

# The Effect of Higher Capital Requirements on Bank Lending: The Capital Surplus Matters

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# Overview

- Motivation and previous research
- Data and methodology (micro and macro)
- Results and simple counterfactual simulations
- Conclusion

## Introduction and motivation

- Relationship between capital adequacy, capital requirements and credit dynamics is important for assessing linkages between banking sector and real economy
- Correct assessment of this relationship is important not only when deciding on macro- and microprudential policy, but also on monetary policy
- This is especially important for the Czech National Bank which is an integrated monetary, macroprudential and supervisory authority
- Moreover, the Czech National Bank is one of the most active macroprudential authorities; it applies three capital buffers and Pillar 2 add-ons:
  - ▶ a conservation buffer (2.5% since July 2014)
  - ▶ a systemic risk buffer (1%–3% for the four banks with effect from October 2014 and for the five banks with effect from January 2017)
  - ▶ a countercyclical capital buffer (0.5% valid from January 2017; currently 1.5%; 1.75% valid from January 2020 and 2% valid from July 2020)
  - ▶ an additional Pillar 2 requirement since 2014 Q1 with a 3-year phase-in period for selected banks (1.7% on aggregate as of 2017 Q4)
- This paper:
  - ▶ analyze the impact of higher additional capital requirements on banks' lending
  - ▶ provide a broader assessment of the relationship between banks' profit, capital, capital surplus and lending
  - ▶ provide the first assessment of this type using Czech supervisory data

## Possible channels of transmission

- Banks may react to higher additional capital requirements in various ways
- Well capitalized banks (i.e. banks with sufficiently high capital surplus) will utilize existing surplus to cover the additional capital requirements
- Less well capitalized banks or banks which want to maintain some voluntary capital cushion above capital requirements, may react by:
  - ▶ slowing down the growth, or even reducing the absolute size, of their balance sheets/loan portfolios,
  - ▶ changing the risk composition of their assets to less risky,
  - ▶ raising equity through, for example, increasing stated capital (or capital issued) or increasing their interest rate margins, which transmits to higher retained earnings,
  - ▶ increasing their retained earnings through, for example, reducing their dividend payout ratio or postponing planned re-investment activities.

## Previous research

- Many studies does not distinguish between simple equity ratio, capital adequacy ratio and capital requirements
- These studies incorrectly interpret the relation between capital ratio and lending as the effect of higher capital requirements
- Three groups of post-crisis studies by identified effect:
  - ① Negative impact of capital requirements on lending (see, e.g., Aiyar *et al.* , 2014; Bridges *et al.* , 2015; de Ramon *et al.* , 2016)
  - ② Negative impact of various capital ratios on lending (see, e.g., De Nicolo, 2015; Noss & Toffano, 2014; MAG, 2010)
  - ③ Positive impact of capital ratio on lending (see, e.g., Berrospide & Edge, 2010)
- Inconsistencies in the literature may be explained by:
  - ▶ different explanatory variables and/or time spans,
  - ▶ different reasons driving changes in capital ratios (e.g., both, higher capital requirements and higher profits may lead to higher capital ratios but they will have opposite effect on capital surplus, and potentially, also on credit supply)
- Therefore, it is important to choose adequately the explanatory variable (capital requirements vs. capital ratios) and to control for possible intermediate transmission channels (e.g. assessing the impact of capital requirements indirectly via capital surplus)

## Methodology: macro-level analysis

- Assessing macro-financial linkages and dynamics of the whole system
- Bayesian VAR model, independent Normal inverse-Wishart prior distribution
- Immune to endogeneity issues, but coefficients not easily interpretable → impulse response functions, simple Cholesky decomposition
- Baseline ordering, subjected to sensitivity analysis:

$Y = [\text{nominal GDP growth, credit growth, proxy for banks' profitability or leverage, implicit risk weights, capital surplus}]$

