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Bank capital buffers around the world: cyclical patters and the effect of market power

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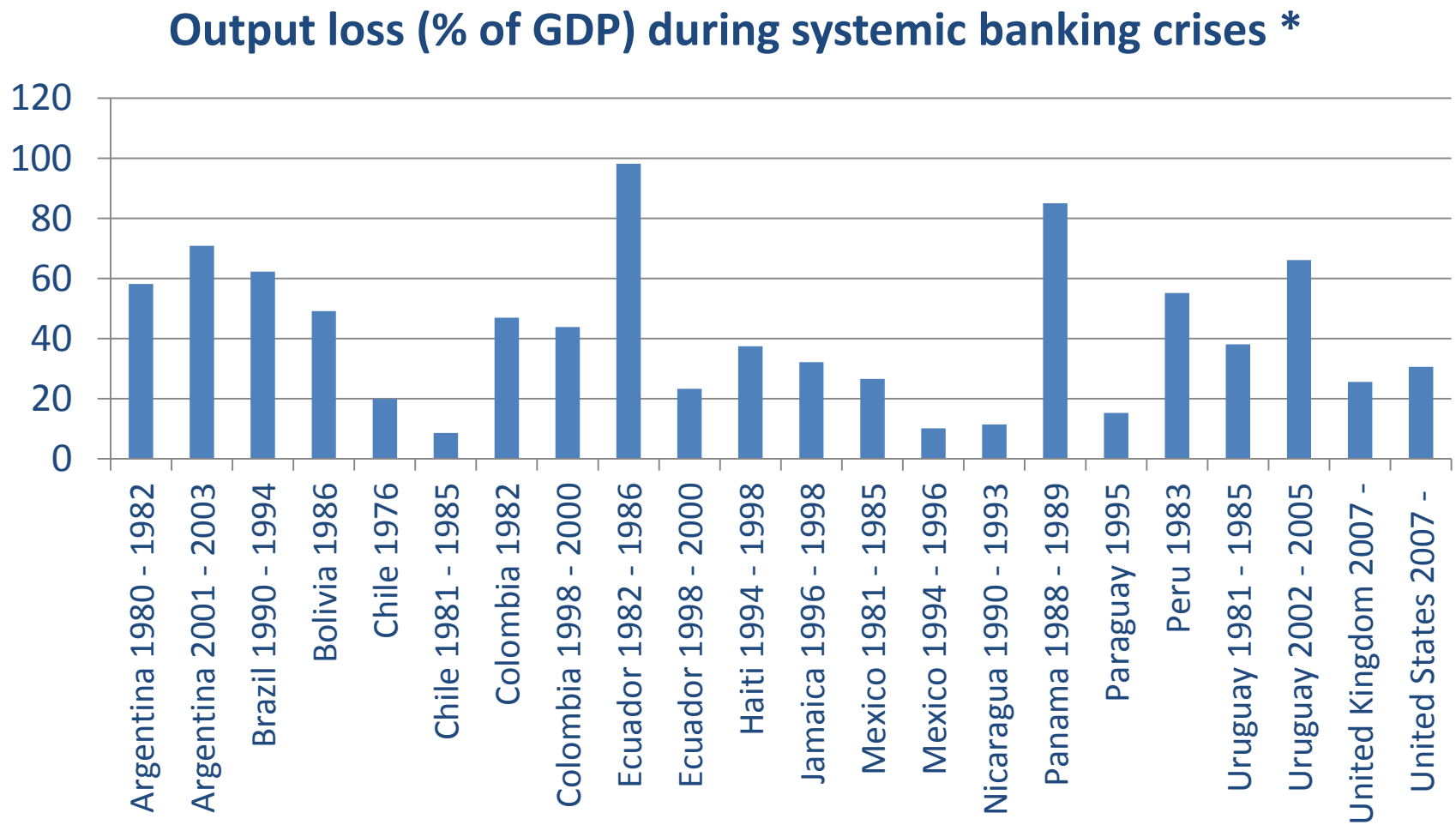
Bank capital buffers around the world

- **Motivation**: banking crisis are costly. Basel III, through capital and liquidity regulation tries to enhance the supervision and risk management of the banking sector.
- **Objective**: understand the determinants of banks' choice of capital buffers.
- **Methodology**:
  - Develop a model of bank's optimal capital-to-asset ratio where cyclicality and profitability are key determinants.
  - Exploit the information of 7,118 banks across 143 countries for the 2001 – 2013 period.
  - Control for other bank (size and share of non-performing loans) and country-level (competition, moral hazard index and regulatory variables as capital stringency, official supervisory power and bank accounting standards) determinants.
- **Contribution**: scope of banks and countries examined, the multiple dimensions factored in, methodological improvements and robustness checks.

