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Monetary policy transmission via banks to firms

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Challenges for Monetary Policy Transmission in a Changing World (ChaMP) Research Network

This paper is one of five Occasional Papers (OPs; listed further below) summarising the strands of research conducted within the framework of the Challenges for Monetary Policy Transmission in a Changing World (ChaMP) Research Network, which was an initiative of the European System of Central Banks (ESCB) and brought together economists from the European Central Bank (ECB), the national central banks comprising the ESCB, the Bank of England and Norges Bank. Overall, it produced 168 individual papers and four papers on cross-country coordinated research projects.

ChaMP sought to revisit our knowledge of monetary transmission channels in the euro area and other European economies following a series of unprecedented shocks, and amid multiple ongoing structural changes and the extension of the monetary policy toolkit over the last decade and a half, including the 2021-23 inflation episode. The five OPs cover the main priorities of the network's two workstreams (WSs). WS1 focused on monetary transmission via the financial system, with OP No 389 covering transmission mechanisms from banks to non-financial corporations, OP No 390 examining mechanisms to households and OP No 391 looking at transmission via non-bank financial intermediation. Meanwhile, WS2 was dedicated to monetary transmission via the real economy, with OP No 392 summarising the network's research on transmission through input-output linkages among non-financial corporations and production sectors and OP No 393 examining how various structural changes interact with monetary policy transmission.

ChaMP was coordinated by a team chaired by Philipp Hartmann (ECB) and consisting of Diana Bonfim (Banco de Portugal), Margherita Bottero (Banca d'Italia), Emmanuel Dhyne (Nationale Bank van België/Banque Nationale de Belgique) and Maria T. Valderrama (Oesterreichische Nationalbank). This core team was supported by Melina Papoutsis, Gonzalo Paz-Pardo, Jean-David Sigaux, Raquel Gil-Antona, Clara Dolci and Simone de Luca (all ECB), along with seven central bank advisers and eight academic consultants. More information can be found on the [ChaMP website](#).

Occasional Papers related to the ECB's ChaMP Research Network

No 389, "Monetary policy transmission via banks to firms"

No 390, "Monetary policy transmission through the financial system to households"

No 391, "Monetary policy transmission and non-bank financial intermediation"

No 392, "The propagation of shocks across the production network and implications for monetary policy"

No 393, "Monetary policy transmission and structural changes"

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Abstract

This Occasional Paper reviews evidence from the ChaMP Research Network on the transmission of monetary policy to firms in the euro area. Overall, transmission to firms remains effective, including during the 2022-23 tightening cycle. However, new results show that this transmission is neither uniform nor mechanical. The pass-through from policy rates and other instruments to corporate financing conditions is shaped by multiple layers of heterogeneity that may, in some cases, have aggregate implications.

Country-level segmentation, linked to sovereign risk, institutional frameworks and local lending practices, plays an important role in shaping transmission, especially during periods of stress. Beyond cross-country effects, bank balance sheets and business models also influence transmission by affecting the strength of lending responses. In particular, the composition of banks' liabilities can lead to different speeds of transmission. Firm characteristics further differentiate the impact of monetary policy, with the funding mix playing a critical role. At the contract level, collateralisation and interest rate fixation materially affect both the magnitude and composition of transmission.

As some of these heterogeneities may, in certain circumstances, have aggregate implications, this paper explains how a broad and flexible toolkit, centred on the main policy rate and, when needed, complemented by other policy instruments such as asset purchases and targeted liquidity operations, can be deployed in a proportionate manner to ensure effective monetary policy transmission across a structurally diverse monetary union.

JEL codes: E52, E58, G21, G32

Keywords: monetary policy transmission; bank lending channel; financial fragmentation; country segmentation; firm financing and investment; loan contract features.

Non-technical summary

Monetary policy in the euro area is set centrally but transmitted to firms through a financial system that remains highly heterogeneous. This Occasional Paper reviews recent evidence from the Eurosystem's ChaMP Research Network, demonstrating that while transmission remains effective on average, its strength and speed are neither uniform nor mechanical.

First, at the country level, credit markets remain segmented along national borders despite the progress made in integrating euro area markets. Differences in sovereign risk, institutional frameworks and lending practices account for nearly half of the dispersion in firms' external finance premia, particularly during periods of financial stress, when vulnerabilities amplify asymmetries in transmission. Further, the availability of euro area-wide loan-level data (AnaCredit database) has allowed researchers to uncover how loan characteristics that are key to shaping transmission, such as the share of fixed rate versus floating rate loans, vary across countries. By contrast, transmission through corporate bond markets is far more uniform, with corporate bond spreads being determined largely at the firm level, with the issuer's location making relatively little difference. Taken together, these findings highlight the benefits of deeper capital market integration.

Second, while country-level factors set the baseline for financing conditions, the financial health of individual banks plays an independent role in shaping transmission. Research carried out within the ChaMP network has not only reconfirmed the relevance of standard capital and liquidity constraints and introduced a wider notion of overall balance sheet strength ("bank edge") to capture the broader economic resilience of banks to monetary and financial shocks, but also shown how banks' funding structure plays a relevant role too. From this angle, transmission typically operates at two distinct speeds. It is fast and complete for banks reliant mostly on wholesale markets, but slower and more frictional for those funded primarily by retail deposits. This heterogeneity stems from the different speeds at which these two sets of liabilities react to monetary policy changes. Wholesale instruments reprice almost immediately following policy rate changes, implying that, on average, banks that rely more heavily on this funding source transmit policy impulses more promptly. On the retail side, transmission is affected by the "deposit channel". This posits that the extent to which banks decide to pass policy rate changes on to their retail depositors triggers deposit flows which, if sufficiently large, may affect lending. During the 2022-23 tightening cycle, banks that raised deposit rates by less faced larger outflows, resulting in a more aggressive lending squeeze.

Third, just as banks are not neutral conduits, firms are not uniform recipients of monetary policy. The effectiveness of transmission depends

critically on a firm's financing structure, market access and financial resilience. More precisely, monetary policy weighs disproportionately on small, young and bank-dependent firms, as well as on entrepreneurs with limited private wealth (often the engines of innovation), while larger firms with access to bond markets are partially insulated by their ability to substitute towards market-based finance. In addition, firms' expectations adjust only in response to large shocks, making targeted communication an important complementary tool.

Finally, loan contract design plays a critical role in shaping transmission outcomes. The specific features of lending agreements introduce a highly granular source of heterogeneity, often clustered along national lines. For instance, collateralisation, while facilitating access to credit in normal times, tends to amplify shocks during tightening cycles by tying borrowing capacity to asset valuations.

A separate discussion is warranted for the loan's interest rate fixation period, which determines whether it carries a fixed or floating rate. While ChaMP's findings confirm that floating rate loans amplify the transmission of monetary policy tightening to firm investment, a more novel finding concerns prices: during the first quarters after a tightening, price growth tends to decline more slowly among firms borrowing at floating rates than among those borrowing at fixed rates, reflecting efforts to pass part of the higher cost on to their customers. This helps explain the speed of transmission to inflation in the euro area, where the share of fixed and floating rate loans varies across countries and over time.

Overall, the evidence clearly shows that heterogeneity is an inherent feature of monetary policy transmission to firms in the euro area. While the deposit facility rate remains the primary instrument for steering the policy stance, ensuring a smooth and even pass-through may require a broad policy toolkit, close monitoring based on granular data, and continued progress towards deeper financial integration so that monetary policy impulses are transmitted effectively to the real economy across all Member States.

1 Introduction and conceptual framework

Prepared by Carlo Altavilla, Margherita Bottero and Björn Imbierowicz

Monetary policy in the euro area operates through a vast and diverse financial system in reaching firms and households. For decades, standard macroeconomic models treated this transmission mechanism largely as a uniform process, relying on a “representative bank” and assuming that a change in the central bank’s policy rate would ripple through the economy mechanically and affect all agents in broadly similar ways. However, the unprecedented economic shocks of recent years, together with the growing availability of micro-level data – at the level of individual banks and firms, and even loan-level credit registries – reveal a very different reality: monetary transmission is neither uniform nor mechanical.

Research from the ChaMP network finds that, on average, monetary policy transmission to firms in the euro area remains effective. However, the strength and speed of the pass-through from policy rates to financing conditions are shaped by a complex interplay of structural heterogeneities.

This paper reviews the extensive evidence produced by the Eurosystem’s ChaMP (Challenges for Monetary Policy Transmission) Research Network on the transmission of monetary policy to firms via the banking system in the euro area. The evidence shows that monetary policy remains effective on average, while the strength and speed of the pass-through from policy rates to financing conditions are shaped by a complex web of structural heterogeneities. These heterogeneities do not necessarily offset each other at the aggregate level; rather, in some cases they may shape the ultimate impact of policy actions on the real economy.

By dissecting the transmission mechanism from the country level down to individual loan contracts, we show that understanding these layers of heterogeneity is not merely a technical consideration, but a central prerequisite for the effective design and implementation of monetary policy in a monetary union that is financially integrated yet structurally diverse.

Three overarching themes emerge from our analysis, illustrating how country-level segmentation, private sector balance sheets and the policy toolkit jointly shape the aggregate effects of monetary policy.

First, country-level segmentation remains a core driver of heterogeneous transmission (see Section 2). Despite significant progress in European integration, supported also by the introduction of the Single Supervisory Mechanism (SSM) more than ten years ago, credit markets often remain segmented along national borders. Differences in sovereign risk, macroeconomic conditions and institutional frameworks continue to generate structural cross-country variation in the external finance premia paid by firms. These frictions become particularly pronounced during periods of financial stress, when local vulnerabilities amplify asymmetries in transmission. While improvements in sovereign creditworthiness have helped to smooth these differences, the evidence is clear that

Country-specific factors remain a key driver of heterogeneity in monetary policy transmission.

convergence at the national level is not enough in itself to fully insulate local financing conditions from sovereign risk. Achieving a more robust decoupling requires deeper structural integration, notably through greater capital market integration by completing the savings and investments union and the banking union (see also Draghi, 2014, and Constâncio, 2014).

Second, bank and firm balance sheets matter just as much as country-level factors. The specific financial conditions of intermediaries and borrowers play an independent and quantitatively important role (see Sections 3 and 4). A variance decomposition analysis shows that differences across banks and firms explain as much of the dispersion in financing conditions as country-level characteristics do. On the supply side, banks act as active filters of monetary policy. Their capitalisation, funding structures (e.g. wholesale versus retail) and local competitive landscapes significantly amplify or dampen policy signals. Smaller and more constrained banks transmit policy more forcefully, while differences in deposit pass-through and competition amplify heterogeneity. On the demand side, the impact of monetary policy is highly uneven across the corporate sector. Small, young and bank-dependent firms, often key contributors to innovation and productivity growth, are more exposed to credit tightening than larger firms with access to market-based finance. Even the specific features of lending agreements can be a source of heterogeneity in monetary transmission (see Section 5). For instance, during tightening cycles, price growth tends to decline more slowly among firms borrowing predominantly at floating rates than among those borrowing at fixed rates, reflecting efforts to preserve their cash flow by passing part of the cost increase on to their customers. Thus, the proportion of floating/fixed rate loans in the economy may alter the speed of transmission of monetary policy to inflation. Consequently, aggregate indicators of transmission often mask substantial compositional and redistributive effects that can weigh on long-term economic dynamics.

Third, heterogeneity calls for a broad and flexible policy toolkit in order to safeguard monetary policy transmission. The deposit facility rate remains the primary instrument for steering the monetary policy stance. However, the complexity of the transmission mechanism implies that additional instruments may be deployed in specific circumstances to preserve the smooth functioning of monetary policy. As reviewed in this paper, tools such as asset purchases and targeted longer-term refinancing operations can be effective in addressing particular frictions in the financial system. Their use is guided by the principle of proportionality, with the choice and calibration of instruments continuously assessed against their intended objectives and potential side effects.

A caveat is in order. The research surveyed here analyses a variety of outcomes, ranging from bank rates, quantities and credit standards to firm investment and expectations, as well as loan contract features. This diversity, together with the partial-equilibrium approach adopted by most papers, does not allow the findings to be assessed against a single set of

In this context, effective monetary policy requires a broad set of policy tools, combined and deployed on the basis of the proportionality principle.

outcome variables, nor does it allow for a precise assessment as to how the different sources of heterogeneity combine to shape transmission. Nonetheless, a sufficiently consistent picture emerges to draw conclusions broad enough to identify novel sources of heterogeneity and shed light on their underlying mechanisms.

Understanding and addressing heterogeneity is a fundamental requirement for the effective design and implementation of monetary policy in a financially integrated yet structurally diverse euro area.

Overall, this Occasional Paper shows that deeper integration and stronger financial positions among countries and institutions alike support a smoother and more predictable transmission of monetary policy. By contrast, institutional and financial segmentation dampens and distorts pass-through. Greater harmonisation of contractual, legal and financial frameworks would not eliminate heterogeneity altogether, but would reduce unwarranted dispersion in borrowing conditions, limit amplification through local financial frictions and enhance the effectiveness of a common monetary policy. Fostering greater capital market integration by completing the Savings and Investments Union would help reduce disparities in access to different funding sources among firms in different jurisdictions, thereby promoting firm growth and, ultimately, innovation throughout the euro area. Moreover, the completion of the banking union would further level the playing field across intermediaries, reducing the effects of the heterogeneities that we still observe today. This is particularly important in the current geopolitical environment, where idiosyncratic shocks may amplify differences across the euro area and carry the risk of persistent fragmentation. Ultimately, acknowledging heterogeneity is essential for the Eurosystem to ensure that its policy impulses reach all corners of the real economy, thereby delivering on its mandate of price stability.

2 Country-level heterogeneity

Prepared by Simona Malovaná and Zuzana Gric

Research conducted within the ChaMP network confirms that the bank lending channel of monetary policy remains a key determinant of financing conditions among firms in the euro area and operated effectively during the 2022-23 tightening cycle.¹ At the same time, most credit relationships between lenders and borrowers remain largely confined within national borders. Based on a variance decomposition exercise and the associated identifying assumptions, estimates show that country-specific factors alone account for around half of the cross-sectional variation in the external finance premia faced by euro area firms. While structural and cyclical differences have narrowed compared with the past, this within-country concentration of lending becomes particularly pronounced during episodes of financial stress, when divergences in sovereign risk, bank liquidity conditions and bank balance sheet vulnerabilities amplify differences in monetary transmission across jurisdictions.

2.1 The strength of the bank lending channel in the euro area

The credit channel of monetary policy remains a powerful and persistent driver of financing conditions among firms.

