Identifying Credit Supply Shocks: A New Approach and Evidence from the Eurozone

Abstract

This paper proposes a novel approach to identify credit supply shocks using data from the Bank Lending Survey of the Euro Area. By leveraging information on realised and expected changes in lending standards and demand conditions, we construct a measure of unanticipated changes in lending standards for consumer and enterprise loans. This measure captures exogenous and unanticipated variation in credit availability. Utilising the Local Projections method, we estimate the causal effects of unanticipated changes in lending standards on an array of macroeconomic indicators, such as real GDP, inflation, unemployment and trade balance. Our results indicate that both consumer and enterprise credit supply shocks have qualitatively similar effects: an unanticipated easing in lending standards stimulates consumption and real GDP while reducing unemployment. However, while investment expenditures increase following an unexpected easing of enterprise lending standards, no comparable effect is observed for consumer lending. A potential mechanism explaining these findings is that when enterprise lending standards are relaxed, firms gain access to what would have otherwise been idle capital at reduced costs, leading to increased investment, which, through the multiplier effect, boosts consumption and output. In contrast, the lifting of borrowing constraints on consumers drives consumption and GDP, but with limited impact on investment. Our findings thus underscore the importance of bank lending in stimulating investment activity in the bank-dependent Eurozone economy. We document asymmetries in the magnitude of responses, with the majority of macroeconomic variables responding more strongly to unexpected easing of lending standards than tightening.

Key Words: Lending standards, credit supply, household credit, enterprise credit, local projections
JEL Code: E44, E51, G21

1 Introduction

The aftermath of the Great Recession witnessed the emergence of a body of literature analysing the effects of credit expansions (Jordà *et al.*, 2020; Mian *et al.*, 2020; Müller & Verner, 2024). A major challenge confronting this literature lies in empirically disentangling movements in bank credit into shocks to credit supply and credit demand (Bassett *et al.*, 2014; Bernanke & Gertler, 1995). During economic downturns, it can be difficult to determine whether the decline in bank lending stems from reduced credit demand due to fewer investment opportunities or from a lower credit supply resulting from banks' pessimistic economic outlook, leading to higher risk premium and interest rates and stricter assessment of loan applications. Furthermore, economic disturbances affecting credit conditions may have independent effects on real variables. Therefore, estimating the causal effects of changes in credit demand or supply requires identifying 'exogenous' and 'unanticipated' sources of variation in credit conditions.

In this paper, we propose a new measure of credit supply shocks constructed using the Bank Lending Survey (BLS) of the Euro Area. The BLS collects data from a representative sample of banks in the Eurosystem on realised and expected changes in lending standards and loan demand on different lending categories, such as enterprise and consumer loans. We utilise the BLS dataset to construct a measure of unanticipated changes in lending standards that is uncontaminated by credit demand. This identification strategy draws inspiration from recent literature that exploits the difference between realised and anticipated values in macroeconomic variables to identify fiscal policy (Abiad *et al.*, 2016; Auerbach & Gorodnichenko, 2012) and monetary policy shocks (Furceri *et al.*, 2018). Subsequently we analyse the effects of enterprise and consumer credit supply shocks on a range of macroeconomic indicators such as real GDP, consumption, investment, net exports, unemployment and inflation using Local Projections method proposed by Jordà (2005). The advantage of this approach over traditional VAR models more commonly employed in this literature is that local projections do not impose strict restrictions on the dynamics of the system, such as restrictions on the signs and the magnitudes of the responses. Hence, it is a relatively flexible approach with fewer assumptions. Additionally, following Gorodnichenko and Lee (2020), we compute the share of the forecast error variance of all our dependent variables explained by credit supply shocks.

To construct the measure of credit supply shocks, we first calculate the difference between realised and expected changes in lending standards. We recognize that even if changes in lending standards are unanticipated, they may still be driven by shifts in credit demand. For example, a sudden negative shock to loan demand might encourage banks to give loans on more lenient conditions, resulting in the deviation of the realised lending standards from the expected. In the second step, we account for this possibility by purging the unanticipated changes in credit demand from unanticipated changes in credit supply using a fixed effects OLS regression. The residuals obtained from this regression give us a measure of credit supply shocks[1]. These disturbances may result from factors such as banks' internal reassessment of the riskiness of their customers, introduction of new regulatory and supervisory framework, or shifts in banking strategies (Bassett *et al.*, 2014).

In recent years, there has been a resurgence in utilising bank loan surveys to identify credit supply shocks. Within this literature, there are three dominant approaches: (i) identifying credit supply shocks by incorporating lending standards into a recursive VAR model (e.g., Lown and Morgan, 2006), (ii) using sign restrictions (e.g., Choi, 2021), (iii) matching bank-level lending surveys with other bank-level datasets to analyse the effects of credit shocks on credit volumes in individual country studies (e.g., Bassett *et al.*, 2014). Our paper contributes to this literature by identifying credit supply shocks by exploiting the difference between realised and anticipated changes in lending standards – a strategy inspired by recent studies on fiscal and monetary policy shocks. Unlike many other studies in the literature, we differentiate between possible differences in banks' lending strategies for consumer and enterprise loans. Rather than focusing on a single country, we utilise panel data for 10 Eurozone countries. Additionally, we analyse whether lending shocks have asymmetric effects, i.e., whether easing and tightening of lending standards generate different results in terms of the sign and the size of the responses.

In contrast to some recent studies that highlight distinct macroeconomic effects of household and firm credit

[1]Throughout the paper, we use credit supply shocks and unanticipated changes in lending standards interchangeably.

expansions (e.g., Müller and Verner, 2024), our key findings suggest largely similar qualitative responses to unexpected changes in consumer and enterprise lending standards. Unanticipated easing of lending standards in both categories results in higher consumption, imports, and real GDP, while reducing unemployment. However, we do observe a difference in investment behaviour. While investment expenditures increase following an unexpected easing of enterprise lending standards, no similar response is seen with consumer credit supply shocks. Furthermore, we find that credit supply shocks for enterprise loans operate through both lower interest rates and increased lending volume, whereas for consumer loans, only the latter mechanism is statistically significant.

We interpret these results as follows. When enterprise lending standards are relaxed, firms gain access to what would have otherwise remained idle capital at reduced costs, leading to increased investment. Subsequently, through the multiplier effect, consumption and output also rise. In the case of consumer credit, an unexpected easing of standards alleviates borrowing constraints that previously limited consumers. This allows individuals to access larger amounts of consumer credit, resulting in a boost in consumption, which in turn drives up GDP. However, the accelerator mechanism is not strong enough to produce a statistically significant impact on investment. From a policy perspective, our findings suggest that addressing the Eurozone's investment shortfall requires focusing on accommodative lending standards for enterprises.

Moreover, we find that easing and tightening of lending standards generate qualitatively symmetric macroeconomic responses. While an easing of lending standards leads to a typical expansion in the form of higher consumption, investment, GDP and fall in the unemployment rate, tightening generates corresponding recessionary outcomes. However, quantitatively, most macroeconomic variables exhibit stronger responses to credit easing than to tightening. Finally, our analysis shows that unanticipated changes in lending standards explains a relatively modest portion of the variation in our endogenous variables, with explained variation in forecast error peaking at 6.77%. We conduct several robustness tests, accounting for factors such as the Global Financial Crisis, the COVID-19 pandemic, and economic uncertainty. Additionally, we examine alternative measures of lending standards and credit demand, and assess the robustness of our findings with respect to outliers and country exclusions. Our results remain robust across all specifications.

The remainder of our paper is organised as follows. Section 2 discusses the related literature and explains our contributions. Section 3 describes the data and our identification strategy. Section 4 explains our empirical strategy. Section 5 describes the results. Finally, section 6 concludes.

2 Related Literature

This paper relates to three strands of literature, summarised in Table 1. First, it builds on the literature that analyses the diverse impacts of household and firm credit expansions on macroeconomic outcomes. Within this literature, a prevalent approach run cross-country regressions to assess the impact of bank lending to different borrowers on a range of macroeconomic indicators (Beck *et al.*, 2012; Büyükkarabacak & Krause, 2009; Mian *et al.*, 2017, 2020; Müller & Verner, 2024). Typically, the findings from this literature point to positive effects associated with firm credit, whereas expansions in household credit tend to be linked with unfavourable macroeconomic dynamics. For instance, shocks to household debt generate a boom-bust cycles whereby growth increase for two to three years, followed by a significant decline. Importantly, this

pattern is confined to household credit as expansions in firm credit do not generate similar outcomes. Other findings indicate that household credit booms are linked with a shift towards nontradable sector output and employment, real exchange rate appreciations, and a deterioration in trade balance. This paper contributes to this literature by proposing a novel measure of enterprise and consumer credit supply shocks that relies on bank lending surveys.

Second, this paper is closely related to the literature that uses data from bank loan surveys. Lown and Morgan (2006), a seminal study in this literature, investigates how changes in lending standards, as reported by the Federal Reserve's Senior Loan Officers Surveys (SLOOS) correlate with subsequent fluctuations in loan volumes, spending, and inventory investment in a recursive VAR model. The authors report that tighter lending standards has a significantly negative impact on GDP.

Lown and Morgan note that tighter standards do not necessarily represent a contraction of bank loan supply. They could, for instance, signal a negative disturbance to the economic activity that reduces the demand for loans when banks tighten their standards. The authors follow two strategies to address this concern. First, they rely on a Cholesky decomposition to identify the component of the changes in lending standards that is orthogonal to other determinants of loan supply and demand. Second, they include proxies for loan demand into their VAR specifications. In this paper, we propose an alternative approach that relies on a richer set of information on realised and expected changes in lending standards contained in lending surveys.

In a later study, Bassett *et al.* (2014) refine Lown and Morgan's analysis by removing the components associated with credit demand from the fluctuations in lending standards. This is done by decomposing the changes in lending standards into a component that has been purged of the bank-specific and macroeconomic factors that, in addition to affecting banks' credit policies, also have a simultaneous effect on credit demand. Similar to Lown and Morgan, the authors then include this measure into a recursive VAR model, with results indicating that negative shocks to credit supply are associated with substantial declines in output and the capacity of households and businesses to borrow from the banking sector. Del Giovane *et al.* (2011), Van der Veer and Hoeberichts (2016), and Altavilla *et al.* (2020) similarly use bank-level survey data to identify credit supply shocks. Given the bank-level responses to BLS is not publicly available, our strategy relies on isolating the demand effects using aggregate level data[2].

While many studies incorporate lending survey data into recursive VAR models, Choi (2021) disentangles the demand and supply factors in bank lending using a Bayesian sign-restriction VAR model. Using the Korean bank lending survey, Choi finds that an adverse credit supply shock has a substantial negative effect on output, while a negative loan demand shock does not have any recessionary effects. Other studies use bank loan surveys for different objectives such as identifying the international bank lending channel of monetary policy (Filardo & Siklos, 2020). Ciccarelli *et al.* (2015) use the SLOOS and the BLS to identify the credit supply and credit demand channels of monetary policy.

The final body of literature this paper relates to exploit the difference between realised and expected values of macroeconomic variables to identify shocks. Auerbach and Gorodnichenko (2012) and Abiad *et al.* (2016)

[2]Although having access to micro-level data could enable us purging bank-specific factors that may affect credit demand, as noted by Choi (2021), it would not necessarily be a better approach in estimating the macroeconomic effects of these shocks, which is our main interest in this study.

construct a measure of unanticipated changes in fiscal policy and public investment. Furceri *et al.* (2018) follows a similar strategy to identify monetary policy shocks. In this paper, we will adapt their strategy to identify credit supply shocks.

Table 1: Summary of the key empirical papers in the literature

Paper	**Data**	**Empirical Strategy**	**Key Contribution & Results**
Lown and Morgan (2006)	US FED Senior Loan Officers Survey	VAR Cholesky decomposition	The first study to use bank loan survey data to identify credit shocks in the US. It does not distinguish between credit demand and supply. A negative shock to lending standards has a negative impact on GDP.
Bassett *et al.* (2014)	FED SLOOS	VAR Cholesky decomposition	Constructs a new measure of credit supply indicator, which adjust changes in lending standards to macroeconomic and bank -specific factors affecting loan demand. Tightening of lending standards causes a decline in output and the capacity of economic agents to borrow from banks, increase in credit spreads, and easing of monetary policy.
Ciccarelli *et al.* (2015)	SLOOS and the Euro Area Bank Lending Survey (BLS)	VAR Cholesky decomposition	Exploits information on the factors affecting banks' lending standards to identify different monetary policy transmission channels.
Choi (2021)	Korean Bank Loan Officer Survey + 12 other countries	VAR model with sign restrictions	Incorporates bank lending survey data into a VAR model with sign restrictions. The key idea is that the lending rate does not fully reflect the credit market conditions in the bank-based economies.
Del Giovane *et al.* (2011)	BLS data on Italy & micro-data on loans for participating Italian banks	Panel Fixed Effects	It combines BLS survey data on factors behind changes in lending standards with bank-level data on loans from Italy.
Filardo and Siklos (2020)	Panel of 16 countries	Global VAR	Expansionary monetary policy result in lower credit standards.
Mian *et al.* (2017)	Panel of 30 countries	IV Regression Recursive VAR Local Projections	Analyses the macroeconomic effects of credit expansion by distinguishing between 'credit demand' and 'credit supply' channels. Household credit expansions operate primarily through boosting household demand rather than boosting productivity.
Ricci *et al.* (2023)	Regional data from Italy	Local Projections	Tightening of firm lending standards reduce firm credit growth, especially for credit lines.

