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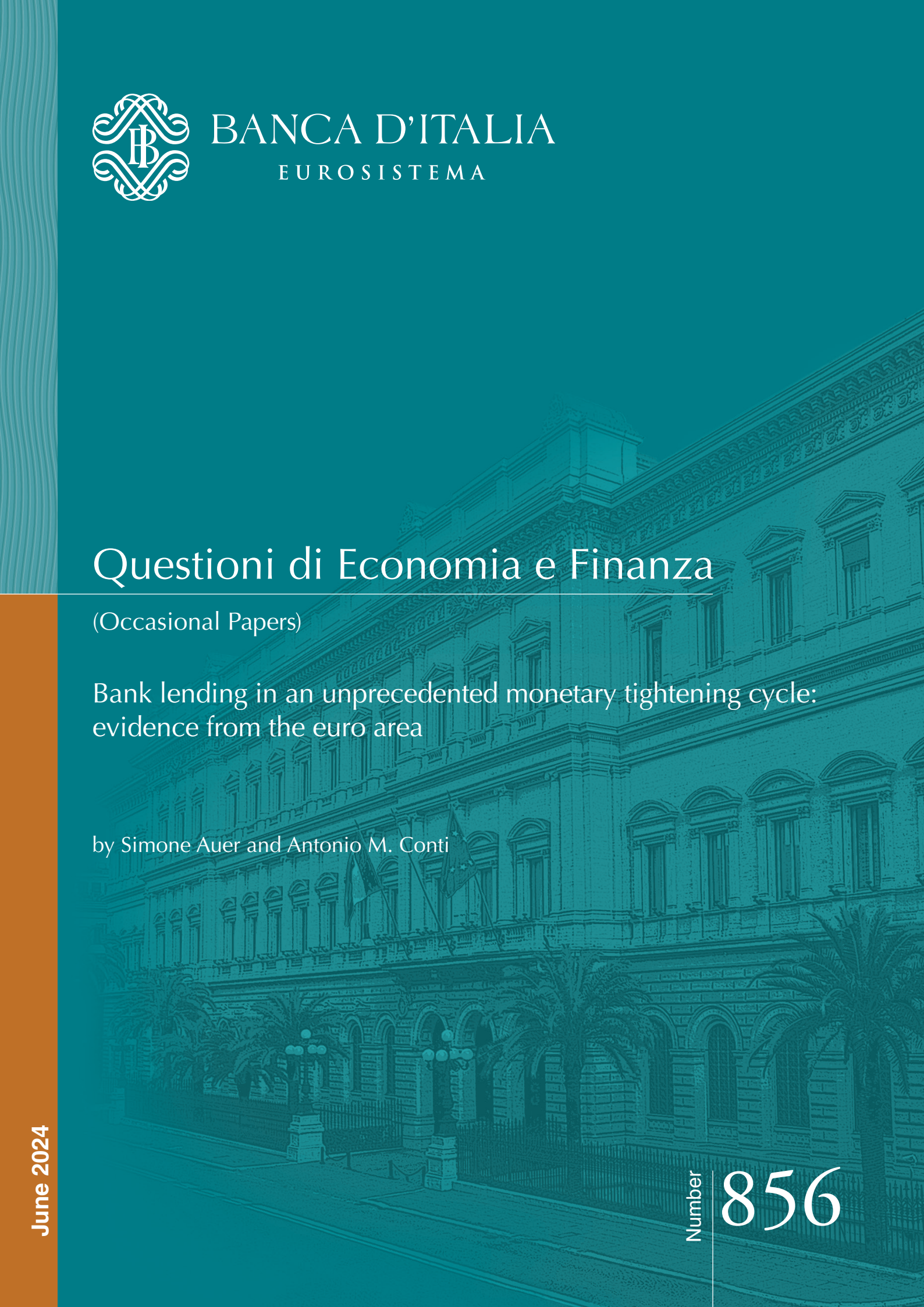

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BANK LENDING IN AN UNPRECEDENTED MONETARY TIGHTENING CYCLE: EVIDENCE FROM THE EURO AREA

by Simone Auer* and Antonio M. Conti*

Abstract

This paper assesses the evolution of bank lending to non-financial corporations (NFCs) in the euro area in the context of the ECB's unprecedented monetary tightening in 2022-23. To this end, we use a medium-scale Bayesian Vector Autoregressive model that includes short- and long-term interest rates, business cycle variables and credit demand and supply indicators drawn from the euro-area Bank Lending Survey (BLS). The decrease in credit growth in 2022-23 is found to be larger than expected based on historical regularities in the counterfactual scenario that is obtained by conditioning only on the actual path of interest rates, real GDP and consumer prices. However, when BLS indicators of credit demand and, above all, credit supply are added to the set of conditioning variables, the gap between the counterfactual and the actual path of loans to NFCs is significantly reduced. Our analysis underscores the increased importance of the bank lending channel in influencing credit dynamics during this period, compared with previous episodes of monetary tightening.

JEL Classification: C32, E32, E37, E51, E52.

Keywords: monetary policy, bank lending channel, interest rate channel, counterfactual scenarios, Bayesian VAR models.

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1. Introduction[1]

The response of bank lending rates and volumes to monetary policy decisions represents a crucial aspect of the monetary transmission mechanism, as it sets the groundwork for the impact on aggregate demand. In a monetary tightening, the transmission through the bank lending channel contributes to dampening economic activity and reducing upward pressures on inflation.