Costs of systemic banking crises in Latin America and the Caribbean



*** Cumulative sum of the differences between actual and trend real GDP over the period (*T, T+3*), expressed as a percentage of trend real GDP, with *T* the starting year of the crisis.**

Source: Laeven and Valencia (2013). Systemic banking crisis database. IMF Economic Review 61: 225-270

Basel III phase-in arrangements

	Phases	2013	2014	2015	2016	2017	2018	2019
Capital	Leverage Ratio		Parallel run 1 Jan 2013 – 1 Jan 2017 Disclosure starts 1 Jan 2015				Migration to Pillar 1	
	Minimum Common Equity Capital Ratio	3.5%	4.0%	4.5%				**4.5%**
	Capital Conservation Buffer				0.625%	1.25%	1.875%	**2.5%**
	Minimum common equity plus capital conservation buffer	3.5%	4.0%	4.5%	5.125%	5.75%	6.375%	**7.0%**
	Phase-in of deductions from CET1*		20%	40%	60%	80%	100%	**100%**
	Minimum Tier 1 Capital	4.5%	5.5%	6.0%				**6.0%**
	Minimum Total Capital		8.0%					**8.0%**
	Minimum Total Capital plus conservation buffer		8.0%		8.625%	9.25%	9.875%	**10.5%**
	Capital instruments that no longer qualify as non-core Tier 1 capital or Tier 2 capital		Phased out over 10 year horizon beginning 2013					
Liquidity	Liquidity coverage ratio – minimum requirement			60%	70%	80%	90%	**100%**
	Net stable funding ratio						Introduce minimum standard	

* Including amounts exceeding the limit for deferred tax assets (DTAs), mortgage servicing rights (MSRs) and financials.

– – transition periods

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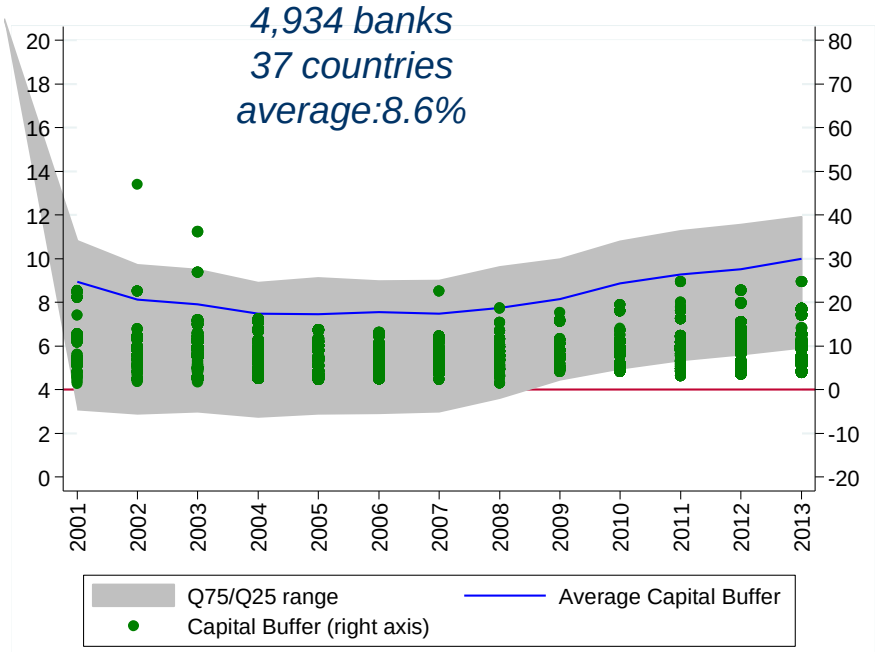
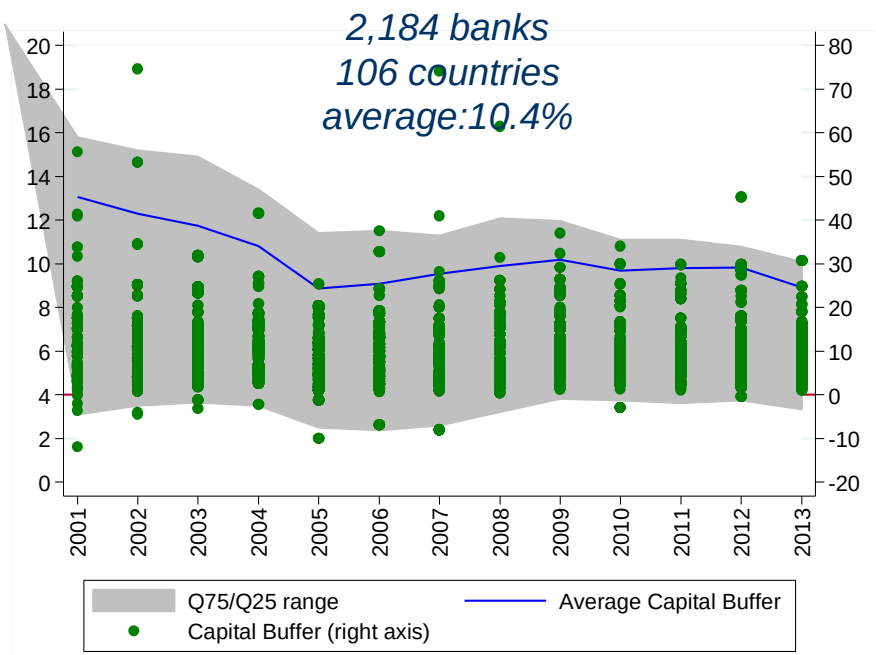
Bank capital buffers

- Bank capital buffers, which are holdings of banks' capital-to-asset ratio in excess of the regulatory minimum.*

Developed



Developing



- **What are the determinants of the observed levels of banks' capital buffers?**

* Following Jokipii and Milne (2008) we define the capital buffer as the bank capital ratio less the Minimum Capital Ratio (MCR). The bank capital ratio is approximated by the Total Capital Ratio (TCR), which measures the actual regulatory capital ratio in each jurisdiction. TCR data comes from Bankscope, MCR data from WB database "The Regulation of Banks around the World", surveys I, II, III and IV. Barth et al. (2001, 2004, 2006, 2012).