3 Data

The dataset comprises of 10 Eurozone countries[3]. The data used to construct credit supply shock proxies is obtained from the Euro Area's Bank Lending Survey (BLS). The choice of countries and the sample period (2003Q1-2023Q2) is informed by data availability.

[3]Austria, Spain, Finland, Greece, Ireland, Italy, Lithuania, Latvia, Portugal, and Slovenia.

The BLS reports quarterly data on realized and expected changes in lending standards and loan demand. The data is collected from a representative sample of banks in each country by the national central banks of the Eurosystem (see Ciccarelli *et al.*, 2015 and Berg *et al.*, 2005 for further details on the survey setup). The survey contains 23 questions. For this study, we concentrate on two sets of questions, summarised in Table B1, one concerning lending standards and the other concerning loan demand.

The first set of questions examines whether the banks have changed (over the past three months) and expected to change (over the next three months) their credit standards on different loan categories. These questions are phrased as follows:

> "Over the past three months, how have your bank's credit standards as applied to the approval of loans or credit lines to [enterprises or loans to households] changed? Please note that we are asking about the change in credit standards, rather than about their level."
>
> "Please indicate how you expect your bank's credit standards as applied to the approval of loans or credit lines to [enterprises or households] to change over the next three months. Please note that we are asking about the change in credit standards, rather than about their level."

The second set of questions concerns realized and expected loan demand. A prototypical question is phrased as follows:

> "Over the past three months (apart from normal seasonal fluctuations), how has the demand for loans or credit lines to [enterprises or households] changed at your bank? Please refer to the financing need of enterprises independent of whether this need will result in a loan or not."
>
> "Please indicate how you expect demand for loans to [enterprises or households] to change over the next three months at your bank (apart from normal seasonal fluctuations). Please refer to the financing need of households independent of whether this need will result in a loan or not."

The questions are answered by senior loan officers, such as the chairperson of the banks' credit committees (Ciccarelli *et al.*, 2015). There are two main lending categories in the survey: enterprise loans and household loans. Enterprise loans are further disaggregated by the size of the enterprise (SMEs and large) and by the duration of the loan (short and long term). The questions on household loans, on the other hand, are reported only at the disaggregated level for "loans for house purchase" and "consumer credit and other lending." In this paper, we focus only on the overall enterprise and consumer loans.

In answering the questions on lending standards, the officers can choose one of the following options: "tightened considerably", "tightened somewhat", "remained basically unchanged", "eased somewhat", and "eased considerably". These qualitative responses are then quantified into diffusion indices and net percentages by the BLS.

The diffusion index reflects "the difference between the *weighted* sum of the percentages of banks responding "tightened considerably" and "tightened somewhat", and the *weighted* sum of the percentage of banks responding "eased considerably" and "eased somewhat". The net percentage, on the other hand, indicates "the difference between the sum of the percentages of banks responding "tightened considerably" and "tightened somewhat" and the sum of the percentages of banks responding "eased considerably" and "eased somewhat".

Given that net percentages do not make any distinction between the degree of tightening or easing of standards, we use diffusion indices that assign different weights. However, we acknowledge that any choice of weights involves a degree of arbitrariness. Therefore, we test the robustness of our key results to using net percentages (See Figure A5).

Given the above definitions, in the BLS dataset, a positive value indicates a net tightening of lending standards. In this paper, we reversed the sign so that a positive value indicates net easing. Algebraically, changes in lending standards can be represented by:

$$\text{SR}_\rho = \left(w_C \cdot P_{EC_\rho} + w_S \cdot P_{ES_\rho}\right) - \left(w_C \cdot P_{TC_\rho} + w_S \cdot P_{TS_\rho}\right) \tag{1}$$

Similarly, expected changes in lending standards are given by:

$$\text{SE}_\rho = \left(w_C \cdot P^E_{EC_\rho} + w_S \cdot P^E_{ES_\rho}\right) - \left(w_C \cdot P^E_{TC_\rho} + w_S \cdot P^E_{TS_\rho}\right) \tag{2}$$

Realised and expected changes in loan demand are defined as:

$$\text{DR}_\rho = \left(w_C \cdot P_{IC_\rho} + w_S \cdot P_{IS_\rho}\right) - \left(w_C \cdot P_{DC_\rho} + w_S \cdot P_{DS_\rho}\right) \tag{3}$$

$$\text{DE}_\rho = \left(w_C \cdot P^E_{IC_\rho} + w_S \cdot P^E_{IS_\rho}\right) - \left(w_C \cdot P^E_{DC_\rho} + w_S \cdot P^E_{DS_\rho}\right) \tag{4}$$

where P, EC, ES, TC, TS, IC, IS, DC, and DS stand for percentage, eased considerably, eased somewhat, tightened considerably, tightened somewhat, increased considerably, increased somewhat, decreased considerably, and decreased somewhat respectively. The subscript ρ indicates loan type, with E for enterprise loans and C for consumer loans. The diffusion index assigns weights based on the intensity of the response, with lenders who answered "considerably" receiving double the weight ($w_C = 1$) compared to those who answered "somewhat" ($w_S = 0.5$). In the case of net percentages, both weights are equal to one.

3.1 Constructing Credit Supply Shocks

To construct our credit supply shock measures, we first calculate the difference between realised and expected changes in lending standards. We refer to this variable as *unadjusted and unanticipated changes in lending standards* (UUCLS). We calculate the UUCLS at time t by subtracting the one-period lag of expected changes in lending standards from the one period lead of realised standards (Equation 5)[4].

A $UUCLS$ of 20 indicates that 20 percent of banks have relaxed their lending standards more than they had anticipated.

[4]This is because in bank lending surveys, the information on realised standards (or loan demand) at time t is stored in the data entry for t+1, whereas the information on expected standards comes from the data entry from t-1.

$$\text{UUCLS}_{\rho,t} = \text{SR}_{\rho,t+1} - \text{SE}_{\rho,t-1} \tag{5}$$

Unadjusted and unanticipated changes in credit demand (UUCCD) are estimated similarly:

$$\text{UUCCD}_{\rho,t} = \text{DR}_{\rho,t+1} - \text{DE}_{\rho,t-1} \tag{6}$$

While *UUCLS* stands out as a possible candidate to capture credit supply shocks, we recognise the possibility that this measure could still reflect the confluence of demand and supply factors. For example, banks might decide to grant loans on easier terms and conditions following an unexpected negative shock to loan demand. If this is the case, we might mistakenly interpret the fluctuations in *UUCLS* as resulting from supply-side changes, such as changes in the regulatory environment or industry strategies, whereas what is driving these fluctuations is a sudden change in loan demand. To address this concern, we use a fixed-effects model to remove the portions in the fluctuations in the *UUCLS* that are associated with unexpected and unadjusted changes in loan demand, given by *UUCCD*. Formally, we estimate the following regression equation[5]:

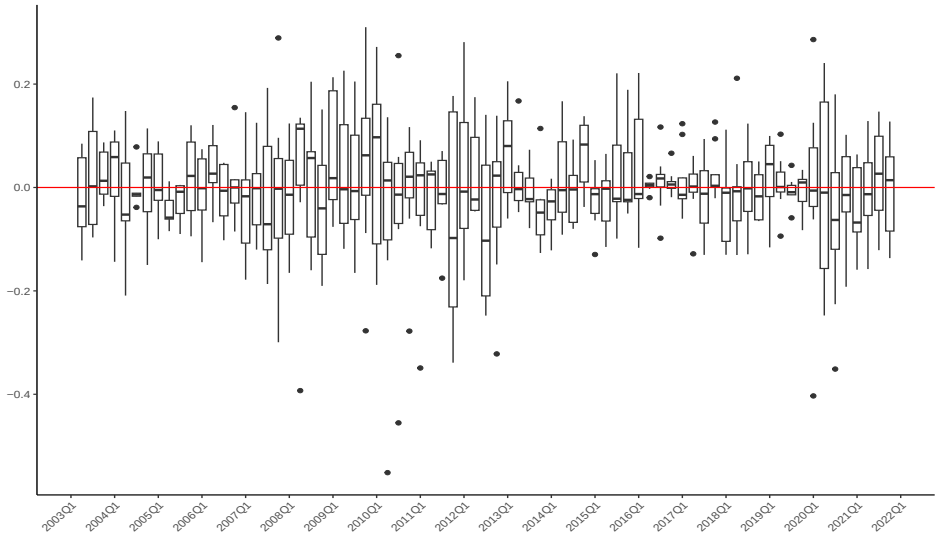
$$\text{UUCLS}_{\rho,t,i} = \text{UUCCD}_{\rho,t,i} + \alpha_i + f_t + e_{\rho,t,i} \tag{7}$$

where ρ, t, α_i, f_t and e denote lending category, time, country fixed-effects, time fixed-effects and error-term, respectively. The residuals from this regression capture exogenous credit supply shocks for different lending categories ρ that are orthogonal, by construction, to unexpected changes in credit demand. In other words, the unadjusted and unanticipated changes in lending standards are purged of the demand related factors. We denote this measure by *UCLS* (i.e., dropping the term unadjusted from *UUCLS*). A positive value of 10% in unanticipated changes in lending standards would indicate that, having controlled for unexpected changes in credit demand, 10 per cent of the banks have eased their lending standards more than they had anticipated.

In Figure 1 and Figure 2, we depict the cross-country distribution of unanticipated changes in enterprise and consumer lending standards using box plots. Over the sample period, the boxes in each figure contain both positive and negative values, indicating a substantial asynchronicity in the shocks across countries, especially for enterprise credit. We also observe an increase in the height of the boxes during crises periods (e.g., GFC, the Eurozone crisis, the Covid Pandemic). This suggests a higher degree of heterogeneity in the magnitude of the shocks during crises periods and is consistent with the findings of Hristov *et al.* (2012).

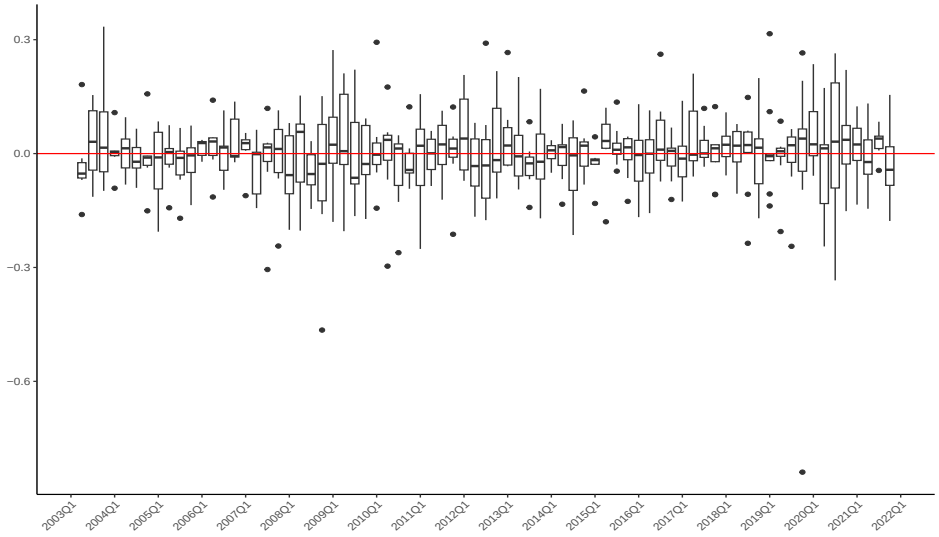
[5]The results of this regression are presented in Table B3.

Figure 1: Cross country distribution of unanticipated changes in enterprise lending standards



Note: The figure shows the cross-country distribution of unanticipated changes in enterprise lending standards. On each box, the black horizontal line indicates the median and the edges of the box indicate the 25 and 75 percentiles. The whiskers show the extreme data points not considered as outliers. Outliers are given by the black dots.

Figure 2: Cross country distribution of unanticipated changes in consumer lending standards



Note: The figure shows the cross-country distribution of unanticipated changes in consumer lending standards. On each box, the black horizontal line indicates the median and the edges of the box indicate the 25 and 75 percentiles. The whiskers show the extreme data points not considered as outliers. Outliers are given by the black dots.

3.2 Other Variables

Other data used in the analysis are real GDP, consumption, gross fixed capital formation (GFCF), exports, imports, trade balance to GDP, unemployment rate, GDP deflator, loan volume, loan rates, and policy rate. Following Ciccarelli *et al.* (2015), we use EONIA, the average of overnight rates for unsecured interbank lending, as the policy rate for the Euro area. It is argued that the EONIA reflects the monetary policy stance of the ECB better than the official main refinancing rate given that the bank implemented various unconventional measures in its liquidity management during the crisis (Hristov *et al.*, 2012). These series are taken from EUROSTAT and ECB. Variable definitions are provided in Table 2. Summary Statistics are provided in Table 3.