International evidence confirms that the credit channel remains a powerful and persistent driver of financing conditions among firms. A comprehensive synthesis of cross-country studies shows that a 1 percentage point interest rate hike lowers credit volumes by approximately 0.9 per cent and credit growth by roughly 2.7 percentage points after four years, an effect that is remarkably consistent across advanced economies (see Bajžík et al., 2023). In the euro area, the 2022-23 tightening cycle resulted in more immediate and even stronger pass-through to lending rates for non-financial corporations than the 2005-08 cycle, reflecting also the unprecedented speed and magnitude of the policy rate increases. Importantly, banks' risk perceptions amplified this transmission, contributing measurably to the slowdown in GDP and inflation (see Conti, Neri and Notarpietro, 2024).²

Credit conditions in the euro area remain segmented along national borders, albeit to a lesser extent than in the past, thanks to the progress made by individual countries.

Beneath these aggregate trends, however, considerable heterogeneity can be seen in lending rates when measured at more granular levels (country, bank, firm and contract), as shown in Chart 1 below. Building on this stylised fact, a granular analysis of millions of loan contracts from AnaCredit (Analytical Credit Datasets) – an ECB-established dataset providing detailed, harmonised information on individual bank loans in

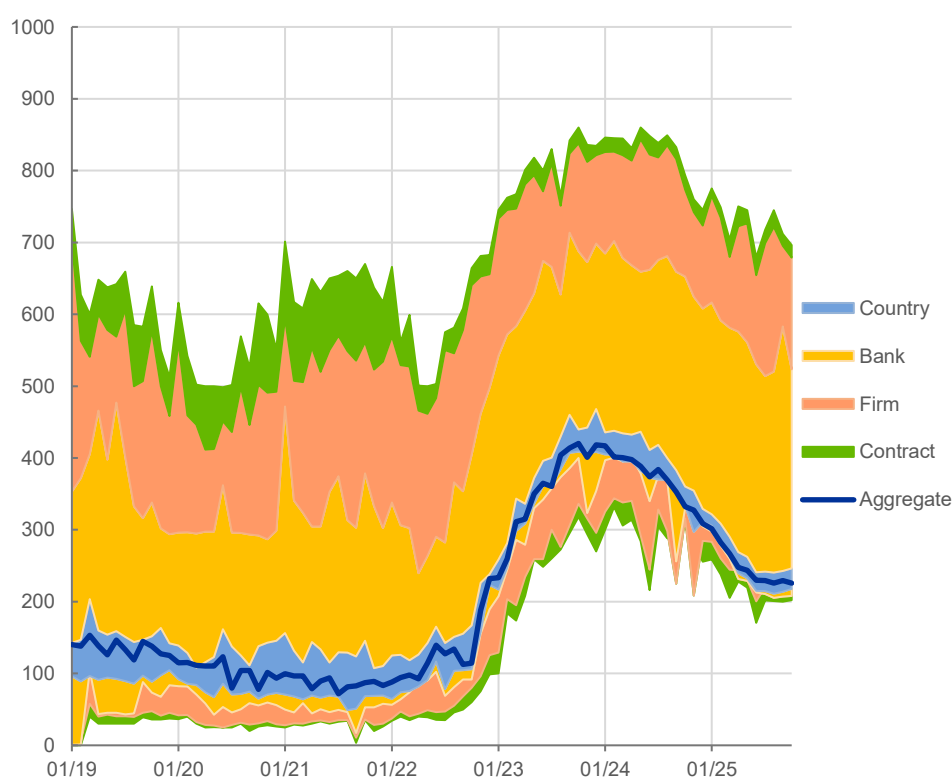
¹ See Kamps et al. (2025) on the recent ECB Monetary Policy Assessment.

² Pfarrhofer and Stelzer (2026) find that these differences in transmission strength may arise from the asymmetric effects of monetary policy within the bank lending channel, with contractionary shocks being transmitted more effectively to the real economy.

the euro area – reveals that, over the period 2019-2023, country-level factors, largely linked to sovereign spreads, accounted for roughly half of the unconditional variance in the external finance premium faced by euro area firms (see Altavilla, Gürkaynak and Quaedvlieg, 2024).³ While bank and firm characteristics accounted for the remainder, country specificities continue to act as a significant source of friction. Even within the same country, credit supply and demand responses can diverge systematically across bank-firm relationships, reflecting both broader macroeconomic conditions and idiosyncratic factors (see De Jonghe and Lewis, 2025).

Chart 1

Bank loan rates across different levels of data aggregation



Source: Altavilla C., Gürkaynak, R. and Quaedvlieg, R. (2024), "Macro and micro of external finance premium and monetary policy transmission", *Journal of Monetary Economics*, Volume 147, 103634. Notes: The chart depicts the value-weighted average bank loan rate. Each shaded region provides the 5-95% distribution of bank loan rates at the relevant level of aggregation.

These divergences have persistent real economic consequences.⁴ Firm-level evidence from Belgium during the sovereign debt crisis highlights that credit tightening reduces physical productivity with a lag, a mechanism often masked in aggregate revenue-based measures

³ These estimates are obtained by sequentially decomposing the external finance premium (measured by the loan rate spread relative to a maturity-matched OIS rate) into increasingly granular components, starting with country-time effects, followed by bank-time and firm-time effects, with contract-level effects obtained as a residual.

⁴ See the seminal work of Peek and Rosengreen on the impact of credit supply shocks and real effects (Peek, J. and Rosengren, E., 2000, 2005).

Differences in credit conditions expose countries to different shocks that risk fuelling cross-country divergence.

because firms adjust prices to manage liquidity pressures (see Lenzu, Rivers, Tielens and Hu, 2025). Consequently, country-specific episodes of financial tightening risk amplifying persistent cross-country divergence in national productivity growth. Importantly, the transmission of policy shocks through this segmented network is more homogeneous than in the past, but is not yet fully uniform. While the timing of peak effects is broadly similar across countries (typically 8-12 months), the magnitude of the lending response still varies substantially (see Ferstl and Graf, 2026).⁵

A special case of country heterogeneity arises for non-euro area EU members. Spillovers from ECB monetary policy decisions to neighbouring countries fan out via a complex mix of credit and trade channels. Gric, Janků and Malovaná (2025) show that the co-existence of independent domestic and euro rates prompts banks to tilt loan supply towards the more remunerative currency, especially when these intermediaries are large, less-capitalised, and lend to large firms with low leverage. Audzei and Franta (2025) find that spillovers to Czech firms' investment operate predominantly via the export-related component of the trade channel, although these effects have attenuated since 2014. Notably, in the current context, these financial linkages may increasingly interact with geopolitical tensions, exchange rate volatility and global dollar funding conditions, potentially amplifying heterogeneity further and warranting fuller integration (see Section 3.4 for a discussion of how these new sources of risk affect transmission by altering banks' appetite for risk).

Corporate bond markets appear to transmit monetary policy far more uniformly than bank credit markets, highlighting the critical importance of deeper financial integration.

Finally, corporate bond markets appear to transmit monetary policy far more uniformly than bank credit markets (see also Section 4.1). Evidence combining AnaCredit-based bank loan data with corporate bond market information shows that, while euro area bank loan spreads remain strongly segmented by country, corporate bond spreads behave similarly to those in the United States: they are largely determined at the firm level, with the issuer's location making relatively little difference (see Chitu, Gori and Gürkaynak, 2026). Evidence for the money market, using transaction-level money market statistical reporting (MMSR) data, also points to significant price segmentation by country, which is related to the segmentation observed in the bank lending to firms (see Forti Grazzini and Soares, 2026). This stark contrast provides strong empirical support for deeper capital market integration. Deeper and more integrated bond markets are essential for decoupling financing conditions from local sovereign risk and foster a more uniform transmission of monetary policy.

⁵ In their study of the effects of a common euro area monetary policy using country-specific local projections, Ferstl and Graf (2026) find that, while the timing of the peak impact of a monetary policy shock on bank lending is largely synchronised across countries, the magnitude of the peak effects varies significantly.

Box 1

Cross-country differences in loan pricing and monetary policy pass-through

Prepared by Kārlis Vilerts and Konstantīns Beņkovskis (Latvijas Banka)

Although the euro area has a single currency and common monetary policy, financial systems differ significantly across Member States. As a result, lending practices may also vary considerably across jurisdictions, reflecting local specificities as well as bank and firm characteristics, in ways that have not yet been comprehensively addressed. Detailing these differences and understanding their implications for monetary policy transmission is now possible thanks to the AnaCredit database, which provides harmonised and granular data on firm-level lending across all euro area countries. Researchers from the Eurosystem's ChaMP initiative have shown, in a cross-country study, how these heterogeneous lending practices contributed to the uneven transmission of monetary policy during the post-pandemic tightening cycle (see Vilerts et al., 2025).

The cross-country variation in local lending practices stems from three main factors: (a) the share of fixed- versus floating rate loans, (b) interest rate fixation periods, and (c) the choice of the reference rates (Chart A).⁶ In countries such as Latvia, Lithuania, Cyprus, Finland, Estonia and Ireland, corporate lending is predominantly floating rate and indexed to various short-term benchmark rates, ranging from overnight to 12-month EURIBOR rates. In contrast, most new loans in the Netherlands, Belgium, Germany, France and Italy, especially those for investment purposes, are fixed-rate. Indeed, even within the fixed-rate segment, maturities differ: in Italy, they often mature within one year, while in France and the Netherlands, maturities often extend beyond ten years.

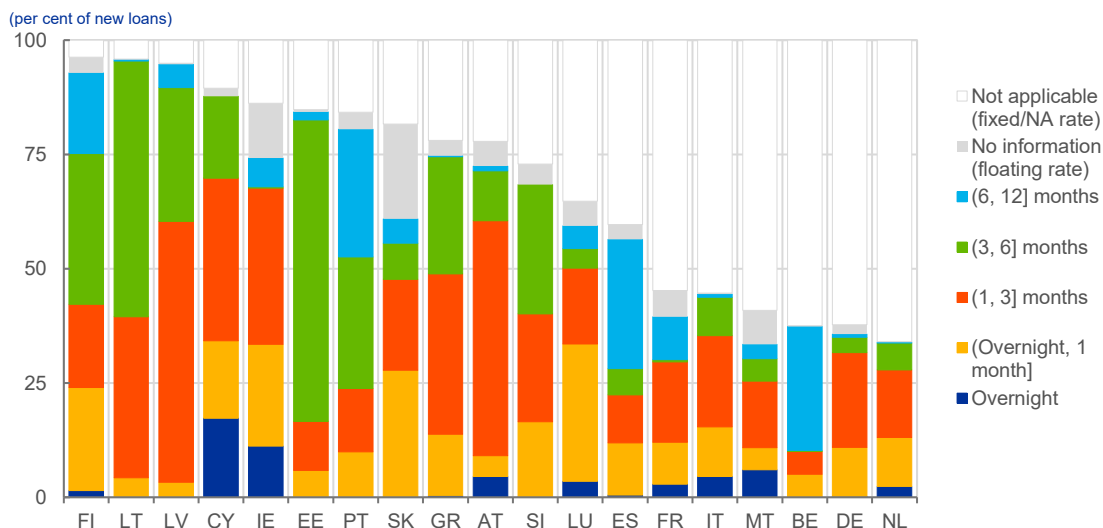
This variation exposes lending rates to different segments of the risk-free yield curve, which react differently to the same monetary policy shock. To account for this variation, Vilerts et al. (2025) propose a granular measure of loan interest rate sensitivity that accounts for the maturity of the relevant risk-free rate. Specifically, they decompose the loan interest rate into the relevant risk-free rate and the corresponding premium. For fixed rate loans, the relevant risk-free rate is the OIS rate matched to the loan's maturity at origination, while for floating rate loans, it is the OIS rate with the same maturity as the underlying reference rate.

There is a striking degree of cross-country variation in the average maturity of the relevant risk-free rates. In Latvia, Ireland and Italy, these maturities average around six months, while in the Netherlands, Malta and France they exceed five years. Importantly, this variation is not solely explained by the prevalence of fixed-rate or floating rate lending. Some countries with short average risk-free rate maturities are dominated by short-reset floating rate loans (e.g. Latvia, Ireland and Finland), while in others fixed-rate lending is more common, but tends to be concentrated in short maturities (e.g. Italy). This underscores the need to move beyond the standard binary classification of fixed versus floating rates, which are commonly used in economic models, to accurately capture loan sensitivity to short-term interest rate changes.

⁶ Banks' propensity to require collateral is also segmented along national borders, albeit in a less conspicuous way. See Section 5.1 for a discussion.

Chart A

Structure of newly issued floating rate loans to NFCs, by countries and reference rate maturity, 2022-2023



Source: Vileris, K., Anyfantaki, S., Benkovskis, K., Bredl, S., Giovannini, M., Horky, F.M., Kunzmann, V., Lalinsky, T., Petroulakis, F. and Zutis, K. (2025), "Details matter: loan pricing and transmission of monetary policy in the euro area", *Working Paper Series*, No 3078, ECB, Frankfurt am Main. Notes: New loans to euro area NFCs (excluding financial and insurance activities) issued in 2022-2023, denominated in euro, exceeding €25,000, with a positive interest rate. The sample consists of the following types of loan: credit lines other than revolving credit, revolving credit and other loans, excluding syndicated loans. Fixed rate loans have interest rates that remain constant over the entire duration of the loan. NA means not available. Floating rate loans have interest rates that adjust over time. Shares are value-weighted. The horizontal axis represents the country of residence of the bank. Countries are arranged according to the share of new loans with fixed interest rates. The results for several countries were subject to additional randomisation to avoid the disclosure of confidential information. In such cases, the figure does not report precise values, although the randomisation procedure preserves the overall trends.

These heterogeneities are meaningful in determining the strength of transmission of monetary policy, which tends to affect mainly the short end of the risk-free yield curve. The ECB's rapid tightening in 2022-2023 raised short-term risk-free rates by nearly 4.5 percentage points, while long-term rates increased by far less. As a result, countries linked to short-term risk-free rates experienced sharper increases in borrowing costs. For example, relevant risk-free rates rose by over 4 percentage points in 11 euro area countries, while the increase was only 2.85 percentage points in the Netherlands. These differences stem solely from the varying maturities of the risk-free rates relevant for each country, as all euro area members share the same risk-free yield curve.