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A benchmark model of bank's optimal capital-to-asset ratio

- Banks use equity (E_t) and deposits (D_t) to fund loans (L_t) to firms and households.

- The objective of the banks is to maximize the net present value of the stream of dividends (div_t):

$$\max_{div_t, E_t, D_t, L_t} \mathbb{E}_t \sum_{t=0}^{\infty} \beta^t \Lambda_t div_t$$

subject to

$$L_t \leq D_t + E_t$$

$$div_t + E_t - E_{t-1} \leq R_t^L L_{t-1} - R_{t-1}^D D_{t-1} - \frac{\psi_t \left(\frac{E_t}{L_t} - \left(\frac{E}{L} \right)_t^{reg} \right)^2}{2}$$

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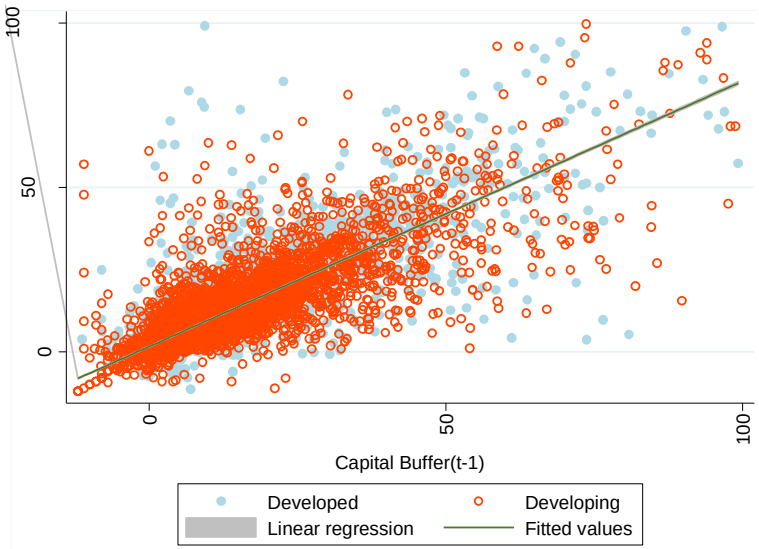
Benchmark determinants of bank's optimal capital-to-asset (loan) ratio

- According to this simple model of bank's capital optimization, it is optimal for a bank to **increase** its capital-to-loan ratio, $\phi_t^* = \frac{\mathbb{E}_t\{\beta \Lambda_{t+1} R_{t+1}^L\} - \mathbb{E}_t\{\beta \Lambda_{t+1} R_t^D\}}{\Lambda_t - \mathbb{E}_t\{\beta \Lambda_{t+1}\} - \mathbb{E}_t\{\beta \Lambda_{t+1} R_t^D\}}$, when:
  - GDP decreases, under the assumptions that the utility function exhibits decreasing marginal utility of consumption and $\mathbb{E}_t\left\{\frac{\Lambda_{t+1}}{\Lambda_t}\right\} > \frac{1}{[1+R_t^D][1+\beta]}$, which represents a pro-cyclical behavior.
  - The marginal return from lending R_{t+1}^L increases.
  - The marginal cost of borrowing R_t^D increases.

Partial adjustment model

- The presence of highly persistent capital buffers could indicate that banks approach their optimum target with a partial adjustment.



$$BUF_{i,t} = \alpha \underbrace{BUF^*_{i,t}}_{\text{not observable}} + (1-\alpha)BUF_{i,t-1} + \underbrace{\eta_i}_{\text{bank-specific determinants}}$$

- The empirical model will be specified as:

$$BUF_{i,t} = \alpha_0 + \alpha_1 BUF_{i,t-1} + \delta^i \underbrace{X_{i,t}}_{\text{vector of variables that determine } BUF^*_{i,t}} + \eta_i + \underbrace{u_{i,t}}_{\text{i.i.d error term}}$$

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Some potential culprits of X_{it}: environmental and bank variables

Variable	Description	Hypotheses	Total		
			Mean	Sd.	Obs.
Buffer (BUF)	Bank capital ratio less the Minimum Capital Ratio (MCR). The bank capital ratio is approximated by the Total Capital Ratio (TCR), which measures the actual regulatory capital ratio in each jurisdiction.		9.14	10.97	40,181
Environmental variables					
Growth rate of Gross Domestic Product (GGDP)	Growth rate of Gross Domestic Product.	According to the model, we expect to observe a **negative (specially US and EME)** relationship between capital buffers and GDP growth, a pro-cyclical behavior.	2.22	3.63	39,550
Money and quasi Money (MCM)	Money and Quasi money (M2) as percentage of GDP	Measures of financial depth associated with easiness of access to capital markets are expected to have a **positive** relationship with capital buffers.	119.33	69.69	35,662
Bank variables					
Bank size (Size)	Logarithm of total bank's asset	Moral hazard motives could imply a **negative** relation with capital buffers, charter value a **positive** one.	14.20	2.08	40,053
Return Over Average Assets (ROAA)	Net income/ average total assets	According to the model, profitability is **positively** associated with the level of capital buffers.	0.75	2.20	40,103
Return Over Average Equity (ROAE)	Net income / average total equity	According to the model, profitability is **positively** associated with the level of capital buffers.	6.90	21.10	40,099

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Sources: IFS for environmental, Bankscope for bank variables and World Bank database "The Regulation of Banks around the World", surveys I, II, III and IV. Barth et al. (2001, 2004, 2006, 2012) for regulatory capital.

