Did the EBA capital exercise lead to a credit crunch in the euro area?

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Motivation

- Did the EBA Capital Exercise of 2011/12 lead to a contraction in lending by euro area banks that were obliged to increase their capital ratios?
- Negative bank capital shock generally associated with contraction of bank lending in the short run but:
  - size of effect remains debated;
  - little evidence available for euro area.
- New dataset: detailed EBA bank capital release & bank balance sheet database collected by the Eurosystem (IBSI).
- Topical in view of the decisions facing the new European Single Supervisory Mechanism (SSM).

Motivation

- Timing of the 2011/12 EBA Capital Exercise criticised for potentially contributing to a euro area credit crunch.

  "I think there are usually, by and large, three reasons why banks may not lend. (...) The second reason is a lack of capital. (...) So your question is about the second, a lack of capital. Now, the EBA exercise was in a sense right in itself, but it was decided at a time when things were very different from what they are today. (...) So in itself under these circumstances the EBA exercise has turned out to be pro-cyclical."

Mario Draghi, ECB Press conference, 12 January 2012.

Motivation

- Three common challenges in identify impact of regulatory shocks to bank capital:
  - Shocks often difficult to define (e.g. Basel III).
  - Disentangling credit supply and demand effects requires good controls for demand.
  - If all (large) banks are treated, difficult to construct credible control group.

Motivation

- Our dataset allows us to address these challenges:
  - EBA announcement largely unexpected (just 3 months after disclosure of July 2011 EBA Stress Tests), with short implementation period.
    - NB: 8 bank groups that failed the July ST **are not** in October CE sample.
  - