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Does Capital Make Bankers Complacent?

Empirical Evidence from Small-scale Banking

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May 28, 2014

Abridged version

Yes and No.

Research questions

- Minimum capital requirements have become the backbone of modern banking regulation. Regulatory rules require banks to build up capital with the aim of curbing risks generic for banking.

- Is there an impact of changes in bank capital on the lending volume?
- Is this impact only a transitory short-term adjustment or does it have long-run effects?
- Is the impact non-linear in nature and therefore difficult to capture with usual methods?

- In this paper we propose a new theoretically motivated empirical framework to study these questions, and apply the framework to Austrian bank data.

Bank capital and lending behaviour: Three views

- "Bank capital is expensive; the build-up is costly and affects lending behavior"
  The claim that equity is expensive leads to claims that high capital requirements are costly and would affect credit markets adversely
- "Bank capital structure does not affect lending behavour"
  Miller, M. (1995). Do the "M-M" propositions apply to banks? Journal of Banking and Finance, 19(3), 483-489.
  Admati, A.R. et al (2010) Fallacies, Irrelevant facts, and myths in the discussion of captial regulation: Why bank capital is not expensive" Stanford GSB Research Paper No. 86.
- "Bank capital is different and affects lending behaviour but in a nonlinear way"
  Diamond, D. and Rajan, R. (2000). A theory of bank capital. The Journal of Finance, 55(6), 2431-2465.

Practitioner's view on bank capital

Prevailing view in the banking industry and in politics/regulation

- Bank capital is expensive due to high flotation and underwriting costs involved in raising new capital, particularly for smaller banks.
- The down-side of bank capital is that it imposes a social cost on the economy in the form of restricted lending and retarded economic growth.

MM-view on bank capital

Modigliani and Miller (1958) provides the basic theoretical benchmark model for analyses of capital structure

- The average cost of capital (ρ_k) to any firm is independent of its capital structure.
- The expected yield of a share is a function of its financial risk.
- Liability side has no impact on asset side. Investment is unaffected by financing decisions.
- These propositions apply in principle also to banking; Assumptions are strict: free access to competitive capital markets, no agency costs, no distortions due to government guarantees for bank demand deposits, taxes and capital requirements, etc.
- MM-view stresses that higher capital buffers in banking are beneficial because capital strengthens resilience of the banking sector by motivating banks to take on risks that are socially first-best (Admati, A.R. et al, 2010).

Hybrid view on bank capital

According to Diamond and Rajan (2000)

- Agency costs are the central ingredient.
- Capital is a soft budget constraint compared to deposits because the holder of the former cannot run on the bank whereas depositors can (and they do when the rumor has it...) . Depositors must be served on a first-come-first-serve basis as long as the bank is liquid.
- Deposits (supposed to be as liquid as cash) exert the strongest disciplining effect on bank management possible even when deposits are insured against payment default.
- In case of default deposits are no longer cash (it takes time and transaction costs to get the money back from the insurance company). Hence, deposits feature prominently as a hard budget constraint for the bank management even under realistic market conditions.

Hybrid view on bank capital (cont.)

- Higher bank capital affects incentives of bankers.
- Since capital is a soft budget constraint to the banker higher capital increases complacency of bankers and reduces intermediation (intermediation is seen as activity that is costly and requires effort).
- Without uncertainty - intermediation is maximized by an all-deposited bank.

- With macroeconomic uncertainty and asymmetric information the prediction changes

- With macroeconomic uncertainty and asymmetric information also "good" banks may experience bank runs. In such a situation minimum capital bank regulation is socially optimal.
- Optimal capital base determined by control deficit of depositors and the desirable resilience of banks to shocks

Central prediction of hybrid view (Diamond and Rajan, 2000)

- Incentive effects of capital become nonlinear under performance uncertainty.
  - More capital forces bankers with low intermediation record (and high rents) to increase their effort (more intermediation). Low-end bankers are likely to have 'low-liquid, low-market value loan portfolios' and, hence, are in need of a safer capital structure (more capital). However, additional capital will only be provided when low-end banker credibly signals intermediation improvement (more intermediation, less rents).
  - More capital allows bankers with high intermediation record (and low rents) to become complacent (lowering intermediation). High-end bankers are expected to have high-liquid loan portfolios and, hence, are in no need of a safer capital structure (more capital). Hence, additional capital, say, due to regulation will be provided without contigencies (hence, in this particular case capital will be freeing up some extra space for rent-seeking, that is, lowering intermediation).
- This is the central proposition for our empirical test (Complacency hypothesis).