Some potential culprits of X_{it}: bank (continue) and regulatory variables

Variable	Description	Hypotheses	Total		
			Mean	Sd.	Obs.
Bank variables					
Loan Loss Reserve Gross Loans (LLRGL)	Non-performing loans / total bank assets	The higher the ratio of non-performing loans as a percentage of total bank assets, the larger the capital buffers, a **positive** relation.	3.29	5.13	31,731
Cost of Funding (CF)	Interest Expenses/ total funding	According to the model, the cost of capital is positively associated with the level of capital buffers.	1.20	66.21	19,496
Regulatory variables					
Overall Capital Stringency (OCS)	Index that measures the extent of regulatory requirements regarding the amount of capital banks must hold. Higher values indicate greater stringency.	The stringency of capital regulation, the level of intervening power by authorities, and the enforcement of accounting standards, could be expected to have a **positive** relationship.	5.12	1.38	24,191
Official Supervisory Power (OSP)	Index that measures the extent to which official supervisory authorities have the authority to take specific actions to prevent and correct problems. Higher values indicating greater power.		11.09	2.37	32,430
Bank Accounting (BACC)	Dummy variable that takes a value of 1 when the income statement includes accrued or unpaid interest or principal on nonperforming loans and when banks are required to produce consolidated financial statements.		3.51	0.53	35,930
Boone Indicator (BOONE)	Measure of competition linking marginal costs to market share	Higher competition could lead to **lower (EME)** levels of buffers due to lower profitability and charter value, but if pool of borrowers is affected by competition, then could lead to **higher (OECD)** levels to cover losses.	-0.05	0.12	35,649
Moral Hazard Index (MHI)	Moral hazard index based on countries deposit insurance scheme (Demirgüç-Kunt and Detragiache, 2002). Higher values indicate more moral hazard.	The implicit insurance is expected to have a **negative (EME)** relationship with capital buffers.	119.33	69.69	35,662

Sources: Bankscope for bank variables and World Bank database "The Regulation of Banks around the World", surveys I, II, III and IV. Barth et al. (2001, 2004, 2006, 2012) for regulatory variables.

We use the two-step system GMM estimators, with Windmeijer (2005) corrected standard error to account for potential endogeneity.

Methodology

- The introduction of a lagged dependent variable among the right-hand side variables in: $BUF_{i,t} = \alpha_0 + \alpha_1 BUF_{i,t-1} + \delta^i X_{i,t} + \eta_i + u_{i,t}$ creates an endogeneity problem since the lagged dependent variable might be correlated with the disturbance term.

- To solve this problem, Arellano and Bond (1991) developed a difference GMM estimator for the coefficients in the above mentioned equation, where the lagged levels of the regressors are the instruments for the equation in first differences.

- However, Arellano and Bover (1995) and Blundell and Bond (1998) suggest to difference the instruments instead of the regressors in order to make them exogenous to the fixed effects. This leads from the difference GMM to the system GMM estimator, which is a joint estimation of the equation in levels and in first differences.

- Hence, we use the <u>two-step system GMM estimators</u>, with Windmeijer (2005) corrected standard error.

Estimation results: baseline specification

Table 3. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BUF(-1)	0.564***	0.564***	0.606***	0.588***	0.607***	0.589***	0.505***	0.497***
	(0.0891)	(0.0893)	(0.0869)	(0.0887)	(0.0868)	(0.0887)	(0.0927)	(0.0952)
SizeCo	-0.956***	-0.937***	-0.785**	-0.878***	-0.711**	-0.864***	-1.058***	-1.075***
	(0.331)	(0.329)	(0.305)	(0.326)	(0.307)	(0.325)	(0.389)	(0.398)
GGDP	-0.119***	-0.0996***	-0.0977***	-0.0996***	-0.0822***	-0.0858***	-0.0973***	-0.103***
	(0.0229)	(0.0246)	(0.0264)	(0.0252)	(0.0281)	(0.0267)	(0.0287)	(0.0286)
ROAA	0.520***	0.533***					0.563***	0.558***
	(0.102)	(0.106)					(0.118)	(0.120)
LLRGL	0.195***	0.203***	0.190***	0.195***	0.198***	0.201***	0.160***	0.172***
	(0.0464)	(0.0480)	(0.0441)	(0.0441)	(0.0459)	(0.0454)	(0.0467)	(0.0480)
BOONE	2.362***	2.380***	1.811**	1.447**	1.751**	1.389*	2.833***	2.942***
	(0.749)	(0.766)	(0.708)	(0.731)	(0.725)	(0.751)	(0.745)	(0.945)
OCS	0.246***	0.261***	0.243***	0.233***	0.251***	0.245***	0.280***	0.247***
	(0.0471)	(0.0475)	(0.0445)	(0.0457)	(0.0448)	(0.0459)	(0.0590)	(0.0609)
OSP	-0.0581*	-0.0267	-0.0400	-0.0615**	-0.00604	-0.0401	-0.00939	0.0130
	(0.0299)	(0.0322)	(0.0271)	(0.0303)	(0.0322)	(0.0330)	(0.0407)	(0.0457)
BACC	0.336**	0.449***		0.342**		0.418***		0.371**
	(0.149)	(0.148)		(0.155)		(0.149)		(0.184)
MCM		0.00400***			0.00259*	0.00277*		
		(0.00154)			(0.00136)	(0.00153)		
ROAE			0.0331***	0.0316***	0.0341***	0.0327***		
			(0.00831)	(0.00813)	(0.00868)	(0.00849)		
CF							-0.0247	-0.0287*
							(0.0161)	(0.0165)
Cons	1.768**	0.330	2.384**	1.698**	1.464	0.687	2.833**	1.439
	(0.813)	(1.012)	(0.939)	(0.831)	(1.111)	(1.070)	(1.126)	(1.195)

Capital buffers are:

Directly related to: past buffer (BUF(-1)), profitability (ROAA or ROAE), non-performing loans (LLRGL), market power (BOONE), regulators supervisory power (OCS and BACC) and market liquidity (MCM).