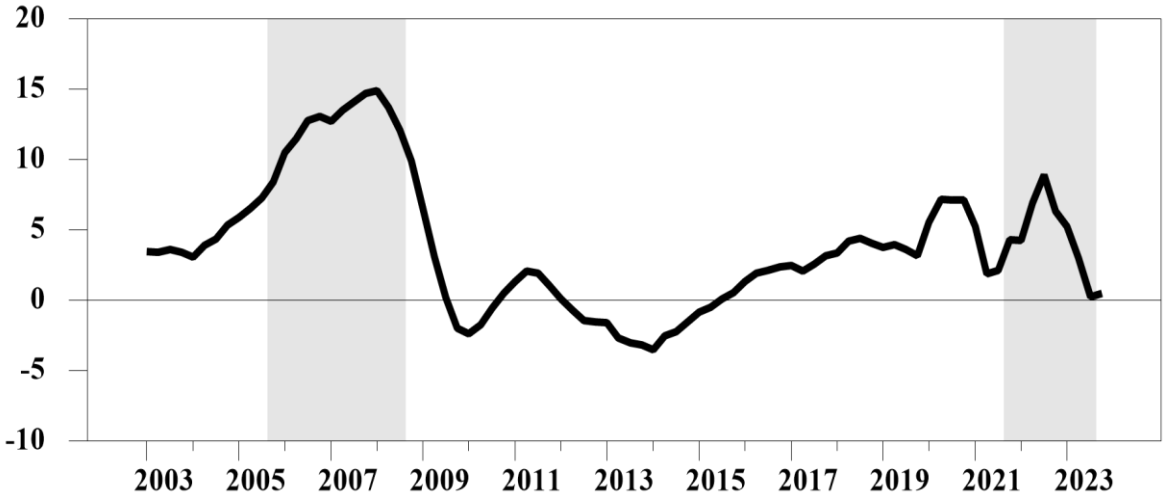
The dynamics of bank lending to non-financial corporations (NFCs) in the euro area (EA) have weakened markedly during the ECB's 2022-23 monetary policy tightening cycle. The annual growth rate of loans to NFCs declined sharply from a peak of 8.9 percent in September 2022, reached when firms intensified their recourse to bank lending as a reaction to the adverse energy shock triggered by the Russia-Ukraine conflict (Figure 1). Since the end of 2023, NFC bank lending in the EA has been stagnating. Such a sharp weakening in credit in such a short period of time was previously observed only after the collapse of economic activity induced by the Global Financial Crisis. Even taking into account the size and the pace of policy rate hikes by the ECB during the 2022-23 monetary tightening cycle, the decline in the growth rate of loans to NFCs may have been steeper than implied by historical regularities.

This paper investigates this hypothesis by exploiting a counterfactual scenario analysis. Within a Bayesian Vector Auto Regression (BVAR) framework, we first estimate model parameters until 2021:Q4, before the start of the monetary policy tightening cycle. We then run counterfactual scenarios based on (*i*) pre-tightening parameters linking credit to its main drivers and (*ii*) different conditioning sets (for a similar exercise on the US economy see Aastveit et al., 2017). In the first ("baseline") counterfactual scenario, the conditioning set only includes the actual evolution of interest rates and business cycle variables, drivers that are typically sufficient to describe NFC loan dynamics adequately. In the second ("augmented") counterfactual scenario, we then augment the conditioning set with credit demand and supply indicators from the EA Bank Lending Survey (BLS), which show a more pronounced contraction and a sharper tightening, respectively, relative to past tightening cycles. A significant deviation between the counterfactual and the actual path of the annual growth rate of loans to NFCs would suggest that the recent monetary policy tightening

[1] The views expressed in this paper are those of the authors and do not necessarily reflect those of Banca d'Italia or the Eurosystem. For useful comments, we thank Margherita Bottero, Fabio Busetti, Martina Cecioni, Paolo Del Giovane, Antonio Di Cesare, Giuseppe Ferrero, Stefano Neri, Sergio Nicoletti Altimari, Alessandro Secchi, Fabrizio Venditti and Roberta Zizza.

cycle, characterized by its unprecedented size and pace, has triggered some amplification mechanism in the transmission to the credit market.

FIGURE 1. ANNUAL GROWTH RATE OF LOANS TO NFCS AND MONETARY TIGHTENING CYCLES
(percentage changes)



Source: ECB.
Notes: The black line plots the y-o-y growth rate of NFCs loans in the EA. The grey shaded areas plot periods of monetary policy tightening, respectively between 2005:Q4 and 2008:Q3 and 2021:Q4 and 2023:Q3.

The analysis yields three main findings. First, according to the "baseline" counterfactual scenario, credit dynamics in the 2022-23 monetary tightening phase have been significantly weaker than implied by historical regularities. Moreover, the baseline scenario is also unable to accurately track the actual contraction of NFC loan demand and the observed tightening in credit supply. Second, in the "augmented" scenario the gap between the counterfactual and the actual lending volumes is substantially reduced. This suggests the presence of amplification mechanisms in the transmission of the 2022-23 monetary policy tightening to loan dynamics operating through both the interest rate and bank lending channels. Third, higher banks' risk perception turns out to be the main factor explaining the weakness in bank lending up to the first half of 2023; loan demand factors were more relevant in the second half of 2023.

Our interpretation of the results is the following. While the 2005-08 tightening cycle was mainly driven by a sequence of inflationary demand shocks in a context of robust economic activity and, at least initially, relatively low borrower risk the 2022-23 tightening was implemented to counter adverse supply shocks which themselves were having severe negative effects on economic growth. The monetary policy tightening amplified the worsening in banks' risk perception and the reduction of firms' demand for loans to finance fixed investment that was being driven by the deterioration of the economic outlook caused by the adverse supply shocks.

Our work is related to a growing body of literature examining the interplay between monetary policy, financial intermediation and the business cycle. The closest contribution to ours is Giannone et al. (2019), who study EA loan and deposit dynamics during the Global Financial Crisis and the Sovereign Debt Crisis. Compared to their contribution, we only focus on loans but we extend the analysis to include the "missing inflation" period and the Covid-19 pandemic and we deepen the characterization of the credit channel of monetary policy by exploiting BLS indicators as in Ciccarelli et al. (2015).

