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The effect of macroprudential policies on credit developments in Europe 1995-2017

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- Macroprudential authorities have at their disposal **a diversity of instruments**, that incl. a standarized set of tools under CRDIV, but also an even richer set of tools that remain within the national remit (e.g. borrower-based standards)

- There is (still) relatively little empirical evidence supporting the selection of these instruments to address specific systemic risks

- We make a step in this direction by looking at **a broad set of measures** and **comparing** their effectiveness in **controlling credit growth**?

- We also assess their **interactions** with **monetary policy** in order to provide an additional guidance to macroprudenial policy-makers on the optimal use of instruments in the monetary policy cycle

- **Diversity** of instruments and their **limited comparability in time and across borders** is also one of the key challenges in the empirical studies on the effectiveness of macroprudentiual policies

- This makes the use of **narrative information** a viable option: the identification is achieved via knowledge of **the type of a measure and the timing of its application**

- MaPPED (Budnik and Kleibl, 2018) provides a detailed account of policies **with a macroprudential character** for over 20 years and for 38 countries

- It also separates **policy actions** and **policy instruments** allowing the **construction of different policy indicators**

Motivation: Studies based on a larger sample of countries

- Earlier empirical findings on the effect of macroprudential instruments on credit growth…

	Lim et al. (2011)	Cerutti et al. (2017)	Akinci and Olmstead-Rumsey (2015)
Capital based	Countercyclical effect of **CCyB-type buffers**, negative effect of **profit distribution restrictions** and **dynamic provisioning**	Negative effect of **dynamic provisioning**	Negative effect of **capital requirements**, and other housing policies (incl. RW)
Borrower-based	Counter-cyclical effect of **LTV and DTI caps**	Negative effect of **LTV, DTI caps**	Negative effect of **LTV**
Reserve requirements and other	Counter-cyclical effect of **reserve requirements**	Negative effect of **reserve requirements, limits on FX loans, concentration limits**	Positive effect of **reserve requirements**
Sample	49 countries incl. 20 EU Member States	64 countries incl. 27 EU Member States	57 countries incl. 28 EU Member States
General take-aways		All above instruments **not significant for developing countries** (incl. borrower based instruments)	

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- Macroprudential policies can have a significant impact on the evolution of credit to non-financial sector also in **developed (EU) economies**

- **Capital based-measures supress** the growth rate (or procyclicality) of credit to NFCs, and **the transmission of monetary policy**. Overwhelming evidence on a positive and complementary to monetary policy impact of **profit distribution restrictions.**

- **Borrower-based measures,** such as LTV or DSTI limits, affect the growth rate of credit persistently and **positively**. There are however likely to have a significant countercyclical impact on credit due to their **positive interactions with monetary policy. Sectoral exposure** exhibit **a reverse** pattern.

- **Caps on** longer- and shorter-term **maturity mismatches** have (if anything) a **positive** impact on the credit growth and **negatively affect the transmission of monetary policy**. Strongest evidence of the negative and counterbalancing impact of **FX limits**.

Data: Overview

- Sample **period**: 1995Q1-2017Q4

- Countries: all 28 EU

- **Macroeconomic variables**: **LHS** real bank credit to the NFPS (GDP deflator adjusted, BIS & national sources), to households and enterprises, **RHS** GDP (SDW), real monetary policy interest rate (BIS & national sources)

- **Macroprudential (*and other*) policies**:

    - **Capital-based**: (i) Minimum capital requirements, (ii) Capital buffers, (iii) Profit distribution restrictions , (iv) Risk weights, (v) General provisioning rules incl. general provisioning, (vi) Minimum capital requirements

    - **Borrower-based**: (i) LTV, (ii) DSTI/DTI/LTI, (iii) Other income based eligibility requirements, (iv) Other lending standards

    - **Liquidity requirements**: (i) Liabilities based reserve requirements, (ii) Asset based reserve requirements, (iii) FX exposure limits, (iv) Short-term liquidity requirements, (v) Long-term liquidity requirements

    - **Other**: (i) Exposure limits to sectors, (ii) Large exposure/concentration limits, (iii) Taxes

Credit persistence and time-invariant country effects

Credit demand/supply factors: economic activity, monetary policy

$$\Delta cr_{i,t} = \alpha_i + \alpha_i{}^c \Delta cr_{i,t-1} + \beta_i{}^y \Delta y_{i,t} + \beta_i{}^r r_{i,t} +$$

$$+ \theta^0 I_{i,t} + \theta^1 I_{i,t} \Delta y_{i,t} + \theta^2 I_{i,t} r_{i,t} + \gamma_i X_{i,t} + \varepsilon_{i,t}$$