Table 2: Variable Definitions

Variable name	**Explanation**	**Source**
UCLS	Unanticipated changes in lending standards, our calculations	BLS
UCLD	Unanticipated changes in loan demand, our calculations	BLS
Real GDP	Gross domestic product at market prices (in logs). Seasonally and calendar adjusted. Chain linked volumes, million euro, 2010=100	Eurostat
GDP deflator	GDP deflator (in logs). Seasonally and calendar adjusted, 2010=100.	Eurostat
Consumption	Final consumption expenditures of households (in logs). Seasonally and calendar adjusted. Chain linked volumes, million euro, 2010=100	Eurostat
GFCF	Gross fixed capital formation (in logs). Seasonally and calendar adjusted. Chain linked volumes, million euro, 2010=100	Eurostat
Exports	Exports of goods and services (in logs). Seasonally and calendar adjusted. Chain linked volumes, million euro, 2010=100	Eurostat
Imports	Imports of goods and services (in logs). Seasonally and calendar adjusted. Chain linked volumes, million euro, 2010=100	Eurostat
Net Exports to GDP	(Exports - Imports) / Real GDP, our calculations	Eurostat
Unemployment rate	Unemployment rate (15-74 years old). Seasonally adjusted but not calendar adjusted. Percentage of population in the labour force.	Eurostat
Policy Rate	The average of overnight rates for unsecured interbank lending (EONIA)	ECB
NFC loan volume	Non-Financial Corporations (NFC) credit volume (in logs). Outstanding amount of loans from monetary financial institutions (excl. ESCB) to NFC. Million euro. Averaged from monthly data.	ECB
Consumer loan volume	Consumer credit volume (in logs). Outstanding amount of loans from monetary financial institutions (excl. ESCB) to households (all maturity). Million euro. Averaged from monthly data.	ECB
NFC loan rate	Interest rates on loans to corporations (outstanding amounts). Averaged from monthly data.	ECB
Consumer loan rate	Interest rates on loans to households (outstanding amounts). Averaged from monthly data.	ECB

4 Empirical Strategy

To estimate the impact of credit supply shocks on our set of key macroeconomic variables, we estimate impulse response functions using the Local Projections method (Jordà, 2005). Local projections have three key advantages over the traditional VAR models that are more commonly employed in this literature. First, local projections do not impose any restrictions on the dynamics of the variables in the system (Alpanda & Zubairy, 2019). As a result, impulse responses obtained from local projections are argued to be more robust to model misspecification than traditional VAR models. As Musso *et al.* (2011) notes, although there is greater consensus in the literature on how to identify monetary policy shocks, it is more challenging to come up with restrictions for identifying credit supply shocks. Therefore, using an estimation strategy that is light

Table 3: Summary Statistics

Variable	Observations	Mean	Std Dev	Min	Max
UCLS_E	644	−0.002	0.10	−0.55	0.31
UCLS_C	644	−0.001	0.11	−0.84	0.33
UCLD_E	644	0.0005	0.17	−0.77	0.61
UCLS_C	644	−0.001	0.16	−0.73	0.64
Real GDP	644	4.67	0.14	4.39	5.39
GDP deflator	644	4.66	0.10	4.32	5.02
Consumption	644	10.07	1.44	7.57	12.42
GFCF	644	9.17	1.45	5.91	11.45
Exports	644	10.04	1.16	7.72	11.84
Imports	644	10.01	1.13	7.78	11.84
Net Exports to GDP	644	0.03	0.09	−0.40	0.54
Unemployment rate	644	9.12	4.34	3.70	26.30
Policy rate	644	0.62	1.35	−0.49	4.25
NFC loan volume	644	10.98	1.48	8.40	13.52
Consumer loan volume	644	11.24	1.60	8.50	13.68
NFC loan rate	644	3.26	1.42	1.03	7.00
Consumer loan rate	644	7.27	2.93	2.13	19.20

on restrictions and hence let the data to "speak for itself" is preferable (*ibid.*). Secondly, in VAR estimations, misspecification errors are compounded with the forecast horizon given that VAR estimations extrapolate the parameters into future horizons. Local projections overcome this weakness by estimating parameters sequentially at each point of interest (Adämmer, 2019). Finally, Local Projections utilises a greater number of observations to calculate the IRFs only for the dependent variable of interest, which enhances the stability and precision of the estimates (Abiad *et al.*, 2016).

For each future period h, we estimate the following equation using quarterly data:

$$y_{i,t+h} - y_{i,t-1} = \beta^h \text{UCLS}_{i,t} + \theta^h X_h + \alpha_i^h + \epsilon_{i,t+h}^h \tag{8}$$

where y is the dependent variable, $UCLS$ is unanticipated changes in lending standards for either of the two different lending categories (enterprise or consumer lending), X is a vector of control variables, consisting of the lagged values of the dependent variable, the shock variable, real GDP and policy interest rate in first differences for four periods, and α_i is country fixed effects. h, i, t, and ϵ denote forecast horizon, country, time, and error-term, respectively. The impulse response graphs represent the sequence of all estimated β's. We use Driscoll-Kraay robust standard errors (Driscoll & Kraay, 1998).

The dependent variable y is given either by real GDP, consumption, GFCF, exports, imports, net exports to GDP, unemployment rate, or GDP deflator. Real GDP, consumption, and GFCF are in natural logs. For these variables, $(y_{i,t+h} - y_{i,t-1}) \times 100$ indicate the cumulative change in that variable from base year, $t-1$ up to year $t+h$ in percent. Net exports to GDP and unemployment rate are ratios.

5 Results

Figure 3 shows impulse responses to an unexpected change in lending standards for enterprise credit. Dark and light blue dashed lines represent the 68% and 90% confidence intervals. An unanticipated relaxation

of enterprise lending standards has a positive, long-lasting and statistically significant impact on real GDP, consumption, GFCF, imports and inflation. The effects on net exports and the unemployment rate are negative, while the response of exports lacks statistical significance.

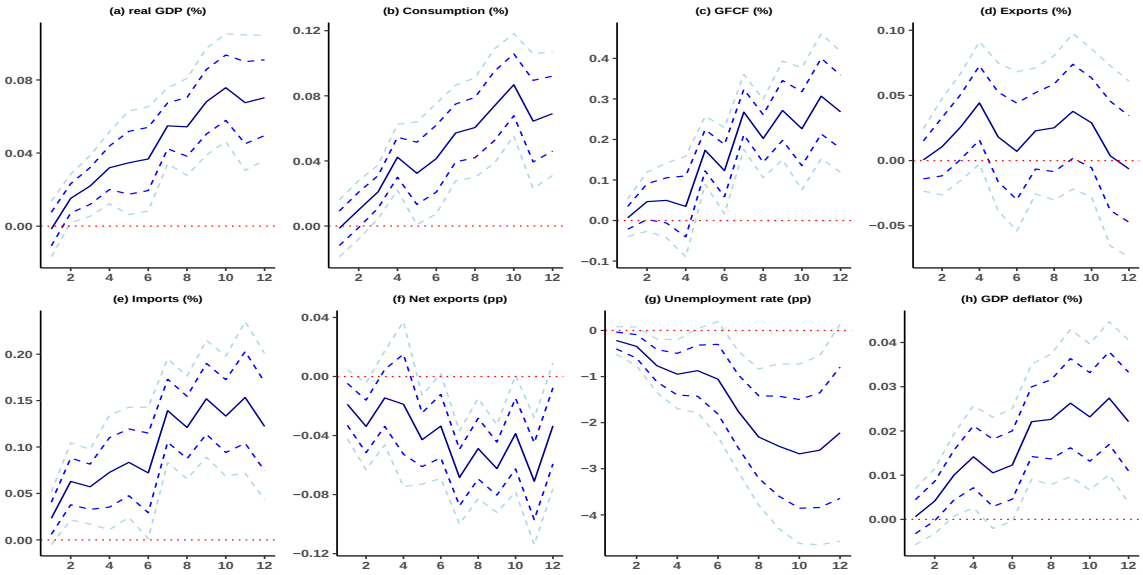
Our findings indicate that real GDP increases by 7% three years after an unanticipated shock to enterprise lending standards (panel a). Similarly, the level of consumption (panel b) rises by 6% during the same period. The effect on GFCF (panel c) is likewise positive; and as expected, the magnitude is larger compared to consumption, with approximately 30% cumulative increase three years post shock. A potential mechanism underlying these results is that an easing of enterprise lending standards releases funds that would have otherwise remained idle, thereby financing firms' investment projects, potentially at a lower cost. As a result, the relaxation of standards results in higher investment and GDP, which in turn increases consumption through the multiplier effect.

These findings are of particular importance for the Eurozone, where persistently subdued investment levels since the European Sovereign Debt Crisis have posed a significant challenge to economic recovery (Barkbu *et al.*, 2015; Nasir, 2022). Survey evidence suggests that high cost of capital and limited access to funding have constrained investment, particularly among smaller firms, in certain euro countries. The importance of lending conditions on investment is amplified by the Eurozone's predominantly bank-based financial system, where banks account for approximately 90 percent of debt financing, compared to just 51 percent in the US (Fernández Fernández, 2024). This high dependence on bank financing makes changes in lending standards and capital costs particularly consequential for both investment performance and the transmission of monetary policy through the bank-lending channel (Jimborean, 2009). Our findings thus underscore the critical importance of lending conditions in stimulating investment in the bank-dependent Eurozone economy.

The response of exports is positive but lacks statistical significance (panel d). In contrast, imports show a positive and significant response, stabilising at around 12% after seven quarters (panel e). Consistent with these findings, the effect on net exports is negative (panel f); however, the magnitude is relatively small, reflecting an approximate decline of 0.04 percentage points three years after the shock. The unemployment rate falls by a total of 2.2 percentage points three years after an unexpected easing of enterprise lending standards (panel g). Finally, panel h shows that an unexpected changes in lending standards causes an extra 2% cumulative inflation three years after the shock.

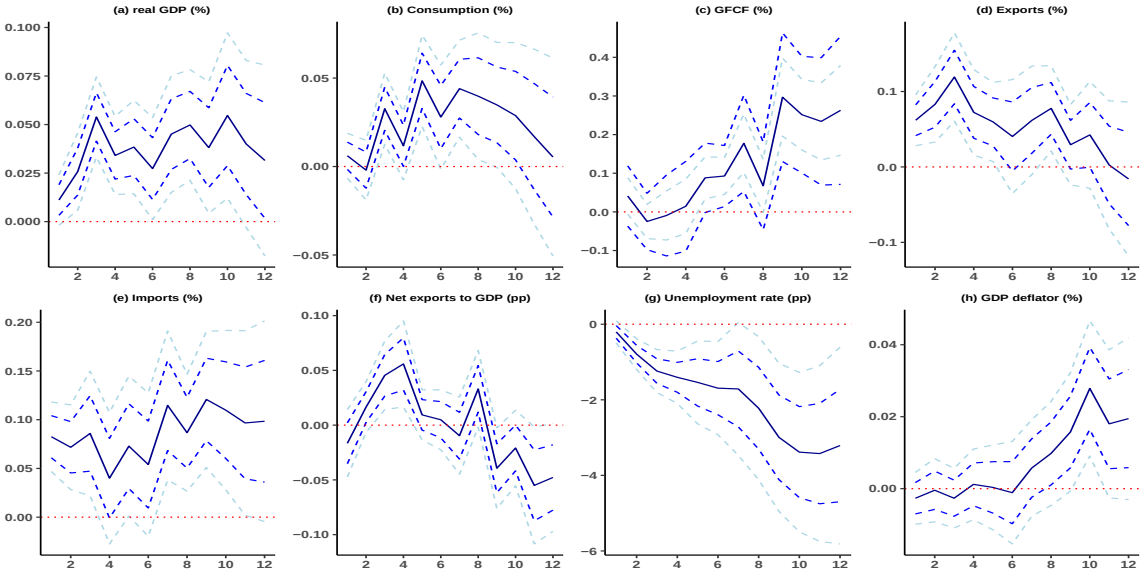
To assess the economic significance of our results, we scale them to one-standard-deviation so that they have an order of magnitude related to the unexpected changes in lending standards. The results, reported in Figure A1, suggest that a one-standard-deviation shock to $UCLS\_E$ is associated with increases of 0.73 percent in real GDP, 0.72 percent in consumption, and 2.81 percent in GFCF. Imports increase by 1.28 percent, the unemployment rate falls by 13.25 percentage points, and the GDP deflator rises by 0.23 percent cumulatively in the three years following a one standard deviation shock to $UCLS\_E$.

Figure 3: Impulse responses to an unanticipated change in enterprise lending standards



Note: The figures plot the estimate of β's from Equation 8 for unanticipated changes in enterprise lending standards. Dark and light blue dashed lines indicate 68% and 90% confidence intervals respectively. All estimates control for country fixed effects, lagged values of the dependent variable, the shock variable, real GDP and policy interest rate (in first differences) for four periods. Driscoll-Kraay robust standard errors are used. Standard errors are clustered at the country level.

Figure 4: Impulse responses to an unanticipated change in consumer lending standards



Note: The figure plots the estimate of β's from Equation 8 for unanticipated changes in consumer lending standards. Dark and light blue dashed lines indicate 68% and 90% confidence intervals respectively. All estimates control for country and year fixed effects, lagged values of the dependent variable, the shock variable, real GDP and policy interest rate (in first differences) for four periods. Standard errors are clustered at the country level.

Figure 4 presents the results for consumer credit. An unanticipated relaxation of consumer lending standards has a positive and statistically significant impact on real GDP, consumption, exports, and imports. There is a negative and long-lasting effect on unemployment rate. The impact on the GFCF and inflation lacks statistical significance for most periods.