Significantly, changes in lending rates are not purely mechanical as they do not follow changes in risk-free rates one-to-one. Throughout the sample period (2022-23), banks partially offset these rises by reducing loan premia, a smoothing mechanism that mitigated the impact of risk-free rate rises for the loans most exposed to shorter maturities. This adjustment mechanism, not driven by time-varying bank-level heterogeneity, smoothed cross-loan differences in lending rate changes that would have been more pronounced had lending rates moved purely in line with the relevant risk-free rates.

Overall, from a monetary policy perspective, these findings underscore the importance of accounting for heterogeneity in lending practices across the euro area. Simple counterfactual calculations suggest that aggregate monetary policy pass-through to lending rates in the euro area is approximately 13% stronger than it would be if all new loans carried fixed interest rates for their entire duration. Conversely, aggregate pass-through would be about 30% stronger if all new loans were floating rate and tied to short-term benchmarks, such as the 1-month EURIBOR.

Overall, the literature reviewed in this section points to three broad conclusions regarding the geography of monetary policy transmission. First, at the aggregate level, the bank lending channel remains a key determinant of financing decisions among firms. The evidence shows that policy rate increases induce economically large and persistent contractions in credit volumes, underscoring the effectiveness of monetary policy in steering euro area economic activity. Second, despite significant progress in European financial integration, bank credit conditions remain segmented across countries, especially during periods of stress. Country-level factors alone explain about half of the variation in the external finance premia that firms face, reflecting persistent differences in sovereign risk, cyclical positions and local lending practices. Third, this heterogeneity leaves Member States exposed to asymmetric shocks with persistent real effects. Specifically, credit tightening episodes can impair physical productivity, thereby increasing the risk of persistent cross-country divergence.

These findings provide a compelling case for fostering greater capital market integration by completing the savings and investments union and the banking union. Deepening capital markets is essential not only for promoting funding diversification but also for decoupling local financing conditions from sovereign risk, thus fostering a more uniform transmission of monetary policy across the euro area.

3 Bank heterogeneity

Prepared by Franziska Maruhn, Sebastian Bredl and Tommaso Gasparini

While country-level factors set the baseline for financing conditions, the financial health of individual intermediaries plays a separate role in shaping transmission. Research within the ChaMP network confirms and expands upon the finding that banks act as active filters of monetary policy: their balance sheet strength, funding structures and competitive environment critically influence how policy rate changes translate into lending rates and credit supply.^{7,8} Notably, these characteristics appear to rival country-level effects in explaining the cross-sectional variance in lending rates (see Altavilla, Gürkaynak and Quaedvlieg, 2024). The following sections explore three key dimensions of this heterogeneity: (i) the classic amplification mechanisms working through capital and liquidity; (ii) the speed of transmission dictated by wholesale versus retail funding; and (iii) the impact of market structure and competition, including from non-bank financial institutions (for further discussion, see Anyfantaki et al., 2026). Lastly, we discuss how these traditional channels interact with new sources of risk, such as climate and geopolitical shocks.

3.1 Capital and liquidity

Bank capital remains a primary driver of lending decisions. A well-established body of literature finds that weaker capitalisation amplifies the transmission of monetary policy shocks via the bank lending channel (see, for example, Peek and Rosengren, 1995, Kishan and Opiela, 2000, and Jiménez et al., 2012). New evidence from the recent tightening cycle confirms this mechanism but offers a more nuanced view regarding the definition of “balance sheet strength”.

The transmission of monetary policy continues to be stronger among less capitalised banks. Using data from the Eurosystem’s Bank Lending Survey (BLS), García-Posada and Paz (2024) find that, in response to

At the bank level, the strength of bank balance sheets remains a key determinant of monetary policy transmission.

⁷ The amplification mechanisms can be split into three channels: (1) the bank lending channel, or bank balance sheet channel, focuses on how banks’ external financing constraints change with monetary policy, thus amplifying the impact on banks’ capacity and willingness to lend (see, for example, Bernanke and Gertler, 1995; Kashyap and Stein, 2000; Jiménez, Onega, Peydró and Saurina, 2012); (2) the borrower balance sheet channel focuses on how borrowers are affected by changes in monetary policy that influence banks’ willingness to grant credit (see, for example, Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Bernanke, Gertler and Gilchrist, 1999); and (3) the risk-taking channel focuses on how banks’ propensity to take risk increases with lower rates (see, for example, Adrian and Shin 2009; Borio and Zhu, 2012; Dell’Ariccia, Laeven and Suarez, 2017). Finally, recent research points to an additional deposits channel that operates via banks’ market power in deposit markets and further amplifies transmission (see Drechsler, Savov and Schnabl, 2017).

⁸ For a more detailed discussion of ChaMP research findings on monetary policy transmission to households, see Bonfim et al. (2026).

Monetary policy transmission remains stronger among banks with weaker capital positions.

restrictive monetary policy measures, less capitalised banks tighten credit standards more aggressively than their more capitalised peers, with particularly pronounced effects on small and medium-sized enterprises (SMEs). This finding is corroborated by Faccia, Hünnekes and Köhler-Ulbrich (2024), who combine BLS responses with granular Individual Balance Sheet Items (IBSI) and Individual MFI Interest Rate (IMIR) data. They show that less capitalised banks report a stronger tightening of credit standards when funding costs increase, particularly when they are exposed to riskier firms.

Quantitative models corroborate these empirical findings. Using a model calibrated to the euro area, Abad, Bigio, García, Marbet and Nuño (2025) show that monetary tightening reduces lending more strongly among weakly capitalised banks than among more capitalised banks. The authors also show that this gap narrows as idiosyncratic borrower risk declines: in that counterfactual scenario, the responses of fixed and variable rate lending become more similar, while the intermediate case lies between the baseline and the low-risk scenario. They therefore conclude that part of the heterogeneous transmission of monetary policy operates through cross-bank differences in capitalisation generated by borrower risk.⁹ Furthermore, the interaction between capital and policy stance is state-dependent. Jude and Leveuge (2025) find that the easing impact of monetary policy during the COVID-19 crisis was more pronounced in countries where countercyclical capital buffers were reduced simultaneously, highlighting the synergies that exist between prudential and monetary frameworks.

Recent research suggests that looking at regulatory capital alone may not fully capture bank resilience. Altavilla, Begenau, Burlon and Maruhn (2024) therefore propose a broader measure of bank balance sheet strength, termed “bank edge”. While regulatory capital reflects a bank’s loss-absorbing capacity under supervisory rules, bank edge captures how the overall balance sheet structure and risk exposure affect both profitability and lending capacity. The two measures are thus complementary: regulatory capital reflects solvency buffers, whereas bank edge captures the broader economic resilience of banks to monetary and financial shocks. Bank edge relies on a large set of bank- and instrument-level datasets to characterise banks’ balance sheet structure, income and expenses, ranging from supervisory data and security-level statistics (the Centralised Securities Database, CSDB, and Securities Holdings Statistics Group, SHSG) to IBSI and AnaCredit. Using bank-firm-level data from AnaCredit merged with Orbis, and

⁹ Low bank capital can also be viewed as a source of uncertainty from a bank’s perspective. When bank capital is low, it becomes increasingly uncertain whether the bank will be able to meet capital requirements in the future. Interestingly, Vansteenberghe (2025) documents that another dimension of bank-related uncertainty, namely inflation uncertainty, also predominantly affects smaller and financially constrained firms. The author demonstrates that French banks raise lending rates when they perceive greater uncertainty regarding future inflation, with these increases primarily affecting small firms. Another dimension of uncertainty is borrower-related uncertainty stemming from volatile borrower returns. Henricot, Herrera, Mendicino and Supera (2025) find that this type of uncertainty makes lending rates more responsive to changes in borrowers’ leverage, which – as the authors demonstrate in a macro-banking model – makes loan volumes and investment less responsive to monetary policy.

Liquidity constraints amplify transmission, especially during periods of Quantitative Tightening (QT).

controlling for firm demand, the authors show that banks with a higher “edge” supply more credit, thereby ensuring a smoother transmission of monetary policy to firm investment.

Beyond capital, bank liquidity also amplifies transmission. Volk (2026) uses AnaCredit in combination with bank-level data for the euro area over the period 2020 to 2024 to show that monetary tightening generates a persistent and significant decline in loan supply, with particularly pronounced effects among banks with low liquidity and also among smaller intermediaries. Giannetti, Jasova, Mendicino and Supera (2025) show that securities losses resulting from monetary policy tightening erode banks’ capacity to pledge securities as collateral in interbank markets, thereby restricting credit supply, with more pronounced effects among banks with lower liquidity buffers and higher collateral utilisation. While internal capital markets within banking groups partially cushion domestic subsidiaries, liquidity redistribution remains segmented across countries, contributing to uneven monetary policy transmission across euro area countries. The recent withdrawal of central bank liquidity has rekindled the importance of banks’ liquidity positions. This shift from ample liquidity to quantitative tightening (QT) has allowed researchers to isolate specific liquidity effects. For instance, Burlon, Ferrari, Tushteva and Kho (2025) show that the rapid liquidity withdrawal following the TLTRO III recalibration supported the transmission of policy tightening. Banks with lower liquidity replaced cheap central bank funds with expensive market funding, leading to a sharper contraction in credit supply.¹⁰

This mechanism is not unique to the euro area. Indeed, Chavaz, Patozi and Wazzi (2025) find that UK banks exposed to the Bank of England’s QT cycle reduced loan supply and increased mortgage spreads. They document that these banks purchased additional liquid securities to self-insure, at the expense of lending. Interestingly, liquidity shocks can also originate from the borrower side. Agarwal, Mayordomo, Rodríguez-Moreno and Tarantino (2025) show that in Spain, where floating rate mortgages predominate, rising interest rates triggered early mortgage repayments among wealthier households, generating a liquidity inflow that enabled banks, particularly those with lower ex ante liquidity, to sustain lending to smaller firms.

¹⁰ Interestingly, however, high-liquidity banks also resorted to a faster contraction in on-balance sheet exposures when they had larger off-balance sheet exposures backed by the very same liquidity to be unwound. The relevance of off-balance sheet exposures is also consistent with other evidence from the United States (see, for example, Acharya Chauhan, Rajan and Steffen, 2023, and Acharya and Rajan, 2024).

3.2 Funding structure: wholesale and retail funding

Greater reliance on money markets as a funding source is linked to a quicker pass-through to funding costs and, subsequently, to loan rates.

The 2022-23 tightening cycle in the euro area demonstrated how the speed and strength with which monetary policy reaches end-borrowers depend critically on how banks finance themselves. Transmission typically operates at two distinct speeds: it is fast and complete for banks reliant on wholesale markets, but slower and more frictional for those funded primarily through retail deposits.

Money markets represent the first step in the transmission chain. Because wholesale instruments reprice almost immediately following policy rate changes, banks heavily reliant on this funding source transmit policy impulses more rapidly to new lending rates (see Figueres and Spanò, 2024). However, this process is not frictionless. Recent evidence shows that collateral scarcity in repo markets, where banks exchange high-quality liquid assets for cash, can create significant segmentation.

Distortions in repo markets can significantly influence monetary policy transmission, benefitting banks that borrow in cheaper repo market segments.

Schneider (2024), using the Money Market Statistical Reporting (MMSR) dataset, shows that during the 2022-23 tightening episode, localised scarcity of specific collateral (e.g. German bunds) allowed banks holding these assets to borrow at rates significantly below the deposit facility rate (see also Nguyen, Tomio and Vari, 2023). This funding cost advantage had material consequences: banks benefiting from “cheap” repo funding were slower to raise their lending and deposit rates, implying that asset scarcity can inadvertently dampen transmission. Similarly, Tischer (2021) finds that banks holding scarce assets earn higher intermediation profits and offer lower rates on corporate loans. These distortions can even spill over into broader market pricing of bonds and derivatives, although Grasso and Poinelli (2025) show that flexible implementation of central bank asset purchases (e.g. through securities lending) can effectively mitigate these frictions, improving repo market functioning and policy transmission (see also Section 6).

Monetary policy tightening, followed by retail deposit outflows triggered by incomplete pass-through to deposit rates, is associated with an additional squeeze in credit supply.

On the retail side, transmission is affected by the “deposit channel” (see Drechsler et al., 2017). The ChaMP network has produced extensive evidence confirming that the incomplete pass-through to deposit rates is a key driver of a subsequent contraction in credit supply in the euro area. Cappelletti, Marqués-Ibáñez, Reghezza and Salleo (2024) show that banks which experience larger deposit outflows curtail lending more aggressively, especially through long-term and fixed rate lending. Gutiérrez, Martorell and Melnychuk (2025) complement these findings by showing that banks which raise deposit rates by less than the policy rate face larger outflows and, consequently, curtail lending more aggressively, especially to riskier borrowers.

The extent to which banks differ in their exposure to deposit outflows ultimately determines the potency of the deposit channel.

Three main structural factors emerge as determinants of this pass-through from policy rates to deposit rates, operating through banks’ heterogeneous exposure to deposit outflows.

First, market power plays a central role. Higher concentration weakens transmission: banks with significant market power, or operating in

concentrated local markets, are slower to adjust their deposit rates following an interest rate hike (see Auer, Conti and Farroni, 2025; Bussiere, Gasparini, Horny and Nguyen, 2025; Kho, 2024). This deposit rate stickiness dampens the increase in funding costs but simultaneously attenuates the monetary impulse transmitted to savers. Beriša, Mužić and Zrnc (2026) confirm this pattern for Croatia.¹¹

Second, depositor sophistication shapes banks' pricing responses. Depositors differ markedly in their sensitivity to interest rates: banks serving more financially sophisticated investors, whose clients can easily shift funds into market-priced instruments such as bonds or money market funds, are compelled to raise deposit rates more rapidly in order to stop outflows (see Basten, Cucic and Schepens, 2025). By contrast, banks serving less financially sophisticated depositors can sustain lower deposit rates for longer periods without incurring significant funding losses.

Third, banks' business models, particularly those that rely on cross-selling, introduce a strategic dimension to deposit pricing. Basten and Juelsrud (2025) show that banks may deliberately set deposit rates below (or above) market levels to subsidise other activities, such as mortgage lending, thereby strengthening the link between their deposit franchise value and loan pricing.

Consistent with these mechanisms, transmission through the deposit channel often exhibits asymmetry over the monetary policy cycle. Kho (2025) documents that, in concentrated markets, deposit rates display upward rigidity during tightening phases but downward flexibility during easing episodes. As a result, banks tend to delay passing on rate increases to savers while adjusting more rapidly when policy loosens, a pattern that may amplify monetary stimulus during downturns. Finally, beyond the role of liability structures, the transmission of monetary policy is also shaped by how individual banks perceive and process policy signals. Idiosyncratic informational shocks can influence banks' proprietary trading and lead to asymmetric pass-through to deposit rates, particularly during easing cycles (see Fecht, Imbierowicz and Kellers, 2026). This suggests that the bank lending channel is filtered not only by balance sheet characteristics but also by the private information of individual intermediaries.