Persistent effect of an instrument

Countercyclical effect of an instrument & Interactions with monetary policy

- $\Delta cr_{i,t}$ - change in real credit (q-o-q) at time t in country i
- $\Delta y_{i,t}$ - change in GDP (q-o-q) at time t in country i
- $r_{i,t}$ - monetary policy interest rate at time t in country i
- $I_{i,t}$ - policy index variable at time t in country i
- $X_{i,t}$ - other control variables at time t in country i
- $\varepsilon_{i,t}$ - residual
- α_i - country (fixed) effects
- $\alpha^c, \beta^y, \beta^i, \theta^0, \theta^1, \gamma$ – regression coefficients

No strict exogeneity (3)

Time-effects (5)

$$\Delta cr_{i,t} = \alpha_i + \alpha_i{}^c \Delta cr_{i,t-1} + \beta_i{}^y \Delta y_{i,t} + \beta_i{}^r r_{i,t} + \theta^0 I_{i,t} + \theta^1 I_{i,t} \Delta y_{i,t} + \theta^2 I_{i,t} r_{i,t} + \gamma_i X_{i,t} + \varepsilon_{i,t}$$

Endogeneity (1)

Policy measurement (1)
Endogeneity (2)

1. Measurement of policy $I_{i,t}$

2. Endogeneity of RHS variables, $\Delta y_{i,t}$, $r_{i,t}$, $I_{i,t}$

3. No strict exogeneity of $\Delta cr_{i,t}$ in a panel setup

4. Time-effects and cross-sectional correlation of residuals (Pesaran, 2006):

$$\varepsilon_{i,t} = \delta_t + \sum_{p=0}^{P} \sum_{k=1}^{K} \delta_{p,k,i} F_{k,t-p} + v_{i,t}$$

- δ_t - time-effects
- $\delta_{p,k,i}$ - country-specific heterogenous slopes
- $F_{k,t-p}$ - K common factors (p-th lag)
- $v_{i,t}$ - i.i.d. error

- **1996Q1**: introduction of an LTV limit on mortgage loans of **90% [level] for second-home buyers [scope] [activation]**

- 1998Q2: an introduction of a stricter LTV limit of 80% for **FX mortgage loans [currency] for first-and second-home buyers**

- 1999Q1: tightening of the LTV limit on FX loans to 70% and extending the LTV limit on domestic currency loans to second-home buyers

- 2003Q1: loosening of the LTV limit on mortgage loans in domestic and FX currency – 10% of loans in bank portfolio can be exempted from the limit **[exemptions]**

- 2008Q2: LTV limit on FX currency loans removed

- **2014Q4**: LTV limit on mortgage loans in domestic currency removed **[deactivation]**

Representation in regressions
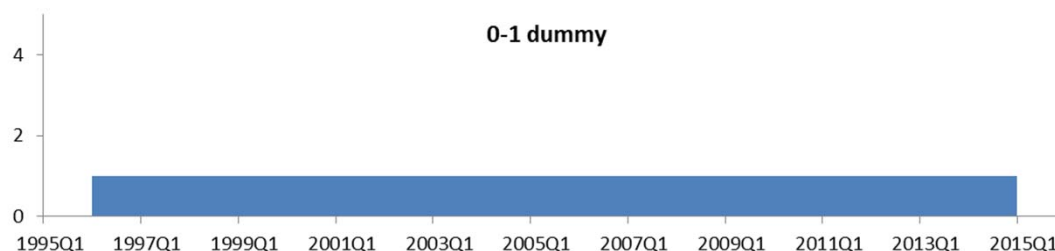
Examples of use: Lim et al (2011), Cerutti et al (2015)
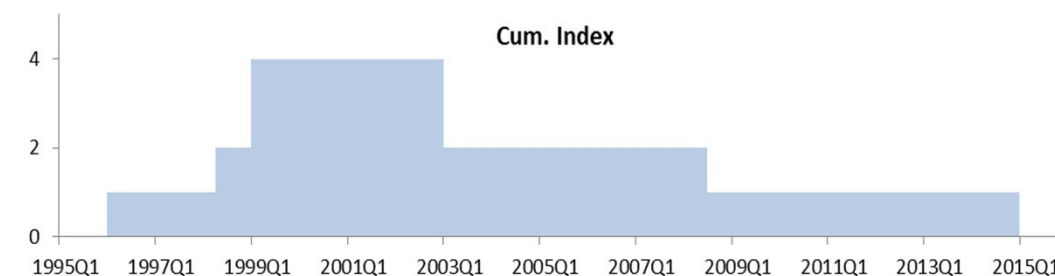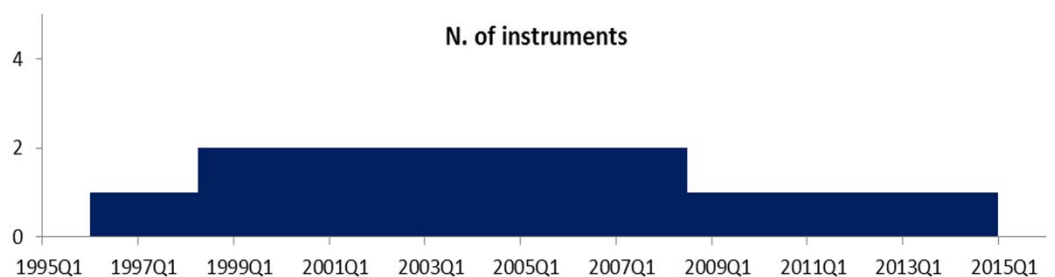
Examples of use: Akinci and Olmstead-Rumsey (2015)