Inversely related to: relative size (SizeCo) and GDP growth (GDPG).

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Estimation results: excluding US banks

Table 4. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013. Equations excluding the US.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BUF(-1)	0.565***	0.563***	0.598***	0.585***	0.595***	0.585***	0.478***	0.472***
	(0.0910)	(0.0912)	(0.0920)	(0.0934)	(0.0930)	(0.0938)	(0.0986)	(0.0990)
SizeCo	-1.191***	-1.181***	-1.132***	-1.136***	-1.084***	-1.133***	-1.628***	-1.546***
	(0.367)	(0.367)	(0.381)	(0.379)	(0.386)	(0.380)	(0.455)	(0.439)
GGDP	-0.0934***	-0.0648**	-0.0897***	-0.0761**	-0.0589*	-0.0538*	-0.0846***	-0.0689**
	(0.0271)	(0.0295)	(0.0296)	(0.0301)	(0.0331)	(0.0322)	(0.0311)	(0.0325)
ROAA	0.531***	0.551***					0.537***	0.541***
	(0.127)	(0.131)					(0.134)	(0.138)
LLRGL	0.210***	0.224***	0.201***	0.210***	0.219***	0.220***	0.190***	0.203***
	(0.0520)	(0.0543)	(0.0478)	(0.0494)	(0.0509)	(0.0511)	(0.0528)	(0.0546)
BOONE	2.194***	2.199***	1.825**	1.228*	1.724**	1.154	2.927***	2.785***
	(0.738)	(0.755)	(0.713)	(0.711)	(0.726)	(0.736)	(0.753)	(0.962)
OCS	0.0952**	0.104**	0.111**	0.0893*	0.104**	0.0953**	0.0742	0.0321
	(0.0478)	(0.0475)	(0.0459)	(0.0477)	(0.0461)	(0.0476)	(0.0613)	(0.0641)
OSP	-0.0795**	-0.0439	-0.0902**	-0.0789*	-0.0424	-0.0526	-0.0879*	-0.0490
	(0.0400)	(0.0401)	(0.0404)	(0.0406)	(0.0427)	(0.0415)	(0.0507)	(0.0520)
BACC	-0.192	-0.0663		-0.145		-0.0473		-0.267
	(0.169)	(0.161)		(0.172)		(0.164)		(0.235)
MCM		0.00544***			0.00441***	0.00421***		
		(0.00166)			(0.00149)	(0.00163)		
ROAE			0.0327***	0.0330***	0.0347***	0.0349***		
			(0.0116)	(0.0120)	(0.0125)	(0.0128)		
CF							-0.0222	-0.0148
							(0.0184)	(0.0215)
Cons	4.426***	2.721*	3.719***	4.183***	2.439*	2.870**	4.959***	5.416***
	(1.343)	(1.419)	(1.259)	(1.304)	(1.359)	(1.438)	(1.443)	(1.767)

Capital buffers are:

Directly related to: past buffer (BUF(-1)), profitability (ROAA or ROAE), non-performing loans (LLRGL), market power (BOONE), regulators supervisory power (OCS ~~and BACC~~) and market liquidity (MCM).

Inversely related to: relative size (SizeCo) and GDP growth (GDPG).

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Estimation results: organizational type

Table 5. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013: Buffers and Type of Banks.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cooperative	0.705***	0.596***	0.322*	0.620***	0.243	0.562***	0.197	0.417
	(0.200)	(0.205)	(0.176)	(0.195)	(0.186)	(0.203)	(0.239)	(0.262)
Savings	1.346***	1.310***	1.100***	1.286***	1.132***	1.266***	1.114***	1.159***
	(0.317)	(0.322)	(0.265)	(0.313)	(0.306)	(0.321)	(0.298)	(0.394)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Equations excluding the US.								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cooperative	0.724***	0.515**	0.532***	0.614***	0.395*	0.459**	0.438	0.428
	(0.215)	(0.217)	(0.199)	(0.212)	(0.202)	(0.215)	(0.276)	(0.288)
Savings	0.765***	0.599**	0.788***	0.699***	0.532**	0.576**	0.525*	-0.449
	(0.252)	(0.258)	(0.206)	(0.248)	(0.242)	(0.255)	(0.290)	(0.528)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013: Type of Banks and Cyclicality.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cooperative*GGDP	0.248***	0.225***	0.218***	0.232***	0.207***	0.213***	0.242***	0.250***
	(0.0421)	(0.0418)	(0.0436)	(0.0436)	(0.0440)	(0.0435)	(0.0554)	(0.0573)
Savings*GGDP	0.255***	0.262***	0.258***	0.253***	0.258***	0.259***	0.204***	0.170**
	(0.0602)	(0.0605)	(0.0540)	(0.0566)	(0.0582)	(0.0570)	(0.0643)	(0.0718)
GGDP	-0.136***	-0.117***	-0.111***	-0.116***	-0.0959***	-0.102***	-0.117***	-0.121***
	(0.0237)	(0.0257)	(0.0270)	(0.0257)	(0.0288)	(0.0276)	(0.0298)	(0.0295)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Equations excluding the US.								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cooperative*GGDP	0.282***	0.250***	0.256***	0.261***	0.243***	0.234***	0.279***	0.274***
	(0.0460)	(0.0459)	(0.0470)	(0.0476)	(0.0487)	(0.0478)	(0.0619)	(0.0634)
Savings*GGDP	0.0475	0.0481	0.105	0.0602	0.0630	0.0618	-0.0211	-0.146
	(0.0819)	(0.0826)	(0.0691)	(0.0810)	(0.0816)	(0.0824)	(0.0989)	(0.133)
GGDP	-0.119***	-0.0891***	-0.0950***	-0.0811***	-0.0657**	-0.0584*	-0.112***	-0.0866***
	(-4.29)	(-2.98)	(-3.59)	(-2.92)	(-2.12)	(-1.92)	(-3.58)	(-2.68)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: cooperative and savings banks hold higher capital buffers.

