Leakages from macroprudential regulations

The case of household-specific tools and corporate credit[1]

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[1]The views expressed here are our own and do not necessarily represent those of the European Central Bank.

Motivation

Could sector-specific macroprudential regulations increase riskiness of lending to other sectors? Consider two channels:

- If lenders operate under predefined targets for returns/lending or fixed risk-appetite, a tightening of regulations in one segment could be compensated by increasing targets in other segments, potentially involving lending to borrowers that otherwise would be perceived as too risky.
- If a macroprudential action in an overheating sector leads to a perception of reduced risks in the economy, this could induce agents in other sectors to take on more risk (Bengui and Bianchi 2019).

Focus of this paper

We study leakages from the household-specific macroprudential regulations (MaPPs) to credit in the corporate sector:

- focus on **household-specific MaPPs** due to their broad adoption
- and study their impact on the **risk profile of corporate credit**
- ... using **cross-country panel regressions** with household-specific MaPPs while controlling for broad-based and corporate-specific MaPPs
- provide some supporting evidence also for **bank corporate lending volumes**

Related literature

Papers documenting spillovers/leakages from financial regulations:

- tightening of financial regulations in the home country leads to more and riskier lending in host countries (Houston et al. 2012, Ongena et al. 2013)
- liquidity and sectoral MaPPs affect cross-border bank credit (Kang et al. 2017)
- MaPPs limiting FX borrowing by banks lead to higher FX debt issuance by corporates (Ahnert et al. 2020)
- borrower-based MaPPs slow down credit growth of corporates, but predominantly for SMEs (Ayyagari et al. 2018)

Case studies documenting leakages from sector-specific MaPPs:

- Auer and Ongena (2016): Swiss banks with a higher share of residential loans shifted lending to riskier and smaller firms after the introduction of a mortgage-specific CCyB in 2012
- Acharya et al. (2020): Irish banks more affected by LTI and LTV introduction in 2015 increased their holdings of high-yield securities and increased lending to the corporate sector (at lower rates).

Outline

Next slides:

- data
- construction of MaPP variables: household-specific MaPPs and other MaPPs
- construction of the dependent variable: corporate credit riskiness
- empirical specification and results
- supporting evidence: corporate loan growth

Not shown today, but also in the paper:

- household-specific MaPPs are effective in achieving their stated goals: an unexpected $MaPP^{HH}$ tightening over past four quarters slows credit to the household sector and lowers real house price growth.

Data

Data: BIS (credit, exchange rates) and IMF (GDP, **iMaPP**, FCIs, house prices), Datastream (**balance sheet data for listed firms**, global variables, 3m money market rates), Fitch Connect (**bank-level balance sheet**), World Bank (WDI, GFDD), Haver (bank lending standards for corporate loans as reported in loan officer surveys), Consensus Forecasts (1-year ahead GDP forecasts), Wu-Xia shadow rates.

Sample: 29 economies (13 advanced plus 16 emerging) over 2002Q1-2018Q4 for credit riskiness, and 13 economies over 1998-2018 for credit volume (5 advanced and 8 emerging).

Macroprudential policies (MaPPs)

We construct two MaPP indicators from the IMF iMaPP database:

- $MaPP^{HH}_{i,t}$: household-specific MaPPs that include changes in the LTV, LTI, DTI and DSTI limits
- $MaPP^{BC}_{i,t}$: broad and corporate sector-specific MaPPs that capture changes in bank capital requirements, restrictions on overall bank credit growth, and restrictions on loan characteristics (for all loans or for corporate loans only)

	$MaPP^{HH}$	$MaPP^{BC}$	Overlap $MaPP^{HH}$ and $MaPP^{BC}$
Number of actions	*120*	*66*	*5*

Macroprudential policies (MaPPs)

Potential endogeneity issues:

- likely a smaller concern since decisions to ease or tighten household-specific MaPPs should be taken independently of the situation in the corporate sector (supported by small overalap between the $MaPP^{HH}$ and the $MaPP^{BC}$ in our sample)
- always control for broad and corporate-specific MaPPs
- robustness: control for measures of vulnerabilities in the household sector: household credit growth, house price growth

Compute the MaPP *shocks* as deviations from policy rules as in Ahnert et al. (2020) and in Brandao-Marques et al. (2020):

- control for 1 year ahead GDP forecast, GDP growth, Credit to GDP Growth, House Price Growth, Financial Development, Exchange rate depreciation etc.