An unexpected easing of consumer lending standards increases real GDP by approximately 3% over three years (panel a), while consumption rises by 2% after two quarters, peaking at 3% in five quarters (panel b). Interestingly, the response of consumption to a consumer credit supply shock is smaller compared to enterprise credit shocks, which can potentially be related to the fact that both lending volumes and interest rates respond to enterprise credit supply shocks whereas shocks to consumer credit affect only the lending volume (See Figure 5). The impact on GFCF lacks statistical significance for most time periods (panel c). The mechanism behind these results likely stems from lifted borrowing constraints. Eased lending standards allow consumers to access more credit, boosting consumption and GDP. However, the accelerator mechanism is not strong enough to generate a statistically significant positive impact on capital formation.

Both exports and imports show positive effects. The impact on exports dissipates after six quarters (panel d), while imports increase by 9% three years post-shock (panel e). Consequently, net exports experience a short-lived, lagged positive effect, with the net exports to GDP ratio rising by 5 percentage points after four quarters (panel f). There is a negative and long-lasting impact on the unemployment rate (panel g), similar in trend and magnitude to that of the enterprise lending standards shock. The effect on GDP deflator (panel h) lacks statistical significance.

Most of our key findings align qualitatively with those reported in other studies. Consistent with Hristov *et al.* (2012), Bassett *et al.* (2014), and Lown and Morgan (2006), we observe an increase in real GDP following an unexpected easing of credit conditions[6]. Our findings on the price level corroborate those of Hristov *et al.* (2012), while our results for consumption, investment, and unemployment are in line with Ricci *et al.* (2023). Studies utilising loan tendency surveys to identify credit shocks do not address external imbalances and differentiate between shocks to consumer and enterprise lending standards, which makes direct comparisons of our results in this area challenging.

One strand of literature suggests that expansions in household versus firm lending may have distinct macroeconomic implications. Theoretically, credit expansions could enhance an economy's productive capacity by increasing the ability of previously credit constrained firms to borrow and grow. They may also increase overall consumer demand by allowing households to borrow and consume more (Ugurlu, 2023). Some studies demonstrate a positive correlation between lending to non-financial businesses and economic growth, while consumer and mortgage credit expansions either lack a positive correlation with growth (Beck *et al.*, 2012) or are linked to slow-down in growth (Mian *et al.*, 2020). Contrary to these insights, our estimations show that most of our macroeconomic variables respond similarly to unexpected changes in enterprise and consumer lending standards. However, one important exception is gross fixed capital formation. While investment expenditures increase by 3% three years following an unexpected easing of enterprise lending standards, no statistically significant effect is observed in the case of consumer lending standards.

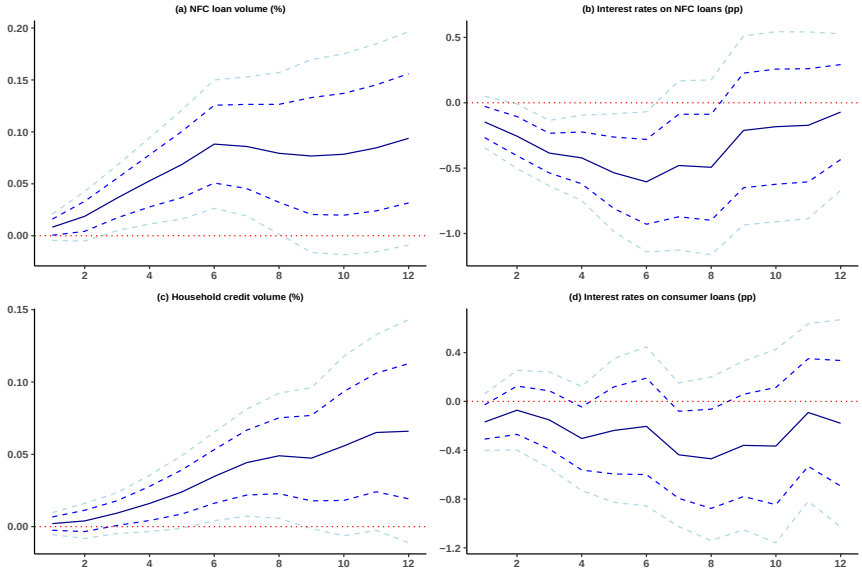
[6]These papers analyse the impact of tightening of lending standards. However, our results are quantitatively similar.

To explore the potential explanations for our results, we examined the correlation between enterprise and consumer lending standards. If banks' strategic behaviour in determining lending standards does not depend much on the category of lending, the data generating process behind unexpected changes in enterprise and consumer lending standards may be highly similar. This could potentially explain the qualitative similarities in the IRFs in Figure 3 and Figure 4. In Figure A2, we plot unexpected changes in lending standards for enterprise and consumer loans averaged across countries over time. While similarities exist in certain periods (e.g., unexpected tightening of standards at the onset of the Global Financial Crisis), the overall co-movement is limited, with a correlation coefficient of 0.25. We also report the correlation coefficient between $UCLS\_E$ and $UCLS\_C$ for each country. Except for Portugal (cor=0.54), the correlation coefficients never exceed 0.5 (Figure A2). As a result, we rule out the high level of co-movement in unexpected changes in enterprise and consumer lending standards as a potential explanation.

5.1 Transmission Channels

In Figure 5, we investigate the potential mechanisms through which the relaxation of lending standards may have operated. Banks may ease their lending standards in two primary ways: by increasing the volume of loans (through rejection a smaller percentage of loan applications) for a given level of interest rates, or by reducing interest rates for a given volume of loan demand. We observe a positive response of credit volume (panel a) and negative response in interest rates for non-financial corporations (NFC) loans (panel b). This suggests that easing of enterprise lending standards manifested itself in both the quantity and price of credit. In the case of consumer credit, we similarly observe a positive response of credit volume (panel c) and a negative response of lending rates on consumer loans (panel d); however, the response of lending rates on consumer loans lacks statistical significance. Collectively, these findings indicate that the easing of lending standards operates through both channels in the case of enterprise loans while only the quantity channel is statistically significant for consumer loans. This finding may suggest that banks have greater bargaining power over their customers in the consumer loan market compared to the enterprise loan market. Given the typically riskier nature of consumer loans (EBA, 2020), banks may be reflecting the easing of lending standards primarily through increased credit volumes rather than reduced interest rates. Our findings are also in line with and add to the evidence on the interest rate pass-through which suggests it to be lower for consumers than the enterprise lending (Bondt, 2005). It shows that analogous to the monetary easing through cutting policy rates, the ease of consumer lending standards may also have limited transmission through the interest rate channel.

Figure 5: Transmission Channels



Note: The figure plots the estimate of β's from Equation 8 for unanticipated changes in lending standards for consumer credit. Dark and light blue dashed lines indicate 68% and 90% confidence intervals respectively. All estimates control for country and year fixed effects, lagged values of the dependent variable, the shock variable, real GDP and policy interest rate (in differences) for four periods. Standard errors are clustered at the country level.

5.2 Forecast Error Variance Decomposition

In this section, we apply the forecast error variance decomposition (FEVD) method developed by Gorodnichenko and Lee (2020). This approach allows us to quantify the contribution of credit supply shock to the forecast error variance of different variables over different time horizons. We begin by estimating the model outlined in Equation 8 but leaving out the contemporaneous effect of the shock. In the second step, we extract the residuals from this regression and regress them on the credit supply shocks occurring between t and $t+h$. The R-squared of this second-stage regression indicates the share of forecast error variance attributed to our credit supply shock.

Table 4 reports the FEVD results for unanticipated changes in lending standards for enterprise and consumer credit at 4, 8, and 12 quarters. The main conclusion from this exercise is that unanticipated easing in lending standards accounts for a relatively small portion of the variation in the dependent variables. This holds true for both enterprise and consumer credit. For instance, after twelve quarters, an unanticipated shock to enterprise and consumer lending standards explain 1.73 and 5.81 percent of the variation in real GDP, respectively. They also explain 4.13 and 6.77 percent of the variation in consumption expenditures.

As anticipated, unexpected changes in consumer lending standards account for a greater variation in consumption expenditures compared to enterprise lending standards. Likewise, enterprise lending standards explain a larger variation in GFCF than consumer lending standards.

Table 4: Forecast Error Variance Decomposition

horizon	Real GDP	Consumption	GFCF	Exports	Imports	Net Exports	Unemployment Rate	GDP Deflator
Enterprise Shocks								
4	0.68	0.78	2.08	1.25	1.73	2.54	0.15	1.40
8	2.11	1.97	2.11	2.19	3.27	4.01	0.48	2.02
12	1.73	4.13	2.64	3.41	4.28	6.45	0.80	2.54
Consumer Shocks								
4	0.28	0.37	0.63	1.34	1.05	1.61	0.36	0.45
8	1.27	2.55	1.70	1.53	1.00	1.90	0.62	0.75
12	5.81	6.77	1.81	3.63	3.99	5.85	2.08	3.09

Note: This table presents results from the FEVD methodology of Gorodnichenko and Lee (2020). The values indicate how much of the variation in different endogeneous variables are explained by enterprise and consumer credit supply shocks. The values represent percentages (%).

5.3 Asymmetric Effects

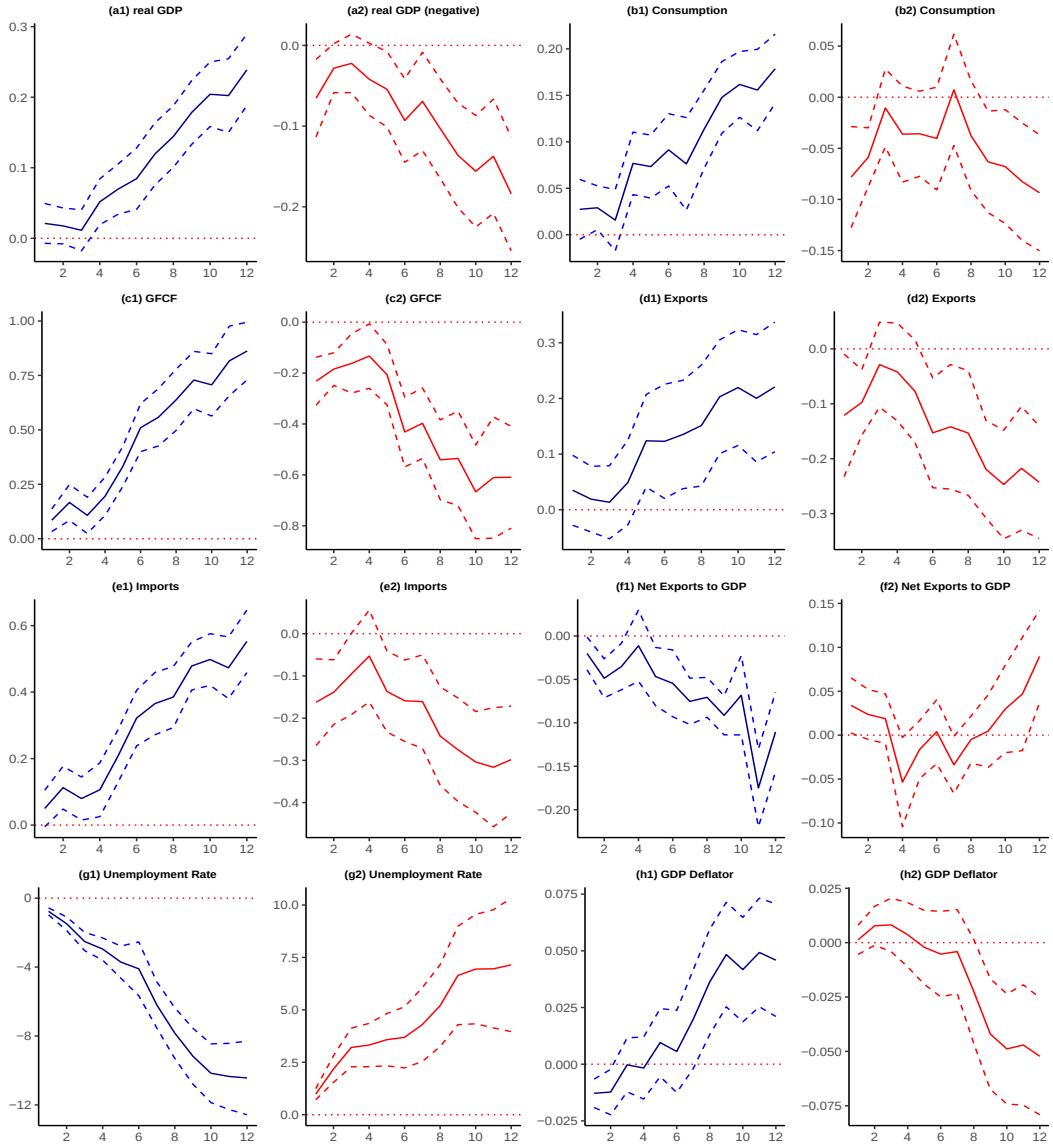
In this section, we examine whether the effects of credit supply shocks are symmetric or asymmetric. Although there is a long tradition of examining the asymmetric effects of monetary policy shocks (see e.g., Cover, 1992; Furceri *et al.*, 2018; Kurt, 2024; Weise, 1999), the literature on the asymmetric effects of credit shocks remains limited. Within the existing literature, researchers have taken two main approaches. The first approach examines how credit supply shocks affect the economy differently depending on the state of the economy, such as during recessions versus expansions. For instance, Colombo and Paccagnini (2020), using the excess bond premium as a measure of credit supply shock, find that credit supply shocks explain a greater variance in production, employment and inflation during recessions than in normal times.

