

Household Credit, Global Financial Cycle, and Macroprudential Policies: Credit Register Evidence from an Emerging Country

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Banking Crises, Global Financial Cycle, and Macroprudential Policies

- Banking crises occur after periods of strong credit growth and availability of foreign liquidity
- Crises lead to credit crunches with large negative real effects
- Banking crises and post-crisis fallout are strongly predicted by household debt dynamics

- The **global financial cycle** [Rey \(2013, 2016\)](#) generates spillovers to local credit cycles and policy dilemmas in emerging markets (EM)

- Regulation needs to take a macroprudential dimension
 - ▶ Macroprudential policy - an approach to financial regulation aimed at reducing risks in the financial sector as a whole
 - ▶ Reduce negative externalities from the financial sector, cyclical vulnerabilities, and systemic risk

Research Questions

- Do macroprudential policies affect **the level and composition of local bank credit** to households?
 - ▶ Foreign currency (FX) lending
 - ▶ Borrower riskiness
 - ▶ Foreign bank funding
- Do macroprudential policies dampen **the transmission of external financial conditions** to the local household credit cycle?
 - ▶ Global risk appetite
 - ▶ Foreign monetary policy
- Do the effects **vary by type of macroprudential policy** (bank- vs. borrower-based)?

Empirical Identification

Laboratory for empirical identification: Romania

- ① Small open bank-dependent EM
- ② Comprehensive credit register with microdata on all loans to individuals
- ③ Deployed wide range of macroprudential policies during a boom-bust cycle; wide variation in instruments (bank- vs. borrower-based)
- ④ One of few countries that implemented macroprudential policies for both boom and bust
- ⑤ Exposed to global financial conditions through majority foreign-owned banking system (foreign funding, FX loans)

Results: Macroprudential Policy Has Strong Compositional Effects on Household Credit

Macroprudential policy has relatively stronger effects on FX loans, especially:

- 1 to *ex-ante* riskier borrowers (DTI)
- 2 from banks reliant on foreign funding

Macroprudential policy has relatively stronger effects in reducing cross-border spillovers to riskier types of credit (FX) when:

- 1 external financial conditions are loose (VIX is low)
- 2 foreign monetary policy rates are low

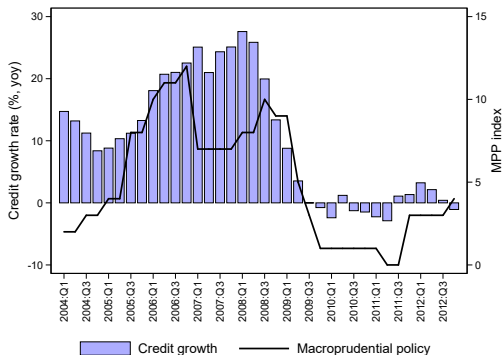
Borrower-side measures generally more effective; bank measures more effective for foreign funding exposure

Contribution to the Literature

- Literature on impact of macroprudential policies on the credit cycle
 - ▶ Cross-country studies [Cerutti Claessens Laeven \(2017\)](#), [Ghosh Ostry Qureshi \(2017\)](#), [Vandenbussche Vogen Detragiache \(2015\)](#)
 - ▶ Microdata studies focus on credit to non-financial firms [Jimenez et al \(2017\)](#)
 - ▶ Yet household leverage key driver of financial crises [Mian Sufi and Verner \(2017\)](#), [Mian and Sufi \(2015\)](#)
 - ▶ Household debt more important for financial crises and costs than corporate debt
 - ▶ Most related study: [Acharya et al \(2017\)](#): HH loans in Ireland reponse to LTI, LTV
 - ▶ **Contribution:** Focus on household credit; comprehensive credit-register, a full boom-bust cycle; different effects for bank- vs. borrower-based policies
- Literature on spillovers from international capital flows and the “global financial cycle”
 - ▶ Investor uncertainty and risk aversion (VIX) [Baskaya et al \(2017a, b\)](#), [Bruno and Shin \(2015a\)](#), [Forbes and Warnock \(2012\)](#)
 - ▶ Foreign monetary policy “international bank lending and risk-taking channel” [Morais Peydro Ruiz \(2017\)](#), [Coimbra and Rey \(2017\)](#), [Bruno and Shin \(2015b\)](#), [Giannetti and Laeven \(2012\)](#)
 - ▶ Global bank activities and shocks [Cetorelli and Goldberg \(2012, 2011\)](#)
 - ▶ **Contribution:** Push these questions further to examine the role of macroprudential policies