Riskiness of corporate credit allocation

We consider three measures of credit riskiness, CC^s, based on three indicators of firm-level financial vulnerability:

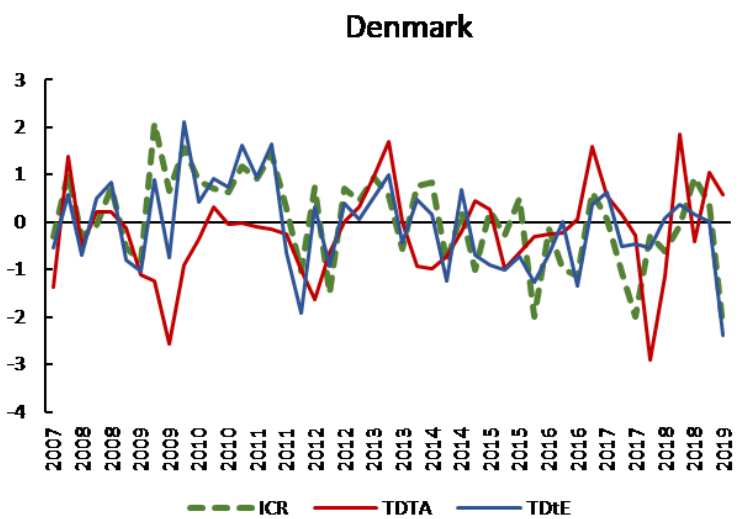
- **leverage-based measure (TDTA)**: difference in the ratio of total debt to total assets of the top 20% debt issuers and the bottom 20% debt issuers,
- **debt overhang (TDtE) and interest coverage ratio (ICR) measures**, constructed as above, but using the ratio of total debt to EBITDA or the interest coverage ratio (interest expenses to EBITDA).

Motivation: (i) cyclical changes in the pricing of credit risk disproportionately affect financing costs of low-quality firms, (ii) such measures of credit riskiness are more reliable signals of credit market overheating than rapid credit growth (Greenwood and Hanson 2013, IMF 2018)

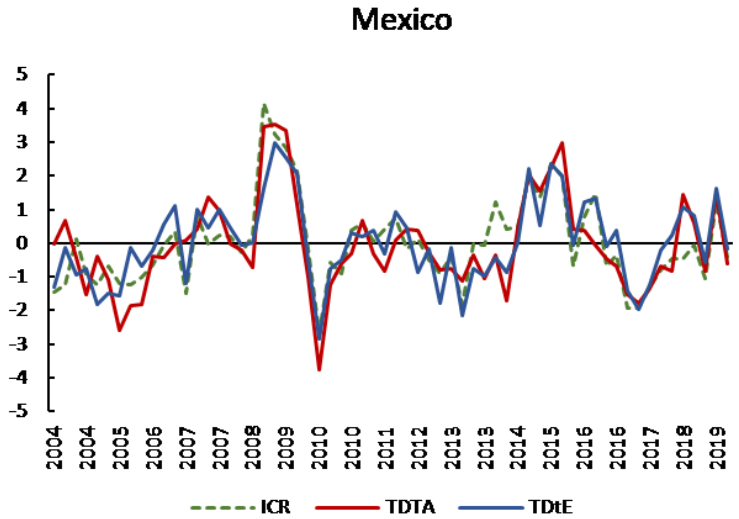
Riskiness of corporate credit allocation

After seasonal adjustment, the correlation between the three alternative measures is high, although it varies somewhat across countries:

Average correlation	TDTA	TDtE	ICR
TDTA	*1*		
TDtE	*0.5*	*1*	
ICR	*0.38*	*0.79*	*1*



Low correlation



High correlation

Riskiness of corporate credit allocation

A potential drawback of the three measures is that they do not distinguish between bank and bond financing and focus on listed firms only:

- yet, there are several channels through which MaPPs binding for banks only, could affect non-bank corporate credit (risk perceptions channel, predefined return and lending targets)
- robustness (I): control for the ratio of corporate bond issuance to corporate bank credit, and their interactions with MaPPs
- robustness (II): use bank lending standards from surveys of loan officers as the dependent variable

Empirical specification

A dynamic panel regression of corporate credit riskiness measure CC^s in quarter t in country i:

$$CC^s_{i,t} = \alpha + \gamma CC^s_{i,t-1} + \sum_{k=1}^{4} \beta_{1,k} \varepsilon^{HH}_{i,t-k} + \sum_{k=1}^{4} \beta_{2,k} \varepsilon^{BC}_{i,t-k} + \beta_3 X_{i,t-1} + \delta_i + \delta_t + \epsilon_{i,t}, \tag{1}$$

where $X_{i,t-1}$ includes yoy growth in the credit-to-GDP ratio, yoy real GDP growth, qoq ER appreciation against USD.

