Does credit supply lead loan demand? An empirical investigation

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Motivation

- The credit demand schedule is typically assumed to be invariant to changes in the credit supply schedule.
- However, this assumption is questionable when firms' demand for credit, particularly for investment purposes, depends on their expectations regarding the overall credit supply by banks, beyond just lending rates.
- Any macroeconomic statistic or indicator that informs firms about the occurrence or intensity of a change in the credit supply schedule can influence their expectations, thus enhancing the link between supply and demand.
- Are there situations where this might be the case? The answer is yes, particularly when strategic complementarities exist in agents' investment decisions.

Investments delays and low credit demand

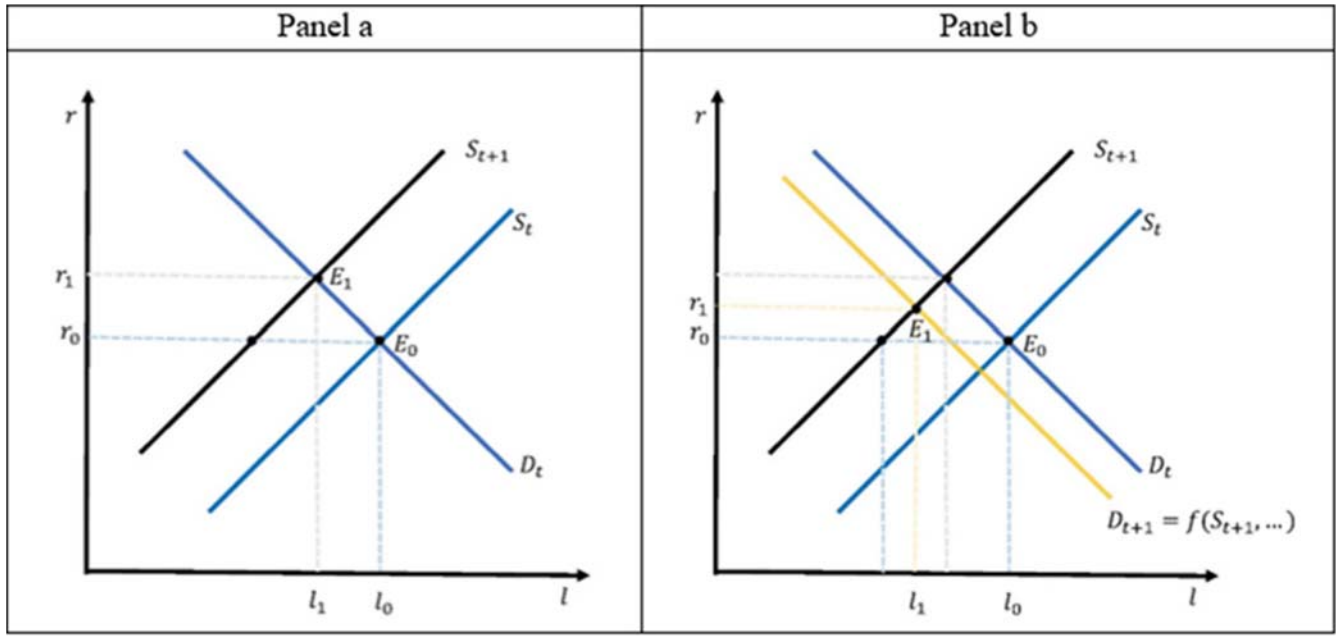
- If individual returns on investment increase with the aggregate level of investment (Bryant, 1983; Cooper and John, 1988; Acemoglu, 1993), firms may postpone investment when they expect that other firms - whose investments depend on bank loans - will face difficulties in obtaining credit.

- To the extent that these firms depend on bank financing, investment delays are reflected in a lower demand for credit, as discussed in Albertazzi and Esposito (2017).

- The linkage between credit supply and demand is likely more pronounced in economies with a significant presence of small and medium-sized enterprises (SMEs), which typically rely on bank credit and have limited access to alternative funding sources.

Policy implications

- Taking into account the effect of credit supply movements on credit demand is particularly important, as it can influence the equilibrium impact of any shock that affects the credit supply schedule.



Main question

- **To what extent disseminating information about banks' credit supply - signaling whether a movement in the loan supply curve is occurring - affects firms' credit demand for investment purposes?**

- We use aggregate data from the Bank lending survey (BLS) and confidential individual replies by participating Italian banks. Importantly for our analysis, the results of the survey are extensively commented on official publications and receive significant media attention.