## Methodology: micro-level analysis

- Dynamic panel data model with fixed effects
- **First**, possible transmission channels of higher additional capital requirements are examined:

$$EA_{i,t} = \alpha_1 EA_{i,t-1} + \beta_1 ORCR_{i,t} + \gamma_1 X_{i,t-1} + \nu_{1,i} + \epsilon_{1,i,t} \quad (1)$$

$$RE_{i,t} = \alpha_2 RE_{i,t-1} + \beta_2 ORCR_{i,t} + \gamma_2 X_{i,t-1} + \nu_{2,i} + \epsilon_{2,i,t} \quad (2)$$

$$CA_{i,t} = \alpha_3 CA_{i,t-1} + \beta_3 ORCR_{i,t} + \gamma_3 X_{i,t-1} + \nu_{3,i} + \epsilon_{3,i,t} \quad (3)$$

$$CS_{i,t} = \alpha_4 CS_{i,t-1} + \beta_4 ORCR_{i,t} + \gamma_4 X_{i,t-1} + \nu_{4,i} + \epsilon_{4,i,t} \quad (4)$$

$$RW_{i,t} = \alpha_5 RW_{i,t-1} + \beta_5 ORCR_{i,t} + \gamma_5 X_{i,t-1} + \nu_{5,i} + \epsilon_{5,i,t} \quad (5)$$

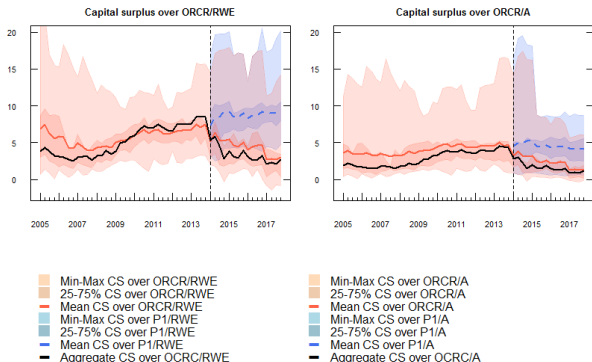
$$\% \Delta loans_{i,t} = \alpha_6 \% \Delta loans_{i,t-1} + \beta_6 ORCR_{i,t} + \gamma_6 X_{i,t-1} + \nu_{6,i} + \epsilon_{6,i,t} \quad (6)$$

- **Second**, the impact on banks' lending is examined in more detail:
  - ▶ Direct transmission vs. indirect transmission via capital surplus
  - ▶ Banks' internal capital targets considered ("intentional" vs. "unintentional" capital surplus)
- Estimation techniques: (i) single-equation: LSDV and bootstrap-based bias corrected estimator (BBBC; De Vos *et al.*, 2015); (ii) multiple-equation systems: three-stage least squares (3SLS) procedure

# Data

- Bank-level data; confidential supervisory data (FINREP, COREP)
- 14 banks on a consolidated basis (90% of total assets of the banking sector); foreign bank branches excluded
- Two time spans: (i) 2004 Q4–2017 Q4 (56 quarters; 630 observations), (ii) 2013 Q1–2017 Q4 (20 quarters; 276 observations)

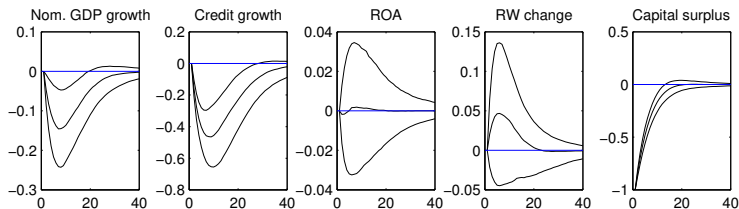
Figure: Capital Surplus





## Results: BVAR

Figure: Negative Shock to Capital Surplus



**Note:** 32th, 50th and 68th percentiles of the distribution reported.

- Positive relationship between capital surplus and bank loan growth; transmission to nominal GDP growth
- Lower capital surplus  $\rightarrow$  less space for balance sheet expansion  $\rightarrow$  slower credit growth
- Sensitivity analysis wrt different proxy variables for banks' profitability and leverage, monetary policy conditions and lending rate; the impact on banks' lending and GDP growth remains robust

