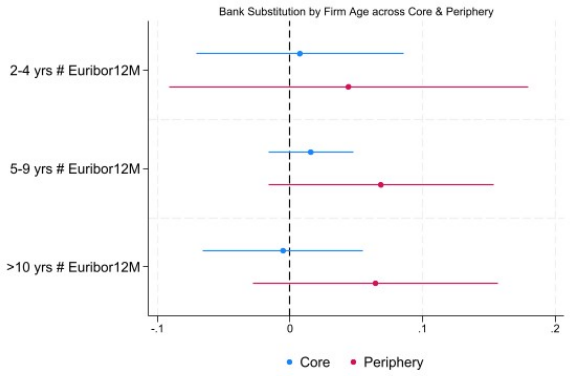
(a) Turnover



(b) Company Size



(c) Firm Age



(d) Credit Risk