Table 6: both types of banks have a counter-cyclical fluctuation.

Excluding US banks Savings*GDPG losses its significance.

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Estimation results: relative size

Table 7. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013: Size and Cyclicality.

	(1) BUF	(2) BUF	(3) BUF	(4) BUF	(5) BUF	(6) BUF	(7) BUF	(8) BUF
GGDP*SizeCo	-0.126***	-0.127***	-0.0984**	-0.105***	-0.0942**	-0.107***	-0.161***	-0.155***
	(-3.03)	(-3.15)	(-2.48)	(-2.71)	(-2.44)	(-2.83)	(-2.99)	(-3.02)
GGDP	-0.0702**	-0.0484	-0.0517	-0.0461	-0.0363	-0.0297	-0.0438	-0.0414
	(-2.15)	(-1.44)	(-1.45)	(-1.30)	(-0.96)	(-0.82)	(-0.97)	(-0.92)
Equations excluding the US								
	(1) BUF	(2) BUF	(3) BUF	(4) BUF	(5) BUF	(6) BUF	(7) BUF	(8) BUF
GGDP*SizeCo	-0.135***	-0.136***	-0.115**	-0.117***	-0.113**	-0.119***	-0.187***	-0.178***
	(-2.97)	(-3.07)	(-2.44)	(-2.63)	(-2.46)	(-2.73)	(-3.21)	(-3.26)
GGDP	-0.0480	-0.0162	-0.0370	-0.0173	-0.00507	0.00744	-0.0288	-0.00397
	(-1.26)	(-0.41)	(-0.93)	(-0.42)	(-0.12)	(0.18)	(-0.61)	(-0.08)

Table 8. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013: Size Effects in Developed and Developing Economies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SizeCo	-0.650**	-0.673**	-0.545*	-0.612*	-0.482*	-0.620**	-0.628*	-0.610
	(0.317)	(0.311)	(0.291)	(0.321)	(0.286)	(0.312)	(0.364)	(0.381)
SizeCo*Developing	-0.993***	-0.880***	-0.833***	-0.859***	-0.809***	-0.812***	-1.170***	-1.167***
	(0.237)	(0.245)	(0.225)	(0.221)	(0.246)	(0.235)	(0.286)	(0.286)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Equations excluding the US								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SizeCo	-0.899**	-1.054***	-0.939**	-0.919**	-0.997***	-1.036***	-1.423***	-1.339***
	(0.368)	(0.370)	(0.387)	(0.395)	(0.386)	(0.388)	(0.449)	(0.454)
SizeCo*Developing	-0.646***	-0.287	-0.452**	-0.483**	-0.196	-0.223	-0.409	-0.390
	(0.219)	(0.233)	(0.212)	(0.214)	(0.238)	(0.237)	(0.259)	(0.260)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: on average, procyclicality of capital buffers is due to large banks.

Table 8: on average, procyclicality of capital buffers of large banks is greater in developing countries. When excluding the US, the relative size effect on procyclicality of large banks is stronger for developed countries.

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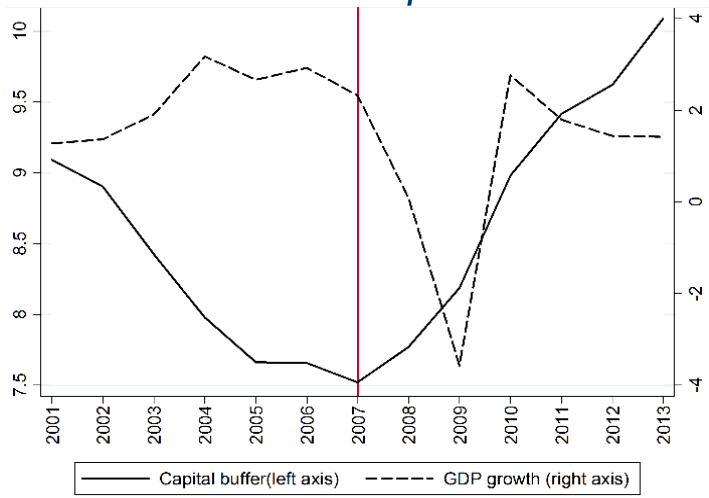
Estimation results: cyclicality in developed and developing economies