- The headline aggregate indicators of credit supply (analogously, *credit standards*) and credit demand provide a useful approximation of shifts (or rotations) in the loan supply and loan demand schedules, respectively.

Main evidence

- **Investment-related credit demand is significantly affected by news regarding credit supply**

  An easing of *credit standards* in a given quarter (publicly observable) leads to an increase in (investment-related) loan demand in the following quarter.

- Caveat
  - We base our analysis on firms' demand schedule at the bank level, as reported by the Italian groups participating in the BLS, and control for bank specific variables. Clustering firms' credit demand at the bank level provides average effects.
  - However, a more sophisticated analysis would use Anacredit firm-bank level data to examine individual firm demand, controlling for firm characteristics, accounting for composition effects, and exploring heterogeneity across different types of enterprises.

Data

- Confidential replies to the BLS by participating Italian banks on credit supply and demand developments.

- BLS individual replies are represented by a discrete variable (increase/ease, unchanged, decrease/tight) taking values (1,0, −1)

- BLS headline supply indicator is the difference between the percentages of banks responding that in the previous quarter their credit standards "eased somewhat" and "eased considerably" and the percentages of banks responding "tightened somewhat" and "tightened considerably"

- Quarterly information from 2003Q1 to 2024Q4 for an unbalanced panel of 20 banks (with a maximum of 13 banks per quarter).
- We match this dataset with individual bank lending data from the Bank of Italy supervisory reports. The matched panel provides a total of 789 observations.

Econometric specification

$$\Delta CDI_{it} = \alpha + \beta CS_{t-1} + \gamma \Delta CDI_{it-1} + \delta \Delta X_{it} + \zeta Z_{it} + q_t + b_i + \varepsilon_{it}$$

ΔCDI_{it} = *change in investment-related credit demand reported by bank i at time t*

CS_t = *BLS credit standard indicator*

ΔX_{it}: *BLS replies on credit terms and conditions and on credit standards*

Z_{it}: *banks balance sheet variables*

q_t: *time fixed effects*

b_i: *banks fixed effects*

Identification approach

- We use **time fixed effect** and **bank fixed effect** to control for unobservable variables that influence CDI both at the aggregate and at the individual level.

- Some of the unobservable variables - such as *the perception of risk* stemming from the general economic situation and its outlook - are correlated with the included variable of interest (CS). We run an **IV estimation** using as instruments the BLS indicators of *cost of funds and balance sheet constraints* (namely, bank's capital and the costs related to the bank's capital position, bank's ability to access market financing and bank's liquidity position).

- Banks' replies regarding their perceived credit demand for investment purposes can originate both by movements *along the demand curve* or by *shifts (or rotations) of the demand curve*. In order to identify the latter effect we **exploit individual replies on how credit standards changed at bank-level**.

Table 1. Regression table (OLS with an ordered dependent variable)

Change in investment-related credit demand (CDI) reported by bank *i* at time *t*	(1)	(2)	(3)	(4)
Credit standards for loans to firms (CS) at time *t-1*	0.636 (0.858)	0.702*** (0.093)	0.557*** (0.111)	0.583*** (0.131)
Change in investment-related credit demand (CDI) reported by bank *i* at time *t-1*	0.350*** (0.056)	0.350*** (0.056)	0.335*** (0.049)	0.322*** (0.053)
Change in terms and conditions on the margin on the average loan for bank *i* at time *t*			0.079** (0.024)	0.054* (0.022)
Change in terms and conditions on the size of the loan or credit line for bank *i* at time *t*			0.101 (0.088)	0.091 (0.091)
Change in Credit Standards (CS) reported by bank *i* at time *t*			0.044 (0.061)	0.023 (0.055)
GDP growth, quarterly				0.010 (0.031)
ICP Inflation, quarterly				-0.047 (0.038)
GDP growth, annual, expectations 10 years ahead				0.151* (0.065)
10-year IRS				0.033* (0.016)
Share of loans to total assets for bank *i* at time *t*				0.602* (0.305)
Constant	0.074 (0.094)	0.074 (0.094)	0.038 (0.088)	-0.502** (0.179)
Observations	719	719	719	719
Macro Controls (GDP, Inflation)	NO	NO	NO	YES
Terms and conditions for bank *i*	NO	NO	YES	YES
Controls for bank *i*	NO	NO	NO	YES
IV	NO	YES	YES	YES
Banks FE	YES	YES	YES	YES
Time FE	YES	YES	YES	NO

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Robustness checks

- Consider “easing” and “tightening” regimes.
- Estimate the regression using an ordinal variable for *credit standards* that is equal to 1 when the net percentage of bank is positive, -1 if it is negative and zero otherwise.
- Estimate the regression using the net percentage of banks’ that “expect” an easing/tightening of credit standards for the following quarter.
- Logit estimation.
- Substitute into our main specification the macroeconomic variables used in Altavilla et al. (2019) and use as an instrument the Loan Supply Indicator (LSI) derived in their paper.