Some preliminaries

- Banker's performance as credit creator is measured by share of credit in total liabilities (deposits + capital). A record of high shares signals 'good performance', a record of low shares signals 'bad performance'.
- Complacency: Instead of effort-intensive credit creation the banker parks money in low-effort non-credit assets (i.e., money market placements).
- Implications for data selection: We need a set of homogenous, straight relationship banks. Only the latter are targeted by the Diamond-Rajan (2000) theory.
- Model predictions are dynamic and steady-state in nature. We need an empirical model that allows to disentangle long-run relationships from short-run adjustments.

The data

- Focus on local relationship banks with very simple balance sheet structure and no access to capital markets.
- Sample size: balanced sample of 281 small to medium-sized Austrian banks (out of approx. 800) covering 18 years (1995 to 2012) that did not undergo mergers and acquisitions during this time and do not have atypical capital structure (usually SPV with banking license)
- Balance sheet data deflated using GDP deflator (2005=100)

The data (cont.)

Homogeneous sample

- similar business model: local depositors and local borrowers (firms and households), similar idiosyncratic risks
- similar options to build up capital: retained earnings and limited access to capital markets
- face the same regulatory environment, similar business cycles
- did not undergo any merger and acquisition processes and were never in financial distress
- For robustness we also use an unbalanced sample of banks (412 banks); commercial banks are only covered in the very year in which they meet the imposed requirements (no access to capital markets, primarily relationship banking, serving only local markets).

Descriptive statistics

Variable		Mean	Std. Dev.	Observations
total assets	overall	73.51997	59.45436	N = 5058
	between		56.08644	n = 281
	within		19.99268	T = 18
credit ratio	overall	0.5241553	0.13052	N = 5058
	between		0.1157745	n = 281
	within		0.0606366	T = 18
equity ratio	overall	0.0792926	0.0311811	N = 5058
	between		0.0242313	n = 281
	within		0.0196744	T = 18
cost-income ratio	overall	0.7002931	0.0978869	N = 5058
	between		0.0660537	n = 281
	within		0.0723423	T = 18

Econometric specification I

- Dynamic Fixed Effect Estimator (DFE) with error correction and an interaction term
- Dependent variable $y_{i,t}$ is share of loans to the private sector in total liabilities (capital plus deposits) of bank i at time t
- Bank capital is $z_{i,t}$ and other explanatory variables are encompassed by $X_{i,t}$
- We want to assess long-run (equilibrium) relationships and short-run adjustments.
- Parsimonious approach

Econometric specification II

From an ARDL model we can derive the following equation

$$\Delta y_{i,t} = \phi_i y_{i,t-1} + \gamma_i^* z_{i,t} + \delta_i^* X_{i,t} + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{ij}^* \Delta z_{i,t-j} + \\ + \sum_{j=0}^{r-1} \delta_{ij}^* \Delta X_{i,t-j} + \mu_i + \epsilon_{i,t}$$

In order to account for the contrasting trade-offs of bank capital we impose the following parameter restriction on

$$\gamma_i^* = \alpha_{i,0} - \alpha_{i,1} y_{i,t-1}$$

This leads to:

$$\Delta y_{i,t} = \phi_i^* y_{i,t-1} + \alpha_{i,0} z_{i,t} - \alpha_{i,1} (z_{i,t} \times y_{i,t-1}) + \delta_i^* X_{i,t} + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta y_{i,t-j} \\ + \sum_{j=0}^{q-1} \gamma_{ij}^* \Delta z_{i,t-j} + \sum_{j=0}^{r-1} \delta_{ij}^* \Delta X_{i,t-j} + \mu_i + \epsilon_{i,t}$$

Econometric specification III: Design of test hypothesis

Given that (i) both ϕ_i^* and ϕ_i are negative and statistically different from zero, (ii) $\alpha_{i,0}$ is positive and statistically different from zero and γ_i^*, respectively, and (iii) $\alpha_{i,1}$ is negative and statistically different from zero, the complacency hypothesis then holds if there is a $y_{i,t-1}^*$ with $\alpha_{i,0}$ strictly larger than $\alpha_{i,1}y_{i,t-1}$ for $y_{i,t-1} < y_{i,t-1}^*$, and $\alpha_{i,0}$ strictly smaller than $\alpha_{i,1}y_{i,t-1}$ for $y_{i,t-1} > y_{i,t-1}^*$, respectively.