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- (Most) **Systematic approach** to testing the impact of policy instruments

- **Policy measurement**: three types of indices, **a dummy, a number of instruments in place, a cumulated index of net tightenings**

- **Estimator**: the common correlated effects (partially) pooled (CCEP) by Pesaran (2006) and Chudik & Pesaran (2015)

- **Endogeneity treatment**: IV or lagged RHS variables specifications

- **Control variables**: 'a sum' of other policies, including the interactions of the aggregated policy index with GDP growth rate and interest rate

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Outcome variable	Real credit to private sector (Q-o-Q)					
Policy index	d (0-1)		D (0-n)		S (Cumulative)	
Estimator	CCE/IV	CCE/Lagged	CCE/IV	CCE/Lagged	CCE/IV	CCE/Lagged
MINCAP						
I^{MINCAP}			0.00172 (0.00372)	-0.00484 (0.00383)	0.00339 (0.00286)	0.000835 (0.00221)
$I^{MINCAP} \times \Delta y$			-0.308* (0.166)	0.0495 (0.134)	-0.106 (0.100)	-0.0220 (0.0533)
$I^{MINCAP} \times r$			0.00263 (0.00216)	0.00374*** (0.00128)	-0.000674 (0.000554)	-0.000133 (0.000242)
R^2			0.086	0.179	0.048	0.084
$p^*(rk)$			0.0317		0.0106	
$p^*(J)$			0.308		0.682	
$p^*(CD)$			0.693	0.947	0.883	0.756
$p^*(F)$			0.151	0.0348	0.574	0.919
CAPBUF						
I^{CAPBUF}	0.00461 (0.00755)	-0.00925 (0.00581)	-0.000848 (0.00227)	-0.00448 (0.00286)	0.000321 (0.00222)	-0.000160 (0.00280)
$I^{CAPBUF} \times \Delta y$	-0.856** (0.344)	0.0923 (0.160)	-0.404*** (0.131)	-0.0672 (0.0949)	0.0755 (0.0977)	0.104 (0.102)
$I^{CAPBUF} \times r$	0.00165 (0.00124)	0.00152* (0.000805)	-0.000733 (0.000857)	0.00145** (0.000610)	0.000738 (0.000694)	0.000340 (0.000539)
R^2	0.090	0.123	0.060	0.183	0.052	0.106
$p^*(rk)$	0.0341		0.0577		0.0497	
$p^*(J)$	0.511		0.644		0.471	
$p^*(CD)$	0.467	0.631	0.647	0.305	0.672	0.886
$p^*(F)$	0.0435	0.228	0.00578	0.0698	0.639	0.643
PROFIT						
I^{PROFIT}	0.0244** (0.0118)	0.0184** (0.00848)	0.0192 (0.0118)	0.0146* (0.00844)	0.0305** (0.0133)	0.0155** (0.00776)
$I^{PROFIT} \times \Delta y$	-0.145 (0.533)	-0.0167 (0.287)	0.910 (0.597)	0.275 (0.261)	-0.597 (0.524)	0.206 (0.241)
$I^{PROFIT} \times r$	-0.00894** (0.00352)	-0.00612*** (0.00174)	-0.00890*** (0.00345)	-0.00613*** (0.00183)	-0.00972*** (0.00363)	-0.00709*** (0.00177)
R^2	0.033	0.085	0.042	0.079	0.050	0.088
$p^*(rk)$	0.0212		0.0957		0.0871	
$p^*(J)$	0.522		0.437		0.604	
$p^*(CD)$	0.959	0.934	0.892	0.835	0.725	0.659
$p^*(F)$	0.0523	0.00343	0.00869	0.00299	0.0306	0.000473