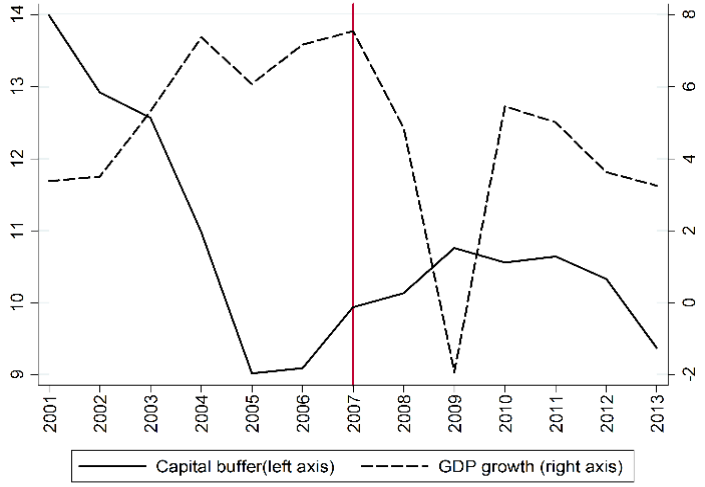
Table 9. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013: Cyclicality in Developed and Developing Economies.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GGDP*Developing	-0.204***	-0.186***	-0.195***	-0.189***	-0.183***	-0.177***	-0.180***	-0.166***
	(0.0354)	(0.0340)	(0.0329)	(0.0342)	(0.0334)	(0.0333)	(0.0375)	(0.0390)
GGDP	0.0578	0.0554	0.0675*	0.0626*	0.0682*	0.0606	0.0512	0.0378
	(0.0373)	(0.0370)	(0.0369)	(0.0379)	(0.0392)	(0.0378)	(0.0416)	(0.0436)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Equations excluding the US.								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GGDP*Developing	-0.199***	-0.166***	-0.182***	-0.182***	-0.158***	-0.157***	-0.122***	-0.107***
	(0.0372)	(0.0339)	(0.0342)	(0.0359)	(0.0334)	(0.0338)	(0.0362)	(0.0382)
GGDP	0.0766*	0.0705*	0.0627*	0.0782*	0.0695*	0.0739*	0.0189	0.0240
	(0.0398)	(0.0386)	(0.0364)	(0.0400)	(0.0387)	(0.0389)	(0.0378)	(0.0422)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Developed



Developing



Pro-cyclicality is a more generalized problem in developing countries, which is particularly worrisome in the light of rapidly decreasing capital buffers in the recent period of economic slowdown in developing countries.

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Estimation results: cyclical effect of buffer components

Table 10. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Total Capital Ratio (TCR), 2001-2013. Decomposition of Cyclical Buffer Effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TCR(-1)	0.588***	0.592***	0.621***	0.616***	0.625***	0.619***	0.572***	0.568***
	(0.0906)	(0.0916)	(0.0880)	(0.0877)	(0.0891)	(0.0888)	(0.0873)	(0.0866)
SizeCo	-1.067**	-1.071**	-0.970**	-0.968**	-0.922**	-0.969**	-1.027**	-1.020**
	(0.476)	(0.475)	(0.421)	(0.439)	(0.437)	(0.437)	(0.443)	(0.459)
GGDP	-0.172***	-0.164***	-0.158***	-0.156***	-0.158***	-0.149***	-0.156***	-0.157***
	(0.0284)	(0.0297)	(0.0305)	(0.0302)	(0.0320)	(0.0312)	(0.0341)	(0.0340)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Tier 1, 2001-2013: Decomposition of Cyclical Buffer Effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tier 1(-1)	0.540***	0.543***	0.567***	0.560***	0.564***	0.561***	0.491***	0.487***
	(0.106)	(0.108)	(0.107)	(0.106)	(0.107)	(0.108)	(0.130)	(0.132)
SizeCo	-1.173**	-1.148**	-1.034**	-0.969*	-0.920*	-0.962*	-1.685**	-1.584**
	(0.539)	(0.543)	(0.504)	(0.518)	(0.519)	(0.518)	(0.679)	(0.712)
GGDP	-0.130***	-0.102***	-0.107***	-0.0829**	-0.0763*	-0.0629	-0.122***	-0.106***
	(0.0332)	(0.0342)	(0.0409)	(0.0395)	(0.0422)	(0.0410)	(0.0393)	(0.0404)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Loans to Assets ratio, 2001-2013: Decomposition of Cyclical Buffer Effects.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Loans to assets(-1)	0.935***	0.919***	0.976***	0.938***	0.926***	0.921***	0.842***	0.800***
	(0.0379)	(0.0384)	(0.0311)	(0.0373)	(0.0372)	(0.0378)	(0.0360)	(0.0449)
SizeCo	-0.524**	-0.453**	-0.723***	-0.558**	-0.499**	-0.476**	-0.688***	-0.289
	(0.218)	(0.222)	(0.185)	(0.222)	(0.225)	(0.226)	(0.235)	(0.281)
GGDP	0.205***	0.166***	0.231***	0.201***	0.168***	0.159***	0.103*	0.100*
	(0.0489)	(0.0523)	(0.0482)	(0.0473)	(0.0502)	(0.0507)	(0.0560)	(0.0564)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

- Larger banks have lower values for the three components (magnitude in the loan-to-assets effect is relatively smaller).
- Global banks behave procyclically with respect to the regulatory capital ratio. They do so, both, by decreasing (increasing) Tier 1 capital ratios during periods of increased (decreased) economic activity and by (relatively strongly) increasing (reducing) lending ratios during periods of increased (decreased) economic activity.