Econometric specification IV

For the empirical test we use a first-order ADRL structure($p = 1$ and $q = 1$):

$$\begin{aligned}\Delta CQU_{i,t} = {} & \phi^* CQU_{i,t-1} + \alpha_0 lnEK_{i,t} + \alpha_1 (lnEK_{i,t} \times CQU_{i,t-1}) + \delta_1^* CIR_{i,t} \\ & + \delta_2^* RINTEX_t + \delta_3^* GROWTH_{i,t} + \delta_4^* lnINC_{i,t} + \gamma_{11}^* \Delta lnEK_{i,t} \\ & + \delta_{11}^* \Delta CIR_{i,t} + \delta_{21}^* \Delta RINTEX_t + \delta_{31}^* \Delta GROWTH_{i,t} \\ & + \delta_{41}^* \Delta lnINC_{i,t} + \psi_i CRISIS_t + \mu_i + \epsilon_{i,t}\end{aligned}$$

Econometric specification IV (cont.)

- Error correction term - $\phi < 0$, μ_i are the fixed bank effects and $\epsilon_{i,t}$ is an i.i.d error.
- *CQU* is the share of loans to the non-finacial sector in total liabilities, *EK* is the capital base (equity plus reserves), and *CIR* is the cost-income ratio (measure of bank efficiency) at the individual bank level.
- *GROWTH* and *INC* are the growth rate of production and GDP per head, respectively both of which of the district in which the bank is headquartered (control for common factor, cross-section dependence).
- *RINTEX* is the interest rate of loans adjusted for inflation expectations at the macro-level and *CRISIS* captures the impact of the financial market crisis from 2008 to 2010, respectively (control for common factor, cross-section dependence).

Regression results I: Balanced sample

Dep.Var.: $\Delta CQU_{i,t}$

	Banker's complacency unconsidered				Banker's complacency considered			
	Coeff.	p-value	95% conf.	interval	Coeff.	p-value	95% conf.	interval
$CQU_{i,t-1}$	-0.173	0.000	-0.196	-0.150	-0.122	0.000	-0.155	-0.089
$lnEK_{i,t}$	-0.002	0.574	-0.008	0.004	0.018	0.002	0.007	0.030
$lnEK_{i,t} \times CQU_{i,t-1}$					-0.039	0.000	-0.058	-0.020
$CIR_{i,t}$	-0.026	0.043	-0.051	-0.001	-0.026	0.035	-0.051	-0.002
$RINTEX_t$	-0.007	0.000	-0.009	-0.005	-0.007	0.000	-0.009	-0.005
$GROWTH_{i,t}$	0.007	0.000	0.004	0.010	0.008	0.000	0.005	0.011
$lnINC_{i,t}$	-0.034	0.004	-0.010	-0.010	-0.030	0.008	-0.053	-0.008
$\Delta lnEK_{i,t}$	-0.042	0.000	-0.052	-0.033	-0.040	0.000	-0.050	-0.031
$\Delta CIR_{i,t}$	-0.008	0.467	-0.029	0.013	-0.007	0.508	-0.027	0.014
$\Delta RINTEX_t$	0.007	0.000	0.005	0.009	0.007	0.000	0.005	0.009
$\Delta GROWTH_{i,t}$	-0.000	0.042	-0.001	-0.000	-0.000	0.001	-0.001	-0.000
$\Delta lnINC_{i,t}$	-0.720	0.000	-1.045	-0.394	-0.742	0.000	-1.055	-0.429
$CRISIS_t$	-0.000	0.937	-0.005	0.004	-0.001	0.810	-0.005	0.004
$CONSTANT$	0.478	0.000	0.251	0.705	0.421	0.000	0.198	0.643
R-squared	0.155				0.160			
Number of observations	4,496				4,496			
Number of banks	281				281			
Number of periods	16				16			