An alternative specification to capture potential nonlinearities (Cerutti et al. 2017):

$$\begin{aligned} CC^s_{i,t} = \alpha + \gamma CC^s_{i,t-1} + \beta_1 \bar{\varepsilon}^{HH}_{i,t-1} + \beta_2 \bar{\varepsilon}^{HH}_{i,t-1} \times \Delta Credit_{i,t-1} + \\ + \beta_3 \bar{\varepsilon}^{BC}_{i,t-1} + \beta_4 \bar{\varepsilon}^{BC}_{i,t-1} \times \Delta Credit_{i,t-1} + \beta_5 X_{i,t-1} + \delta_i + \delta_t + \epsilon_{i,t} \end{aligned} \tag{2}$$

Macroprudential shocks and credit growth

Correlations between household-specific macroprudential shocks, broad-based and corporate-specific macroprudential shocks and credit to GDP growth are very low.

	ε^{HH}	ε^{BC}	$\bar{\varepsilon}^{HH}$	$\bar{\varepsilon}^{BC}$
ε^{HH}	1			
ε^{BC}	0.03	1		
$\bar{\varepsilon}^{HH}$			1	
$\bar{\varepsilon}^{BC}$			0.08	1
$\Delta Credit$	0.03	0.03	-0.02	0.01

Baseline results

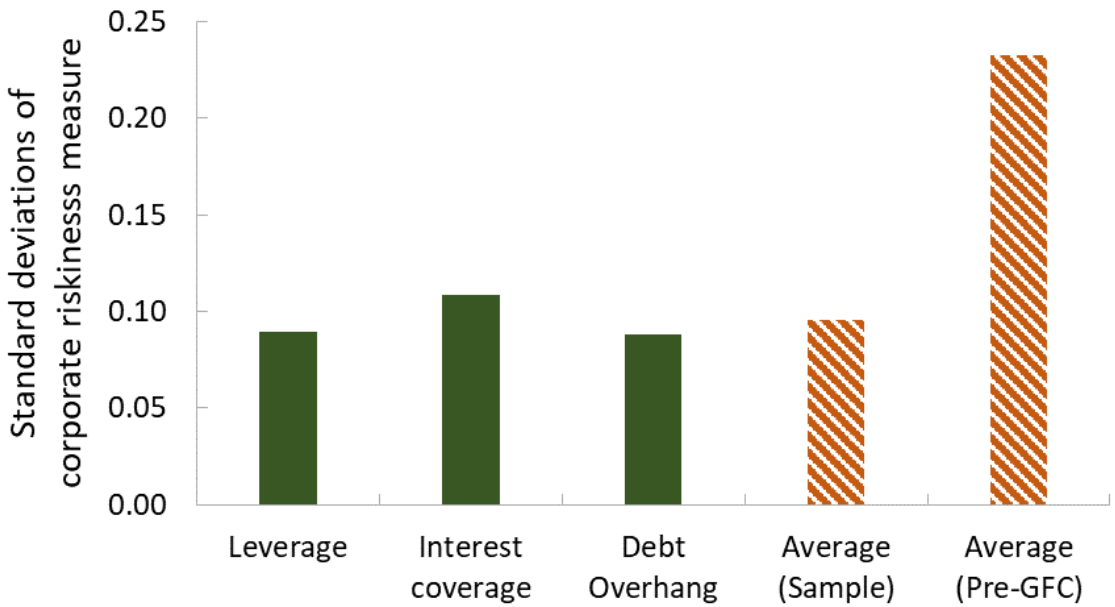
VARIABLES	(1) TDTA	(2) ICR	(3) TDtE	(4) TDTA	(5) ICR	(6) TDtE
$Dep.Variable_{t-1}$	0.486***	0.328***	0.385***	0.487***	0.326***	0.381***
ε^{HH}, Lag 1	0.004	-0.061	-0.061			
ε^{HH}, Lag 2	0.057	0.008	-0.044			
ε^{HH}, Lag 3	0.116**	-0.012	-0.023			
ε^{HH}, Lag 4	0.004	0.064	0.062			
ε^{BC}, Lag 1	0.064	0.087	0.113			
ε^{BC}, Lag 2	0.096	0.004	0.058			
ε^{BC}, Lag 3	-0.118	-0.080	-0.000			
ε^{BC}, Lag 4	-0.102	-0.156	-0.193			
$\bar{\varepsilon}^{HH}_{t-1}$				0.020	-0.029	-0.067*
$\bar{\varepsilon}^{BC}_{t-1}$				0.026	0.019	0.023
$\bar{\varepsilon}^{HH}_{t-1} \times \Delta Credit_{t-1}$				0.012**	0.014*	0.022**
$\bar{\varepsilon}^{BC}_{t-1} \times \Delta Credit_{t-1}$				-0.018*	-0.022	-0.015
$\Delta Credit_{t-1}$	0.021***	0.025***	0.032***	0.019***	0.022**	0.028***
ΔGDP_{t-1}	0.044***	0.034***	0.057***	0.041***	0.031**	0.055***
$\Delta_q ER_{t-1}$	-0.011*	0.013*	0.009	-0.011**	0.012*	0.008
Observations	1,257	1,257	1,247	1,257	1,257	1,247
Number of Countries	24	24	24	24	24	24
Adjusted R-squared	0.379	0.169	0.251	0.381	0.173	0.254
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Interaction				Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Quantification of the impact