- As a rule the **measurement of policies matters**, many results sensitive to the change in policy index

- A change in the estimator matters less and affects mostly significance levels (not signs)

- (Not seen) **controlling for other policies**, and especially their interactions with GDP and interest rates, significantly affects the results

	Total credit	NFC credit	Household credit
MINCAP			
CAPBUF	(CC)	-	
PROFIT	+	+	(+)
RW	- / (CC)	-	
SPECPROV		-	
GENPROV			+
LTV	(CC)	(+)/(CC)	
DTI	+	+	(+)/(PC)
INCOME	(+)		+
LENDSTD		(+)	(+)
ABRR	-		(-)
RR			
LIQLT	(+)	(+)	(+)
LIQST	(+)	(+)	
FXLIM	+	+	+
LAREXP			(+)
SECEXP	-	-	-
TAX			

Legend: +/- a positive/negative persistent impact of an instrument on credit growth, PC/CC pro-/countercyclical impact, () low statistical significance

- Significant and **positive impact on credit growth** of profit distribution restrictions, DTI caps (weaker on remaining lending standards), caps on FX mismatch (weaker on long- and short-term liquidity limits)

- Significant and **negative impact on credit growth** of sectoral exposure limits

- **Little evidence on counter- or procyclical impact** of policy instruments

	Total credit	NFC credit	Household credit
MINCAP			
CAPBUF		+	
PROFIT	-	-	-
RW	(+)	(+)	
SPECPROV	-		-
GENPROV	+	+	(+)
LTV		(-)	-
DTI	-	(-)	-
INCOME	-	(-)	-
LENDSTD			
ABRR			+
RR			(+)
LIQLT			(-)
LIQST	+	(+)	
FXLIM	+		(+)
LAREXP	(-)	(+)	(-)
SECEXP	+	+	(-)
TAX	(+)	(+)	

Legend: +/- a moderating/amplifying effect of an instrument on monetary policy transmission, () low statistical significance

- **Amplifying (complementary)** impact on the transmission of monetary policy of profit distribution restrictions, LTV, DTI, income related lending standards

- **Dampening (counterbalancing)** impact on the transmission of monetary policy of general provisioning rules, sectoral exposure limits, (weaker evidence on other capital-based and short-term liquidity caps)

- This **affects the assessment** of the effect of macroprudential instrument **on the (credit) cycle**…

- Change in the measurement of monetary policy stance: the nominal instead of the real monetary policy interest rates

- Controlling the regressions for a banking crisis dummy (as in Cerutti at al., 2015)

- Dropping one country at a time

- Panel regressions and narrative evidence provide a useful framework for the '**selection**' of effective policy measures (here: the effectiveness measured in terms of the impact on credit growth)

- A share of macroprudential instruments appears to have a **lasting (across the cycle) positive impact on credit growth** (profit distribution restrictions, borrower-based standards, caps on maturity and FX mismatches)

- A share of instruments affects mostly **sectoral credit growth** leading to the redirection rather than the reduction of the overall credit e.g. capital buffers on NFC credit, and reserve requirements on household credit.

- The transmission of **many macroprudential policies** (capital-, borrower- and liquidity-based alike) to a substantial degree hangs on their **interactions with monetary policy**.

- With countercyclical monetary policy, **borrower-based policies,** or **profit distribution restrictions** (and specific provisioning standards) will act **countercyclically**, whereas capital buffers, general provisioning, RW, liquidity standards and sectoral exposure limits **'procyclically'**

- **Countercyclical macroprudential policy** should take into account **monetary policy stance**. E.g. when monetary policy is loose, LTV, DTT bite less whereas (other borrower standards) sectoral exposure limits (alike) more.

Conclusions: Caveats

- The outcomes are silent about the appropriate calibration of policy measures (weak measurement of policy intensity)

- No account is taken for announcement effects

- Not all measures used in the analysis targeted credit growth (pros – exogeneity, cons – the assessment of effectiveness is not fully valid)

- For some instruments e.g. sectoral risk weights or capital buffers, an additional analysis on a higher degree of granularity could be justified

- Endogeneity concerns prevail – these can be addressed looking forward by employing bank-level (rather than country-level) data as in Claessens et al. (2014)

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