The second approach investigates the differences between positive and negative credit supply shocks. A study by Finck and Rudel (2023) finds that private debt, mortgage debt, and debt-to-GDP ratio respond slightly more to positive credit supply shocks whereas they do not find significant asymmetries when it comes to inflation and GDP. In contrast, Manaresi and Pierri (2024) report that negative credit supply shocks have a more pronounced impact on productivity growth compared to positive shocks in Italian corporations. Similarly, Barnichon *et al.* (2022) find that tightening financial conditions has a larger and more persistent effect on output than easing. In this paper, we are closer to the latter approach as we distinguish between positive shocks (unexpected easing of lending standards) and negative shocks (unexpected tightening).

From a theoretical standpoint, asymmetric responses to positive and negative shocks may arise for various reasons. For instance, information asymmetries may exacerbate firms' difficulties in accessing credit during economic downturns due to deterioration in their net worth. During a negative credit supply shock that reduces available lending, a company's balance sheet health becomes even more critical in determining its ability to secure financing. In contrast, credit availability typically increases during a positive credit supply shock. Consequently, obtaining financing during a downturn could be disproportionately more challenging in the face of a negative shock compared to a positive one. Such asymmetries may also arise if central banks respond more robustly to credit easing than to tightening (Finck & Rudel, 2023). In terms of estimation, this may pose empirical challenges around identification. The novelty of our approach discussed earlier is

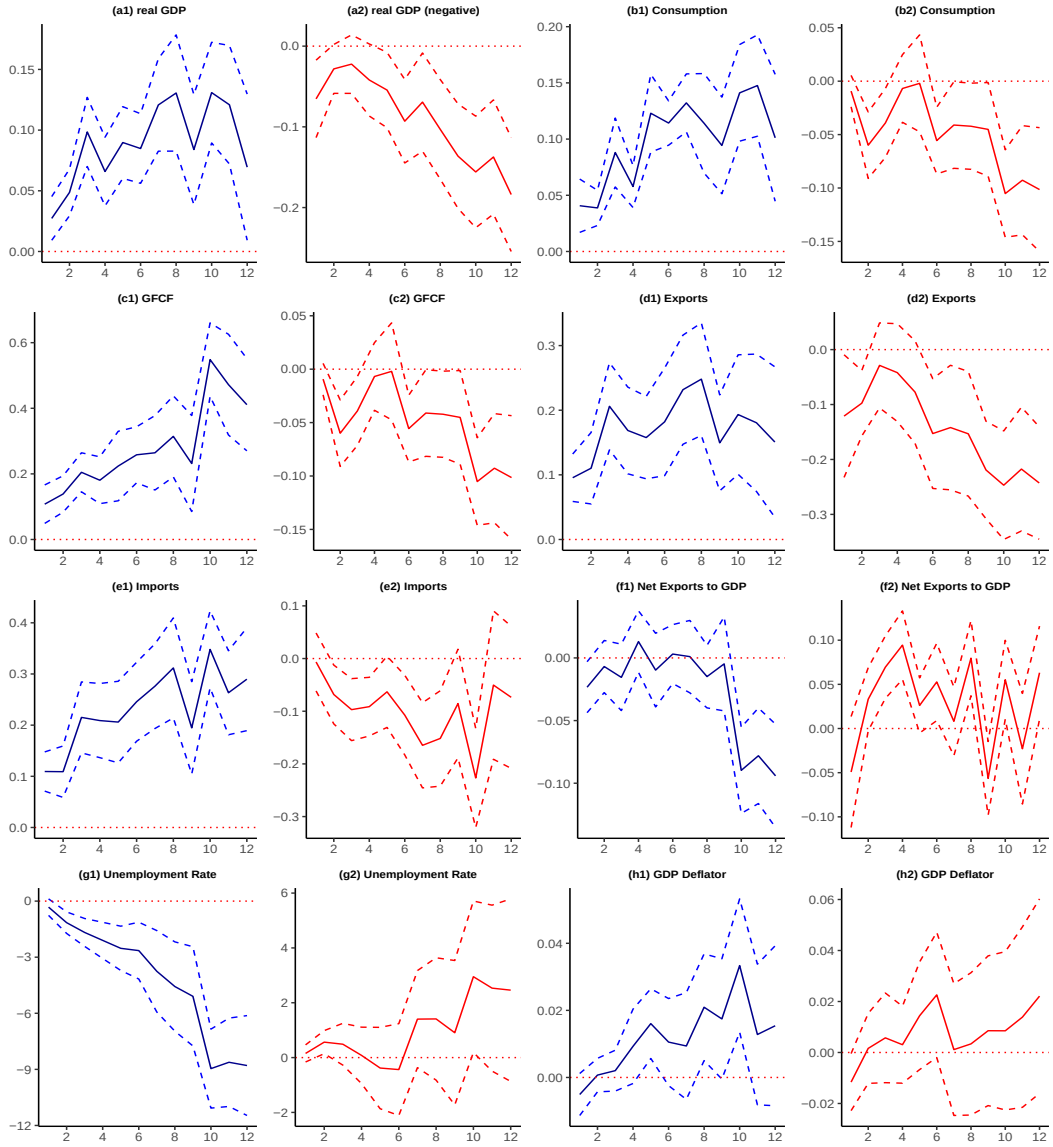
that the credit supply shocks can be distinguished from that of demand shocks.

Figure 6: Positive and negative shocks to unanticipated changes in enterprise lending standards



Note: Blue and red lines indicate positive and negative shocks respectively. Dashed lines indicate 68% confidence intervals. All estimates control for country and year fixed effects, lagged values of the dependent variable, the shock variable, real GDP and policy interest rate (in first differences) for four periods. Standard errors are clustered at the country level.

Figure 7: Positive and negative shocks to unanticipated changes in consumer lending standards



Note: Blue and red lines indicate positive and negative shocks respectively. Dashed lines indicate 68% confidence intervals. All estimates control for country and year fixed effects, lagged values of the dependent variable, the shock variable, real GDP and policy interest rate (in first differences) for four periods. Standard errors are clustered at the country level.

We report our results in Figure 6 and Figure 7. We plot the responses of various variables to unexpected easing (in blue) and tightening (in red) of lending standards. The results, especially for enterprise credit, do not indicate significant qualitative asymmetries. That is while an unexpected easing of lending standards leads to typical expansionary outcomes – higher GDP, consumption, investment, and lower unemployment – an unexpected tightening triggers recessionary outcomes. However, in line with the broader empirical evidence and theory, we observe some quantitative differences. With the exception of exports, the response of our variables to an unexpected easing of enterprise lending standards is larger in magnitude than their

response to a tightening of standards.

Below we report results from a formal test for the hypothesis that positive and negative credit supply shocks have asymmetric effects (see Table 5). We can reject the null hypothesis that positive and negative shocks have similar quantitative effects on consumption, GCFC, imports, net exports to GDP and unemployment rate. However, for GDP and GDP deflator, we cannot reject the null hypothesis at the 5% level. In other words, the differences in the absolute values of impulse responses to an easing and tightening of lending standards are statistically significant except for GDP and GDP Deflator.

Table 5: Statistical Significance of Differences in Impulse Responses to Positive and Negative Shocks

	Enterprise Credit		Consumer Credit	
Variable	t-test	p-value	t-test	p-value
Real GDP	2.135	0.056	2.135	0.056
Consumption	3.287	0.007	4.563	0.001
GFCF	2.474	0.031	5.163	0.000
Exports	-2.031	0.067	2.209	0.049
Imports	3.306	0.007	9.598	0.000
Net Exports to GDP	2.927	0.014	-1.725	0.112
Unemployment Rate	2.679	0.021	4.889	0.000
GDP Deflator	1.371	0.198	0.988	0.345

Note: In this table, we perform a t-test for the hypothesis that positive and negative shocks to unexpected changes in lending standards (for enterprise and consumer credit) have asymmetric effects. Given that the coefficient signs are in opposite directions, we perform the test on the differences in absolute values.

In the case of consumer lending standards, we observe qualitatively symmetric responses in all variables except for the unemployment rate. Similar to enterprise credit, easing of consumer lending standards has expansionary effects whereas tightening results in contractionary effects. However, while an easing of consumer lending standards lowers the unemployment rate, tightening does not have a statistically significant positive impact. Quantitatively, we find that the response of variables to a positive consumer credit supply shock is on average stronger than that to negative shocks[7]. These differences are statistically significant in most cases, as indicated in Table 5.

Comparing with the existing literature, our results lend more support to the findings of Finck and Rudel (2023) (on debt and debt-to-income ratios) indicating that positive credit supply shocks play a larger role than negative shocks. This contrasts with Barnichon *et al.* (2022) who find that negative shocks to financing conditions generate larger and more persistent macroeconomic effects. To summarise, while our results are qualitatively symmetric — showing that easing of lending standards is associated with expansionary outcomes and tightening with recessions — quantitatively, most of our dependent variables respond more

[7]Except for net exports to GDP; however, as Table 5 shows the difference in the response of this variable lacks statistical significance.

strongly to easing of lending standards than tightening, a pattern consistent across both consumer and enterprise credit.

5.4 Robustness Checks

We perform several tests to check the robustness of our findings. First, we validate our identification strategy by analysing the impact of credit supply and demand shocks on lending rates. If our measure accurately captures credit supply shocks, we expect unexpected changes in lending standards to result in a decrease in interest rates, while unexpected changes in credit demand should raise interest rates. Indeed, a substantial body of literature identifying credit demand and supply shocks relies on this type of sign restrictions. To validate our identification, we calculated unexpected changes in credit demand that are independent of credit supply conditions. Following a similar approach to our construction of credit supply shocks in Section 3.1, we first calculated the difference between realized and expected changes in credit demand as described in Equation 6. We then used a fixed-effects model to remove the fluctuations in $UUCCD$ that are associated with $UUCLS$. The impulse responses of credit volume and interest rates to unanticipated and adjusted changes in credit demand ($UUCD$) support our expectations: interest rates rise following a positive credit demand shock (Figure A3) and fall following a positive credit supply shock (Figure 5) across both lending categories. These findings strengthen our confidence in our identification strategy.

Second, in order to rule out the possibility that the results are driven by dynamics of the crises periods, we exclude the period corresponding to the Global Financial Crisis and the Covid-19 Pandemic from our sample. Excluding these periods does not change the sign and the pattern of our baseline impulse responses (Figure A4). On the contrary, the results become more pronounced with increased statistical significance. Second, we check the robustness of our results to using net percentages instead of diffusion indices (Figure A5). Qualitative results remain unchanged. Thirdly, we account for economic uncertainty by controlling for the Economic Policy Uncertainty (EPU) Index. This step addresses the possibility that differences between realized and expected changes in lending standards might reflect fluctuations in economic uncertainty. The impulse response functions presented in Figure A6 demonstrate that our key conclusions hold when controlling for the EPU index. Next, to make sure that the results are not driven by extreme values, we winsorize the dependent variables at the one percent level (Figure A7). Our results are robust to excluding the outliers. Finally, we check whether the results are driven by any specific countries in our sample. To do this, we generate the impulse responses by excluding one country at a time from our analysis. As shown in Figure A8, the gray lines, representing the impulse responses obtained by excluding different countries at a time, are in close proximity to the solid black line, which depicts the actual impulse response function. This suggests that excluding individual countries does not significantly alter our overall findings, indicating that the results are not overly dependent on any particular country in the sample.

6 Conclusions

The dynamics of credit have major implications for the macroeconomy, and it is vital to understand the genre of credit shocks. The causal effects of changes in credit demand or supply require identifying 'exogenous' and 'unanticipated' sources of variation in credit conditions. Yet disentangling movements in banks' credit into

credit supply and credit demand shocks has been a longstanding challenge. This difficulty is exacerbated by the business cycle. To address this issue, our study proposes a new measure of credit supply shocks. In doing so, we drew on the Bank Lending Survey of the Euro Area and constructed a measure of credit supply shocks by exploiting the difference between realised and anticipated changes in lending standards that are uncontaminated by credit demand. We further analysed the effects of identified enterprise and consumer credit supply shocks on key macroeconomic indicators. Additionally, we analysed whether lending shocks have asymmetric effects. To ensure the validity of inferences, we performed several robustness tests that account for the Global Financial Crisis, COVID-19, alternative measurement of credit standards as well as economic uncertainty.

Our key results led us to conclude that the responses of most macroeconomic variables to unexpected changes in consumer and enterprise lending standards are qualitatively similar. For instance, credit supply shocks in both lending categories lead to higher consumption, imports and real GDP, while also reducing unemployment. However, investment is one macroeconomic variable that responds differently. We find that enterprise credit supply shocks are more effective in boosting investment compared to consumer credit supply shocks. From a policy perspective, while relaxing credit standards for both consumers and businesses helps boost consumption, GDP growth, and employment, addressing the Eurozone's investment shortfall requires focusing on accommodative lending standards for enterprises.