Paper contribution

- Amplification of Shocks
- Impact of Public Information
- Monetary Policy Considerations
- Vulnerability of Small Firms
- Caution in Data Analysis

Thank you!

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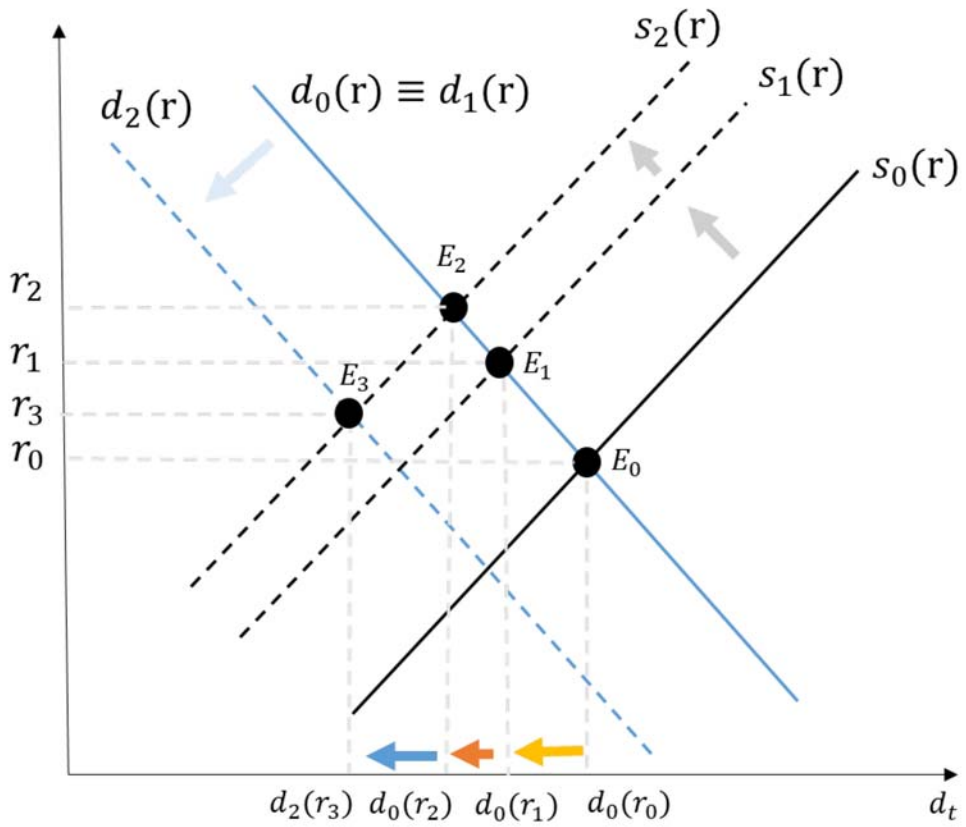
The linkage between credit supply and demand