The remainder of the paper is structured as follows. In Section 2 we describe our empirical framework and the design of the counterfactual scenarios. In Section 3 we show the main findings. Section 4 concludes and provides some policy considerations. An Appendix is also available.

2. Empirical framework

2.1 Bayesian VAR model

To evaluate whether the recent weakening of NFCs loan dynamics aligns with historical patterns, we employ a Bayesian Vector Auto Regression (BVAR) framework, a state-of-the-art methodology also widely used for policy purposes (see for example Lane, 2023; Schnabel, 2023). Specifically, we set up the following medium-scale BVAR model:[2]

$$\boldsymbol{Y}_t = \boldsymbol{c} + \boldsymbol{B}(L)\boldsymbol{Y}_{t-1} + \boldsymbol{u}_t \quad (1)$$

where $\boldsymbol{Y}$ is a vector of endogenous variables, $\boldsymbol{c}$ is a vector of constant terms, and $\boldsymbol{u}$ is a vector of residuals $\boldsymbol{u}_t \sim nid(\mathbf{0}, \boldsymbol{\Sigma})$. $\boldsymbol{B}(L)$ is a matrix polynomial in the lag operator L, while t denotes the (quarterly) time frequency and $\boldsymbol{\Sigma}$ is a variance/covariance matrix.

Our BVAR includes macroeconomic, financial, and credit variables. In particular, it incorporates eight endogenous variables: real GDP, HICP (Harmonized Index of Consumer Prices), short and long-term market rates (represented by the €-STR and the 10-year IRS, respectively), NFC lending volumes, interest rates on new loans to NFCs, and indicators of credit demand and supply sourced from the euro area BLS. In particular, with respect to factors affecting credit supply, we include banks' risk perception, whose sharp increase was a characteristic feature of the last

[2] This BVAR is a simplified version of the larger model developed by Conti et al. (2023) for the Italian economy, but augmented by the two "soft" BLS indicators. For the start of the sample we are constrained by the BLS indicators, available since 2002:Q4, while 2023:Q4 is the last quarter (entirely) available at the time of writing. Prior settings are similar to those recommended by Aastveit et al. (2017); for more details, see Appendix B.

tightening cycle and a key driver of lending rates (Bottero and Conti, 2023). On the demand side, we include firms' demand for loans to finance fixed investment, which experienced a deep and persistent decline.[3]

2.2 Design of counterfactual scenarios

We design a series of projection exercises on the dynamics of loans to NFCs in the EA since 2022:Q1, using conditional forecasts. These can be interpreted as counterfactual scenarios that enable us to assess whether the credit dynamics during the current tightening cycle could have been anticipated on the basis of historical regularities.

In practice, each exercise consists of three steps. First, we estimate the BVAR coefficients over the sample 2002:Q4-2021:Q4,[4] just prior to the spike in long-term market interest rates driven by the start of the normalisation process of monetary policy and the raising expectations of imminent policy rate hikes.[5] Second, we assume that only a subset of the variables included in the BVAR model is known for the full sample until 2023:Q4, while the other variables are only observed until 2021:Q4. Third, we compute conditional forecasts for all unobserved variables over the period 2022:Q1-2023:Q4, based on the estimated coefficients (step 1) and the conditioning set (step 2).

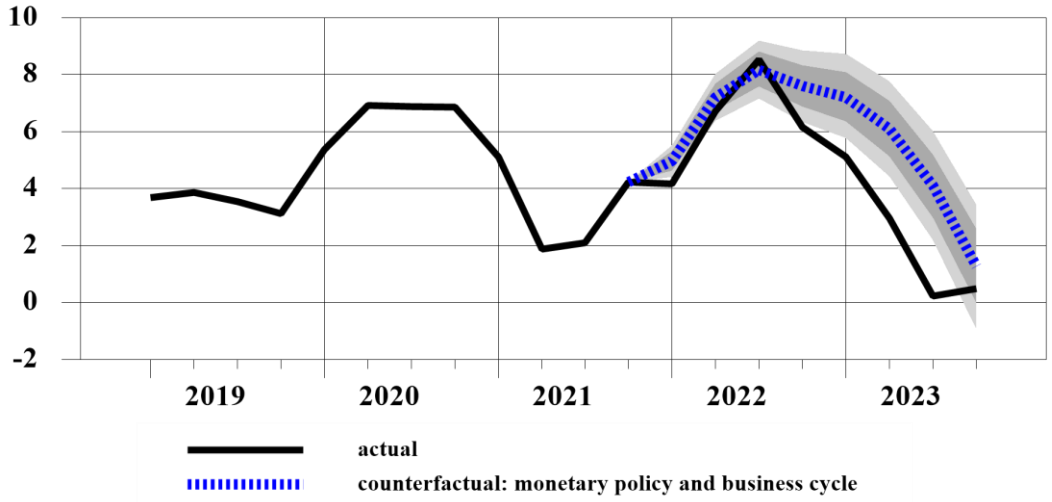
3. Findings

Despite incorporating the actual evolution of interest rates and business cycle variables, the conditional forecasts fail to accurately capture the magnitude and pace of the decline in the annual growth rate of loans to NFCs. In the first exercise, labelled the "baseline" counterfactual, we compute the conditional forecasts including in the conditioning set the observed path of €-STR, 10-year IRS, real GDP and HICP over the period 2022:Q1-2023:Q4 and leaving the remaining variables, i.e. lending volumes and rates and BLS credit demand and supply indicators, to evolve endogenously.[6] The counterfactual NFC lending growth tracks the actual dynamics fairly well until the end of 2022:Q2, when firms intensified their recourse to bank lending as a response to the inflation surge triggered by the adverse energy shock (Figure 2). However, the model is unable to

[3] For more details on the specification see Appendix B.
[4] In order to check for the impact of the pandemic period, in Appendix C we estimate the model until 2019:Q4 and then compute the "baseline" counterfactuals since 2022:Q1. The results are broadly confirmed and are shown in Figures C1-C3.
[5] In December 2021, the ECB announced its decision to discontinue the net asset purchases under the Pandemic Emergency Purchases Programme (PEPP) at the end of March 2022. The PEPP was very effective in stabilizing financial markets and lowering sovereign bond yields (see, among others, Bernardini and Conti, 2023).
[6] Notice that all the main messages here conveyed remain robust when adding the actual evolution of NFCs lending rates to the conditioning set of the "baseline" counterfactual scenario.

replicate the steep decline in loan dynamics which started in the fall of 2022, with a gap between the counterfactual and the actual annual growth rates of about 2.5 percentage points on average until 2023:Q4.