Regarding transmission channels, our analysis shows that the credit supply shocks operate through both lower interest rates and larger volume of lending on enterprise loans and manifest only through increased lending volume of consumer loans. This asymmetry suggests that in the case of consumer loans, the lender has greater bargaining power in setting the interest rates which is economically intuitive. This can have policy implications where the ease in the monetary and credit conditions is not passed to the consumers through a decline in interest rates. This aligns with the literature on the interest rate pass-through being lower for consumers than enterprises. It implies that analogous to the monetary easing through cutting policy rates, the ease of consumer lending standards may also have limited transmission through the interest rate channel.

Lastly, we conclude that there are no significant qualitative asymmetries between the effects of easing and tightening lending standards. However, there are quantitative differences in terms of the magnitude of the impact of change in lending standards, with most macroeconomic variables exhibiting stronger responses to unexpected easing of credit than unexpected tightening. These qualitative symmetries and quantitative asymmetries imply that the magnitude of the policy response should also be proportionally different.

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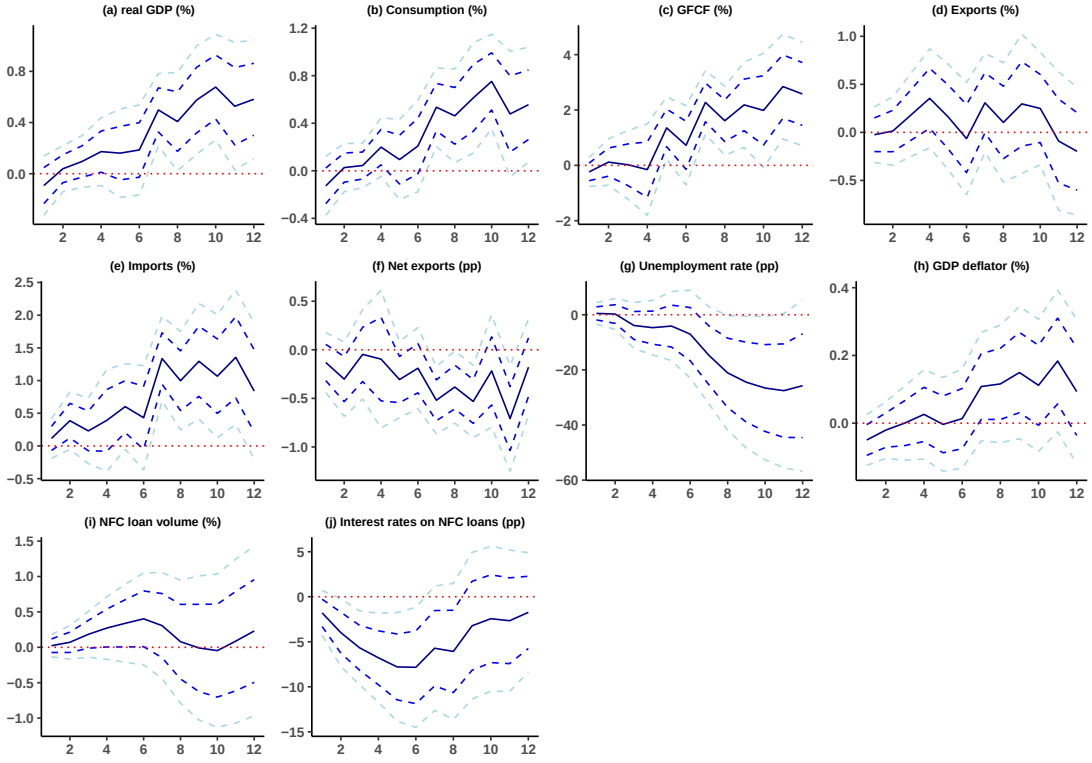
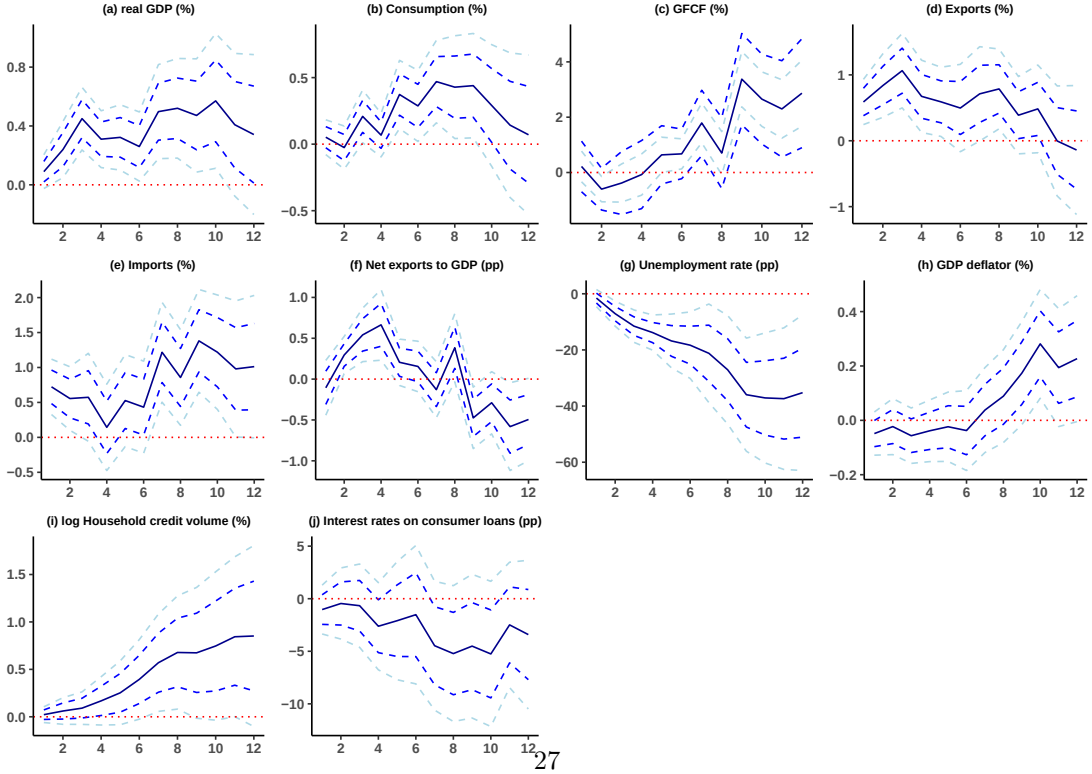
Appendix A Additional Figures

Figure A1: Standard deviation shocks



(a) Enterprise loans



(b) Consumer loans

Figure A2: Unexpected changes in enterprise and consumer lending standards (quarterly averages)

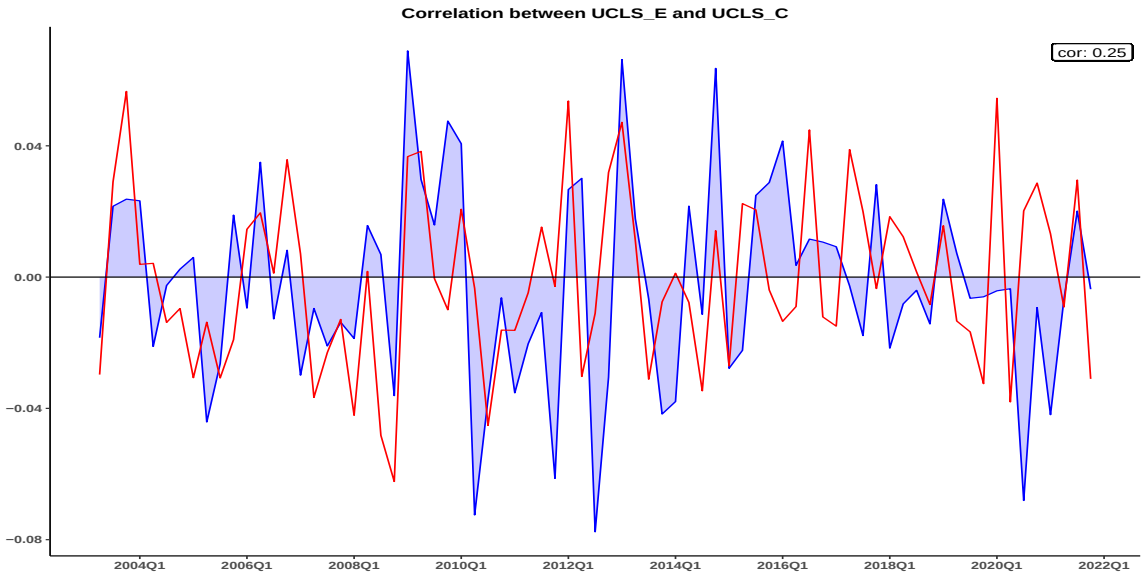
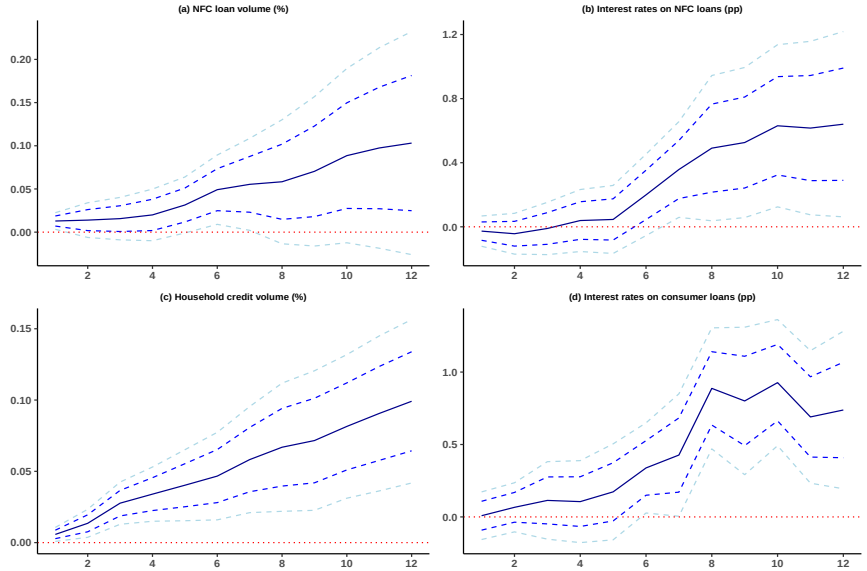
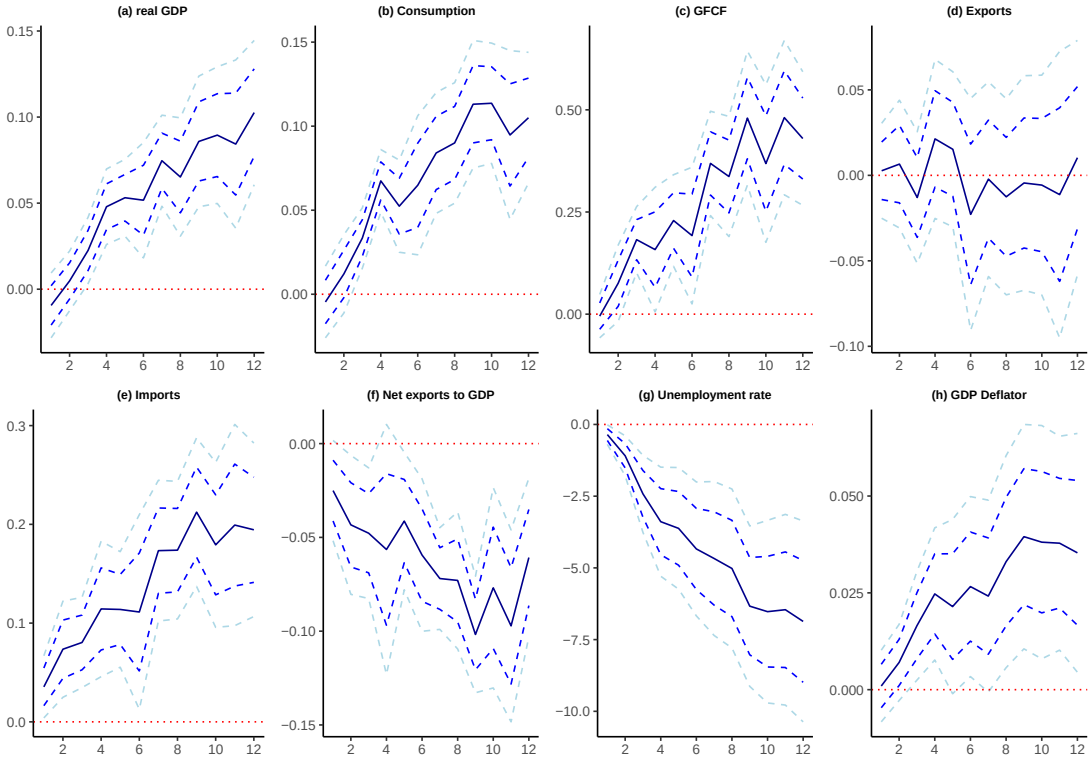