Greater concentration in deposit markets is associated with a slower pass-through to deposit rates following rate hikes, particularly where depositors have limited alternative options.

¹¹ Böhnke et al. (2025) find more nuanced results for German banks. They show that banks with greater market power appear to have a stronger pass-through on both the asset and liability sides. They rationalise their findings by suggesting that greater market power may sometimes induce fiercer competition.

3.3 Market structure: competition

While deposit market concentration typically dampens transmission, the effects of lending market concentration are more complex, as they depend on factors such as the extent of relationship lending and the degree of specialisation.

While concentration in deposit markets typically weakens transmission (see Section 3.2), the impact of concentration in lending markets is more nuanced. Concentration is a potential determinant of the strength of competition. Standard theory suggests that stronger competition accelerates pass-through (see, for example, Leroy and Lucotte, 2015, Drechsler et al., 2021, and Heckmann-Draisbach and Hardt, 2025). However, ChaMP evidence reveals that in the euro area, this relationship is shaped by the interplay between regional market structure and relationship lending.

Research on banking competition and relationship lending has shown that market structure influences how banks shield their clients from interest rate hikes and the associated costs. Di Filippo, Giordana, Kaempff, Kremer and Leboutellier (2026a,b) use AnaCredit data at the individual loan level to analyse how bank lending rates change when firms switch banks and how this affects the transmission of monetary policy shocks. In regions where the loan market is highly concentrated, they find that firms switch banks less frequently and are charged higher interest rates. However, this differential gradually disappears on subsequent loans granted to the same firm after the switch. Although established clients may face higher lending rates than switchers, they may be partially compensated by the fact that pass-through on their loans is lower when monetary policy shocks are positive and higher when monetary policy shocks are negative. Kuhmann (2025) finds that banks specialising in specific industries tend to smooth rate hikes for their core clients, although, in the absence of alternative financing, this specialisation can lead to borrower capture. Aggregate evidence remains mixed: while Bredl (2025) finds limited effects of regional concentration on pass-through to small firms, Kho (2024) suggests that bank-level asset concentration can amplify transmission asymmetries.

Competition also arises from non-banks operating within the same loan market as banks.

Competition also arises, and increasingly so, from non-banks serving the same loan market as banks. While non-banks may act as a “spare tyre” for the financial system, stepping in when banks pull back, ChaMP research shows that non-bank financial intermediaries (NBFIs) may either amplify or attenuate the effects of monetary tightening, depending critically on which NBFIs types dominate a market and their funding structures (see Anyfantaki et al., 2026). Aggregate evidence from Bajzík et al. (2025), together with sector-level studies, indicates that a larger NBFIs sector does not systematically cushion the effects of monetary tightening, with stronger contractions occurring under financial stress (see Tiza Mimun et al., 2025).

Micro-level evidence helps to explain this pattern. The direction of responses among individual institutions is determined primarily by the maturity structure of their funding, described as the “liability wedge”. This underscores the importance of the composition of financial institutions’ funding side when it comes to monetary policy transmission (see Section

3.2). Irish loan-level evidence for non-financial firms from Goncharenko and Lukmanova (2025) shows that retail credit firms and specialised finance providers, which rely on short-term wholesale funding that reprices immediately following changes in policy rates, pass through an additional 17 basis points per 100-basis-point hike than banks do. Additional amplification channels operate through fund outflows and deposit withdrawals (see Fecht and Kellers, 2025 and Nicoletti et al., 2025). By contrast, long-term funded NBFIs, such as leasing companies, insurers and pension funds, tend to attenuate the effects of conventional monetary tightening for certain borrowers (see Bednarek et al., 2025). Danish evidence from Cucic and Gorea (2025) provides support for this spare tyre hypothesis by tracing the effects from loan-level credit supply through to aggregate real outcomes. Funding linkages between banks and NBFIs create additional channels through which the non-bank sector shapes aggregate credit supply, with the direction depending on whether NBFIs are net providers or recipients of bank funding (see Li et al., 2025).

3.4 Additional borrower risks

Borrower risk continues to influence bank transmission, amplifying the pass-through of monetary tightening to riskier firms.

The study of the transmission mechanism is also evolving to account for emerging dimensions of risk. Borrower risk remains a key determinant of the supply of credit by banks, both in terms of pricing and volumes. New evidence based on AnaCredit data shows that banks tend to charge higher spreads to riskier firms, but only up to a point, after which they increasingly rely on quantity adjustments (see Volk, 2026a). Traditional credit assessments are increasingly incorporating the effects of structural transformations, specifically climate change and geopolitical fragmentation, thereby reshaping how banks allocate credit.

Climate transition risk and related supervisory/prudential frameworks influence credit allocation.

Climate transition risk, together with the related supervisory and prudential frameworks, increasingly influences credit allocation, potentially amplifying the transmission of monetary tightening for firms lagging in the transition. At the same time, if the underlying risk classifications are inaccurate, these instruments may inadvertently distort credit allocation and increase systemic risk. Banks are actively pricing climate-related risks. Using AnaCredit data combined with firm-level emissions targets, Altavilla, Boucinha, Pagano and Polo (2024) show that, conditional on observed firm probabilities of default, banks charge higher interest rates to firms with higher carbon emissions and lower rates to those with credible emission reduction targets. Since observed probabilities of default may not fully capture climate-related credit risk, these findings should be interpreted with caution: they may reflect either residual pricing of climate risk beyond standard credit metrics or a failure to fully incorporate climate risk into banks' risk assessments. Both pricing effects are more pronounced for banks that have made explicit commitments to decarbonisation. Consistent with the risk-taking channel of monetary policy, tighter policy leads banks to increase both credit risk

Geopolitical risk can heighten borrower risk and affect banks' willingness to lend, thereby reshaping the distribution of policy effects across sectors and firms.

premia and carbon-related premia, while reducing lending to high-emission firms more sharply than to low-emission firms. While restrictive monetary policy raises borrowing costs and curtails credit supply across all firms, its contractionary effects are comparatively weaker for low-emission firms and for those credibly engaged in the decarbonisation transition. In this context, Colesanti Senni, Pagliari and van 't Klooster (2023) discuss the potential for “green” targeted refinancing operations (Green TLTRO). While operationally complex, such instruments could incentivise significant emission reductions by linking central bank funding costs directly to the taxonomy-alignment of bank loan books.

Geopolitical shocks have also emerged as a distinct source of bank-level heterogeneity. Fecht, Greppmair and Imbierowicz (2026) document that banks with asset exposures to Russia and Belarus experienced a sharp increase in funding costs following Russia's invasion of Ukraine. This idiosyncratic shock translated into immediate and broad-based lending restrictions. The resulting “silent tightening” was quantitatively equivalent to an additional 57-basis-point policy rate hike for more exposed banks. As monetary policy tightened thereafter, these banks faced disproportionately larger increases in both funding costs and loan rates. This highlights how geopolitical fragmentation can act as a local friction undermining the uniform transmission of a single monetary policy.

This section points to three broad conclusions regarding the role of financial intermediaries. First, banks are not neutral conduits but active filters of monetary policy. Evidence shows that a bank's financial health, defined not only by regulatory capital but by its broader “edge” in generating returns, is a key determinant of transmission. Weaker capital and liquidity buffers amplify contractionary shocks, leading to sharper reductions in credit supply that can weigh disproportionately on bank-dependent SMEs. Second, the speed of transmission is structurally determined by funding and market characteristics. A clear “two-speed” pattern emerges: transmission is faster and more complete for banks relying more heavily on wholesale funding and facing competition from non-bank lenders, but slower and stickier for banks funded primarily by retail deposits, especially in concentrated markets. While this stickiness can temporarily shield borrowers from rate hikes, it ultimately creates an uneven playing field across the monetary union. Third, the banking channel is increasingly sensitive to new and emerging sources of risk. Climate transition and geopolitical exposures are no longer long-term background issues but immediate drivers of funding costs and lending spreads, thus introducing new sources of heterogeneity into the transmission mechanism.

Overall, these findings show how the homogenous transmission of monetary policy critically relies on a banking market populated by well-capitalised and liquid intermediaries that have access to a diversified mix of retail and wholesale funding sources. While the situation has improved significantly, cross-border consolidation and the completion of the banking union remain essential to sever the link between local bank

idiosyncrasies and firms' financing conditions. A fully integrated market, with common deposit insurance and cross-border liquidity management, would ensure that one euro of lending is priced consistently regardless of the location of a bank's headquarters.

4 Firm heterogeneity

Prepared by Aino Silvo, Giulio Nicoletti, Alessandro Modica, Konstantīns Beņkovskis and Massimo Giovannini

Just as banks are not neutral conduits, firms are not uniform recipients of monetary policy. The effectiveness of transmission depends critically on a firm’s financing structure, market access and financial resilience.¹² The evidence gathered by the ChaMP network opens the “black box” of the credit channel (see Bernanke and Gertler, 1995), revealing that aggregate transmission masks substantial heterogeneous effects across firms. Specifically, we show that monetary policy disproportionately affects small, young and bank-dependent firms – often the engines of innovation – while larger firms with access to bond markets are partially insulated by their ability to switch to market-based finance. The following sections analyse how these asymmetries arise from: (i) the composition of corporate debt and working capital needs; (ii) internal liquidity and owner wealth; and (iii) the heterogeneous formation of expectations.

4.1 Debt structure

A key prediction of the bank lending channel is that firms reliant on bank loans are more sensitive to short-term rate hikes than those with access to market-based credit, as banks’ credit supply is disproportionately affected by monetary policy (see, for example, Kashyap et al. 1993, Bernanke and Gertler 1995, and Holmström and Tirole, 1997). New granular evidence confirms this, but with a twist regarding the type of policy instrument. Alder, Coimbra and Szczerbowicz (2025) analyse French firm-level data to show that financing structure shapes the transmission channel. They find that, on average, firm investment decreases following monetary policy contractions (see Chart 2). While conventional policy tightening (rate hikes) sharply reduces investment among bank-dependent firms, bond-dependent firms are less affected by these hikes but respond strongly to “bond spread shocks” (e.g. changes in sovereign spreads), which are often driven by unconventional policy tools such as asset purchases (see Chart 3). These two types of monetary policy shock are transmitted through different channels: conventional policy mainly affects bank loan rates, while bond spread shocks affect bond yields and market liquidity. Although firms can partially switch from bank loans to bond issuance following these shocks, this substitution is incomplete and does not fully offset the contraction in investment. Gulan and Silvo (2026) use a New Keynesian model to show that, while profitable firms can switch from shrinking bank credit to bond

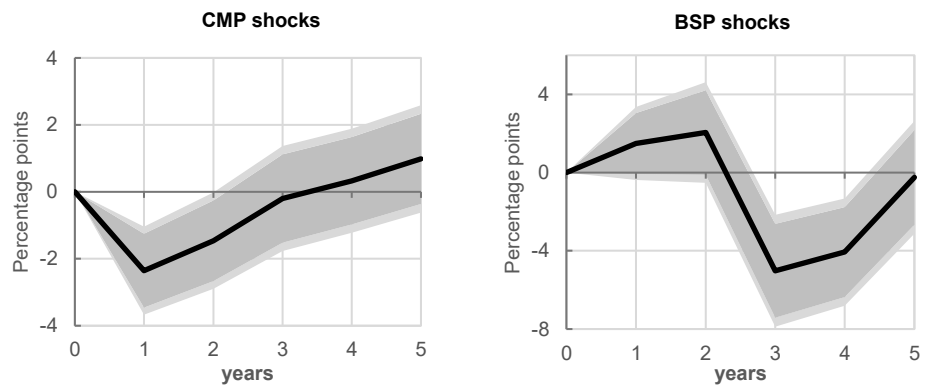
Monetary policy can affect firms unevenly: large firms that rely on bond financing tend to be more exposed to central bank balance sheet tightening, while smaller firms reliant on bank lending are more sensitive to increases in short-term policy rates.

¹² For a broader discussion on how structural features of the economy interact with the financial constraints discussed here, see Ascari et al. (2026).

issuance during a tightening episode, this option is unavailable to smaller, less profitable firms. Consequently, monetary contractions lead to a compositional shift in the economy, squeezing bank-dependent firms while high-quality bond issuers partly smooth the shock. These findings underscore that firms' debt structure is a key source of heterogeneity in monetary policy transmission, aligning with earlier findings based on US firm-level data (see Becker and Ivashina, 2014).

Chart 2

Average response of firm investment to conventional monetary policy (CMP; left panel) and bond spread (BSP; right panel) shocks

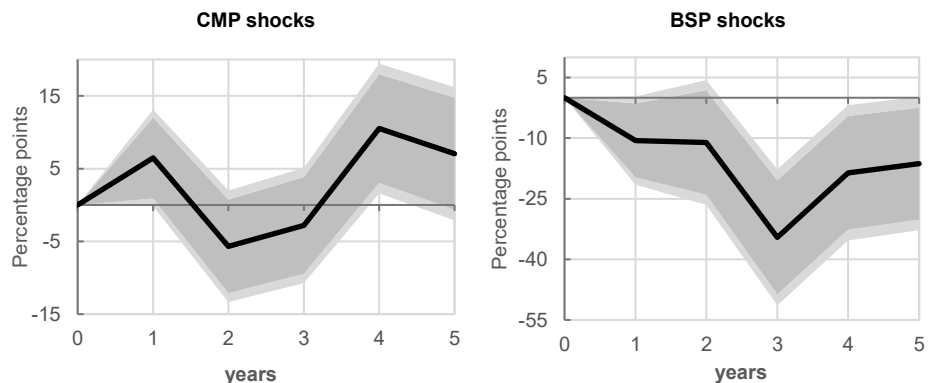


Notes: Light (dark) grey bands correspond to 95% (to 90%) confidence intervals. X-axis: years after the shock.

Source: Alder, Coimbra and Szczerbowicz (2025).

Chart 3

Response of firm investment to conventional monetary policy (CMP; left panel) and bond spread (BSP; right panel) shocks, interacted with firms' bond shares



Notes: Light (dark) grey bands correspond to 95% (to 90%) confidence intervals. X-axis: years after the shock.

Source: Alder, Coimbra and Szczerbowicz (2025).

Beyond the source of external financing, the use of funds also matters: firms with greater working capital needs are more exposed to monetary policy tightening.