FIGURE 2. ANNUAL GROWTH RATE OF LOANS TO NFCS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY AND BUSINESS CYCLE
(percentage changes)



Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

The conditioning set is also inadequate to reproduce banks' risk perception and firms' demand for loans for fixed investment. In more detail, the observed contribution of higher risk perception to bank supply tightening has been stronger than that implied by historical regularities, at least until 2023:Q1 (Figure 3a). Indeed, the combination of a worsening macroeconomic outlook driven by adverse supply shocks and a swift rise in policy rates implemented by the ECB to prevent a de-anchoring of inflation expectations translated into a faster deterioration of borrowers' creditworthiness in financial intermediaries' assessment (De Cos, 2024).[7] At the same time, the actual contraction in firms' demand for loans to finance fixed investment was also deeper and more persistent than implied by historical regularities, hinting at a stronger than expected interest rate channel as well (Figure 3b).[8] This amplification effect on loan demand in a monetary policy tightening may be related to the unprecedented scale and speed of the interest rate hikes.

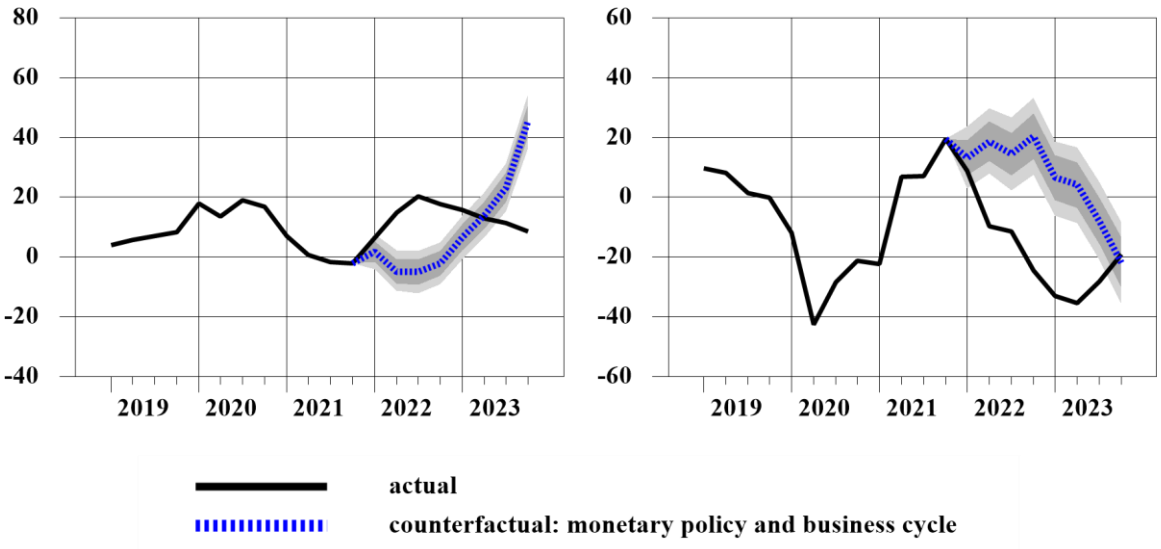
[7] Since 2023:Q2, instead, the realized actual evolution of banks' risk perception is somewhat lower than the counterfactual one, likely reflecting the delayed adjustment of the model. Nevertheless, since it is well known that BLS supply indicator lead loan growth by about 4 quarters (Huennekes and Köhler-Ulbrich, 2022), banks' risk perception will likely weaken loan dynamics in 2024.
[8] Notice that the model does generally a good job in anticipating the evolution of banks' risk perception and firms' demand for loans for fixed investment, notwithstanding the volatile nature of these survey-based indicators (see Figg. A2-A3, where we focus on the Sovereign Debt Crisis and the launch of the APP, respectively).

FIGURE 3. BLS SUPPLY AND DEMAND INDICATORS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY AND BUSINESS CYCLE

(net percentages)

a. Banks' risk perception

b. Firms' demand for loans for fixed investment



Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

Incorporating the observed evolution of banks' risk perception and firms' loan demand for fixed investment into the conditioning set significantly improves the fit of the BVAR conditional forecast to the actual NFC lending growth. Given the inability of the model to replicate the evolution of the BLS demand and supply indicators, we conduct a second counterfactual scenario, labelled "augmented", where we expand the previous conditioning set by adding the actual path of banks' risk perception and firms' demand for loans to finance fixed investment (observed over the period 2022:Q1-2023:Q4). The counterfactual path of NFC lending growth significantly improves, closely tracking the actual one. This suggests that BLS indicators help the model to deal with some amplification mechanisms in the bank lending channel and in the interest rate channel during the 2022-23 tightening cycle (Figure 4a).