## Results: dynamic panel data model, direct effect

Table: Baseline Estimation Results

Dependent var.:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	EA	REA	CA	CS	CS	RW	RW	% $\Delta$ loans
Dependent var. (t-1)	0.956*** (0.058)	0.994*** (0.059)	0.895*** (0.054)	0.641*** (0.046)	0.600*** (0.046)	0.809*** (0.059)	0.793*** (0.053)	0.852*** (0.057)
ORCR	0.0208 (0.046)	0.564* (0.032)	-0.052 (0.032)	-0.609** (0.073)	-0.636** (0.076)	-0.056 (0.171)	0.046 (0.176)	-0.737** (0.354)
ROA (t-1)	0.004 (0.156)	0.083 (0.073)	-0.013 (0.138)	-0.147 (0.259)	-0.066 (0.259)			
LLPA (t-1)	0.241 (0.210)	0.154 (0.170)	0.166 (0.123)	-0.386*** (0.120)	-0.445*** (0.121)	1.007*** (0.366)	1.121*** (0.379)	0.437 (0.575)
CA (t-1)								1.593*** (0.493)
Lending rate (t-1)								-1.269* (0.669)
Macro controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Asset structure	No	No	No	No	Yes	No	Yes	No
Observations	276	276	276	276	276	276	276	276

**Note:** Specifications are estimated using bootstrap-based bias corrected estimator. Bootstrapped standard errors reported in parentheses; \*\*\*, \*\*, and \* denote the 1%, 5%, and 10% significance levels.

- Statistically significant and negative impact on capital surplus and loan growth, and positive on retained earnings

# Results: dynamic panel data model, well vs. less well capitalized banks

Table: Estimation Results wrt Banks Capitalization

	(1)	(2)
Estimation method:	BBBC	LSDV
Dependent var.:	$\% \Delta loans$	$\% \Delta loans$
$\% \Delta loans$ (t-1)	0.853*** (0.0582)	0.749*** (0.0465)
ORCR*dLowCS	-1.147* (0.659)	-1.751*** (0.576)
ORCR*(1-dLowCS)	-0.472 (0.305)	-0.606 (0.365)
LLPA (t-1)	0.445 (0.496)	0.166 (0.263)
CA (t-1)	1.404** (0.542)	1.794** (0.695)
Lending rate (t-1)	-1.161* (0.673)	-1.501*** (0.442)
Real GDP growth	-0.0859 (0.377)	-0.0838 (0.295)
Observations	276	276

- The effect is statistically significant only for less well capitalized banks (i.e. banks with relatively lower capital surplus); between -1.2pp and -1.8pp vs. -0.7pp for the whole sample

## Results: dynamic panel data model, different lags and leads

**Table:** Coefficient Estimates for Banks with Relatively Lower Capital Surplus

No. of lags	Coeff. on ORCR*dLowCS	
	BBBC	LSDV
-4	not statistically significant	not statistically significant
-3	not statistically significant	not statistically significant
-2	not statistically significant	not statistically significant
-1	not statistically significant	-1.07*
<b>0</b>	<b>-1.19*</b>	<b>-1.78***</b>
1	-1.13**	-1.61**
2	-0.91**	-1.37**
3	not statistically significant	-1.10*
4	not statistically significant	not statistically significant

- Different lags and leads – intended to capture the impact of announcements, phase-ins etc.
- The effect remains the strongest at  $t=0$  (i.e. in the quarter when capital requirements become effective)
- Additional lags or leads do not help to explain banks behavior

## Results: dynamic panel data model, indirect effect via capital surplus

$$CS_{i,t} = \alpha_8 CS_{i,t-1} + \beta_9 ORCR_{i,t} + \gamma_8 X_{i,t-1} + \nu_{8,i} + \epsilon_{8,i,t} \quad (7)$$

$$\% \Delta loans_{i,t} = \alpha_9 \% \Delta loans_{i,t-1} + \beta_{10} CS_{i,t-1} + \gamma_9 X_{i,t-1} + \nu_{9,i} + \epsilon_{9,i,t} \quad (8)$$

Table: System of Two Equations (3SLS)

Dependent var.:	(1) CS	(2) % $\Delta loans$	(3) CS	(4) % $\Delta loans$
Dependent var. (t-1)	0.516*** (0.040)	0.769*** (0.0334)	0.519*** (0.040)	0.765*** (0.0319)
ORCR (t-1)	-0.702** (0.063)			
CS (t-1)		0.197 (0.248)		
ORCR*dLowCS			-0.668** (0.084)	
ORCR*(1-dLowCS)			-0.711** (0.066)	
CS (t-1)*dLowCS				2.188*** (0.445)
CS (t-1)*(1-dLowCS)				-0.236 (0.251)
Macro controls	Yes	Yes	Yes	Yes
Bank-specific controls	Yes	Yes	Yes	Yes
Observations	276		276	