Beyond the source of external financing, the destination of funds also matters when it comes to monetary policy transmission. Firms with high working capital needs, which must constantly refinance their short-term production costs, are highly sensitive to rate hikes. Albertazzi, Ferrando, Gori and Rariga (2025) show that these firms raise their selling-price expectations more aggressively following a tightening episode. This is consistent with the findings of Core et al. (2025) (see Section 5), who document that firms reliant on working capital tend to offload their higher debt burden by raising prices. Albertazzi et al. (2025) identify a granular “cost channel” of monetary policy: in sectors such as manufacturing, higher interest rates rapidly translate into higher financing costs, creating upward pressure on prices that partially offsets the disinflationary demand effect.¹³

4.2 Liquidity and wealth

Monetary tightening is most effective among liquidity-constrained firms¹⁴, whereas those operating in “cash-rich” sectors remain partially shielded. The transmission mechanism interacts not only with the liability side (debt) but also with the asset side (liquidity and wealth) of borrowers. Financial resilience acts as a shield, leading to pronounced asymmetries in how firms weather policy shocks. The internal liquidity of firms acts as a buffer: cash-rich firms can bypass the banking channel. Bottero and Schiaffi (2025), using Italian credit register data, document that liquidity buffers significantly attenuate the pass-through of policy rates. Firms with ample cash reserves enjoy greater bargaining power and face smaller increases in lending rates. This carries important distributional implications: monetary tightening is most effective, and most painful, for liquidity-constrained firms, while “cash-rich” sectors remain partly insulated.

Transmission also depends on the wealth of the business owner. In a novel analysis of SME loan applications, Delis, Ferrando, Mulier and Ongena (2025) show that banks implicitly treat an entrepreneur’s private wealth as collateral, in the spirit of Holmström and Tirole (1997). This makes less wealthy owners more credit-constrained via the balance sheet channel and more sensitive to policy-driven shifts in lenders’ risk appetite via the risk-taking channel. They find that monetary easing significantly increases loan approval rates for less wealthy entrepreneurs (at the 25th percentile of wealth), while having little impact on wealthier ones who are already unconstrained. This suggests that monetary policy has strong inclusionary power at the margin by relaxing constraints for those with the fewest resources.

Monetary policy has important distributional effects through the credit channel, disproportionately affecting young and small firms as well as entrepreneurs with limited private wealth.

¹³ For a more thorough discussion of how monetary policy transmits through interlinked sectors via production networks, see Gebauer et al. (2026).

¹⁴ Ferrando, Lamboglia and Offner (2025) use survey data from SAFE to show that firms experiencing greater financial constraints, such as small enterprises and highly leveraged firms, display a stronger response to monetary policy surprises.

This “marginal” effect is particularly important for young firms, which often lack a credit history and tangible assets that can serve as collateral. Bonfim, García-Posada, Mayordomo and Rodríguez-Moreno (2025) find that standard policy rate cuts are often insufficient in unlocking credit for these opaque borrowers. Only strong monetary easing significantly improves their access to credit, likely by reducing agency costs and increasing banks’ risk-taking appetite (see Section 3.5). Once funded, these entrants show stronger employment and investment growth than their more established peers, highlighting the growth dividend of effective transmission to the extensive margin.

4.3 Expectations

Firms respond not only to actual changes in financing conditions, but also to their expectations regarding inflation and broader macroeconomic conditions (see Coibion et al., 2018; Candia et al., 2023). However, firms do not update these expectations uniformly. Existing evidence points to a form of state-dependent “rational inattention”, whereby only large shocks or certain groups of firms trigger substantial revisions in beliefs.

Ferrando and Forti Grazzini (2025), leveraging the exact timing of survey responses around policy meetings, find that firms systematically update their expectations only in response to sizeable contractionary surprises. Importantly, this channel is driven by large, unconstrained firms. Smaller, financially constrained firms, occupied with their immediate survival, barely revise their medium-term expectations. This challenges standard models that assume uniform information processing.

Can central banks bridge this gap via communication? Bartscher, Duernecker, Goensch and Wehrhöfer (2025) show, via a randomised controlled trial, that providing firms with information about the ECB’s current and future policy rate causally alters their decisions. Firms that are informed that the policy rate is lower than they expected tend to borrow and invest more. This goes to show that clear communication is a distinct policy tool that can steer corporate behaviour even without rates actually changing.

Overall, the literature reviewed in this section points to three broad conclusions regarding firm-level heterogeneity. First, monetary policy produces substantial heterogeneous effects. Tightening episodes weigh disproportionately on bank-dependent SMEs and firms with high working capital needs, while larger firms with access to bond markets or ample internal liquidity are able to smooth the shock. This implies that the aggregate “investment channel” is driven largely by the constrained segment of the corporate sector. Second, the evidence we reviewed shows that monetary policy transmission differs across financing channels, including bank lending and bond markets. In our view, these

In the euro area, larger unconstrained firms adjust their expectations systematically in response to strong contractionary monetary policy shocks.

findings suggest that deeper financial integration via capital markets would help make transmission more uniform across the euro area. The stark contrast between segmented bank loan markets and integrated corporate bond markets provides powerful empirical support for greater capital market integration by completing the savings and investments union and the banking union. Diversifying funding sources for SMEs would make them less exposed to idiosyncratic local banking shocks. Third, the “expectations channel” is neither automatic nor uniform. Firms exhibit rational inattention, reacting primarily to large, salient shocks or direct communication. This suggests that during periods of high uncertainty, central bank communication becomes as critical as the rate decision itself in anchoring corporate planning.

5 Loan-level heterogeneity

Prepared by Aino Silvo, Giulio Nicoletti, Alessandro Modica, Konstantīns Beņkovskis and Massimo Giovannini

Beyond heterogeneity across countries, banks and borrowers, another source of variation arises from the very design of loan contracts. The specific features of lending agreements introduce a highly granular source of heterogeneity in monetary policy transmission. Evidence from the ChaMP network shows that contract characteristics, such as collateral requirements and interest rate fixation, account for a non-negligible share (around 11%) of the variation in the external finance premium (see Altavilla, Gürkaynak and Quaedvlieg, 2024). These types of “devil-in-the-details” technical features therefore have economically meaningful implications for both the aggregate strength and the distribution of monetary policy transmission.

5.1 Collateral

Collateral acts as a double-edged sword: it facilitates access to credit in normal times but amplifies shocks to it during tightening cycles. Prior to the availability of AnaCredit, the precise role of collateral was difficult to quantify. Degryse, De Jonghe, Laeven and Zhao (2025) have recently provided a comprehensive mapping, showing that secured lending accounts for roughly 70% of credit volumes to non-financial corporations in the euro area. They document a clear “collateral premium”: secured loans are, on average, 10-18 basis points cheaper and 33-48% larger than unsecured credit, after controlling for contract features, time-varying firm and bank characteristics, and non-random firm-bank matching. At the intensive margin, under the same set of controls, a 1% increase in collateral value lowers interest rates by 2-4 basis points and raises loan amounts by around 0.8%, which is consistent with the collateral channel described in Chaney et al. (2012). However, this link ties borrowing capacity to asset prices. As documented by Nocera and Roma (2017) and by Battistini, Falagiarda, Hackman and Roma (2025), monetary policy tightening depresses real estate prices. Consequently, firms relying on real estate collateral face a sharp contraction in borrowing capacity, a “collateral channel” that disproportionately stifles SMEs, which lack alternative sources of unsecured funding. However, the aggregate effect remains unclear. Degryse, De Jonghe, Laeven and Zhao (2025) show that, while collateral amplifies shocks at the firm level, countries with a very high prevalence of secured lending exhibit a weaker elasticity of loan amounts with respect to collateral values.

5.2 Pricing agreements

Floating rate loans amplify the transmission of monetary policy tightening to investment, but appear to attenuate its effect on inflation, as more exposed firms are more likely to pass higher debt servicing costs through to final prices.

Besides the level of collateralisation, the specific pricing arrangements of individual loans also have the potential to amplify monetary policy transmission. The findings of De Jonghe and Lewis (2025) corroborate the relevance of both dimensions (collateral and pricing) in shaping the distributional consequences of monetary policy. By identifying demand and supply dynamics at the relationship level, rather than at the bank or firm level, the authors show that firms with fixed rate exposure reduce demand following a monetary policy tightening, while banks simultaneously increase the relative supply of credit to fixed rate borrowers, viewing them as less risky. It follows that a firm's exposure to floating rate debt amplifies the transmission of monetary tightening, as it not only translates directly into higher debt servicing costs, but also results in relatively lower supply of credit, as banks endogenously reallocate their lending towards safer exposures. Similar heterogeneous supply effects can be observed in the case of non-collateralised loans.

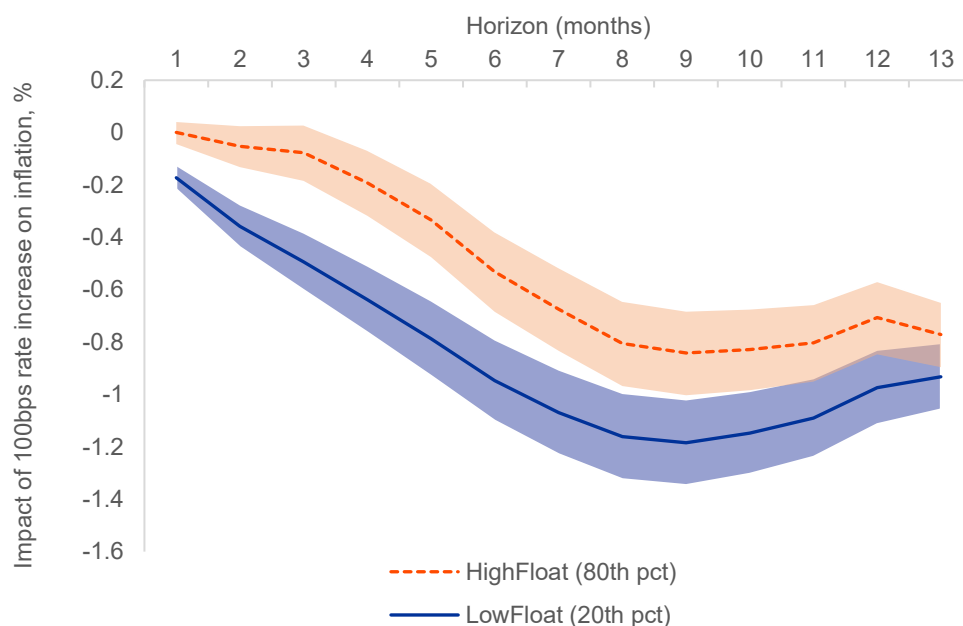
Exposure to floating rate loans affects not only the speed and the magnitude of monetary policy transmission, but also its impact on inflation relative to real activity. The existing literature has largely focused on how borrowers' exposure to floating rate loans adversely affects investment and firms' stock market performance (the so-called cash flow channel, or floating rate channel; see Ippolito et al., 2018; Gürkaynak et al., 2022).

This cash flow channel has attracted particular attention following the 2022-2023 tightening cycle. Floating rate loans transmit policy rate hikes immediately to borrowers' debt servicing costs. Bottero et al. (2025) confirm that this "cash flow channel" is a potent driver of real activity. Using firm-bank level data, they estimate that the 2022-23 tightening episode (approximately a 450-bp increase) reduced the investment rate among firms with floating rate debt by about 15 percentage points relative to those borrowing at fixed rates. This suggests that a high share of floating rate contracts can strengthen the transmission of monetary policy to firms, with potentially relevant macroeconomic effects (see Ippolito et al., 2018; Gürkaynak et al., 2022).

However, the impact on prices is different. Core et al. (2025) identify a supply-side "cost channel". Firms facing higher debt servicing costs due to their exposure to floating rates often pass these costs on to consumers (see Chart 4). This effect is particularly pronounced among manufacturers with high working capital needs and in concentrated markets. The authors estimate that, if the entire euro area had the same high share of fixed rate loans as seen in France or Germany (around 60% of the total loan volume), inflation would have been approximately 0.8 percentage points lower during the recent tightening due to this cost channel, all else being equal.

Chart 4

The impact of monetary policy on inflation: floating and fixed rate markets



Source: Core et al. (2025).

Notes: This chart shows impulse response of inflation (CPI growth) by local projection for a 100-bp increase in the deposit facility rate, using a 12-month horizon and controlling for lagged inflation. The impulse response functions are plotted for markets with a low (20th pct.=30%) vs high (80th pct.=90%) share of floating rate loans using the estimates reported in column (4) of Table 4 in Core et al. (2025). The sample consists of monthly observations at the market level from July 2021 to July 2023. Shaded areas represent 95% confidence bands.

Even within the relatively homogeneous groups of fixed and floating rate loans, monetary policy transmission is materially different depending on loan maturity and the underlying reference rate.

Even within these categories, granularity matters. Vilerts et al. (2025) show that the standard binary classification of fixed versus floating rate loans is insufficient. Instead, the maturity of the relevant rate is key (see Box 1). For fixed rate loans, this corresponds to the loan's maturity at origination, while for floating rate loans, it corresponds to the maturity of the underlying reference rate. A floating rate loan linked to the 1-month EURIBOR transmits policy shifts far more aggressively than one linked to the 12-month EURIBOR. Counterfactuals suggest that if all new loans in the euro area had fixed interest rates, the aggregate monetary policy pass-through to lending rates would have been about 13% weaker, whereas if all euro area loans were linked to one-month reference rates, aggregate pass-through would be 30% stronger. These findings also imply that heterogeneity in loan contract design amplifies cross-country heterogeneity in monetary transmission (see Section 2). However, there has been relatively little research into the factors determining the choice between fixed and floating rate contracts, despite their having been shown to have material consequences for the transmission of monetary policy. This choice likely results from a combination of bank and firm characteristics. Banks tend to offer floating rate loans when they have a larger share of floating rate liabilities, in order to reduce maturity mismatches (see Kirti, 2020). Meanwhile, firms are more likely to choose fixed rate contracts the more financially constrained they are (see Vickery, 2008).

5.3 Credit lines

Finally, transmission operates not just through the price of credit, but also through quantity constraints on available liquidity. Standard models often overlook the fact that firms hold large, unused credit lines as liquidity insurance. Amberg et al. (2023) document that firms utilise, on average, about a quarter of their available credit limits. Under the usual static view of credit constraints, such firms would be classified as unconstrained. However, large unused buffers are not necessarily a sign of financial ease, but may point to “dynamic constraints”: firms anticipate future refinancing risks and hoard borrowing capacity as insurance. Consequently, a larger gap between the credit limit and actual borrowing often signals tighter constraints, as firms feel compelled to preserve a larger safety margin against future uncertainty.

