



EUROPEAN CENTRAL BANK

EUROSYSTEM

Katarzyna Budnik
Martina Jasova

European Central Bank

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

Joint European Central Bank and Central
Bank of Ireland research workshop

*Macroprudential policy: from research to
implementation*

10 July 2018, Dublin,

Central Bank of Ireland

- Macroprudential authorities have at their disposal **a diversity of instruments**, that incl. a standardized 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 macroprudential policy-makers on the optimal use of instruments in the monetary policy cycle

Motivation: Narrative approach

- **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 macroprudential 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)	

Preview of results: **Main findings**

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

- 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

Methodology: Cross-country panel

$$\begin{aligned}
 & \text{Credit persistence and} & \text{Credit demand/supply factors:} \\
 & \text{time-invariant country effects} & \text{economic activity, monetary policy} \\
 & \underbrace{\hspace{10em}} & \underbrace{\hspace{10em}} \\
 \Delta cr_{i,t} = & \alpha_i + \alpha_i^c \Delta cr_{i,t-1} + \beta_i^y \Delta y_{i,t} + \beta_i^r r_{i,t} + \\
 & + \theta^0 I_{i,t} + \theta^1 I_{i,t} \Delta y_{i,t} + \theta^2 I_{i,t} r_{i,t} + \gamma_i X_{i,t} + \varepsilon_{i,t} \\
 & \underbrace{\hspace{10em}} \\
 & \text{Persistent} & \text{Countercyclical effect of an instrument \&} \\
 & \text{effect of an instrument} & \text{Interactions with monetary policy}
 \end{aligned}$$

- $\Delta cr_{i,t}$ - 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

Cross-country panel: Problem areas

$$\Delta cr_{i,t} = \alpha_i + \alpha_i^c \Delta cr_{i,t-1} + \underbrace{\beta_i^y \Delta y_{i,t} + \beta_i^r r_{i,t}}_{\text{Endogeneity (1)}} + \underbrace{\theta^0 I_{i,t} + \theta^1 I_{i,t} \Delta y_{i,t} + \theta^2 I_{i,t} r_{i,t}}_{\substack{\text{Policy measurement (1)} \\ \text{Endogeneity (2)}}} + \gamma_i X_{i,t} + \varepsilon_{i,t}$$

No strict exogeneity (3)
Time-effects (5)

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):

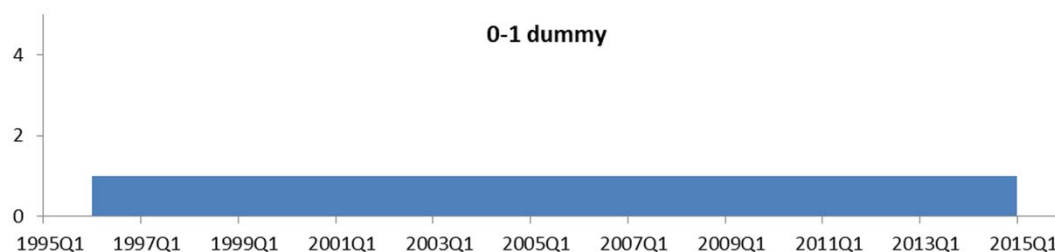
$$\varepsilon_{i,t} = \delta_t + \sum_{p=0}^P \sum_{k=1}^K \delta_{p,k,i} F_{k,t-p} + v_{i,t}$$

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

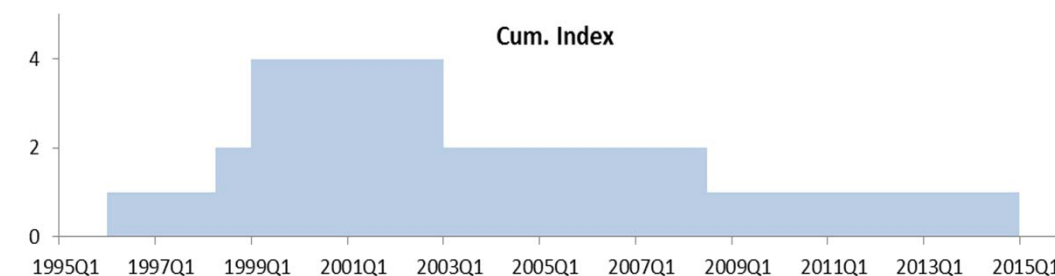
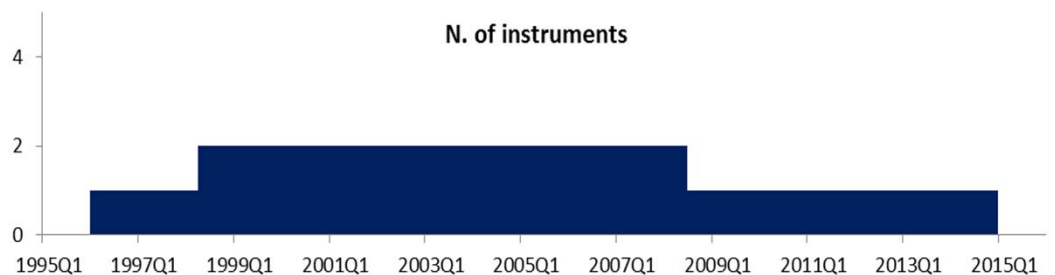
Measuring policy intensity: Various options to construct policy indices

- **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)

- (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

Results: Example (capital-based policies)

Outcome variable Policy index Estimator	Real credit to private sector (Q-o-Q)					
	d (0-1)		D (0-n)		S (Cumulative)	
	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 (0.00288)	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 (0.00288)	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** (0.00778)
$I^{PROFIT} \times \Delta y$	-0.145 (0.533)	-0.0167 (0.267)	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

Results: Persistent or cycle-dependent impact on credit growth

	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**

Results: Interactions with monetary policy

	Total credit	NFC credit	Household credit
MINCAP			
CAPBUF		+	
PROFIT	-	-	-
RW	(+)	(+)	
SPECPROV	-		-
GENPROV	+	+	(+)
LTV		(-)	-
DTI	-	(-)	-
INCOME	-	(-)	-
LENDSTD			
ABRR			+
RR			(+)
LIQLT			(-)
LIQST	+	(+)	
FXLIM	+		(+)
LA REXP	(-)	(+)	(-)
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 et al., 2015)
- Dropping one country at a time

Conclusions: **Take aways**

- 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)

Literature

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