Finally, our framework allows us to conclude that the credit supply factor was relatively more important in explaining the excessive weakness of actual NFC bank lending compared to that implied by historical regularities. In a third counterfactual exercise, we add either banks' risk perception or firms' loan demand for fixed investment to the "baseline" conditioning set. The results show that banks' heightened risk perception played a more important role in closing the gap between actual and counterfactual NFC lending growth especially in late 2022, while the contribution from

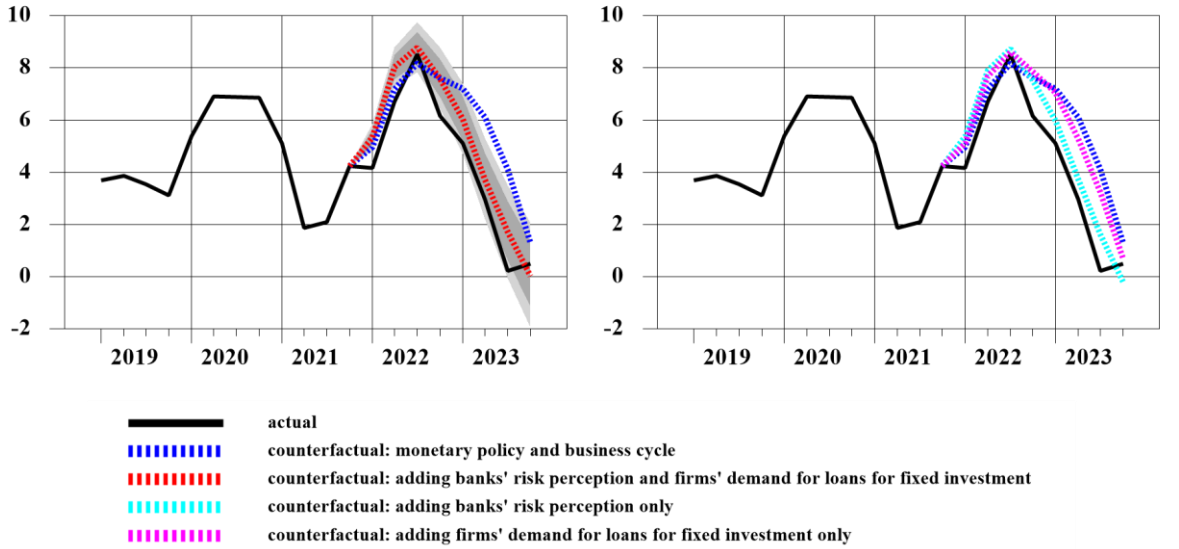
the loan demand factor became increasingly more relevant after 2023:Q3, likely reflecting the usual lags between soft and hard indicators of credit dynamics (Figure 4b).

FIGURE 4. ANNUAL GROWTH RATE OF LOANS TO NFCS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY, BUSINESS CYCLE AND BLS DEMAND AND SUPPLY INDICATORS

(percentage changes)

a. Counterfactual obtained adding jointly BLS demand and supply indicators

b. Counterfactual obtained adding alternatively BLS demand and supply indicators



Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

4. Concluding remarks

This paper provides evidence that during the 2022-23 monetary policy tightening, bank lending to NFCs in the euro area slowed down more than what is implied by historical regularities in a counterfactual scenario based on the actual evolution of interest rates and business cycle variables (typically sufficient to capture loan dynamics appropriately). However, the counterfactual path of NFC lending is significantly closer to the actual one if both firms' demand for credit and, in particular, banks' risk perception are also taken into account in the conditioning set. Therefore, the ECB's unprecedented monetary policy tightening in 2022-23 may have triggered stronger amplification effects on loan dynamics via the bank lending channel than in the past. Given the usual lags with which tighter financing conditions pass-through to the real economy (see, for example, Altavilla et al., 2019), we cannot rule out the possibility that an important part of the effect of the tightening on economic activity and inflation still looms in the pipeline.

Moreover, policy rates are expected to remain in restrictive territory even after the ECB starts cutting them (Panetta, 2024, Bernardini et al., 2024) and will continue to affect corporate debt burden and their economic activity. Should this contribute to the persistence of high banks' risk perception, the evidence presented in this paper suggests that the dynamics of NFCs lending would be affected, dampening the expansionary impulse from lower policy rates.

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Appendix

A Data

Below we list the definition and the source of variables used in the empirical analysis.

TABLE A1. TIME SERIES USED IN THE EMPIRICAL ANALYSIS

Real GDP
Gross domestic product at market prices - euro area 19 (fixed composition) total economy, chain linked volume (rebased), calendar and seasonally adjusted data
Source: Eurostat
Harmonized Index of Consumer Prices (HICP)
HICP - All-items, monthly index, working day and seasonally adjusted
Source: ECB Statistical Data Warehouse
Overnight interest rate
The euro-area short term rate (€-STR) extend before 1st October 2019 using the Euro overnight index average (EONIA), percentage[9]
Source: LSEG
10-year IRS
The 10-year euro interest rate swap, percentage
Source: LSEG
Loans to non-financial corporations
Adjusted loans to non-financial corporations, index of notional stocks, calendar and seasonally adjusted data
Source: ECB Statistical Data Warehouse
Interest rate on new loans to non-financial corporations
The composite cost-of-borrowing for non-financial corporations, percentage
Source: ECB Statistical Data Warehouse
BLS credit supply indicator
Banks' risk perception as a factor contributing to credit standards for new loans to non-financial corporations, net percentages
Source: ECB Statistical Data Warehouse
BLS credit demand indicator
Fixed investment as a factor contributing to demand for loans to non-financial corporations, net percentages
Source: ECB Statistical Data Warehouse

[9] The €-STR is available from 1st October 2019 and is extended backward using the EONIA, the previous overnight benchmark rate for the euro-area money market, and considering a spread of 0.085 percentage points.

B Model specification and prior settings

In the BVAR in equation (1), the estimation is conducted in (log) levels for real GDP, HICP and loans to NFCs, while all the remaining variables are taken in levels. We set the number of lags to 4, which is the minimum to yield uncorrelated residuals.