Romania 2004-2012

- Large credit and housing boom 2004-2008, crash 2009-2012
- Wide range of macroprudential policies both during the boom and bust

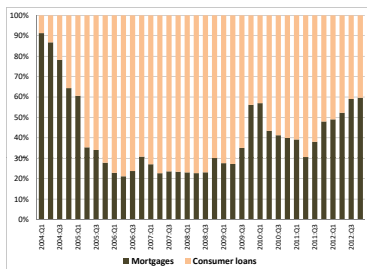


HH credit & macroprudential policies (MPP)

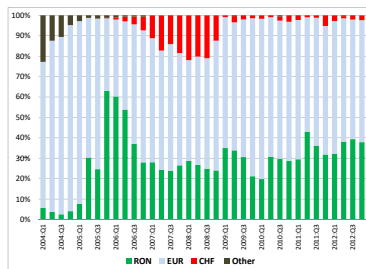
Notes: Real household bank credit growth (yoy) and macroprudential policy index during 2004-2012. Higher values of the index indicate tighter macroprudential conditions.

Household Credit Composition

- Hh credit is about 1/2 of total private credit outstanding
- More than 1/2 of outstanding hh credit is in FX (mainly EUR, CHF)
- Mortgages account for 10% of loans, 40% of outstanding hh credit



Mortgages vs consumer loans



FX vs local-currency loans

Notes: Total bank credit to households by type (mortgages, consumer loans) and currency (FX/RON, EUR/CHF/OTHER) during 2004-2012.

Macroprudential Policies

- Lots of **variation in macroprudential policies (MPP)** over the cycle (MRR on FX and local-currency deposits; limits on FX exposures; changes in capital requirements, provisioning rules; changes in loan-to-value (LTV) and debt-service-to-income (DTI), etc.)

Date	Examples of measures	Overall index	Bank index	Borrower index
2004Q1	consumer credit DTI limit 30%; mgg credit: DTI limit 35%	+1	0	+1
2004Q1	mortgage credit: LTV limit 75%	+1	0	+1
2004Q3	MRR ratio on FX deposits raised from 25% to 30%, MRR on RON remains 18%	+1	+1	0
2005Q1	MRR broadened to include all FX liabilities carrying maturities over 2 years	+1	+1	0
2005Q3	provisioning and loan classification rules changed to account FX risk of borrower	+1	+1	0
2005Q3	DTI further tightened; overall installments across borrower's outstanding loans not exceed 40%	+1	0	+1
2005Q3	bank's FX credit exposure from loans to unhedged individuals and legal entities not exceed 300% of bank equity	+1	+1	0
2007Q1	eligibility criteria for DTI to be determined by banks' internal models	-1	0	-1
2007Q1	foreign currency credit exposure limits removed	-1	-1	0
2009Q2	MRR on FX liabilities with residual maturity > 2 years reduced from 40% to 0%	-1	-1	0
2009Q3	MRR on domestic currency liabilities reduced from 18% to 15%	-1	-1	0

- Construct **MPP index** following [Cerutti Claessens Laeven \(2017\)](#)

- ▶ Tightening: +1; Easing: -1
- ▶ Index: cumulative sum of +/ - 1 values [Details](#)
- ▶ MPP sub-indices are highly correlated, especially during the boom [Chart](#)

Data and Empirical Strategy

- **Credit register:** Almost 3,000,000 loans from 42 banks to 1.4 million individuals
 - ▶ Loan information: amount, type, currency, borrower risk and age, location (county)
- **Bank balance sheet data:** foreign funding, size, capital, liquidity, NPL, ROA
- **Macro data:** Monetary policy rate, GDP growth, CPI inflation, VIX, EONIA
- Control for **GDP growth interactions** Local determinants of MPP

- **Specifications:** bank-borrower-quarter loan-level data

$$L_{ijkt} = FE + \beta MPP_{t-z} \times RISK + CONTROLS + \epsilon_{ijkt} \quad (1)$$

$$L_{ijkt} = FE + \beta MPP_{t-z} \times SPILLOVER_{t-z} \times RISK + CONTROLS + \epsilon_{ijkt} \quad (2)$$

testing **differential effects** of macroprudential policy *MPP* on log-loan volume L_{ijkt} from bank i to borrower j in county k in period t

- ▶ *RISK* is borrower riskiness *DTI*, bank foreign funding *FF*, or a dummy for *FX* loans
- ▶ Global *SPILLOVER* is external financial conditions (VIX or EONIA)
- ▶ Granular FEs (bank×time, county×time, loan-type×time) control for unobservables

Differential Effects of Macroprudential Policies

FX vs Local Currency Loans

Dependent variable: $\log(\text{credit volume})$

	Overall index (1)	Overall index (2)	Bank index (3)	Borrower index (4)
Macroprudential policy	-0.0531*** (0.018)			
Macroprudential policy \times FX		-0.0500*** (0.018)	-0.0305 (0.019)	-0.3630*** (0.068)
FX loan	1.6617*** (0.109)	2.1067*** (0.241)	1.9483*** (0.211)	2.5370*** (0.250)
Other controls	Yes	Yes	Yes	Yes
GDP growth interactions		Yes	Yes	Yes
Bank \times Year FE	Yes			
County \times Year FE	Yes			
Loan-type \times Year FE	Yes			
Bank \times Year-quarter FE		Yes	Yes	Yes
County \times Year-quarter FE		Yes	Yes	Yes
Loan-type \times Year-quarter FE		Yes	Yes	Yes
Observations	2,753,494	2,965,459	2,965,459	2,965,459
R-squared	0.219	0.263	0.263	0.264

By currency

EU entry

Differential Effects of Macroprudential Policies

Borrower Riskiness

Dependent variable: $\log(\text{credit volume})$

	Overall index (1)	Overall index (2)	Bank index (3)	Borrower index (4)
Macroprudential policy \times DTI	-0.0002 (0.005)			
Macroprudential policy \times DTI \times FX		-0.0323*** (0.007)	-0.0296*** (0.005)	-0.1317*** (0.027)
Macroprudential policy \times DTI \times RON		0.0177*** (0.004)	0.0091* (0.005)	0.0447*** (0.011)
Borrower DTI	0.6595*** (0.072)	0.6489*** (0.071)	0.6695*** (0.067)	0.6625*** (0.074)
FX loan	1.3612*** (0.068)	1.5589*** (0.085)	1.5096*** (0.082)	1.5888*** (0.085)
Other controls	Yes	Yes	Yes	Yes
GDP growth interactions	Yes	Yes	Yes	Yes
Bank \times Year-quarter FE	Yes	Yes	Yes	Yes
County \times Year-quarter FE	Yes	Yes	Yes	Yes
Loan-type \times Year-quarter FE	Yes	Yes	Yes	Yes
Observations	2,139,941	2,139,941	2,139,941	2,139,941
R-squared	0.271	0.273	0.272	0.273

By cc

Differential Effects of Macroprudential Policies

Bank Exposure to Foreign Funding

Dependent variable: $\log(\text{credit volume})$

	Overall index (1)	Overall index (2)	Bank index (3)	Borrower index (4)
Macroprudential policy \times FX \times Foreign-funding	-0.0023*** (0.001)	-0.0025*** (0.001)	-0.0035** (0.001)	-0.0048** (0.002)
Macroprudential policy \times FX	-0.0166 (0.017)	-0.0024 (0.038)	0.0232 (0.045)	-0.4736*** (0.128)
FX \times Foreign-funding	0.0007 (0.012)	0.0015 (0.011)	-0.0016 (0.011)	-0.0002 (0.010)
Macroprudential policy \times FX \times Foreign bank		-0.0141 (0.036)	-0.0124 (0.043)	0.2194** (0.090)
FX \times Foreign bank		-0.2024 (0.406)	-0.2480 (0.422)	-0.6856** (0.337)
FX loan	2.0756*** (0.237)	2.2313*** (0.361)	2.1754*** (0.391)	3.0888*** (0.368)
Other controls	Yes	Yes	Yes	Yes
GDP growth interactions	Yes	Yes	Yes	Yes
Bank \times Year-quarter FE	Yes	Yes	Yes	Yes
County \times Year-quarter FE	Yes	Yes	Yes	Yes
Loan-type \times Year-quarter FE	Yes	Yes	Yes	Yes
Observations	2,965,459	2,965,459	2,965,459	2,965,459
R-squared	0.263	0.263	0.263	0.264

Spillovers from External Financial Conditions (VIX)

Dependent variable: $\log(\text{credit volume})$

	Overall index (1)	Overall index (2)	Overall index (3)	Bank index (4)	Borrower index (5)
Macroprudential policy	-0.5885*** (0.119)	-0.5981*** (0.119)			
VIX	-0.0655*** (0.020)	-0.0667*** (0.020)	-0.0100 (0.007)	0.0069 (0.009)	-0.0243*** (0.008)
Macroprudential policy \times VIX	0.0177*** (0.004)				
Macroprudential policy \times VIX \times FX		0.0189*** (0.005)			
Macroprudential policy \times VIX \times RON		0.0174*** (0.005)			
Macroprudential policy \times Low VIX \times FX			-0.2317*** (0.050)	-0.2850*** (0.071)	-0.8161*** (0.128)
Macroprudential policy \times Low VIX \times RON			-0.1821*** (0.052)	-0.2224*** (0.071)	-0.4627*** (0.145)
Macroprudential policy \times High VIX \times FX			-0.0928** (0.036)	0.0273 (0.069)	-0.6135*** (0.088)
Macroprudential policy \times High VIX \times RON			-0.1131*** (0.038)	-0.0086 (0.066)	-0.4230*** (0.078)
FX loan	1.6474*** (0.105)	1.5234*** (0.201)	1.8998*** (0.225)	1.8813*** (0.200)	2.3223*** (0.235)
Other controls, GDP interactions	Yes	Yes	Yes	Yes	Yes
Bank \times Semester FE	Yes	Yes	Yes	Yes	Yes
County \times Semester FE	Yes	Yes	Yes	Yes	Yes
Loan-type \times Semester FE	Yes	Yes	Yes	Yes	Yes
<i>P-value t-tests coefficient on MPP \times Low VIX \times FX greater than</i>					
Any other interactions			0.000	0.000	0.000
Observations	2,753,494	2,753,494	2,753,494	2,753,494	2,753,494
R-squared	0.228	0.228	0.228	0.229	0.229

Economic Interpretations of Coefficient Magnitudes

- A tightening of MPP by one SD (3.6 units) reduces average FX loan volume by close to 18% more than it does RON loan volume.
- For borrowers with a given DTI (borrowing from the same bank in same county and quarter), a tightening of MPP by one SD reduces FX loan volume by 11.6% and increases RON loan volume by 6.3%.
- The dampening impact of a tightening in MPP on FX loan volume is larger by 8.2 pps for a bank with high exposure to foreign funding (90th pct, or 35%) vs. a bank with low exposure to foreign funding (10th pct, or 2%).
- With no MPP, a reduction of VIX by one unit raises household credit by 6.5%. This effect is undone by an increase in the MPP index by 3.7 units.

Preliminary Results on Leakages and Real Effects

“Leakages” to Corporate Credit

- When macroprudential policies (especially borrower-based measures) tighten, household credit declines and corporate credit rises, especially to real estate and construction firms.

Real Effects

- In regions where banks have greater exposure to FX loans, risky borrowers, and foreign funding, a tightening of macroprudential policies is associated with fewer construction permits and lower house price growth.

“Leakages” to Corporate Credit

Data source: Corporate credit registry over 2004-2012 matched with firm financials

Dependent variable: $\log(\text{corporate credit volume})$

	(1)	(2)	(3)	(4)	(5)	(6)
Borrower index \times Real estate	0.1673*** (0.047)	0.1601*** (0.047)	0.1526*** (0.045)	0.1254*** (0.043)	0.1151** (0.042)	0.1034*** (0.035)
Borrower index \times Other	0.1086** (0.052)	0.1093** (0.051)	0.1051** (0.050)	0.0759 (0.051)	0.0782* (0.045)	0.0631 (0.040)
Loan controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes	Yes
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes
GDP growth interactions	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes		
County FE	Yes	Yes	Yes	Yes		
Industry FE		Yes	Yes	Yes	Yes	
Year FE	Yes	Yes	Yes	Yes		
Loantype FE			Yes	Yes		
Bank \times Year FE					Yes	Yes
County \times Year FE					Yes	Yes
Loan-type \times Year FE					Yes	Yes
Firm FE				Yes		Yes
Observations	383,603	383,603	383,603	353,634	383,602	353,632
R-squared	0.369	0.370	0.373	0.589	0.409	0.608