Figure A3: Impulse responses to unanticipated changes in credit demand

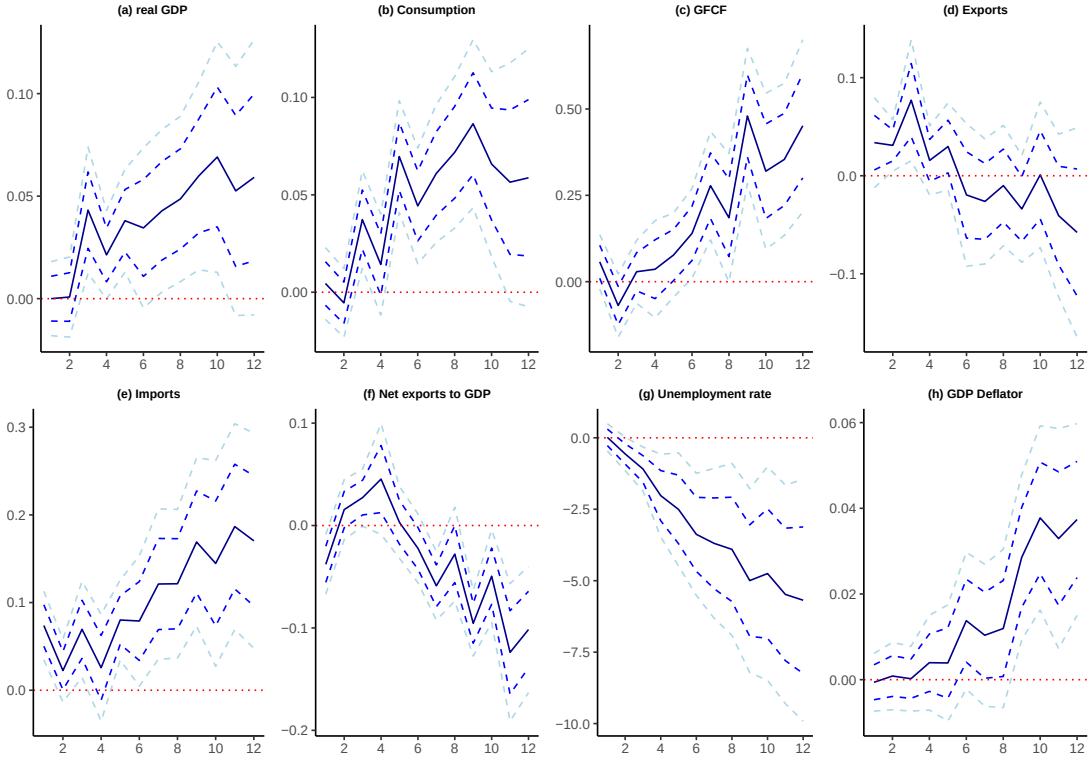


Note: The figure plots the impulse responses to unanticipated changes in enterprise and consumer credit demand. Dark and light blue dashed lines indicate 68% and 90% confidence intervals respectively. All estimates control for country and year fixed effects, lagged values of the dependent variable, the shock variable, real GDP and policy interest rate (in differences) for four periods. Standard errors are clustered at the country level.