We estimate the model using a Normal-inverted Wishart prior and posterior. The basic prior on the VAR coefficients has a Minnesota structure. The mean prior is set to one for each variable's own first lag and zero elsewhere, with a diffuse prior for the covariance matrix of the error terms. The overall tightness of the prior is set to 0.45, a slightly higher value compared to the standard used in the literature, as it is found optimal according to a grid search (similarly to Aastveit et al., 2017). This value improves the performance of conditional forecasts – that is, their fit with the realized values – because it also helps to deal with Covid-19 observations, making the prior more diffuse and giving more relevance to sample estimation in the posterior.[10] The prior for the constant is normal with a zero mean and a standard deviation of 1000.

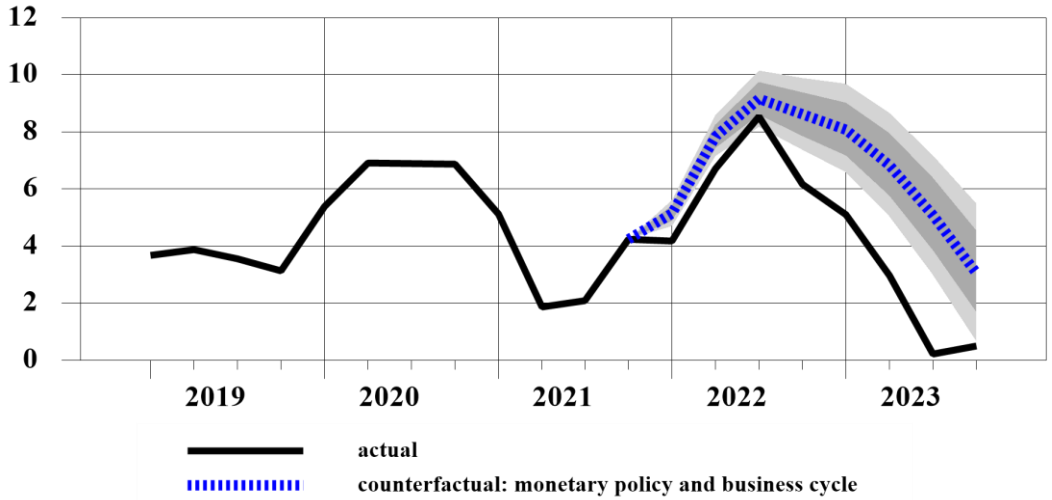
Finally, we also supplement the usual Minnesota prior with the "sum of coefficients" and "dummy initial observation" priors proposed in Doan et al. (1984) and Sims (1993), respectively. In all of our conditional forecasting exercises, we set the hyperparameters governing the tightness on the sum of coefficients prior, and the tightness on the cointegration prior at uninformative values.

[10] The results are confirmed when using a value for overall tightness in the range of 0.35 to 0.45. However, when considering values below 0.35, the persistence of the counterfactual lending dynamics is higher, suffering more from the erratic dynamic correlations observed during the pandemic.

C Robustness and further results

Dealing with Covid-19 exceptional volatility. To verify whether our findings are affected by the exceptional volatility of some observations during the period of Covid-19 pandemic, we repeat our counterfactual exercises estimating the BVAR model until 2019:Q4, instead of 2021:Q4, and then using these coefficients to compute conditional forecasts for the period 2022:Q1-2023:Q4. Results are broadly unaffected (Figures C1-C3).

FIGURE C1. ANNUAL GROWTH RATE OF LOANS TO NFCS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY AND BUSINESS CYCLE, PRE-COVID-19 ESTIMATION SAMPLE
(percentage changes)



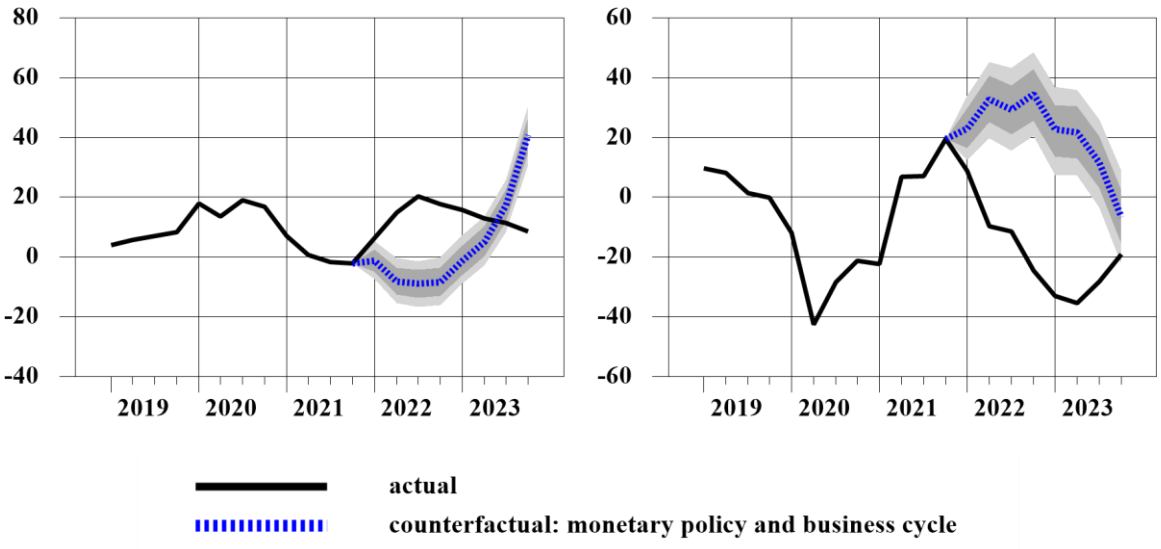
Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

FIGURE C2. BLS SUPPLY AND DEMAND INDICATORS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY AND BUSINESS CYCLE, PRE-COVID-19 ESTIMATION SAMPLE

(net percentages)

a. Banks' risk perception

b. Firms' demand for loans for fixed investment



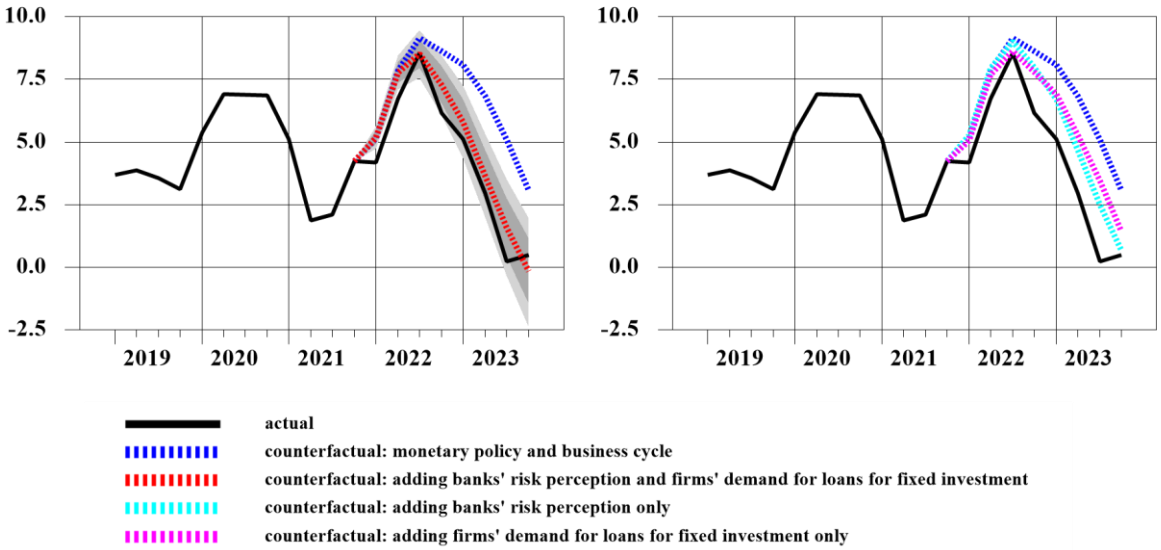
Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

FIGURE C3. ANNUAL GROWTH RATE OF LOANS TO NFCS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY, BUSINESS CYCLE AND BLS DEMAND AND SUPPLY INDICATORS, PRE-COVID-19 ESTIMATION SAMPLE

(percentage changes)

a. Counterfactual obtained adding jointly BLS demand and supply indicators

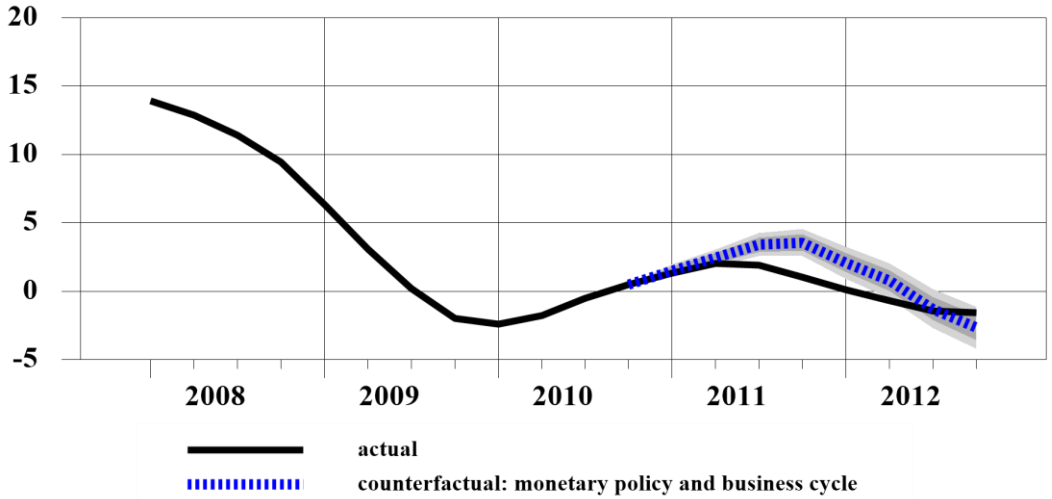
b. Counterfactual obtained adding alternatively BLS demand and supply indicators



Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

Model validation over different periods. We test the ability of our model to correctly predict NFCs loans, banks' risk perception and firms' loan demand for fixed investment over other important periods of weak loan dynamics. In particular, we focus on the Sovereign Debt Crisis and the period immediately following the launch of the Asset Purchases Programme. The results show that our BVAR closely replicates the actual path of lending growth, banks' risk perception and firms' loan demand for fixed investment both in the Sovereign Debt Crisis (Figures C4-C5) and following the launch of the APP (Figures C6-C7). This evidence confirms the increased importance of the bank lending channel in influencing credit dynamics during the 2022-03 tightening cycle, compared with previous episodes of monetary tightening.

FIGURE C4. ANNUAL GROWTH RATE OF LOANS TO NFCS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY AND BUSINESS CYCLE, SOVEREIGN DEBT CRISIS
(percentage changes)