$$\Delta \boldsymbol{d_2} = d_0(r_2) - d_0(r_1)$$

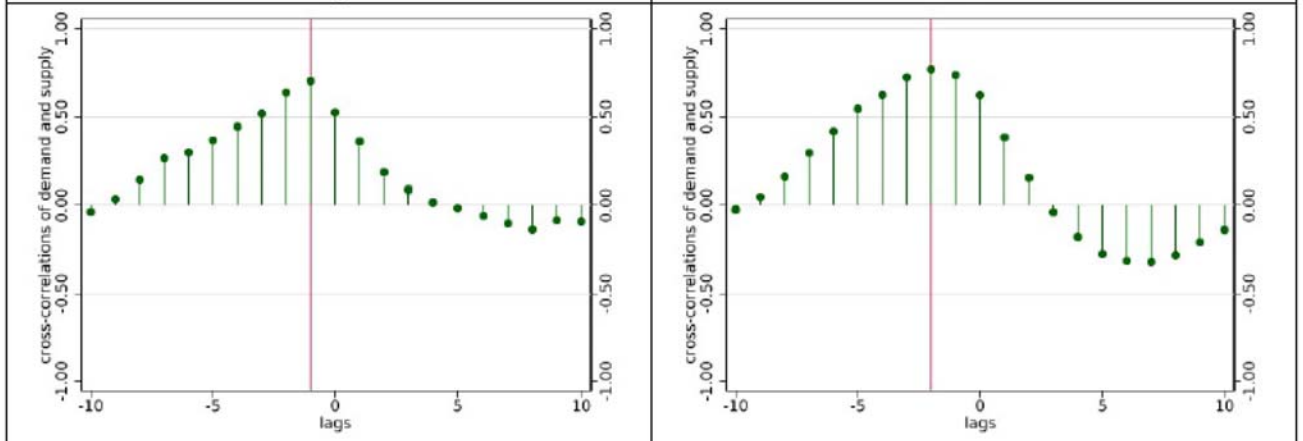
$$\Delta \boldsymbol{d_2} = d_0(r_2) - d_0(r_1) + d_2(r_3) - d_0(r_2) + other$$

Dynamic correlation of credit supply and demand

- Supply leads demand by one quarter in Italy and by two quarters in the euro area. The evidence that the highest positive correlation between these time series occurs with a one- or two-quarter lag aligns with the informational role that the BLS supply indicator may play.

Fig. 3: Cross-correlogram between credit standards for loans to firms and investment-related credit demand

(correlation coefficient by quarter, where 0 denotes contemporaneous correlation and negative values denote leads of BLS supply)



Source: BLS data for Italy and the Euro Area (quarters from 2020Q1 to 2021Q1 are excluded from the dataset)

Linear probability model

Table A3. OLS regression: individual ordinal (with values -1,0,1 and 1-5) and binary response variables

Change in investment-related credit demand (CDI) reported by bank *i* at time *t*	(1) BLS simplified responses (-1,0,1)	(2) BLS responses (1-5)	(3) BLS binary responses (0,1)
Credit standards for loans to firms (CS) at time *t-1*	0.583***	0.732***	0.401***
	(0.131)	(0.126)	(0.073)
Change in investment-related credit demand (CDI) reported by bank *i* at time *t-1*	0.322***	0.320***	0.343***
	(0.053)	(0.050)	(0.035)
GDP growth, quarterly	0.010	0.009	0.021
	(0.031)	(0.037)	(0.024)
ICP Inflation, quarterly	-0.047	-0.047	-0.044
	(0.038)	(0.038)	(0.034)
GDP growth, annual, expectations 10 years ahead	0.151*	0.131	0.123**
	(0.065)	(0.082)	(0.044)
10 years IRS	0.033*	0.043*	0.031**
	(0.016)	(0.017)	(0.012)
Change in banks' loans margin on average loans	0.054*	0.052*	0.124**
	(0.022)	(0.023)	(0.047)
Change in the size of the loan or credit line	0.091	0.057	0.105
	(0.091)	(0.099)	(0.080)
Change in Credit Standards (CS) reported by bank *i* at time *t*	0.023	0.023	-0.034
	(0.055)	(0.056)	(0.060)
Share of loans to total assets for bank *i* at time *t*	0.602*	0.652	0.376
	(0.305)	(0.351)	(0.194)
Constant	-0.502**	1.129***	0.017
	(0.179)	(0.271)	(0.110)
Observations	719	719	719
Model	OLS	OLS	OLS
Macro Controls (GDP, Inflation)	yes	yes	yes
Terms and conditions for bank i	yes	yes	yes
Controls for bank i	yes	yes	yes
IV	yes	yes	yes
Banks FE	yes	yes	yes