- Statistically significant effect only for less well capitalised banks; 1pp increase in capital requirements leads to 1.5pp lower loan growth (-0.7\*2.2)

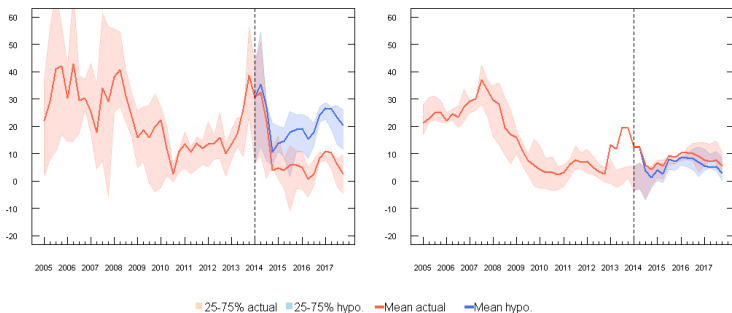
## Summary of selected estimation results

Table: Summary Table

Table	Specification	Data sample	Estimation technique	ST effect	LT effect
<b>2</b>	<b>direct effect</b>	<b>short</b>	<b>BBBC</b>	<b>-0.74**</b>	<b>-4.98</b>
<b>3</b>	<b>direct effect, low-cap</b>	<b>short</b>	<b>BBBC</b>	<b>-1.19*</b>	<b>-7.85</b>
<b>3</b>	<b>direct effect, better-cap</b>	<b>short</b>	<b>BBBC</b>	<b>not statistically significant</b>	
C2	direct effect	short	LSDV	-1.03**	-4.21
C2	direct effect, low-cap	short	LSDV	-1.75***	-6.98
C2	direct effect, better-cap	short	LSDV	not statistically significant	
<b>4</b>	<b>indirect effect</b>	<b>short</b>	<b>3SLS</b>	<b>not statistically significant</b>	
<b>4</b>	<b>indirect effect, low-cap</b>	<b>short</b>	<b>3SLS</b>	<b>-1.47***</b>	<b>-6.22</b>
<b>4</b>	<b>indirect effect, better-cap</b>	<b>short</b>	<b>3SLS</b>	<b>not statistically significant</b>	
C4	indirect effect	short	LSDV	not statistically significant	
C4	indirect effect, low-cap	short	LSDV	-1.48***	-6.18
C4	indirect effect, better-cap	short	LSDV	not statistically significant	
C4	indirect effect	short	BBBC	not statistically significant	
C4	indirect effect, low-cap	short	BBBC	-1.09**	-6.51
C4	indirect effect, better-cap	short	BBBC	not statistically significant	

## Simple counterfactual simulations

Figure: Left Panel: Less Well Capitalized. Right Panel: Well Capitalized



**Note:** Calculated using coefficient estimates from two-equation specifications (indirect effect).

- Hypothetical loan growth if no increase in capital requirements had occurred
- Loan growth of banks with relatively lower capital surplus might have been higher without additional capital requirements
- Banks with relatively lower capital surplus are generally smaller banks with relatively lower share on total credit supply in the Czech Republic; therefore, the total loan growth has not been significantly affected

## Conclusion

- This paper provide the first assessment of the impact of higher additional capital requirements on loan growth using Czech supervisory data
- The effect of higher additional capital requirements on loan growth is negative
- The negative relationship applies primarily to the low-capitalised banks
- 1pp increase in capital requirements depresses loan growth by about 1.2–1.8pp
- Capital surplus is important in the transmission of higher capital requirements