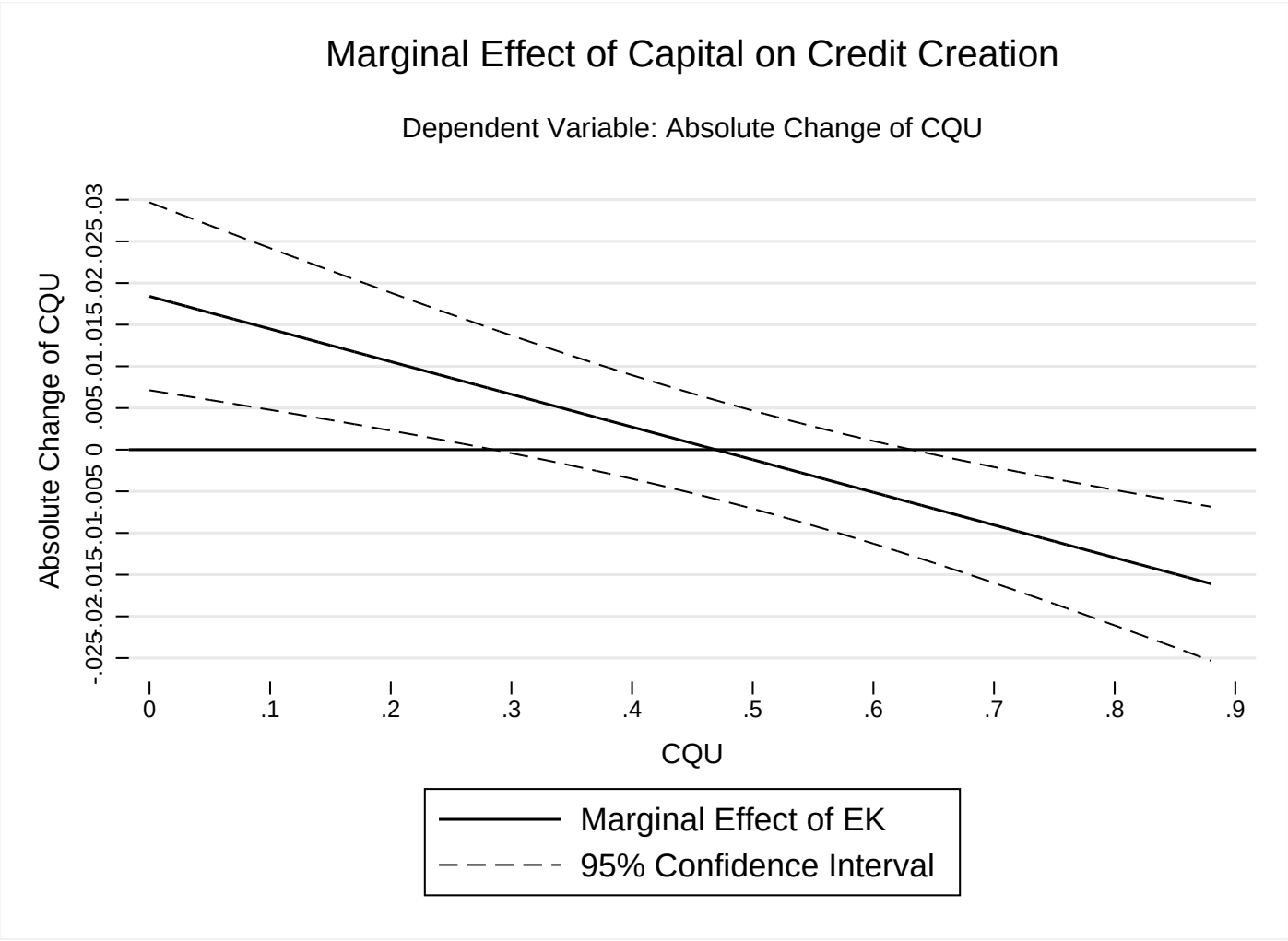
Regression results II: Unbalanced sample