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

«Easing» and «tightening» regimes

Table A4. OLS regression: sample split

Change in investment-related credit demand (CDI) reported by bank *i* at time *t*	(1)	(2)
Credit standards for loans to firms (CS) at time *t-1*	0.681*	0.630**
	(0.309)	(0.202)
Change in investment-related credit demand (CDI) reported by bank *i* at time *t-1*	0.241***	0.320***
	(0.056)	(0.073)
GDP growth, quarterly	0.065	-0.011
	(0.033)	(0.060)
ICP Inflation, quarterly	-0.133	-0.034
	(0.087)	(0.042)
GDP growth, annual, expectations 10 years ahead	0.065	0.185*
	(0.104)	(0.076)
10 years IRS	0.033*	0.027
	(0.016)	(0.031)
Change in terms and conditions on the margin on the average loan for bank *i* at time *t*	0.069	0.025
	(0.051)	(0.038)
Change in terms and conditions on the size of the loan or credit line for bank *i* at time *t*	0.041	0.158
	(0.155)	(0.096)
Change in Credit Standards (CS) reported by bank *i* at time *t*	0.221	-0.035
	(0.119)	(0.065)
Share of loans to total assets for bank *i* at time *t*	0.309	0.635
	(0.381)	(0.393)
Constant	-0.301	-0.542*
	(0.245)	(0.224)
Observations	336	383
Macro Controls (GDP, Inflation)	Yes	Yes
Terms and conditions for bank i	Yes	Yes
Controls for bank i	Yes	Yes
IV	Yes	Yes
Banks FE	Yes	Yes
Credit Standards	Easing/Stable	Tightening

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Ordinal variable for credit standards

Table A5. OLS regression: ordinal variable for credit standards (with values -1,0,1)

Change in investment-related credit demand (CDI) reported by bank *i* at time *t*	(1)	(2)	(3)	(4)
Credit standards for loans to firms (CS, ordinal variable) at time *t-1*	0.115**	0.251***	0.198***	0.202***
	(0.031)	(0.045)	(0.054)	(0.054)
Change in investment-related credit demand (CDI) reported by bank *i* at time *t-1*	0.376***	0.341***	0.337***	0.316***
	(0.059)	(0.053)	(0.052)	(0.049)
GDP growth, quarterly	0.127***	0.115***	0.093***	0.093***
	(0.020)	(0.021)	(0.025)	(0.026)
ICP Inflation, quarterly	-0.108*	-0.090*	-0.075	-0.065
	(0.040)	(0.038)	(0.038)	(0.038)
GDP growth, annual, expectations 10 years ahead	0.063	0.037	0.062	0.060
	(0.068)	(0.064)	(0.061)	(0.060)
10 years IRS	0.017	0.060**	0.051*	0.062**
	(0.021)	(0.021)	(0.023)	(0.020)
Change in terms and conditions on the margin on the average loan for bank *i* at time *t*			0.061*	0.056*
			(0.027)	(0.027)
Change in terms and conditions on the size of the loan or credit line for bank *i* at time *t*			0.105	0.084
			(0.083)	(0.084)
Change in Credit Standards (CS) reported by bank *i* at time *t*			0.025	0.029
			(0.062)	(0.057)
Share of loans to total assets for bank *i* at time *t*				0.605*
				(0.283)
Constant	-0.122	-0.158*	-0.174**	-0.483**
	(0.079)	(0.073)	(0.062)	(0.166)
Observations	719	719	719	719
Macro Controls (GDP, Inflation)	yes	yes	yes	yes
Terms and conditions for bank *i*	no	no	yes	yes
Controls for bank *i*	no	no	no	yes
IV	no	yes	yes	yes
Banks FE	yes	yes	yes	yes

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Expected credit standards

Table A6. OLS regression: net percentage of banks' that report/expect an easing/tightening of credit standards

Change in investment-related credit demand (CDI) reported by bank *i* at time *t*	(1)	(2)
Credit standards for loans to firms (CS, net percentage) at time *t-1*	0.583***	
	(0.131)	
Expected credit standards for loans to firms at time *t-1* for the following quarter		1.026***
		(0.222)
Change in investment-related credit demand (CDI) reported by bank *i* at time *t*	0.322***	0.351***
	(0.053)	(0.054)
GDP growth, quarterly	0.010	-0.007
	(0.031)	(0.036)
ICP Inflation, quarterly	-0.047	0.003
	(0.038)	(0.040)
GDP growth, annual, expectations 10 years ahead	0.151*	0.233**
	(0.065)	(0.077)
10 years IRS	0.033*	0.018
	(0.016)	(0.016)
Change in terms and conditions on the margin on the average loan for bank *i* at time *t*	0.054*	0.064*
	(0.022)	(0.028)
Change in terms and conditions on the size of the loan or credit line for bank *i* at time *t*	0.091	0.036
	(0.091)	(0.081)
Change in Credit Standards (CS) reported by bank *i* at time *t*	0.023	-0.009
	(0.055)	(0.052)
Share of loans to total assets for bank *i* at time *t*	0.602*	0.606*
	(0.305)	(0.244)
Constant	-0.502**	-0.565***
	(0.179)	(0.149)
Observations	719	719
Macro Controls (GDP, Inflation)	yes	yes
Terms and conditions for bank i	yes	yes
Controls for bank i	yes	yes
IV	yes	yes
Banks FE	yes	yes