When domestic credit relative to GDP grows at a rate of one standard deviation above the sample mean, the impact on corporate credit riskiness is around 10 percent of historical standard deviation on average.

Figure: *Estimated impact of a MaPP^{HH} tightening by credit riskiness measure.*



This result supports early policy interventions when credit vulnerabilities are still low, and sectoral leakages are less important.

Robustness

- domestic financial conditions (money market rates or domestic FCI, financial stress index)
- exclude countries (CAN, NLD, KOR) with no or few instances of broad or corporate-specific MaPP actions
- vulnerabilities in the household sector: i) household credit to GDP growth, ii) real house price growth, iii) excluding five countries with highest correlation between corporate credit riskiness and real house price growth
- add interaction of MaPP shocks with yoy growth of corporate bond issuance
- add interaction of MaPP shocks with four-quarter moving average of the ratio of corporate bonds to corporate bank credit

All these results also hold when i) removing 3 countries with highest correlation between MaPP shocks and credit to GDP growth, ii) using MaPP actions instead of shocks, and iii) using Discrol-Kraay standard errors.

Robustness: TDTA measure of credit riskiness

VARIABLES	(1) TDTA	(2) TDTA	(3) TDTA	(4) TDTA	(5) TDTA	(6) TDTA
$TDTA_{t-1}$	0.49***	0.50***	0.47***	0.47***	0.52***	0.48***
$\bar{\varepsilon}^{HH}_{t-1}$	0.02	0.02	0.03	0.04	-0.02	0.02
$\bar{\varepsilon}^{BC}_{t-1}$	0.02	-0.01	0.00	-0.04	0.01	0.03
$\bar{\varepsilon}^{HH}_{t-1} \times \Delta Credit_{t-1}$	0.01*	0.01*	0.01**	0.01	0.02***	0.01*
$\bar{\varepsilon}^{BC}_{t-1} \times \Delta Credit_{t-1}$	-0.02*	-0.02	-0.03**	-0.02	-0.02*	-0.02*
$\Delta Credit_{t-1}$	0.01**	0.01	0.02**	0.01*	0.01*	0.01**
ΔGDP_{t-1}	0.03**	0.04***	0.04***	0.04***	0.03**	0.03**
$\Delta_q ER_{t-1}$	-0.02**	-0.02**	-0.02**	-0.02***	-0.02**	-0.02***
FCI_{t-1}	-0.13**	-0.15***	-0.07	-0.07	-0.14**	-0.12*
Global Volatility		0.10***				
Fed Funds Rate (Difference)		-0.00				
$\Delta NFCBonds_{t-1}$			-0.03			
$\bar{\varepsilon}^{HH}_{t-1} \times \Delta NFCBonds_{t-1}$			-0.16			
$\bar{\varepsilon}^{BC}_{t-1} \times \Delta NFCBonds_{t-1}$			0.53			
Bond_credit_ratio_ma				-0.01		
$\bar{\varepsilon}^{HH}_{t-1} \times Bond\_credit\_ratio\_ma$				-0.00		
$\bar{\varepsilon}^{BC}_{t-1} \times Bond\_credit\_ratio\_ma$				0.01		
ΔHPI_{t-1}						0.00
Observations	1,108	1,108	1,026	1,013	924	1,108
Number of Countries	21	21	21	20	18	21
Adjusted R-squared	0.40	0.37	0.39	0.39	0.42	0.40
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	No	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Robustness: TDtE measure of credit riskiness