Dep.Var.: $\Delta CQU_{i,t}$

	Banker's complacency unconsidered				Banker's complacency considered			
	Coeff.	p-value	95% conf.	interval	Coeff.	p-value	95% conf.	interval
$CQU_{i,t-1}$	-0.176	0.000	-0.195	-0.156	-0.125	0.000	-0.155	-0.094
$lnEK_{i,t}$	-0.001	0.727	-0.006	0.004	0.018	0.000	0.008	0.028
$lnEK_{i,t} \times CQU_{i,t-1}$					-0.036	0.000	-0.054	-0.019
$CIR_{i,t}$	-0.015	0.224	-0.039	0.009	-0.015	0.195	-0.039	0.008
$RINTEX_t$	-0.007	0.000	-0.008	-0.005	-0.007	0.000	-0.008	-0.005
$GROWTH_{i,t}$	0.009	0.000	0.006	0.011	0.009	0.000	0.006	0.011
$lnINC_{i,t}$	-0.025	0.014	-0.044	-0.005	-0.021	0.036	-0.040	-0.001
$\Delta lnEK_{i,t}$	-0.038	0.000	-0.048	-0.029	-0.037	0.000	-0.046	-0.027
$\Delta CIR_{i,t}$	-0.014	0.084	-0.031	0.002	-0.014	0.098	-0.030	0.003
$\Delta RINTEX_t$	0.006	0.000	0.005	0.008	0.006	0.000	0.004	0.008
$\Delta GROWTH_{i,t}$	-0.000	0.075	-0.001	-0.000	-0.000	0.078	-0.001	-0.000
$\Delta lnINC_{i,t}$	-0.846	0.000	-1.125	-0.567	-0.872	0.000	-1.142	-0.602
$CRISIS_t$	-0.001	0.521	-0.005	0.003	-0.002	0.411	-0.006	0.002
$CONSTANT$	0.385	0.000	0.189	0.581	0.319	0.001	0.125	0.513
R-squared	0.156				0.160			
Number of observations	5,605				5,605			
Number of banks	412				412			
Avg. Number of periods	13.6				13.6			