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Margins for Logit regression

Table A7. Margins for Logit regression: individual ordinal (with values -1,0,1) and binary response variables

	(1) Change in investment-related credit demand (CDI) reported by bank *i* at time *t*	(2) Dummy for change in credit demand reported by bank *i* at time *t*
Credit standards for loans to firms (CS) at time *t-1*	0.282***	0.555***
	(0.054)	(0.128)
Change in investment-related credit demand (CDI) reported by bank *i* at time *t-1*	0.158***	0.329***
	(0.033)	(0.042)
GDP growth, quarterly	0.008	0.003
	(0.017)	(0.041)
ICP Inflation, quarterly	-0.036	-0.084
	(0.023)	(0.046)
GDP growth, annual, expectations 10 years ahead	0.116***	0.246**
	(0.027)	(0.081)
10 years IRS	0.011	0.028
	(0.010)	(0.023)
Change in banks' loans margin on average loans	0.028	0.144*
	(0.016)	(0.059)
Change in the size of the loan or credit line	0.058	0.089
	(0.050)	(0.071)
Change in Credit Standards (CS) reported by bank *i* at time *t*	0.018	-0.023
	(0.029)	(0.069)
Share of loans to total assets for bank *i* at time *t*	0.354*	0.548*
	(0.144)	(0.257)
Observations	719	719
Model	Ordered logit	Logit
Macro Controls (GDP, Inflation)	Yes	yes
Terms and conditions for bank i	Yes	yes
Controls for bank i	Yes	yes
IV	No	no
Banks FE	Yes	yes

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: In column (1) estimates regard the outcome corresponding to an increase in investment-related credit demand reported by bank *i* at time *t*; in column (2) estimates regard the outcome corresponding to unchanged/increased investment-related credit demand reported by bank *i* at time *t*.

Altavilla et al. (2019)

Table A8. OLS regression: alternative macroeconomic controls and instrument

Change in investment-related credit demand (CDI) reported by bank *i* at time *t*	(1)	(2)	(3)
Credit standards for loans to firms (CS) at time *t-1*	0.583***	0.543**	0.434**
	(0.131)	(0.172)	(0.157)
Change in investment-related credit demand (CDI) reported by bank *i* at time *t-1*	0.322***	0.320***	0.313***
	(0.053)	(0.051)	(0.062)
GDP growth, quarterly	0.010		0.031
	(0.031)		(0.028)
ICP Inflation, quarterly	-0.047		-0.056
	(0.038)		(0.040)
GDP growth, annual, expectations 10 years ahead	0.151*		0.158*
	(0.065)		(0.067)
10 years IRS	0.033*		0.028
	(0.016)		(0.020)
GDP growth over 1 year at time at time *t-1*		-0.012	
		(0.011)	
GDP growth forecast over 1 year (Consensus)		0.039	
		(0.032)	
Change in Unemployment		-0.089	
		(0.081)	
Shadow rate at time at time *t-1*		0.007	
		(0.007)	
Euro area Change in EBP		0.182**	
		(0.067)	
Euro area VSTOXX		0.004	
		(0.004)	
Euro area change in 3m-in-1y OIS forward at time at time *t-1*		0.063	
		(0.060)	
Change in terms and conditions on the margin on the average loan for bank *i* at time *t*	0.054*	0.058*	0.055
	(0.022)	(0.025)	(0.029)
Change in terms and conditions on the size of the loan or credit line for bank *i* at time *t*	0.091	0.107	0.109
	(0.091)	(0.098)	(0.098)
Change in Credit Standards (CS) reported by bank *i* at time *t*	0.023	0.025	0.030
	(0.055)	(0.055)	(0.061)
Share of loans to total assets for bank *i* at time *t*	0.602*	0.565	0.655*
	(0.305)	(0.358)	(0.313)
Constant	-0.502**	-0.376*	-0.535**
	(0.179)	(0.189)	(0.189)
Observations	719	719	673
Macro Controls	(GDP, Inflation)	Altavilla	(GDP, Inflation)
Terms and conditions for bank *i*	yes	Yes	Yes
Controls for bank *i*	yes	Yes	Yes
IV	(BLS indicators of cost of funds and balance sheet constraints)	(BLS indicators of cost of funds and balance sheet constraints)	Altavilla
Banks FE	yes	Yes	Yes

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$