Figure A4: Excluding GFC and Covid Pandemic

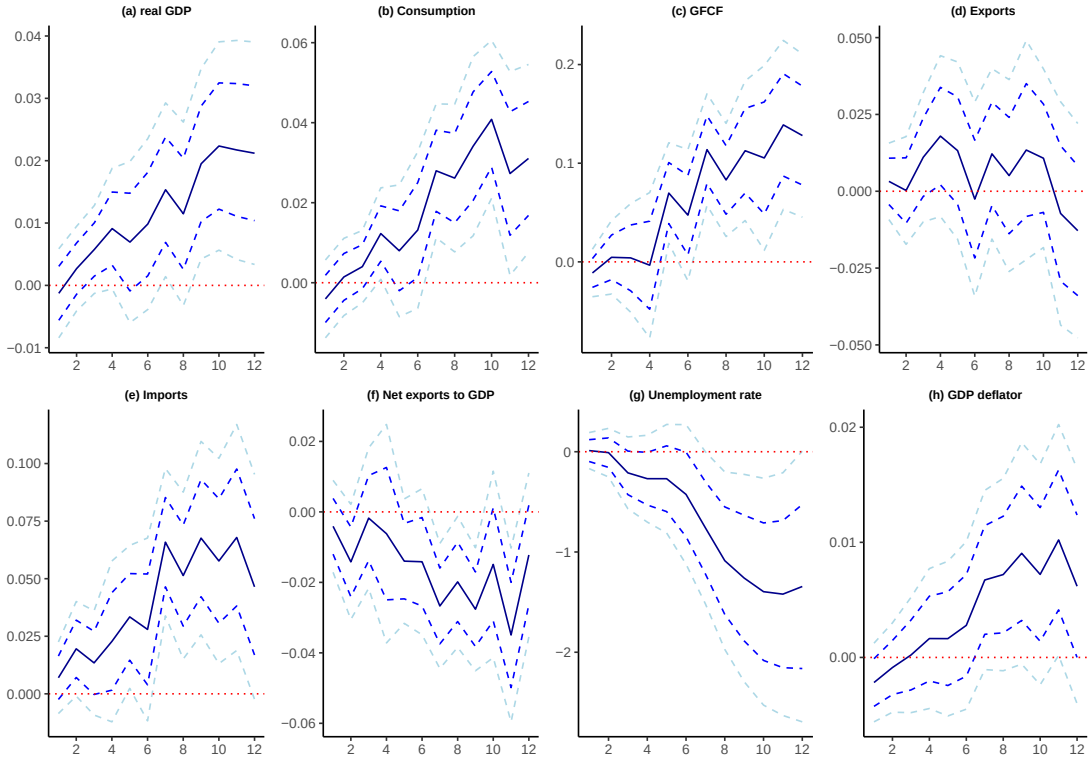


(a) Enterprise loans

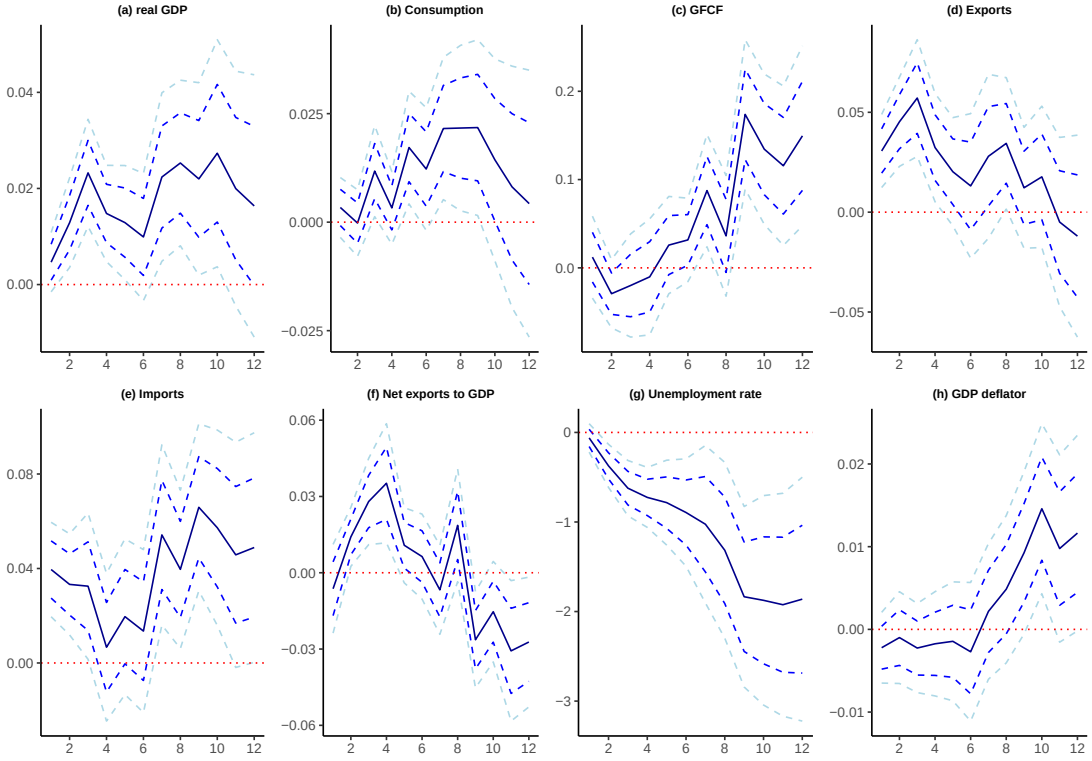


(b) Consumer loans

Figure A5: Using net percentages

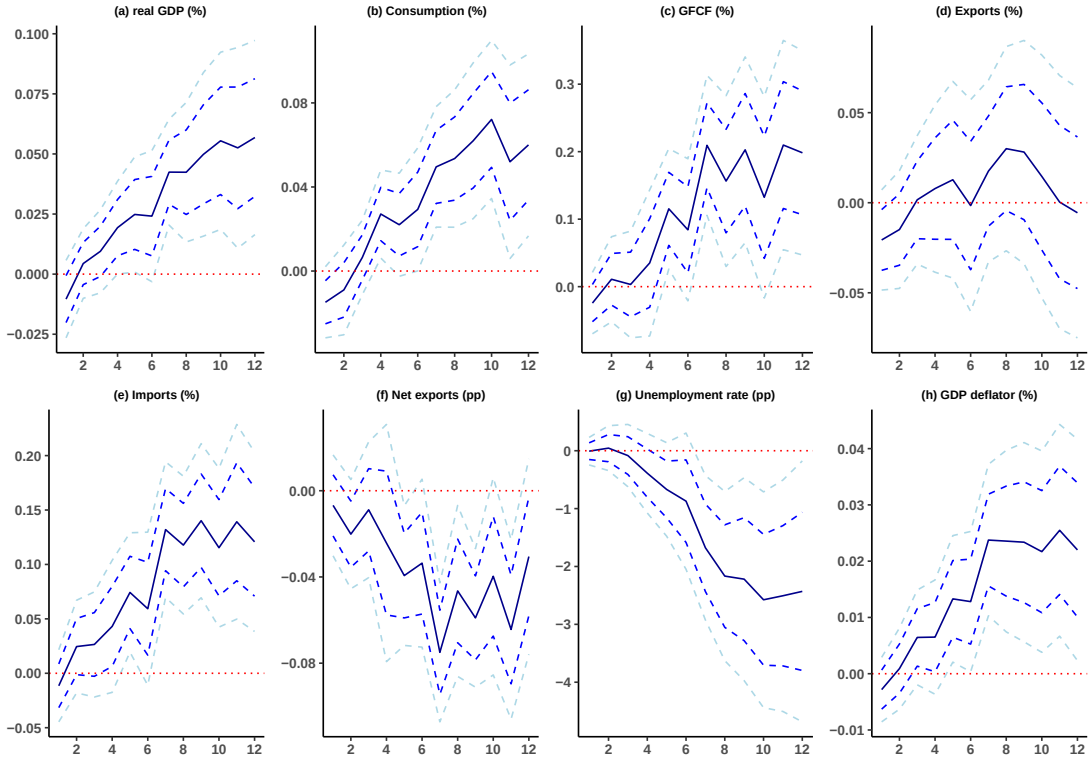


(a) Enterprise loans

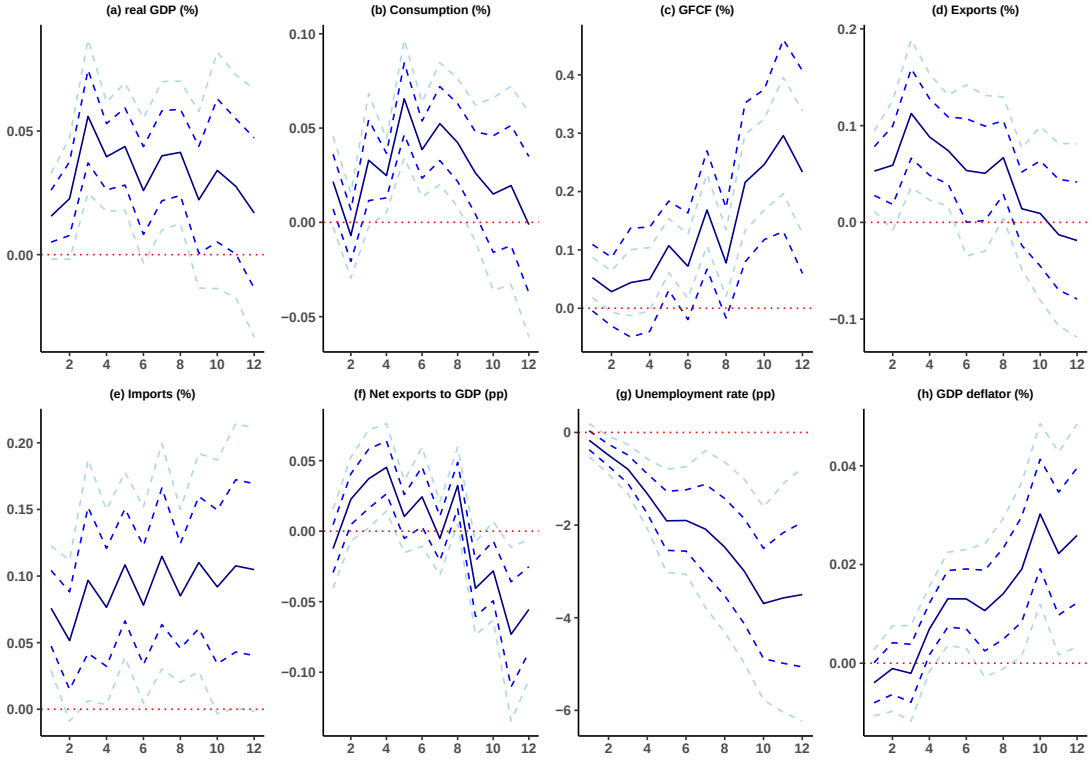


(b) Consumer loans

Figure A6: Controlling for the Economic Policy Uncertainty (EPU) index

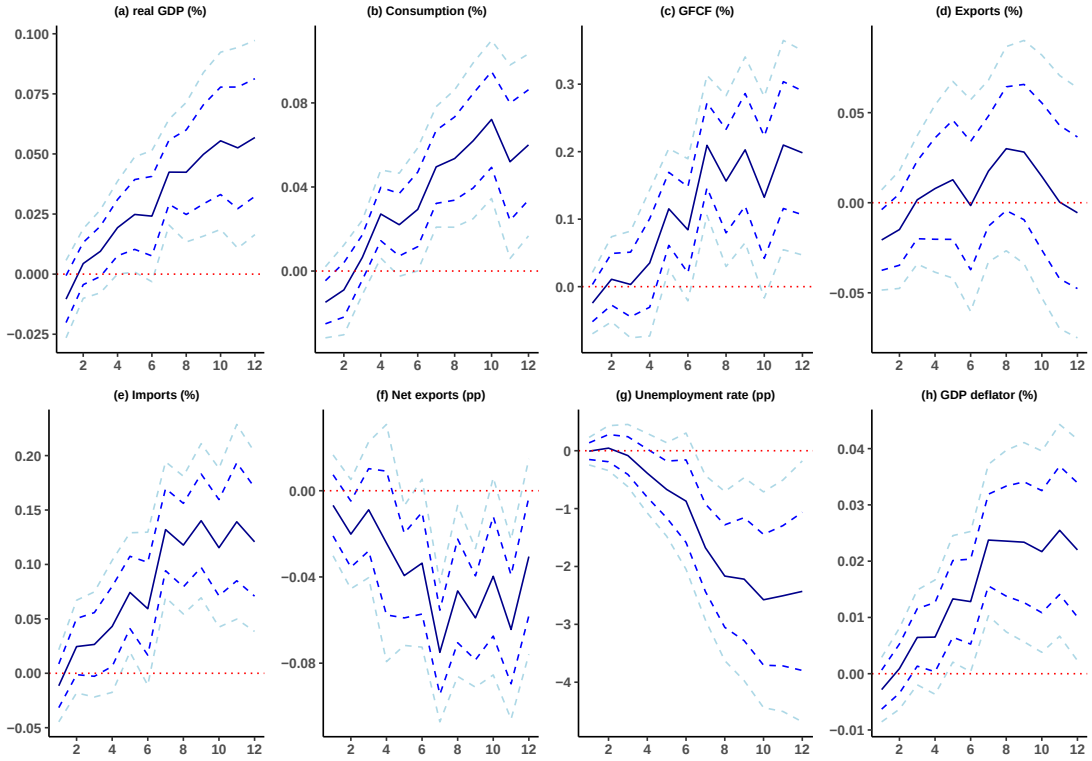


(a) Enterprise loans

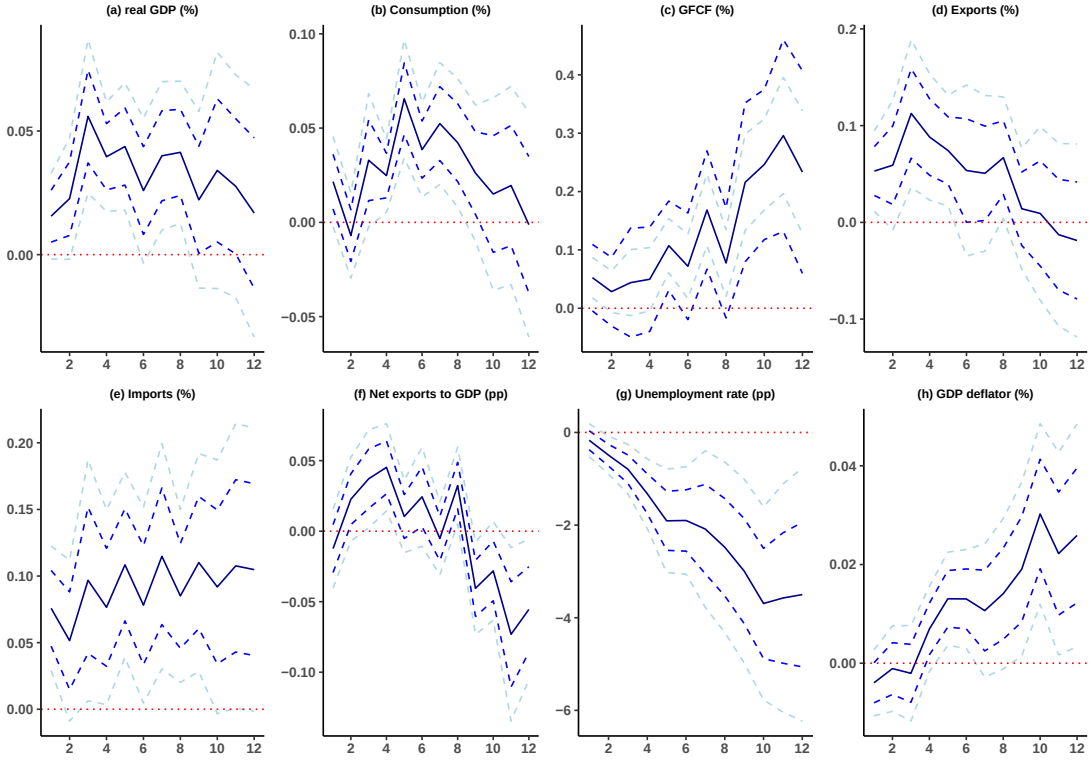


(b) Consumer loans

Figure A7: Winsorisation at the 1% level

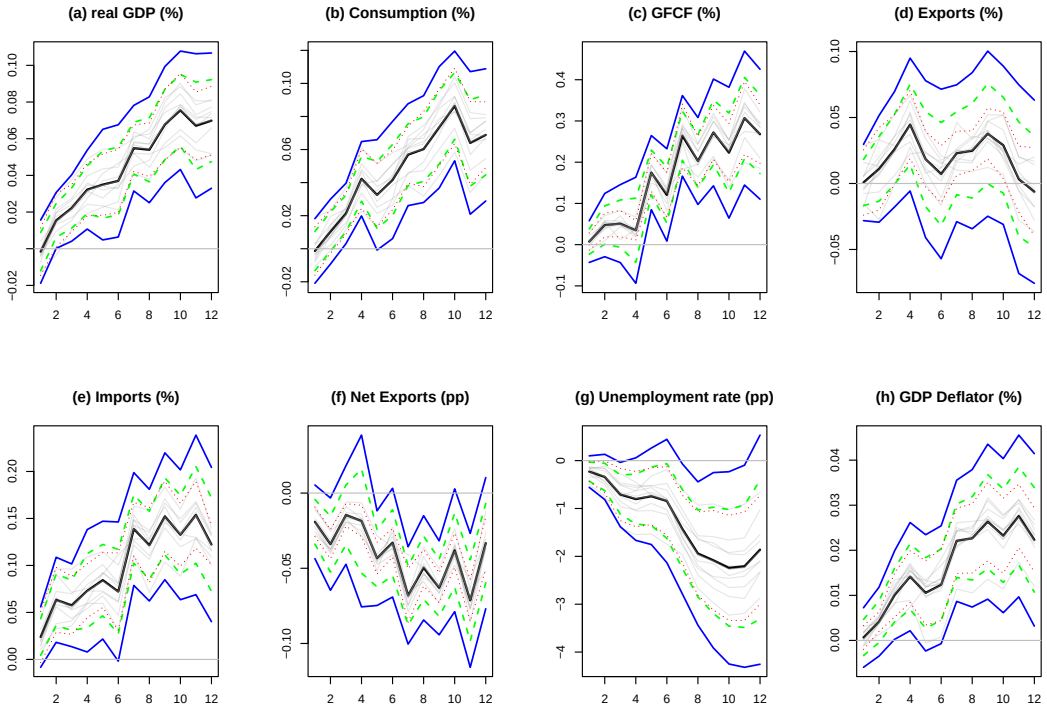


(a) Enterprise loans

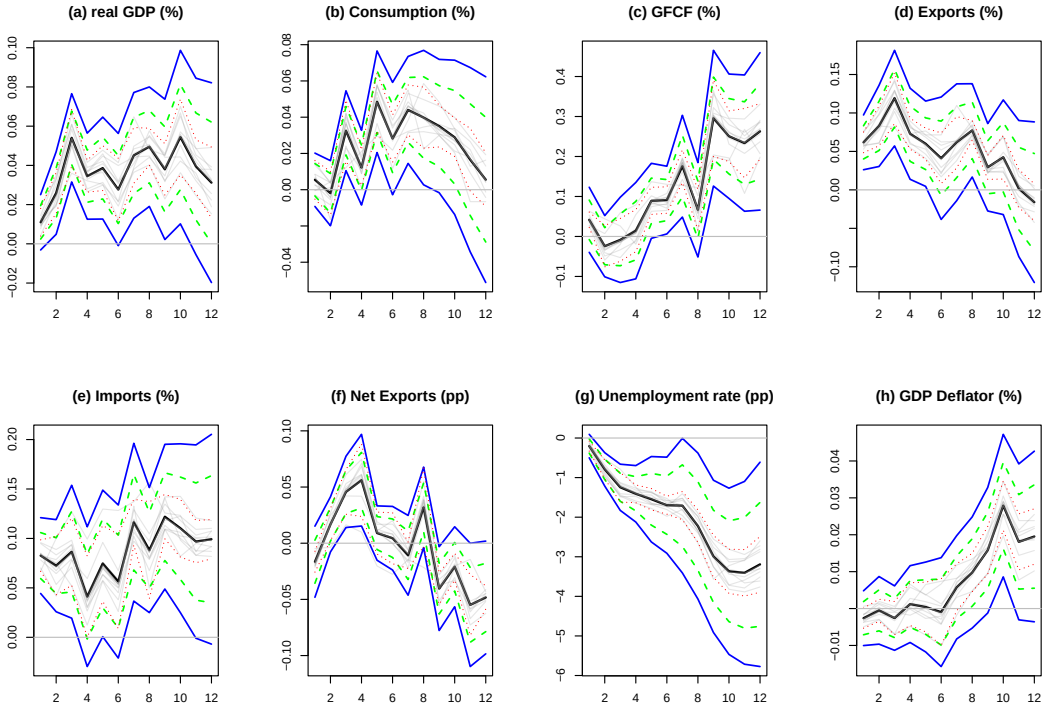


(b) Consumer loans

Figure A8: Country exclusion analysis



(a) Enterprise loans



(b) Consumer loans

Appendix B Additional Tables

Table B1: Overview of the Key Questions from the Euro-Area Bank Lending Survey

Countries	**Period & Loan Category**	**Main Questions for Lending Standards**	**Main Questions for Loan Demand**	**Potential Answers**	**Notes**
Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Portugal, Spain, Slovenia	2003Q1-2022Q4 Household (consumer credit and other lending, house purchase) & Corporate (overall, SMEs, large enterprises, short-term, long-term)	"Over the past three months, how have your bank's credit standards as applied to the approval of loans or credit lines to [enterprises or loans to households] changed? Please note that we are asking about the change in credit standards, rather than about their level." "Please indicate how you expect your bank's credit standards as applied to the approval of loans or credit lines to [enterprises or households] to change over the next three months. Please note that we are asking about the change in credit standards, rather than about their level."	"Over the past three months (apart from normal seasonal fluctuations), how has the demand for loans or credit lines to [enterprises or households] changed at your bank? Please refer to the financing need of enterprises independent of whether this need will result in a loan or not." "Please indicate how you expect demand for loans to [enterprises or households] to change over the next three months at your bank (apart from normal seasonal fluctuations). Please refer to the financing need of households independent of whether this need will result in a loan or not."	Lending standards: Tightened considerably. Tightened somewhat. Remained basically unchanged. Eased somewhat. Eased considerably. N/A. Loan demand: Decreased considerably. Decreased somewhat. Remained basically unchanged. Increased somewhat. Increased considerably. N/A.	In the original dataset, a positive value indicates a net tightening of lending standards (realised or expected). We reversed the sign such that a positive value indicates a net easing. A positive value indicates a net increase in demand for loans (realised or expected).

Table B2: Correlation between UCLS_E and UCLS_C by country

Country	**Corr**	**Country**	**Corr**
Austria	0.182	Latvia	0.347
Finland	0.264	Lithuania	0.023
Greece	0.016	Portugal	0.548
Ireland	0.083	Slovenia	0.059
Italy	0.235	Spain	0.279

Table B3: Results from Estimation of Equation 7

	Dependent variable:	
	UUCLS_E	UUCLS_C
UUCD_E	0.105***	
	(0.019)	
UUCD_C		0.159***
		(0.016)
Country Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes
Observations	1,157	1,157
Adjusted R^2	0.209	0.077
Note:	*p<0.1; **p<0.05; ***p<0.01	