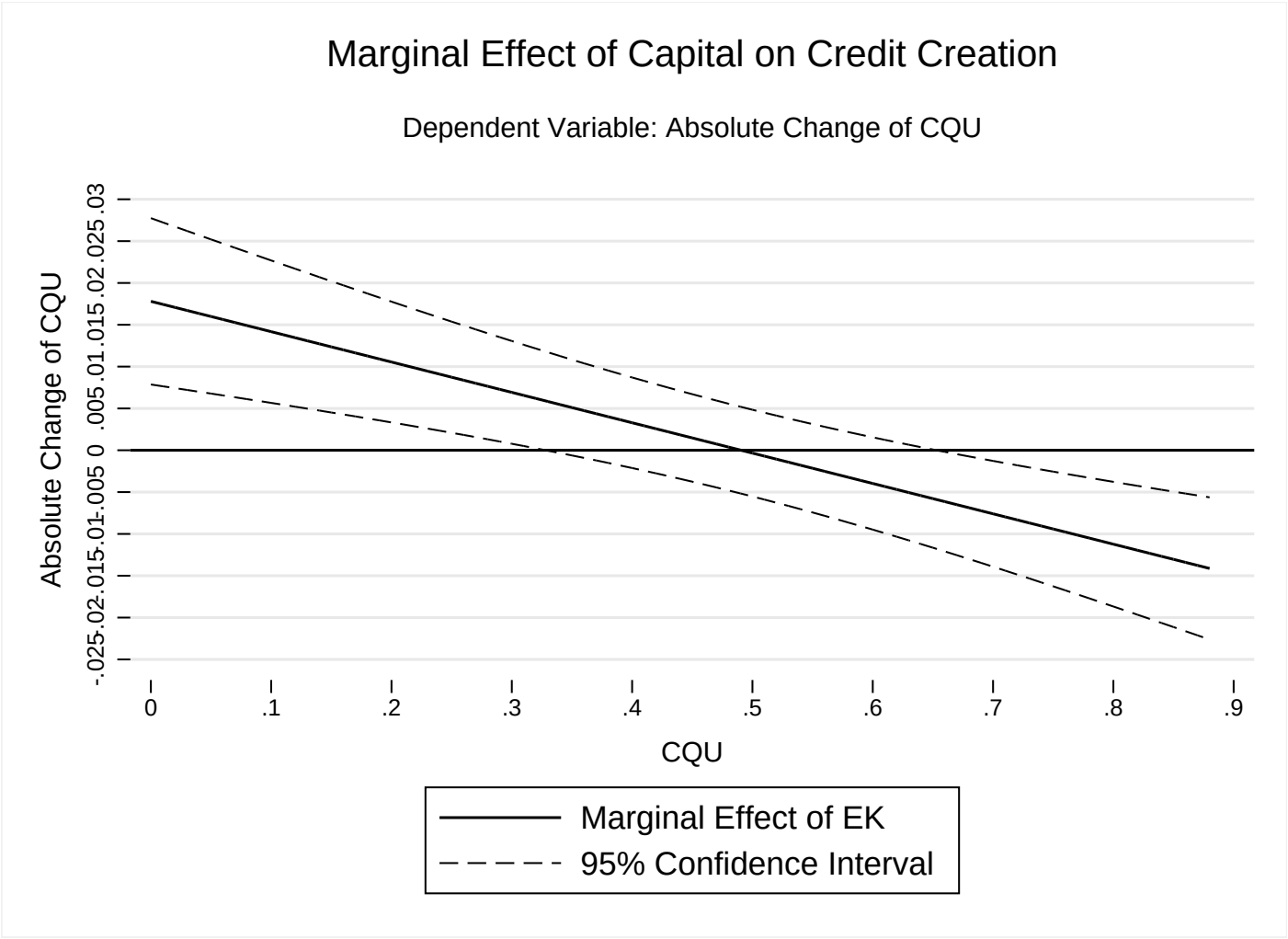
Balanced sample: Complacency effect

$$\gamma^* = \alpha_0 - \alpha_1 y_{i,t-1}$$



Unbalanced sample: Complacency effect

$$\gamma^* = \alpha_0 - \alpha_1 y_{i,t-1}$$



Effects of capital on lending: Alternative specifications

- We also run regressions using credit growth as indicator of bank lending, and various capital ratios as indicators for capital (no evidence for biasing effects due to cross-section dependence was detected).
- We also applied various advanced panel estimators such as system-GMM (with regressors at the individual bank level assumed to be endogenous).
- Qualitative results prove to be robust under all applied cross checks (trade-off remains in place).

- Work in progress.
- Quantitative implications of qualitative results.

Summary

- Findings show a differentiated picture of capital's impact on lending by small relationship banks in Austria:
  - The theory of Diamond-Rajan (2000) predicts a nonlinear impact of bank capital on bank performance (credit creation).
  - This theory is confirmed by the empirical results.
  - Low performance banks (credit creation) tend to increase credit creation when bank capital is increased.
  - High performance banks (credit creation) tend to decrease credit creation when bank capital is increased.
  - Gains at the low end and losses at the high end appear to be symmetric (artefact????)
  - Bank capital regulation may affect small banks lending behaviour.
  - Small banks are especially relevant for small business finance.

Caveat I: Is the DFE estimator appropriate?

- Nickell bias in the dynamic fixed effect model?
  - If model is $I(1)$ then DFE is superconsistent (Pesaran et al. 1999)
  - GMM estimators (e.g. Arrellano and Bond 1991, Blundell and Bond 1998) in the presence of I(1) variables generate weak instrument problem; if unit-root is present moment conditions become completely irrelveant (Han-Phillips, 2010).
  - Panel unit root tests suggest that a number of variables are $I(1)$
  - Some preliminary tests suggest that simultaneity bias is likely to be negligible. More importantly, trade-off within the long-run solution should not be affected by presence/size of simultaneity bias.
- Assumption of homogeneity of coefficients across banks (except μ_i)
  - Pesaran et al. (1999) discuss mean group (MG), pooled mean group (PMG) and dynamic fixed effect (DFE) estimators.
  - MG - no homogeneity restrictions; PMG - homogeneity of long-run restrictions; DFE - identical slope coefficients and error variances.
  - Degrees of freedom (281 banks) and practical issues suggested DFE.
  - Similarity of banks in the sample suggests that economic, cultural, regulatory and institutional environment is relatively homogeneous.

Caveat II: Do we explore an artefact?

- Gains at the low end and losses at the high end appear to be symmetric (indication for an artefact????).
- Is our measure of credit creation meaningful?
- Is our parameter restriction meaningful?

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Many thanks for your attention.

Comments are highly welcome.