When monetary tightening reduces banks' ability to offer larger credit limits, credit growth responds strongly even if interest rates change little, as firms react to the future reduction in credit limits.

This behaviour gives rise to a distinct “capacity channel” for monetary policy (see Amberg et al., 2023). When monetary tightening makes it harder for banks to offer credit limits, credit growth responds strongly even if interest rates change little, as firms react to the reduction in their future borrowing capacity. This mechanism introduces a new layer of heterogeneity: smaller and riskier firms – which are known to be more sensitive to monetary policy changes via the balance sheet channel (see Section 4.2) – tend to rely heavily on these precautionary buffers, making them less responsive than larger firms to marginal changes in credit limits. This suggests that standard New Keynesian models, which rely primarily on the interest rate channel, may underestimate the effects on economic activity of banks actively cutting credit lines in order to preserve capital, as the capacity channel disproportionately affects larger firms.

Overall, the evidence on loan-level heterogeneity points to three main conclusions. First, collateral amplifies the cycle for SMEs. The strong reliance on secured lending in the euro area creates a “collateral channel”, whereby monetary tightening reduces borrowing capacity by depressing asset values. This mechanism disproportionately affects SMEs that lack access to unsecured sources of market financing. Second, contract design creates a trade-off between output and inflation. A high share of floating rate loans amplifies the contraction in real investment (via the cash flow channel) but can simultaneously hinder disinflation by pushing up firms' operating costs (via the cost channel). Third, transmission operates through quantity as much as through price. The management of credit lines reveals a “capacity channel” driven by precautionary motives. Because firms adjust their behaviour in response to expected future liquidity conditions, policy-induced cuts in credit limits can trigger real effects independently of current lending rates.

6 Alternative central bank policy instruments

Prepared by Jorge Abad, Lorenzo Burlon and Tomás Carrera de Souza

The evidence reviewed so far depicts a transmission mechanism that is shaped by a complex interplay of country, bank, firm and contract characteristics. Against this diverse backdrop, the following question arises: is the policy rate alone sufficient to steer the economy under all circumstances? In this final section, we examine how the central bank's toolkit has evolved to manage these frictions and ensure the effective transmission of monetary policy across the currency union.

The recent Monetary Policy Assessment (European Central Bank, 2025) concluded that, while the deposit facility rate remains the primary tool for guiding monetary policy, instruments deployed to ease policy near the effective lower bound – such as the negative interest rate policy (NIRP), forward guidance, asset purchases, and Targeted Longer-Term Refinancing Operations (TLTROs) – were highly effective in easing financial conditions and supporting growth and inflation. Research conducted within the ChaMP network contributed directly to these earlier findings and allows these approaches, which are already in place, to be further developed and strengthened. By providing granular evidence on the heterogeneous effects of these instruments across intermediaries, this research highlighted their state-dependence and the need for a proportional approach when deploying them.

The negative interest rate policy proved effective in stimulating lending and economic activity, yet its transmission was heterogeneous, depending significantly on banks' reliance on retail deposits (see also Section 3.2). While market-based wholesale funding rates tracked policy rate cuts into negative territory, banks were generally reluctant or unable to lower their retail deposit rates below zero, particularly for households. Evidence from Finland indicates that while the interest rate pass-through remained operational in negative territory, it was diminished by approximately 50% compared to positive territory for banks heavily reliant on retail deposits (see Kwan, Ulate and Voutilainen, 2025). Similarly, for the broader euro area, Fungáčová, Kerola and Laine (2025) find that transmission to bank lending rates was weaker among deposit-reliant banks. By contrast, for firms, financially sound banks were able to pass negative rates on to corporate depositors, and this pass-through did not weaken once policy rates turned negative (see Altavilla, Burlon, Giannetti and Holton, 2022).

Prolonged exposure to negative rates raised concerns about the so-called “reversal rate”, the point at which margin compression could erode banks' capital generation enough to stifle lending (see Repullo, 2020; Abadi, Brunnermeier and Kobi, 2023). Quantitative easing (QE) often

The negative interest rate policy was effective in stimulating lending and economic activity. Its effects varied across banks, with those relying on retail deposits facing profitability challenges, partially mitigated by complementary tools such as TLTROs and the two-tier system for reserve remuneration.

replaced higher-yielding securities with negatively remunerated central bank reserves, increasing downward pressure on net interest margins (see Bittner, Rodnyansky, Saidi and Timmer, 2021). However, Fungáčová, Kerola and Laine (2025) show that this dampening effect was less pronounced for long-maturity loans, where maturity transformation helped sustain transmission. Furthermore, Bittner, Bonfim, Heider, Saidi, Schepens and Soares (2022) provide additional evidence using German and Portuguese credit data. This cross-country comparison is informative because the zero lower bound was more binding in Germany, where deposit rates were closer to zero than in Portugal. They find that German banks with higher deposit ratios, i.e. those most constrained by the effective lower bound, actually increased their lending to riskier borrowers in order to maintain profitability. This confirms that the risk-taking channel (see also Bottero et al., 2022; Bubeck et al., 2020) helped sustain credit supply. Crucially, Altavilla, Boucinha, Burlon, Giannetti and Schumacher (2025) show that the “two-tier system” for reserve remuneration supported credit supply among banks with tighter liquidity constraints by preserving the accommodative monetary policy stance while mitigating the direct cost of negative rates on bank intermediation capacity.

Other instruments acted as powerful complements. TLTROs provided funding at highly favourable rates conditional on lending performance, successfully lowering funding costs and boosting credit supply (see Altavilla, Barbiero, Boucinha and Burlon, 2023). Sigmund et al. (2024) find that, in a theoretical setting, a bank’s decision to adjust lending to non-financial corporations depends on the volumes and interest rates of all other balance sheet items, which may themselves be influenced by the availability of TLTROs. Laine and Nelimarkka (2023) show that TLTRO-related policy “news” eased financial conditions and suppressed risk premia well beyond the participating banks by lowering yields and stimulating output and prices. Micro-level evidence confirms this mechanism: Bonfim and Sousa-Leite (2026) find that bidder banks significantly increased loan volumes and cut rates relative to non-bidders. Interestingly, transmission operated through both quantity and price: safer, more productive firms received larger loans, while riskier, smaller firms benefited mainly through lower rates. While the attractive pricing of TLTRO III garnered strong participation and averted a credit crunch, it also interacted with banks’ portfolio choices. Carrera de Souza (2025) notes that some of the liquidity was redirected into short-maturity sovereign bonds, particularly in high-yield jurisdictions. While this compressed sovereign yields, it suggests a degree of “home bias” that may have reinforced the sovereign-bank nexus in specific segments, highlighting the trade-off between broad liquidity provision and targeted lending incentives.

Central bank liquidity supplied via TLTROs significantly stimulates bank lending, with notable effects on the real economy.

The level and composition of central bank liquidity shape monetary policy transmission: non-borrowed reserves supported bank lending and economic activity, while cross-bank differences in liquidity generated variation in lending behaviour during the most recent tightening cycle.

Easier access to central bank liquidity through quantitative easing (QE) in the euro area, particularly when policy interest rates approached their effective lower bound, positively affected GDP, employment, systemic risk, sovereign debt sustainability and credit spreads.

Finally, the framework governing central bank liquidity plays a decisive structural role. First, collateral harmonisation functions as an enabler. Hüttl and Kaldorf (2022) demonstrate that the ECB's 2007 reform, which accepted cross-border bank loans as collateral, acted as a positive funding shock. Banks holding these assets increased their credit supply, particularly to riskier, more credit-constrained firms, effectively relaxing real economy borrowing constraints. Second, the level of reserves matters. Altavilla, Rostagno and Schumacher (2025) identify a distinct "reserve availability channel". They show that liquidity provided through credit easing and quantitative easing policies, such as TLTROs or quantitative easing, stimulates bank lending more strongly than conventional liquidity provision. Firms borrowing from banks with high levels of non-borrowed reserves increase their levels of investment and employment more than otherwise comparable firms. These findings imply that the size of the central bank's balance sheet affects monetary policy transmission, a mechanism typically absent from standard New Keynesian models. Additionally, Fricke, Greppmair and Paludkiewicz (2024) find that, although the contraction of reserves leads to a reduction in lending, reserve-rich banks also experience a wealth effect: remuneration earned on reserves strengthens their capital buffers, partially offsetting the primary contractionary effects of quantitative tightening on lending. Third, QE interacts with pricing among firms. Klein and Zhang (2025) find that quantitative easing allowed financially constrained firms to raise prices more sharply than unconstrained firms, suggesting that QE relaxed their borrowing constraints, in a manner similar to interest rate cuts (see Ottonello and Winberry, 2020), thus reducing the need for firms to engage in fire sales or price cutting. This highlights how firms' balance sheet conditions can affect the effectiveness of alternative monetary policy instruments. The study also adds to the existing literature on the effects of QE policies in Europe (see Rostagno, Altavilla, Carboni, Lemke, Motto, Saint Guilhem and Yiangou, 2021; and Rostagno, Altavilla, Carboni, Lemke, Motto and Saint Guilhem, 2025).

While the effects of central bank emergency liquidity injections are hard to estimate empirically because central bank liquidity provision is highly endogenous (see Albertazzi, Burlon, Jankauskas and Pavanini, 2022), Jasova, Mendicino, Petrella, Puglisi and Supera (2026) tackle this challenge by constructing a novel external instrument based on granular data on ECB and private market repo quotes from the MMSR data. They show that easier access to central bank liquidity in the euro area had positive effects on GDP, unemployment, systemic risk, sovereign debt and credit spreads. They also show that liquidity shocks were transmitted across the yield curve and flattened its slope, in contrast to conventional monetary policy shocks.

Conclusions

Prepared by Carlo Altavilla, Margherita Bottero and Björn Imbierowicz

This Occasional Paper has summarised a comprehensive body of evidence produced by the Eurosystem's ChaMP Research Network. Taken together, the findings indicate that monetary policy transmission to firms remains effective, including during the 2022-23 tightening cycle. However, new evidence has challenged the traditional macroeconomic view of a uniform monetary policy transmission mechanism. Instead, it portrays a process that is heterogeneous, state-dependent and actively filtered by financial intermediaries. This emerging picture carries profound implications for the conduct of monetary policy, the monitoring of financial stability and the structural integration of the euro area.

First, heterogeneity is a defining feature of the euro area financial landscape. While cross-country segmentation remains significant (Section 2), particularly during periods of stress when sovereign risk premia diverge, micro-level characteristics are equally important.

Second, the bank lending channel is shaped by the balance sheet constraints of individual intermediaries. As discussed in Section 3, banks are active filters of monetary policy. Those with lower capital buffers or weaker liquidity positions, or those more reliant on retail deposits, transmit policy shocks differently than their stronger peers. Similarly, on the demand side (Section 4), the effects of monetary policy are unevenly distributed: smaller, younger and bank-dependent firms face sharper contractions in credit availability following a conventional monetary policy tightening than larger corporates with access to bond markets. It has also been shown that contractual features can reverberate to aggregate output, including prices. In particular, reliance on floating rate loans is associated with a dampened effect on price dynamics which, if neglected, can lead to a biased assessment of the effectiveness of past monetary policy actions (Section 5).

Third, heterogeneity underscores the importance of a broad and flexible policy toolkit to preserve the smooth transmission of monetary policy, in line with the approach already laid out in the 2021 Monetary Policy Strategy Review and in the recent Monetary Policy Assessment (European Central Bank, 2025). The deposit facility rate remains the primary instrument for steering the aggregate stance, as underscored in Section 6, while additional instruments may be employed, as appropriate, to address specific transmission impairments. The experience surveyed in this paper shows that tools such as TLTROs and asset purchase programmes can effectively support bank-based credit supply and ease financing conditions when standard rate policy alone is insufficient to ensure effective transmission. The evidence reviewed throughout this paper shows that these instruments differ in terms of their effectiveness,

efficiency and potential side effects. In line with the principle of proportionality and the evidence provided in this Occasional Paper, the selection and calibration of these instruments should be continuously evaluated against their effectiveness, efficiency and potential side effects.

Overall, the evidence on cross-country segmentation and the specific vulnerabilities of bank-dependent borrowers provides compelling empirical support for deepening European financial integration. Our analysis shows that as long as financing conditions remain tightly linked to local bank health and national sovereign risk, monetary policy transmission will remain uneven. Progress towards greater capital market integration by completing the savings and investments union and the banking union is therefore critical. Deeper capital markets would allow firms, especially the young and innovative firms identified as vulnerable in this report, to diversify their funding sources, thus making the economy less sensitive to bank-specific shocks. At the same time, a fully integrated banking market would foster cross-country competition and risk-sharing, thereby helping to decouple local credit conditions from national idiosyncratic shocks.

Finally, the findings underscore the critical value of granular data for modern central banking. The insights presented in this paper, ranging from the role of firm-level inflation expectations to the impact of loan-level collateral values, would not have been possible without the availability of modern datasets such as AnaCredit, IBSI/IMIR, MMSR, CSDB and SHS. To effectively calibrate monetary policy in a heterogeneous union, policymakers must look beyond aggregate averages. Continuous monitoring of the distribution of risks across banks, firms and households is essential to detect emerging transmission bottlenecks and to calibrate policy interventions with precision.

In summary, recognising heterogeneity and addressing impairments are prerequisites for effective monetary policy in the euro area. By explicitly accounting for the diverse financial structures of economic agents and addressing the structural causes of segmentation, the Eurosystem will be better positioned to ensure that its policy impulses reach all corners of the real economy, thereby delivering on its mandate of price stability.