Real Effects

Regional exposure to MPP: Share of FX loans

Dependent variables:	BUILDING PERMITS	HOUSE PRICES	NIGHTLIGHTS
	(1)	(2)	(3)
Overall index×Share FX loans	-0.1001** (0.044)	-0.0504** (0.025)	-0.1832** (0.072)
Share FX loans	0.7227* (0.374)	0.1573 (0.216)	-0.1014 (0.470)
Other bank controls	Yes	Yes	Yes
GDP interactions	Yes	Yes	Yes
Foreign Bank×Macropru	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Year-quarter FE	Yes	Yes	Yes
Observations	1,302	588	378
R-squared	0.318	0.422	0.840

*The overall macropru index is lagged 4 quarters; effects appear after one quarter and become stronger.

*Results are robust to measuring regional exposure to MPP with the share of FX loans based on volume (instead of counts); average borrower DTI; and average bank foreign funding.

Conclusions

- Examine impact of macroprudential policies on the local household credit cycle in an open bank-dependent EM
- As far as we are aware, **first paper** to use a household credit register to study
 - ① the impact of macroprudential policies over a full economic cycle
 - ② whether macroprudential policies reduce impact of global financial conditions on local credit – both household and corporate – and the real economy
- **Bottomline: Macroprudential policies can tame household credit cycles**
- Quantitatively important **compositional effects away from riskier forms of lending** (FX loans, *ex-ante* riskier borrowers)
- Quantitatively important for **reducing effects from the global financial cycle**
- Borrower-based measures generally more impactful than bank-based measures
- There is “leakage” of macroprudential policies to corporate credit; and impacts on the real economy

Appendix: Local Determinants of Macroprudential Policies

Dependent variable: Overall index

	(1)	(2)	(3)	(4)	(5)
Monetary policy	-0.0212 (0.141)				-0.1823 (0.211)
GDP growth		0.3308*** (0.103)			0.4345*** (0.122)
Inflation			0.0135 (0.224)		-0.0308 (0.341)
VIX				-0.0329 (0.065)	0.0500 (0.064)
Observations	36	36	36	36	36
R-squared	0.001	0.233	0.000	0.008	0.300

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Appendix: FX Currency Decompositions

Dependent variable: $\log(\text{credit volume})$

	Overall index (1)	Bank index (2)	Borrower index (3)
Macroprudential policy \times FX \times EUR	-0.0488** (0.018)	-0.0301 (0.019)	-0.3552*** (0.068)
Macroprudential policy \times FX \times CHF	-0.0551 (0.033)	-0.0416 (0.036)	-0.3191*** (0.097)
Macroprudential policy \times FX \times OTHER	-0.1415** (0.054)	-0.0941** (0.046)	-0.7633*** (0.201)
FX loan	2.1041*** (0.241)	1.9479*** (0.211)	2.5248*** (0.249)
Loan, bank, and borrower controls	Yes	Yes	Yes
GDP growth interactions	Yes	Yes	Yes
Bank \times Year-quarter FE	Yes	Yes	Yes
County \times Year-quarter FE	Yes	Yes	Yes
Loan-type \times Year-quarter FE	Yes	Yes	Yes
Observations	2,965,459	2,965,459	2,965,459
R-squared	0.263	0.263	0.264

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Appendix: Baseline 9 Months Around EU Entry

Dependent variable: $\log(\text{credit volume})$

	Overall index (1)	Overall index (2)	Bank index (3)	Borrower index (4)
Macroprudential policy	-0.3118*** (0.079)			
Macroprudential policy \times FX		-0.1080** (0.050)	-0.1867** (0.088)	-0.2301* (0.116)
FX loan	1.3254*** (0.110)	-0.2953 (0.243)	-0.5302* (0.306)	0.0180 (0.266)
Other controls	Yes	Yes	Yes	Yes
GDP growth interactions		Yes	Yes	Yes
Bank \times Year FE	Yes			
County \times Year FE	Yes			
Bank \times Year-quarter FE		Yes	Yes	Yes
County \times Year-quarter FE		Yes	Yes	Yes
Observations	148,417	151,381	151,381	151,381
R-squared	0.178	0.192	0.192	0.192

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Appendix: Borrower Riskiness Currency Decompositions

Dependent variable: $\log(\text{credit volume})$

	Overall index (1)	Bank index (2)	Borrower index (3)
Macroprudential policy \times DTI \times EUR	-0.0340*** (0.007)	-0.0312*** (0.006)	-0.1358*** (0.028)
Macroprudential policy \times DTI \times CHF	-0.0239 (0.015)	-0.0334* (0.017)	-0.0695 (0.041)
Macroprudential policy \times DTI \times OTHER	-0.0536* (0.027)	-0.0352* (0.019)	-0.2797** (0.110)
Macroprudential policy \times DTI \times RON	0.0175*** (0.004)	0.0089* (0.005)	0.0451*** (0.011)
Borrower DTI	0.6504*** (0.071)	0.6700*** (0.067)	0.6622*** (0.074)
FX loan	1.5616*** (0.085)	1.5118*** (0.083)	1.5907*** (0.085)
Other controls	Yes	Yes	Yes
GDP growth interactions	Yes	Yes	Yes
Bank \times Year-quarter FE	Yes	Yes	Yes
County \times Year-quarter FE	Yes	Yes	Yes
Loan-type \times Year-quarter FE	Yes	Yes	Yes
Observations	2,139,941	2,139,941	2,139,941
R-squared	0.273	0.272	0.273

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Appendix: Spillovers from VIX by Loan Type

Dependent variable: $\log(\text{credit volume})$

	Overall index	Bank index	Borrower index	Overall index	Bank index	Borrower index
	Residential Mortgages			Consumer Loans		
MPP×Low VIX×FX	-0.0314*** (0.010)	-0.0390** (0.016)	-0.0784*** (0.024)	-0.2564*** (0.053)	-0.3118*** (0.075)	-0.8438*** (0.127)
MPP×Low VIX×RON	0.0066 (0.023)	0.0290 (0.039)	-0.0370 (0.051)	-0.1984*** (0.056)	-0.2338*** (0.077)	-0.5558*** (0.149)
MPP×High VIX×FX	-0.0053 (0.015)	0.0103 (0.024)	-0.0392** (0.017)	-0.1109** (0.041)	0.0161 (0.075)	-0.6030*** (0.064)
MPP×High VIX×RON	-0.0272 (0.020)	0.0445 (0.056)	-0.1606 (0.097)	-0.1224*** (0.041)	0.0004 (0.074)	-0.5118*** (0.078)
VIX	-0.0035 (0.002)	0.0006 (0.002)	-0.0065** (0.003)	-0.0106 (0.008)	0.0059 (0.010)	-0.0263*** (0.009)
FX loan	0.5604*** (0.190)	0.5657*** (0.155)	0.3428** (0.143)	2.0168*** (0.249)	2.0021*** (0.221)	2.2373*** (0.258)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
GDP growth interactions	Yes	Yes	Yes	Yes	Yes	Yes
Bank×Semester FE	Yes	Yes	Yes	Yes	Yes	Yes
County×Semester FE	Yes	Yes	Yes	Yes	Yes	Yes
Loan-type×Semester FE	Yes	Yes	Yes	Yes	Yes	Yes
<i>P-value t-tests coefficient on MPP×Low VIX×FX greater than</i>						
Any other interaction	0.000	0.000	0.005	0.000	0.000	0.000
Observations	277,590	277,590	277,590	2,475,877	2,475,877	2,475,877
R-squared	0.197	0.197	0.198	0.185	0.186	0.186

Appendix: Spillovers from Foreign Monetary Policy

Dependent variable: $\log(\text{credit volume})$

	Overall index (1)	Bank index (2)	Borrower index (3)
EONIA \times FX	-0.3015*** (0.101)	-0.0966 (0.111)	-0.6035*** (0.109)
EONIA \times Macroprudential policy \times FX	0.0448*** (0.015)	-0.0263 (0.030)	0.2411*** (0.045)
Macroprudential policy \times FX	-0.2791*** (0.051)	-0.1139 (0.074)	-1.3423*** (0.235)
VIX \times FX	-0.0137 (0.021)	0.0121 (0.015)	-0.0296 (0.031)
VIX \times Macroprudential policy \times FX	0.0060*** (0.002)	0.0046** (0.002)	0.0284*** (0.009)
FX loan	2.6930*** (0.390)	1.6440*** (0.309)	3.8198*** (0.581)
Other controls	Yes	Yes	Yes
GDP growth interactions	Yes	Yes	Yes
County \times Year-quarter FE	Yes	Yes	Yes
Bank \times Year-quarter FE	Yes	Yes	Yes
Loan-type \times Year-quarter FE	Yes	Yes	Yes
Observations	2,965,459	2,965,459	2,965,459
R-squared	0.265	0.265	0.265

Appendix: Macroprudential Policy Measures, 2002-2007

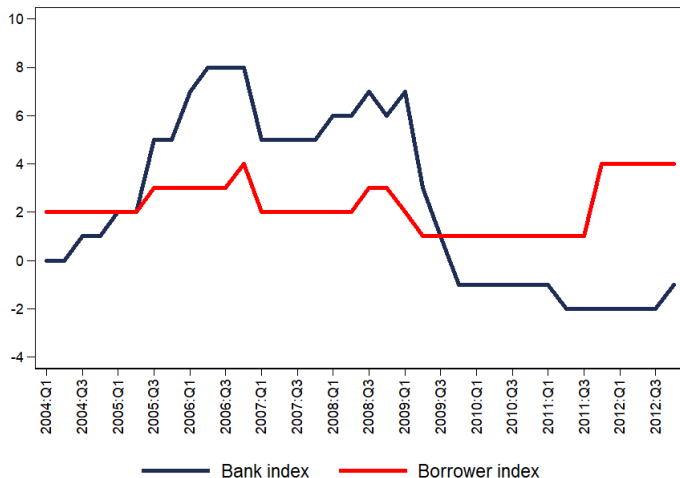
Date	Measure	Coding
2004Q1	consumer credit: installments shall not exceed 30% of net incomes of the borrower and his family; mgg credit: installments shall not exceed 35% of net incomes of the borrower and his family	1
2004Q1	consumer credit: downpayment of at least 25% or cosigner commitment for purchases of goods; collateral and/or cosigner commitment for other types of consumer credit; mortgage credit: credit value shall not exceed 75% of property value	1
2004Q3	reserve requirement ratio on foreign currency deposits raised from 25% to 30%, reserve ratio on domestic currency deposits stays at 18%	1
2005Q1	reserve requirements broadened to include all foreign currency liabilities carrying maturities of over 2 years	1
2005Q3	regulation on provisioning and loan classification refined to take into account the foreign currency risk of the borrower	1
2005Q3	eligibility criteria for DTI further tightened; overall installments associated with the sum of all credit contracts shall not exceed 40% of borrower net income	1
2005Q3	foreign currency credit exposure of credit institutions arising from loans granted to unhedged individuals and legal entities shall not exceed 300% of equity	1
2005Q3	provisioning: credit institutions may include borrowers who do not earn steady income in the currency in which their loan is denominated at most in the "B" financial performance category	1
2005Q3	reserve requirements on domestic currency liabilities reduced from 18% to 16%	-1
2005Q3	reserve requirements base broadened to include all foreign currency liabilities carrying maturities of over two years regardless of the date at which they were raised.	1
2006Q1	reserve requirements on foreign currency liabilities raised from 30% to 35% and later to 40%	2
2006Q2	reserve requirements increased from 16% to 20% (for the first time in 6.5 years)	1
2006Q4	eligibility constraints (LTV, DTI) on household loans also applied to regulated non-bank credit institutions	1
2007Q1	eligibility criteria for DTI to be determined by banks' internal models	-1
2007Q1	foreign currency credit exposure limits removed	-1
2007Q1	loan-to-value (LTV) limit removed	-1
2007Q1	following entry into the European Union, minimum capital requirement drops from 12% to 8%	-1
2007Q1	full enforcement of Basel II regulatory framework. Lower risk-weights (standardized approach) and tightening of operational risk management	-1

Appendix: Macroprudential policy measures, 2008-2012

Date	Measure	Coding
2008Q1	higher provisioning rate for loans to unhedged foreign currency borrowers	1
2008Q1	the October 2005 restriction regarding the possibility to classify an unhedged borrower in the "B" financial performance category at most is removed	-1
2008Q1	a new requirement regarding distinct provisioning coefficients for loans in foreign currency or linked to another currency exchange rate granted to unhedged borrowers (as compared to hedged borrowers) is introduced	1
2008Q3	current year profits are excluded from regulatory capital	1
2008Q3	banks have to consider the interest and exchange rate risk in setting the indebtedness ceiling (set on a case by case basis using internal risk models)	1
2008Q4	reserve requirements on domestic currency liabilities reduced from 20% to 18%	-1
2009Q1	requirement to take into calculation interest rate risk and currency risk when setting the indebtedness ratio for clients taking loans backed by mortgage on the home or the land within city limits was removed	-1
2009Q1	the minimum capital adequacy ratio was set at 10% as long as the multilateral financing arrangement with the EU, the IMF and other IFIs was in place	1
2009Q2	reversal of August 2008 measure regarding capital (current year profits are included in regulatory capital)	-1
2009Q2	a fraction of the collateral value (less than 25%) can be deducted from the value of "loss" (i.e. 90+ days overdue) exposures to compute provisions (under the old regulation, no deduction was allowed)	-1
2009Q2	launch of the first-home mortgage subsidy government program	-1
2009Q2	reserve requirements on foreign currency liabilities with residual maturity greater than two years reduced from 40% to 0%.	-1
2009Q3	reserve requirements on domestic currency liabilities reduced from 18% to 15%	-1
2009Q3	reserve requirements on foreign currency liabilities with maturity less than two years reduced from 40% to 25%	-1
2009Q4	regulation 20/2009 allows inclusion of interim profits in capital	-1
2009Q4	reserve requirements on foreign currency liabilities with maturity less than two years reduced from 30% to 25%	-1
2011Q2	reserve requirements on foreign currency liabilities with maturity less than two years reduced from 25% to 20%	-1
2011Q4	introduce an LTV limit by type of loan currency denomination, and specific foreign currency shocks to determine the maximum indebtedness level	3
2012Q4	extension of regulatory measures to non-financial companies that are unhedged to currency risk by requiring lenders to apply tighter conditions on loans in foreign currencies	1

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Appendix: Bank- and borrower-based MPP indices



Notes: Simple correlation in the time series: 0.36.

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Appendix: Descriptive statistics

	Obs	Mean	Median	St. Dev.
CREDIT REGISTER VARIABLES				
Loan amount (in local currency: RON)	2,965,479	68,173	37,216	208,357
Borrower age (years)	2,965,479	39.17	38.02	10.01
Debt-to-income ratio (DTI)	2,139,977	61.66	42.65	56.49
First-home mortgage	2,965,479	0.0262	0.000	0.160
LOAN TYPES				
Foreign currency loan (FX)	2,965,479	0.336	0.000	0.472
Foreign currency loan in EUR	2,965,479	0.293	0.000	0.455
Foreign currency loan in CHF	2,965,479	0.039	0.000	0.195
Foreign currency loan in other currencies	2,965,479	0.004	0.000	0.061
Local currency loan (RON)	2,965,479	0.664	1.000	0.472
Mortgage (MGG)	2,965,479	0.104	0.000	0.305
Consumer loan (CONS)	2,965,479	0.896	1.000	0.305
Foreign currency mortgage (MGG-FX)	2,965,479	0.093	0.000	0.290
Local currency mortgage (MGG-RON)	2,965,479	0.011	0.000	0.104
Foreign currency consumer loan (CONS-FX)	2,965,479	0.243	0.000	0.429
Local currency consumer loan (CONS-RON)	2,965,479	0.653	1.000	0.476

Appendix: Descriptive statistics (cont'd)

	Obs	Mean	Median	St. Dev.
MACRO VARIABLES				
Macroprudential policy index (MPP): Overall	2,965,479	5.943	7.000	3.581
Macroprudential policy subindex: Bank	2,965,479	2.333	1.500	3.593
Macroprudential policy subindex: Borrower	2,965,479	2.25	2.000	1.052
Monetary policy rate	2,965,479	8.136	7.500	2.373
GDP growth	2,965,479	4.367	6.340	4.998
Inflation	2,965,479	6.253	6.692	2.071
VIX	2,965,479	33.62	35.19	9.082
EONIA	2,965,479	2.389	2.634	1.542
BANK VARIABLES				
Bank size	2,943,757	23.56	23.71	1.077
Bank capital	2,777,235	7.472	7.046	3.272
Bank liquidity	2,943,757	2.584	2.092	1.847
Bank ROA	2,965,479	0.992	1.118	1.836
Bank NPL	2,965,479	3.263	0.962	4.500
Bank risk profile	2,777,234	65.10	65.13	10.38
Bank foreign funding	2,965,479	18.89	15.25	24.98
Foreign bank	2,965,479	0.812	1.000	0.391