VARIABLES	(1) TDtE	(2) TDtE	(3) TDtE	(4) TDtE	(5) TDtE	(6) TDtE
$TDtE_{t-1}$	0.36***	0.37***	0.36***	0.35***	0.37***	0.36***
$\bar{\varepsilon}^{HH}_{t-1}$	-0.09**	-0.07*	-0.09**	0.00	-0.05	-0.09**
$\bar{\varepsilon}^{BC}_{t-1}$	0.02	0.05	-0.03	-0.05	0.01	0.02
$\bar{\varepsilon}^{HH}_{t-1} \times \Delta Credit_{t-1}$	0.02***	0.02**	0.02***	0.02**	0.02**	0.02***
$\bar{\varepsilon}^{BC}_{t-1} \times \Delta Credit_{t-1}$	-0.01	-0.02	-0.04**	-0.01	-0.01	-0.01
$\Delta Credit_{t-1}$	0.02**	0.02***	0.02**	0.02*	0.02**	0.02**
ΔGDP_{t-1}	0.05**	0.04***	0.05***	0.05**	0.04**	0.05***
$\Delta_q ER_{t-1}$	0.00	0.01	0.00	-0.00	0.00	0.00
FCI_{t-1}	-0.21**	-0.17**	-0.16*	-0.16	-0.22**	-0.21**
Global Volatility		0.07*				
Fed Funds Rate (Difference)		-0.02				
$\Delta NFCBonds_{t-1}$			0.00			
$\bar{\varepsilon}^{HH}_{t-1} \times \Delta NFCBonds_{t-1}$			-0.08			
$\bar{\varepsilon}^{BC}_{t-1} \times \Delta NFCBonds_{t-1}$			1.15**			
Bond_credit_ratio_ma				-0.01		
$\bar{\varepsilon}^{HH}_{t-1} \times Bond\_credit\_ratio\_ma$				-0.00		
$\bar{\varepsilon}^{BC}_{t-1} \times Bond\_credit\_ratio\_ma$				0.01		
ΔHPI_{t-1}						0.00
Observations	1,098	1,098	1,017	1,003	921	1,098
Number of Countries	21	21	21	20	18	21
Adjusted R-squared	0.26	0.26	0.26	0.26	0.28	0.26
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	No	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Robustness: ICR measure of credit riskiness

VARIABLES	(1) ICR	(2) ICR	(3) ICR	(4) ICR	(5) ICR	(6) ICR
ICR_{t-1}	0.32***	0.33***	0.31***	0.30***	0.33***	0.32***
$\bar{\varepsilon}^{HH}_{t-1}$	-0.05	-0.03	-0.05	0.06	-0.04	-0.05
$\bar{\varepsilon}^{BC}_{t-1}$	0.01	0.03	-0.02	-0.10	0.01	0.01
$\bar{\varepsilon}^{HH}_{t-1} \times \Delta Credit_{t-1}$	0.02*	0.01*	0.02*	0.01	0.02*	0.02*
$\bar{\varepsilon}^{BC}_{t-1} \times \Delta Credit_{t-1}$	-0.02	-0.03	-0.04**	-0.02	-0.02	-0.02
$\Delta Credit_{t-1}$	0.01	0.02*	0.01	0.01	0.01	0.01*
ΔGDP_{t-1}	0.02	0.02	0.03	0.02	0.01	0.02
$\Delta_q ER_{t-1}$	0.00	0.01	0.00	0.00	0.01	0.00
FCI_{t-1}	-0.20**	-0.17**	-0.15*	-0.15*	-0.21**	-0.21**
Global Volatility		0.11***				
Fed Funds Rate (Difference)		-0.04				
$\Delta NFCBonds_{t-1}$			0.00			
$\bar{\varepsilon}^{HH}_{t-1} \times \Delta NFCBonds_{t-1}$			-0.11			
$\bar{\varepsilon}^{BC}_{t-1} \times \Delta NFCBonds_{t-1}$			0.99*			
Bond_credit_ratio_ma				-0.01		
$\bar{\varepsilon}^{HH}_{t-1} \times Bond\_credit\_ratio\_ma$				-0.00		
$\bar{\varepsilon}^{BC}_{t-1} \times Bond\_credit\_ratio\_ma$				0.01		
ΔHPI_{t-1}						-0.00
Observations	1,108	1,108	1,026	1,013	924	1,108
Number of Countries	21	21	21	20	18	21
Adjusted R-squared	0.19	0.20	0.19	0.19	0.20	0.19
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	No	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Robustness: alternative MaPP measures

Results are robust to using alternative measures of MaPPs:

- $MaPP_2^{BC}$, that captures changes in the countercyclical capital buffer, limits on credit growth (overall and corporate sector specific) and restrictions on corporate loan characteristics
- $MaPP_2^{HH}$, which is sum of changes in LTV, LTI, DTI, DSTI limits and restrictions on household loan characteristics.
- *MaPP* shocks from alternative first-stage regression specifications (not shown below)

Alternate indicator	Coefficient of Interest	TDTA	ICR	TDtE
$MaPP_2^{BC}$	standalone $\bar{\varepsilon}^{HH}$ term	0.018	-0.031	-0.07*
	interaction w. credit-GDP	0.013**	0.013*	0.022**
$MaPP_2^{HH}$	standalone $\bar{\varepsilon}_2^{HH}$ term	0.023	-0.019	-0.047
	interaction w. credit-GDP	0.008	0.009**	0.014**
***$p < 0.01$	**$p < 0.05$ *$p < 0.1$			

Robustness: Bank lending standards

We use data on changes in the lending standards for *corporate loans* as reported by bank loan officers in surveys.

We find that an unexpected tightening of household-specific MaPP is followed by a tightening of lending standard for all corporates. However, this effect seems to differ by firm size and results in:

- relaxation of lending standards for loans to large corporations,
- tightening of lending standards for small and medium-size enterprises (SMEs).

The latter finding is consistent with the evidence that SME owners tend to use personal real estate as collateral for firm loans (Adelino, et al. 2015, Bahaj et al. 2019). It is also consistent with Ayyagari et al. (2018), who find that borrower-based MaPPs reduce borrowing by SMEs.

Robustness: Bank lending standards

NOTE: an increase means a tightening of lending standards:

VARIABLES	(1) LS(All)	(2) LS(All)	(3) LS(SMEs)	(4) LS(SMEs)	(5) LS(Large)	(6) LS(Large)
$DependentVariable_{t-1}$	0.716***	0.716***	0.680***	0.681***	0.680***	0.675***
ε^{HH}, Lag 1	1.301**	1.302**	1.897*	1.892*	0.043	0.076
ε^{HH}, Lag 2	-1.216	-1.216	-1.351	-1.352	-0.991	-0.990
ε^{HH}, Lag 3	-0.503	-0.503	0.687	0.687	-1.616*	-1.615*
ε^{HH}, Lag 4	-1.440	-1.440	-0.037	-0.041	-0.783	-0.774
ε^{BC}, Lag 1	-1.140	-1.140	-2.258	-2.263	-2.051*	-2.010*
ε^{BC}, Lag 2	-1.731	-1.730	-0.036	-0.041	-2.483	-2.448
ε^{BC}, Lag 3	-0.680	-0.679	0.616	0.597	0.570	0.682
ε^{BC}, Lag 4	-1.605	-1.604	-2.569*	-2.589*	-0.382	-0.261
$\Delta Credit_{t-1}$	0.177*	0.177*	0.251**	0.254**	0.157	0.139
ΔGDP_{t-1}	0.344*	0.344**	0.310	0.302	0.365	0.414
$\Delta_q ER_{t-1}$	0.166	0.166	0.079	0.076	0.002	0.023
NR_{t-1}		0.003		-0.053		0.335
Observations	743	743	644	644	644	644
Number of Countries	15	15	13	13	13	13
Adjusted R-squared	0.660	0.659	0.587	0.586	0.622	0.622
Domestic 3-m rate	No	Yes	No	Yes	No	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
p-value (Joint F-test for 4 lags ε^{HH})	0.06	0.06	0.08	0.08	0.03	0.03
p-value (Joint F-test for 4 lags ε^{BC})	0.28	0.39	0.32	0.37	0.16	0.19

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Corporate Loan Growth (CLG)

- We use annual data on bank-level volumes of corporate loans, residential mortgage loans and net loans.
- The variable of interest is the **relative corporate loan growh (CLG)**, which is the difference in the annual growth rate of the ratio of corporate loans to net loans of the top 30% and bottom 30% of residential mortgage lenders (relative to net loans) for a country i at time t.

Corporate Loan Growth (CLG): Empirical specification

A panel regression of the CLG variable in year t in country i:

$$CLG^{s}_{i,t} = \alpha + \beta_1 \bar{\varepsilon}^{HH}_{i,t} + \beta_2 \bar{\varepsilon}^{BC}_{i,t} + \beta_3 \Delta Credit_{i,t} + \beta_4 X_{i,t-1} + \delta_i + \delta_t + \epsilon_{i,t} \quad (3)$$

where $X_{i,t-1}$ includes yoy growth in the credit-to-GDP ratio, yoy real GDP growth, yoy ER appreciation against USD.

An alternative specification to capture potential nonlinearities (Cerutti et al. 2017):

$$\begin{aligned} CLG^{s}_{i,t} = \alpha + \beta_1 \bar{\varepsilon}^{HH}_{i,t} + \beta_2 \bar{\varepsilon}^{HH}_{i,t} \times \Delta Credit_{i,t} + \beta_3 \bar{\varepsilon}^{BC}_{i,t} + \beta_4 \bar{\varepsilon}^{BC}_{i,t} \times \Delta Credit_{i,t} + \\ + \beta_5 \Delta Credit_{i,t} + \beta_6 X_{i,t-1} + \delta_i + \delta_t + \epsilon_{i,t} \end{aligned} \quad (4)$$

CLG: Results

After an unexpected tightening of household-specific MaPPs during credit expansions, **banks with higher exposure to residential mortgages experience much higher corporate loan growth** relative to banks with smaller exposure to residential mortgages.

VARIABLES	(1) CLG	(2) CLG	(3) CLG	(4) CLG	(5) CLG	(6) CLG
$\bar{\varepsilon}_t^{HH}$	-0.14	-0.63	-0.61	-1.22**	-1.33*	-1.47*
$\bar{\varepsilon}_t^{BC}$	0.02	-0.02	0.01	0.01	-0.10	-0.08
$\bar{\varepsilon}_t^{HH} \times \Delta Credit_t$		15.19**	15.30*	20.51**	22.80**	23.56**
$\bar{\varepsilon}_t^{BC} \times \Delta Credit_t$		4.02	6.44	6.55	14.36	13.65*
NR_{t-1}			-0.20**		-0.29***	-0.27**
$\Delta Credit_t$	-10.41**	-13.06**	-13.87**	-16.07*	-15.77*	-13.46**
ΔGDP_{t-1}	0.20	0.23	0.19	0.29*	0.22	0.22
ΔER_{t-1}	-0.01	-0.01	0.04	-0.01*	0.05	0.04
$\Delta BankCredit_t$				3.04	3.73	
$\Delta HouseholdCredit_t$						2.06
Observations	132	132	123	111	102	102
Number of Countries	13	13	12	12	11	11
Adjusted R-squared	0.07	0.08	0.11	0.09	0.22	0.23
Interaction terms	No	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Bank Portfolio Choice Model

We construct a simple model of bank portfolio choice to demonstrate this economic mechanism.

- In the model, positive risk sentiment among investors reduces bank funding costs and results in higher bank lending.
- As bank balance sheets expand, the regulatory capital requirements start to bind, generating interdependence between lending and the risk profile of loans in different loan segments.
- Banks increase lending to segments with lower capital requirements and with a higher risk profile

Conclusions

After an unexpected tightening of household-specific MaPPs during credit expansions:

- The riskiness of corporate credit increases and the effects are quantitatively meaningful.
- Data from bank lending standards indicates that the leakages from the household-specific MaPPs are likely to be more pronounced for credit to large corporates.
- These results support early policy interventions when credit vulnerabilities are still low, as sectoral leakages will be less important.
- They also point to the importance of timely monitoring of vulnerabilities and riskiness in both household and corporate sectors.
- Information on the distribution of the loans in banks' corporate portfolios by firm size might be relevant for assessing the size of potential leakage effects.