References

- Abad, J., Bigio, S., García, S., Marbet, J. and Nuño, G. (2025), “The heterogeneous bank lending channel of monetary policy”, *CEPR Discussion Paper Series*, No 21519.
- Abadi, J., Brunnermeier, M. and Koby, J. (2023), “The reversal interest rate”, *American Economic Review*, Vol. 113, No 8, pp. 2084-2120.
- Acharya, V.V., Chauhan, R.S., Rajan, R. and Steffen, S. (2023), “Liquidity dependence and the waxing and waning of central bank balance sheets”, *NBER Working Paper Series*, No 31050, National Bureau of Economic Research.
- Acharya, V.V., Imbierowicz, B., Steffen, S. and Teichmann, D. (2020), “Does the lack of financial stability impair the transmission of monetary policy?”, *Journal of Financial Economics*, Vol. 138, pp. 342-365.
- Acharya, V.V. and Rajan, R. (2024), “Liquidity, liquidity everywhere, not a drop to use – Why flooding banks with central bank reserves may not expand liquidity”, *Journal of Finance*, Vol. 79, pp. 2943-2991.
- Adrian, T. and Shin, H.S. (2009), “Money, liquidity, and monetary policy”, *American Economic Review*, Vol. 99, No 2, pp. 600-605.
- Agarwal, S., Mayordomo, S., Rodríguez-Moreno, M. and Tarantino, E. (2025), “Household heterogeneity and the lending channel of monetary policy”, *Working Paper Series*, No 2524, Banco de España, Madrid.
- Albertazzi, U., Ferrando, A., Gori, S. and Rariga, J. (2025), “The cost channel of monetary policy: evidence from euro area firm-level survey data”, *Working Paper Series*, No 3097, ECB, Frankfurt am Main.
- Albertazzi, U., Burlon, L., Jankauskas, T. and Pavanini, N. (2022), “The shadow value of unconventional monetary policy”, *CEPR Discussion Paper Series*, No 17053.
- Alder, M., Coimbra, N. and Szczerbowicz, U. (2025), “Corporate debt structure and heterogeneous monetary policy transmission”, *Working Paper Series*, No 933, Banque de France, Paris.
- Altavilla, C., Barbiero, F., Boucinha, M. and Burlon, L. (2023), “The great lockdown: pandemic response policies and bank lending conditions”, *European Economic Review*, Vol. 156.
- Altavilla, C., Begenau, J., Burlon, L. and Maruhn, F. (2024), “Determinants of bank performance: evidence from replicating portfolios”, *Working Paper Series*, No 2937, ECB, Frankfurt am Main.
- Altavilla, C., Boucinha, M., Burlon, L., Giannetti, M. and Schumacher, J. (2025), “Central bank liquidity reallocation and bank lending: evidence

from the tiering system”, *Journal of Financial Economics*, Vol. 168, 104058.

Altavilla, C., Boucinha, M., Pagano, M. and Polo, A. (2024), “Climate risk, bank lending and monetary policy”, *Working Paper Series*, No 2969, ECB, Frankfurt am Main.

Altavilla, C., Gürkaynak, R. and Quaedvlieg, R. (2024), “Macro and micro of external finance premium and monetary policy transmission”, *Journal of Monetary Economics*, Vol. 147, 103634.

Altavilla, C., Lemke, W., Linzert, T., Tapking, J. and von Landesberger, J. (2021), “Assessing the efficacy, efficiency and potential side effects of the ECB’s monetary policy instruments since 2014”, *Occasional Paper Series*, No 278, ECB, Frankfurt am Main.

Altavilla, C., Rostagno, M. and Schumacher, J. (2025), “When banks hold back: credit and liquidity provision”, *Working Paper Series*, No 3009, ECB, Frankfurt am Main.

Amberg, N., Jacobson, T., Quadrini, V. and Rogantini Picco, A. (2023), “Dynamic credit constraints: theory and evidence from credit lines”, *Working Paper Series*, No 422, Sveriges Riksbank.

Anyfantaki, S., Barahona, R., Cucic, D., Fricke, D., Hartmann, P., Kaufmann, C., Lukmanova, E. and Maddaloni, A. (2026), “Monetary policy transmission and non-bank financial intermediation”, *Occasional Paper Series*, No 391, ECB, Frankfurt am Main.

Ascari, G., Audzei, V., Bijmens, G., Bobasu, A., Colciago, A., Dhyne, E., Elfsbacka-Schmoller, M., Grimaud, A., Valderrama, M.T., and Zlobins, A. (2026), “Monetary policy transmission and structural changes”, *Occasional Paper Series*, No 393, ECB, Frankfurt am Main.

Audzei, V. and Franta, M. (2025), “International spillovers from euro area monetary policy to advanced small open economies: investment behaviour of Czech firms”, unpublished working paper, Česká národní banka.

Auer, S., Conti, A.M. and Farroni, P. (2025), “Deposit reliance, market power and monetary policy transmission”, *Working Paper Series*, No 1533, Banca d’Italia.

Bandera, N., Bluwstein, K., Kumhof, M., Salgado-Moreno, M. and Stevens, J. (2025), “Lighting the shadows: central bank policy transmission through banks and non-banks”, *Bank of England Working Paper Series*, forthcoming.

Barth III, M.J. and Ramey, V.A. (2001), “The cost channel of monetary transmission”, *NBER Macroeconomics Annual*, Vol. 16, pp. 199-240.

Bartscher, A.K., Duernecker, G., Goensch, J. and Wehrhöfer, N. (2025), “Causal effects of interest rate expectations on firm decisions and their macroeconomic implications”, unpublished working paper, Frankfurt

School of Finance and Management, Goethe University Frankfurt and Deutsche Bundesbank.

Basten, C., Cucic, D. and Schepens, G. (2025), "Market-priced savings: implications for households, banks, and monetary policy transmission", *Working Paper Series*, ECB, forthcoming.

Basten, C. and Juelsrud, R. (2025), "Monetary policy transmission through cross-selling banks", *Working Paper Series*, No 3072, ECB, Frankfurt am Main.

Bajzik, J., Janků, J., Malovaná, S., Moravcová, C. and Ngo, N.A. (2023), "Monetary policy has a long-lasting impact on credit: evidence from 91 VAR studies", *Working Paper Series*, No 19/2023, Česká národní banka.

Battistini, N., Falagiarda, M., Hackmann, A. and Roma, M. (2025), "Navigating the housing channel of monetary policy across euro area regions", *European Economic Review*, Vol. 171, 104897.

Becker, B. and Ivashina, V. (2014), "Cyclicality of credit supply: firm-level evidence", *Journal of Monetary Economics*, Vol. 62, pp. 76-93.

Beriša, B., Mužić, I. and Zrnc, J. (2026), "Enhancing transmission of monetary policy through deposit competition", *Working Paper Series*, No W-75, Hrvatske Narodne Banke.

Bernanke, B.S. and Gertler, M. (1989), "Agency costs, net worth, and business fluctuations", *American Economic Review*, Vol. 79, No 1, pp. 14-31.

Bernanke, B.S. and Gertler, M. (1995), "Inside the black box: the credit channel of monetary policy transmission", *Journal of Economic Perspectives*, Vol. 9, No 4, pp. 27-48.

Bernanke, B.S., Gertler, M. and Gilchrist, S. (1999), "The financial accelerator in a quantitative business cycle framework", in Taylor, J.B. and Woodford, M. (eds.), *Handbook of Macroeconomics*, Vol. 1C, Elsevier, Amsterdam, pp. 1341-1393.

Beyene, W., De Greiff, K., Delis, M.D. and Ongena, S.R.G. (2021), "Too-big-to-strand? Bond versus bank financing in the transition to a low-carbon economy", *CEPR Discussion Paper Series*, No 16692.

Bittner, C., Bonfim, D., Heider, F., Saidi, F., Schepens, G. and Soares, C. (2022), "The augmented bank balance-sheet channel of monetary policy", *Working Paper Series*, No 2745, ECB, Frankfurt am Main.

Bittner, C., Rodnyansky, A., Saidi, F. and Timmer, Y. (2021), "Mixing QE and interest rate policies at the effective lower bound: micro evidence from the euro area", *CESifo Working Paper Series*, No 9363.

Böhnke, V., Heckmann-Draisbach, L. and Littke, H.C.N. (2025), "Clever banks, stupid customers? The phenomenon of low sight deposit interest rates despite sharply rising reference rates", mimeo.

Bonfim, D., García-Posada, M., Mayordomo, S. and Rodríguez-Moreno, M. (2025), “Monetary policy at the margin”, mimeo.

Bonfim, D. and Sousa-Leite, J. (2026), “Targeted monetary policy and risk”, mimeo.

Bonfim, D., Moretti, L., Aguilar, A., Auer, S., Bandoni, E., Briglevics, T., Cucic, D., Ferrando, A., De Jonghe, O., Kho, S., Mendicino, C., Rodríguez-Moreno, M., Pica, S. and Moura, A.S. (2026), “Monetary policy transmission through the financial system to households”, *Occasional Paper Series*, No 390, ECB, Frankfurt am Main.

Bottero, M., Minoiu, C., Peydró, J.-L., Polo, A., Presbitero, A.F. and Sette, E. (2022), “Expansionary yet different: credit supply and real effects of negative interest rate policy”, *Journal of Financial Economics*, Vol. 146, No 2, pp. 754-778.

Bottero, M., Cascarano, M., Modica, A. and Signoretti, F.M. (2025), “The real effects of monetary policy transmission via the floating rate channel”, *Working Paper Series*, No 1536, Banca d’Italia.

Bottero, M. and Schiaffi, S. (2025), “Firm liquidity and the transmission of monetary policy”, *International Journal of Central Banking*, Vol. 21, No 2, pp. 37-76.

Borio, C. and Zhu, H. (2012), “Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?”, *Journal of Financial Stability*, Vol. 8, No 4, pp. 236-251.

Bredl, S. (2025), “Regional loan market structure, bank lending rates and monetary transmission”, *Discussion Paper Series*, No 30/2025, Deutsche Bundesbank, Frankfurt am Main.

Bubeck, J., Maddaloni, A. and Peydró, J.-L. (2020), “Negative monetary policy rates and systemic banks’ risk-taking: evidence from the euro area securities register”, *Journal of Money, Credit and Banking*, Vol. 52, pp. 197-231.

Burlon, L., Ferrari, A., Tushteva, N. and Kho, S. (2025), “Why gradual and predictable? Bank lending during the sharpest quantitative tightening ever”, *Working Paper Series*, No 3010, ECB, Frankfurt am Main.

Bussière, M., Gasparini, T., Horny, G. and Nguyen, B. (2025), “Deposit funding and the credit channel of monetary policy”, *Working Paper Series*, No 1029, Banque de France.

Candia, B., Coibion, O. and Gorodnichenko, Y. (2023), “The macroeconomic expectations of firms”, in Bachmann, R., Tapa, G. and van der Klaauw, W. (eds.), *Handbook of Economic Expectations*, Chapter 11, Academic Press, pp. 321-353.

Cappelletti, G., Marqués-Ibáñez, D., Reghezza, A. and Salleo, C. (2024), “As interest rates surge: flighty deposits and lending”, *Working Paper Series*, No 2923, ECB, Frankfurt am Main.

- Carrera de Souza, T. (2026), "What's on the menu? Banks, central bank lending, and carry trades", mimeo.
- Chaney, T., Sraer, D. and Thesmar, D. (2012), "The collateral channel: how real estate shocks affect corporate investment", *American Economic Review*, Vol. 102, No 6, pp. 2381-2409.
- Chavaz, M., Patozi, A. and Wazzi, M. (2025), "The bank lending channel of quantitative tightening", *Bank of England Working Paper Series*, forthcoming.
- Chitu, L., Gürkaynak, R. and Gori, S. (2026), "External finance premium: market finance versus bank finance", *Working Paper Series*, No 3235, ECB, Frankfurt am Main.
- Christiano, L.J., Eichenbaum, M. and Evans, C.L. (2005), "Nominal rigidities and the dynamic effects of a shock to monetary policy", *Journal of Political Economy*, Vol. 113, pp. 1-45.
- Coibion, O., Gorodnichenko, Y. and Kumar, S. (2018), "How do firms form their expectations? New survey evidence", *American Economic Review*, Vol. 108, No 9, pp. 2671-2713.
- Colesanti Senni, C., Pagliari, M.S. and van 't Klooster, J. (2023), "The CO₂ content of the TLTRO III scheme and its greening", *DNB Working Paper Series*, No 792.
- Constâncio, V. (2014), "Reflections on financial integration and stability", speech delivered at the Joint ECB-EC Conference on Financial Integration and Stability in a New Financial Architecture, Frankfurt, 28 April.
- Conti, A.M., Neri, S. and Notarpietro, A. (2024), "Credit strikes back: the macroeconomic impact of the 2022–23 ECB monetary tightening and the role of lending rates", *Occasional Paper Series*, No 884, Banca d'Italia.
- Core, F., De Marco, F., Eisert, T. and Schepens, G. (2025), "Inflation and floating-rate loans: evidence from the euro area", *Working Paper Series*, No 3064, ECB.
- Cucic, D. and Gorea, D. (2025), "Non-bank lending and the transmission of monetary policy", *Review of Financial Studies*, Vol. 39, No 4, pp. 966-1014.
- De Jonghe, O. and Lewis, D. (2025), "Identifying relationship-level effects using covariance restrictions", *CEPR Discussion Paper*, No 21400, CEPR Press, Paris & London.
- Dedola, L., Rivolta, G. and Stracca, L. (2017), "If the Fed sneezes, who catches a cold?", *Journal of International Economics*, Vol. 108, pp. S23-S41.

Degryse, H., Goncharenko, R., Theunisz, C. and Vadasz, T. (2023), “When green meets green”, *Journal of Corporate Finance*, Vol. 78, 102355.

Degryse, H., De Jonghe, O., Laeven, L. and Zhao, T. (2025), “Collateral and credit”, *Working Paper Series*, No 3095, ECB, Frankfurt am Main.

Dell’Ariccia, G., Laeven, L. and Suarez, G. (2017), “Bank leverage and monetary policy’s risk-taking channel: evidence from the United States”, *Journal of Finance*, Vol. 72, pp. 613-654.

Delis, M.D., Ferrando, A., Mulier, K. and Ongena, S. (2025), “The poor, the rich, and the credit channel of monetary policy”, *Working Paper Series*, No 3058, ECB, Frankfurt am Main.

Di Filippo, G., Giordana, G., Kaempff, B., Kremer, D. and Leboutteiller, L. (2026a), “Bank lending in the euro area: the role of firm-bank switching and market concentration”, *Working Paper Series*, Banque centrale du Luxembourg, forthcoming.

Di Filippo, G., Giordana, G., Kaempff, B., Kremer, D. and Leboutteiller, L. (2026b), “Firm-bank relationships and the transmission of monetary policy shocks in the euro area”, *Working Paper Series*, Banque centrale du Luxembourg, forthcoming.

Draghi, M. (2014), “Financial integration and banking union”, speech delivered at the conference for the 20th anniversary of the establishment of the European Monetary Institute, Brussels, 12 February.

Drechsler, I., Savov, A. and Schnabl, P. (2021), “Banking on deposits: maturity transformation without interest rate risk”, *Journal of Finance*, Vol. 76, No 3, pp. 1091-1143.