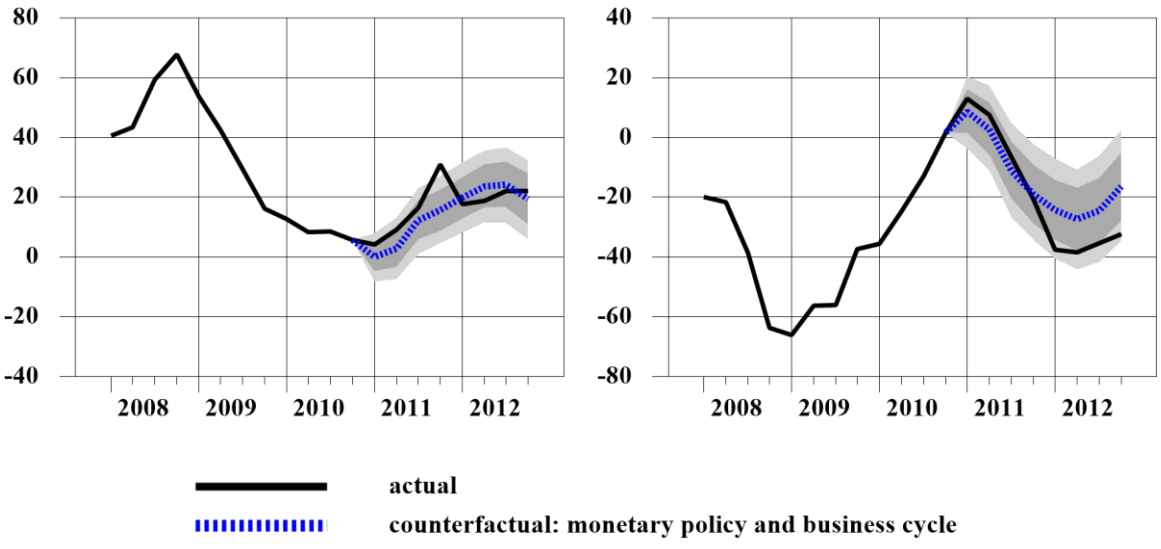
Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

FIGURE C5. BLS SUPPLY AND DEMAND INDICATORS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY AND BUSINESS CYCLE, SOVEREIGN DEBT CRISIS

(net percentages)

a. Banks' risk perception

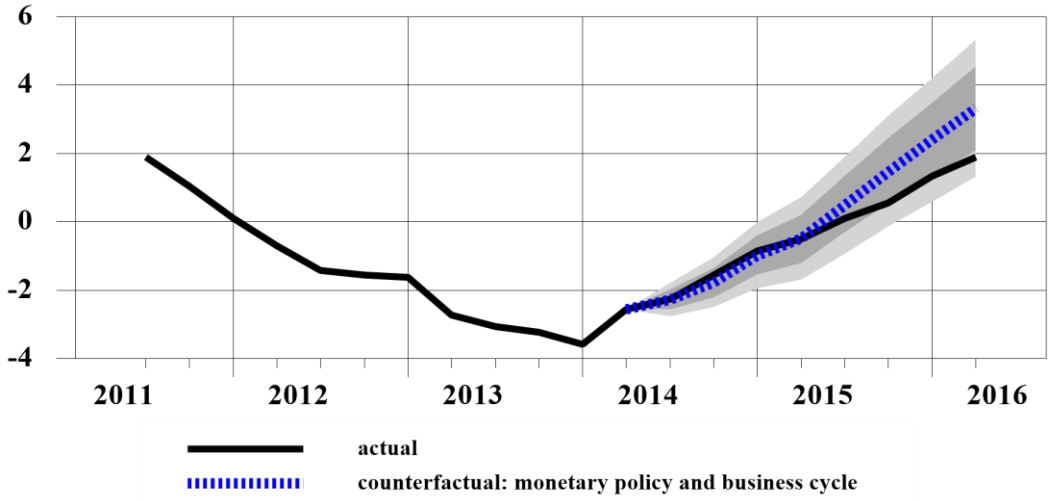
b. Firms' demand for loans for fixed investment



Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

FIGURE C6. ANNUAL GROWTH RATE OF LOANS TO NFCS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY AND BUSINESS CYCLE, LAUNCH OF THE APP

(percentage changes)

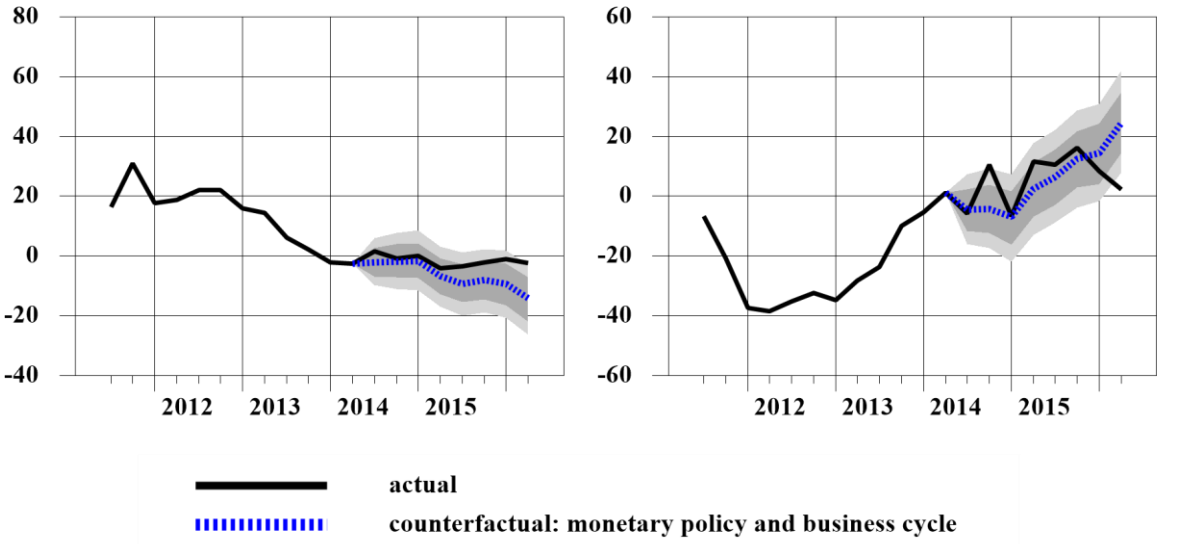


Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.

FIGURE C7. BLS SUPPLY AND DEMAND INDICATORS: ACTUAL AND COUNTERFACTUAL BASED ON MONETARY POLICY AND BUSINESS CYCLE: LAUNCH OF THE APP

(net percentages)

a. Banks' risk perception b. Firms' demand for loans for fixed investment



Source: ECB, Eurostat, LSEG and authors' elaborations.
Notes: the dark (light) grey shaded area is the 68% (90%) credibility interval obtained from the BVAR posterior distribution.