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Endogeneity: GDP = f (banking performance in the context of crises)

Table 11. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2006: Cyclicality and Size in "Tranquil Times"

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SizeCo	-0.567	-0.555	-0.774	-0.727	-0.743	-0.693	-1.185*	-1.210**
	(0.456)	(0.451)	(0.472)	(0.466)	(0.471)	(0.460)	(0.607)	(0.605)
GGDP	-0.213***	-0.212***	-0.240***	-0.252***	-0.238***	-0.252***	-0.233***	-0.235***
	(0.0650)	(0.0664)	(0.0692)	(0.0716)	(0.0695)	(0.0724)	(0.0885)	(0.0853)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013. Cyclicality and Size in "Tranquil Countries". Countries without a systemic banking crisis during 2007-2009 (Laeven and Valencia, 2013)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SizeCo	-0.870**	-0.910**	-0.844**	-0.801**	-0.794**	-0.836**	-0.878**	-0.811*
	(0.405)	(0.405)	(0.373)	(0.381)	(0.379)	(0.377)	(0.435)	(0.450)
GGDP	-0.163***	-0.149***	-0.156***	-0.147***	-0.143***	-0.136***	-0.159***	-0.153***
	(0.0306)	(0.0321)	(0.0325)	(0.0327)	(0.0355)	(0.0342)	(0.0356)	(0.0359)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 11, redo the baseline group of regressions of Table 3, but using data from the 2001-2006 period, "Tranquil Times", and for a set of countries that did not experience systemic banking crisis coinciding with the global financial crisis, "Tranquil Countries."

Although the numbers of observations are reduced (especially in Tranquil Times), the negative coefficient on our cycle variable is still negative, significant and robust. For the "Tranquil Countries" sample, the rest of the controls exhibit similar coefficients and significance levels with respect to the previous exercises.

This, we believe, provide some confidence to fact that our results are not driven by reversed causality from the effects of the global crisis.

Estimation results: competition

Table 12. Estimation Results: Blundell-Bond Two-Step System GMM Estimates for Capital Buffer, 2001-2013: Buffers and competition in Developed and Developing Economies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BOONE*Developing	9.323***	9.577***	8.330***	7.732***	8.782***	8.247***	11.14***	10.63***
	(1.986)	(1.928)	(1.843)	(1.917)	(1.854)	(1.914)	(2.398)	(2.578)
BOONE	-6.304***	-6.661***	-5.946***	-5.728***	-6.540***	-6.383***	-7.700***	-7.087***
	(1.748)	(1.690)	(1.708)	(1.741)	(1.715)	(1.725)	(2.278)	(2.292)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Equations excluding the US

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BOONE*Developing	6.493***	5.985***	5.671***	4.862***	5.205***	4.693**	6.842***	5.955**
	(1.839)	(1.749)	(1.849)	(1.862)	(1.839)	(1.840)	(2.318)	(2.412)
BOONE	-3.851**	-3.470**	-3.517**	-3.290*	-3.249*	-3.287*	-3.575	-2.837
	(1.766)	(1.708)	(1.707)	(1.776)	(1.694)	(1.752)	(2.245)	(2.299)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

- On average the market power indicator is significant and positive, indicating that banking markets where less competitive conditions prevails banks tend to have lower capital buffers.
- More competition is associated with higher capital buffers in developed countries and lower buffers in developing ones.
- The evidence amounts to suggest that the “competition-stability” view finds support for developed economies, whereas the “competition-fragility” one finds it for developing countries.

Summary of results:
determinants of banks' choice of capital buffers

- In this paper, we look for bank capital buffers determinants at a global scale, using a large dataset of 4,934 banks in 37 developed countries and 2,184 in 106 developing ones, over the 2001-2013 period.
- The average bank in the world exhibits pro-cyclical behavior. This would call for the extensive and effective implementation of Basel's III proposed counter-cyclical buffer tools, at a global scale.
- Nevertheless, according to our empirical exercise, this average result is conditional on a series of factors, some affecting the functioning of local markets, its regulation, the level of competition and several bank-specific characteristics.
- This seems to hold, not only with regard to cyclical patterns, but also to the level of buffers.
- Costs of adjustment are important and do not seem to differ greatly across levels of economic development.

Summary of results:
determinants of banks' choice of capital buffers

- Large banks in global and domestic markets behave substantially more pro-cyclically that their smaller peers.
- Cooperative and saving banks tend to hold higher capital buffers in developed economies. Saving banks tend to behave counter-cyclically in the US.
- Banks account standards regulation, overall capital regulatory stringency, bank risk and financial depth rise the capital buffers.
- Most of bank's cyclical adjustment happens in the lending side.
- More competition leads to higher buffers in developed countries but to lower in developing.
- Pro-cyclicality seems to be a more generalized behavior in developing, as in average, not only their larger banks but also the rest banks, tend to fluctuate negatively with the cycle.

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Bank capital buffers around the world: cyclical patters and the effect of market power

Oscar Carvallo Valencia **Alberto Ortiz Bolaños**

Thank you