Ehlers, T., Packer, F. and De Greiff, K. (2022), “The pricing of carbon risk in syndicated loans: which risks are priced and why?”, *Journal of Banking and Finance*, Vol. 136, 106180.

ECB (2021), *The ECB’s monetary policy strategy statement*, European Central Bank, Frankfurt am Main.

ECB (2025), *Monetary Policy Assessment*, European Central Bank, Frankfurt am Main.

Faccia, D., Hünnekes, F. and Köhler-Ulbrich, P. (2024), “What drives banks’ credit standards? An analysis based on a large bank-firm panel”, *Working Paper Series*, No 2902, ECB, Frankfurt am Main.

Fecht, F., Greppmair, S. and Imbierowicz, B. (2026), “A geopolitical shock to bank assets and monetary policy transmission”, mimeo.

Fecht, F., Imbierowicz, B. and Kellers, M. (2026), “Granular monetary policy surprises”, mimeo.

Ferrando, A. and Forti Grazzini, C. (2025), “Do firms listen when the ECB speaks? The impact of monetary policy on firms’ bank loan expectations”, *Working Paper Series*, No 2838, ECB.

Ferrando, A., Lamboglia, S. and Offner, E. (2025), “Monetary policy transmission to investment: evidence from a survey on enterprise finance”, *ECB Working Paper Series*, No 3150.

Ferstl, R. and Graf, B. (2026), “Synchronous but dissimilar: heterogeneity in the bank lending channel across the euro area”, *Working Paper Series*, No 277, Oesterreichische Nationalbank.

Figueres, J.M. and Spanò, G. (2024), “Bank funding structure and interest rate pass-through in the euro area”, *ECB Working Paper*, forthcoming.

Froni, C. and Marcellino, M. (2014), “Mixed-frequency structural models: identification, estimation, and policy analysis”, *Journal of Applied Econometrics*, Vol. 29, No 7, pp. 1118-1144.

Forti Grazzini, C. and Soares, C. (2026), “Right at the source: money market fragmentation and the credit market”, *ECB Working Paper Series*, forthcoming.

Fricke, D., Greppmair, S. and Paludkiewicz, K. (2024), “Excess reserves and monetary policy tightening”, *Discussion Papers*, No 05/2024, Deutsche Bundesbank, Frankfurt am Main.

Fungáčová, Z., Kerola, E. and Laine, O. (2023), “Monetary policy transmission below zero”, *Research Discussion Papers*, No 11/2023, Suomen Pankki – Finlands Bank.

García-Posada, M. and Paz, P. (2024), “The transmission of monetary policy to credit supply in the euro area”, *Working Paper Series*, No 2430, Banco de España, Madrid.

Gebauer, S., Nakov, A., Nuño, G., Osbat, C., Palazzolo, A., Paz-Pardo, G., Paulus, A., Quintana, J. and Valderrama, M.T., (2026) “The propagation of shocks across the production network and implications for monetary policy”, *Occasional Paper Series*, No 392, ECB, Frankfurt am Main.

Georgiadis, G. and Jarociński, M. (2025), “Global spillovers from multi-dimensional US monetary policy”, *Journal of International Economics*, Vol. 158, pp. 104-169.

Giannetti, M., Jasova, M., Mendicino, C. and Supera, D. (2025), “Securities losses and the bank collateral channel of monetary transmission”, *ECB Working Paper Series*, No 3209.

Goncharenko, R. and Lukmanova, E. (2026), “When the spare tyre goes flat: Monetary Policy Transmission through Non-Banks”, available at SSRN: <https://ssrn.com/abstract=5240661>.

- Grasso, A. and Poinelli, A. (2025), “Flexible asset purchases and repo market functioning”, *Working Paper Series*, No 3013, European Central Bank, Frankfurt am Main.
- Gryglewicz, S. (2011), “A theory of corporate financial decisions with liquidity and solvency concerns”, *Journal of Financial Economics*, Vol. 99, No 2, pp. 365-384.
- Gulan, A. and Silvo, A. (2026), “Corporate debt composition, access to credit, and monetary policy”, *Research Discussion Papers*, No 7/2026, Suomen Pankki – Finlands Bank.
- Gürkaynak, R., Karasoy-Can, H.G. and Lee, S.S. (2022), “Stock market’s assessment of monetary policy transmission: the cash-flow effect”, *Journal of Finance*, Vol. 77, No 4, pp. 2375-2421.
- Gutiérrez, J.E., Martorell, E. and Melnychuk, M. (2025), “The nexus between deposits and risk-taking: channels of monetary policy”, *Working Paper Series*, No 2615, Banco de España, Madrid.
- Hanson, M.S. (2004), “The ‘price puzzle’ reconsidered”, *Journal of Monetary Economics*, Vol. 51, No 7, pp. 1385-1413.
- Holmström, B. and Tirole, J. (1997), “Financial intermediation, loanable funds, and the real sector”, *Quarterly Journal of Economics*, Vol. 112, No 3, pp. 663-691.
- Heckmann-Draisbach, J. and Hardt, J. (2026), “Hampered monetary policy transmission – a supply-side story?”, *Journal of Money, Credit and Banking*, available at <https://doi.org/10.1111/jmcb.13216>.
- Henricot, D., Herrera, L., Mendicino, C. and Supera, D. (2025), “Bank lending standards, uncertainty and monetary policy transmission”, mimeo.
- Hüttl, P. and Kaldorf, M. (2022), “Real effects of financial market integration: evidence from an ECB collateral framework change”, *ECONtribute Discussion Paper Series*, No 174.
- Ippolito, F., Ozdagli, A.K. and Perez-Orive, A. (2018), “The transmission of monetary policy through bank lending: The floating rate channel”, *Journal of Monetary Economics*, Vol. 95, pp. 49-71.
- Jarociński, M. and Karadi, P. (2020), “Deconstructing monetary policy surprises: the role of information shocks”, *American Economic Journal: Macroeconomics*, Vol. 12, No 2, pp. 1-43.
- Jasova, M., Mendicino, C., Petrella, I., Puglisi, F. and Supera, D. (2026), “Central bank liquidity shocks”, *ECB Working Paper Series*, forthcoming.
- Jiménez, G., Ongena, S., Peydró, J.-L. and Saurina, J. (2012), “Credit supply and monetary policy: identifying the bank balance-sheet channel with loan applications”, *American Economic Review*, Vol. 102, No 5, pp. 2301-2326.

Jude, C. and Leveuge, G. (2025), “Doubling down: the synergy of CCyB release and monetary policy easing”, *Journal of International Money and Finance*, Vol. 155, 103330.

Kamps, C., Bussière, M., Niessner, B., Tristani, O. and contributors (2025), “Report on monetary policy tools, strategy and communication”, *Occasional Paper Series*, No 372, European Central Bank.

Kashyap, A.K. and Stein, J.C. (1995), “The impact of monetary policy on bank balance sheets”, *Carnegie–Rochester Conference Series on Public Policy*, Vol. 42, pp. 151-195.

Kashyap, A.K., Stein, J.C. and Wilcox, D.W. (1993), “Monetary policy and credit conditions: evidence from the composition of external finance”, *American Economic Review*, Vol. 83, No 1, pp. 78-98.

Kho, S. (2025), “Deposit market concentration and monetary transmission: evidence from the euro area”, *European Economic Review*, Vol. 173, 104933.

Kirti, D. (2020), “Why do bank-dependent firms bear interest-rate risk?”, *Journal of Financial Intermediation*, Vol. 41, 100823.

Kishan, R.P. and Opiela, T.P. (2000), “Bank size, bank capital, and the bank lending channel”, *Journal of Money, Credit and Banking*, Vol. 32, No 1, pp. 121-141.

Kiyotaki, N. and Moore, J. (1997), “Credit cycles”, *Journal of Political Economy*, Vol. 105, No 2, pp. 211-248.

Klein, M. and Zhang, X. (2025), “The inflationary effects of quantitative easing”, *Sveriges Riksbank Working Paper Series*.

Kuhmann, K. (2025), “Bank specialization and the transmission of euro area monetary policy”, *Working Paper Series*, No 6/2025, Latvijas Banka, Riga.

Kwan, S., Ulate, M. and Voutilainen, V. (2025), “The transmission of negative nominal interest rates in Finland”, *Journal of the European Economic Association*, Vol. 23, No 5, pp. 1809-1837.

Laine, O.-M. and Nelimarkka, J. (2023), “Assessing targeted longer-term refinancing operations: identification through search intensity”, *Research Discussion Papers*, No 13/2023, Suomen Pankki – Finlands Bank.

Lenzu, S., Rivers, D., Tielens, J. and Hu, S. (2025), “Financial shocks, prices, and productivity”, *Review of Economic Studies*, forthcoming.

Leroy, A. and Lucotte, Y. (2015), “Heterogeneous monetary transmission in the euro area: does banking competition matter?”, *International Economics*, Vol. 141, pp. 115-134.

Li, J., Supera, D., Ma, Y. and Mendicino, C. (2025), “Bank-to-non-bank lending and the reallocation of credit”, *Columbia Business School Research Paper*, No 5732322.

Malovaná, S., Janků, J. and Gric, Z. (2025), “Corporate lending in face of domestic and foreign monetary policy: insights from AnaCredit”, *Working Paper Series*, Česká národní banka, forthcoming.

McLeay, M., Tenreyro, S. and von dem Berge, L. (2025), “Negative rates and the effective lower bound: theory and evidence”, *Journal of the European Economic Association*, jvaf053.

Moll, B. (2025), “The trouble with rational expectations in heterogeneous agent models: a challenge for macroeconomics”, *Economic Journal*, ueaf104.

Nguyen, B., Tomio, D. and Vari, M. (2023), “Safe asset scarcity and monetary policy transmission”, *Working Paper Series*, No 934, Banque de France.

Nicoletti, G., Rodriguez-D’Acri, C. and Rariga, J. (2025), “Spare tyres with a hole: investment funds under stress and credit to firms”, *Working Paper Series*, No 2917, European Central Bank, Frankfurt am Main.

Nocera, A. and Roma, M. (2017), “House prices and monetary policy in the euro area: evidence from structural VARs”, *Working Paper Series*, No 2073, European Central Bank, Frankfurt am Main.

Oliner, S.D. and Rudebusch, G.D. (1996), “Is there a broad credit channel for monetary policy?”, *Federal Reserve Bank of San Francisco Review*, No 1, pp. 3-13.

Ongena, S., Peydró, J.-L. and van Horen, N. (2021), “Monetary policy, credit institutions and the transmission of monetary policy shocks: evidence from foreign-currency lending in Hungary”, *Journal of Financial Economics*, Vol. 142, No 1, pp. 1-30.

Ottonello, P. and Winberry, T. (2020), “Financial heterogeneity and the investment channel of monetary policy”, *Econometrica*, Vol. 88, No 6, pp. 2473-2502.

Peek, J. and Rosengren, E. (1995), “Bank regulation and the credit crunch”, *Journal of Banking and Finance*, Vol. 19, Nos 3-4, pp. 679-692.

Peek, J. and Rosengren, E. (2000), “Collateral damage: effects of the Japanese bank crisis on real activity in the United States”, *American Economic Review*, Vol. 90, pp. 30-45.

Peek, J. and Rosengren, E. (2005), “Unnatural selection: perverse incentives and the misallocation of credit in Japan”, *American Economic Review*, Vol. 95, No 4, pp. 1144-1166.

Pfrarrhofer, M. and Stelzer, A. (2026), “Are there asymmetries in euro area monetary policy?”, *Working Paper Series*, No 276, Oesterreichische Nationalbank.

Ravenna, F. and Walsh, C.E. (2006), "Optimal monetary policy with the cost channel", *Journal of Monetary Economics*, Vol. 53, No 2, pp. 199-216.

Repullo, R. (2020), "The reversal interest rate: a critical review", *CEPR Discussion Paper Series*, No 15367.

Rocheteau, G., Wright, R. and Zhang, C. (2018), "Corporate finance and monetary policy", *American Economic Review*, Vol. 108, Nos 4-5, pp. 1147-1186.

Rostagno, M., Altavilla, C., Carboni, G., Lemke, W., Motto, R., Saint Guilhem, A. and Yiangou, J. (2021), *Monetary policy in times of crisis: a tale of two decades of the European Central Bank*, Oxford University Press, Oxford.

Rostagno, M., Altavilla, C., Carboni, G., Lemke, W., Motto, R. and Saint Guilhem, A. (2025), "An options-based impact study of the negative interest rate policy and forward guidance", *Journal of Monetary Economics*, Vol. 152, 103776.

Schneider, Y. (2024), "Monetary policy transmission through the repo market's bank funding and lending channel", mimeo.

Schorfheide, F. and Song, D. (2015), "Real-time forecasting with a mixed-frequency VAR", *Journal of Business and Economic Statistics*, Vol. 33, No 3, pp. 366-380.

Sigmund, M., Wächtler, J., Schuster, P., Ferstl, R. and Valderrama, M. (2024), "Take it and leave it: banks' balance sheet optimisation and targeted longer-term refinancing operations", *Working Paper Series*, No 257, Oesterreichische Nationalbank.

Tischer, J. (2021), "Quantitative easing, safe asset scarcity and bank lending", *Discussion Paper Series*, No 35/2021, Deutsche Bundesbank, Frankfurt am Main.

Tiza Mimun, A., Fukker, G. and Sydow, M. (2025), "The effects of monetary policy on banks and non-banks in times of stress", *Working Paper Series*, No 3114, European Central Bank, Frankfurt am Main.

Ulate, M. (2021), "Going negative at the zero lower bound: the effects of negative nominal interest rates", *American Economic Review*, Vol. 111, No 1, pp. 1-40.

Vansteenberghe, E. (2025), "Monetary policy, uncertainty, and credit supply", *Working Paper Series*, No 1024, Banque de France.

Vickery, J. (2008), "How and why do small firms manage interest rate risk?", *Journal of Financial Economics*, Vol. 87, pp. 446-470.

Vilerts, K., Anyfantaki, S., Benkovskis, K., Bredl, S., Giovannini, M., Horky, F.M., Kunzmann, V., Lalinsky, T., Petroulakis, F. and Zutis, K. (2025), "Details matter: loan pricing and transmission of monetary policy

in the euro area”, *International Journal of Central Banking*, Vol. 22, No 2 (2026), pp. 1-89.

Volk, M. (2026), “One policy, many reactions: monetary policy and bank credit supply”, *Discussion Paper*, Banka Slovenije, February.

Volk, M. (2026a), “Bank behaviour in a tightening monetary cycle”, *Discussion Paper*, Banka Slovenije, January.

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