## Thank you for your attention

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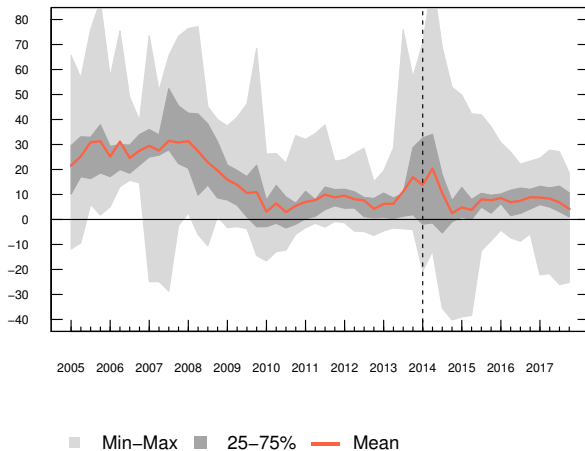
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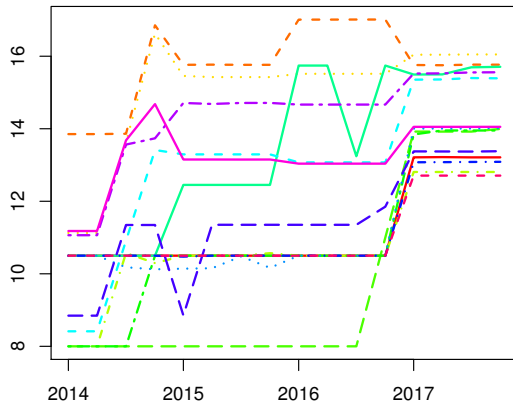
# Loan growth

Figure: Year-on-Year Growth of Loans to Private Sector Excluding Interbank Loans



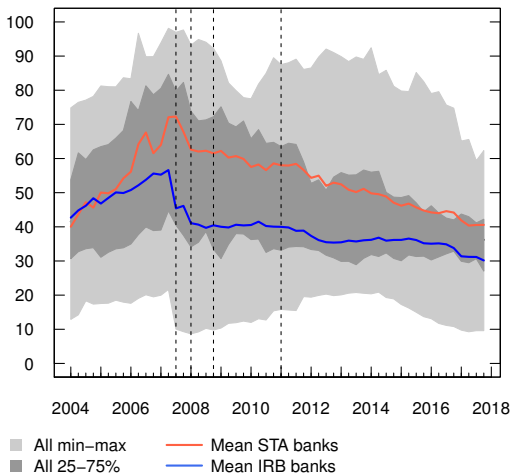
# Capital requirements

Figure: Bank-Level Capital Requirements



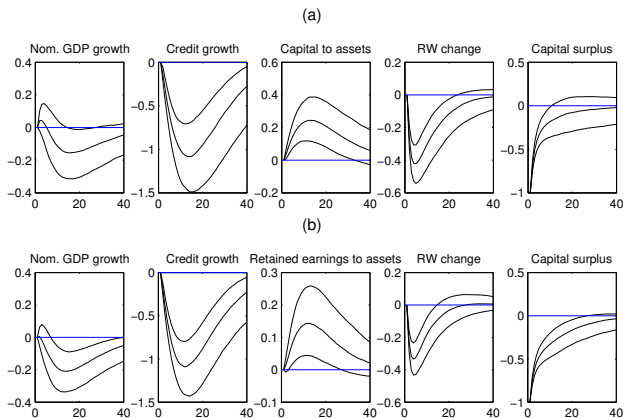
# Implicit risk weights

Figure: Implicit Risk Weights under the STA and IRB Approaches (%)



## Results: BVAR (2)

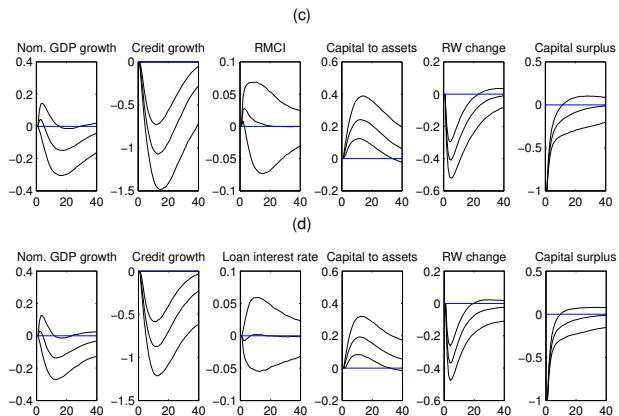
Figure: Negative Shock to Capital Surplus



**Note:** 32th, 50th and 68th percentiles of the distribution reported.

## Results: BVAR (3)

Figure: Negative Shock to Capital Surplus



**Note:** 32th, 50th and 68th percentiles of the distribution reported.

## Simple counterfactual simulations (2)

Figure: All Banks

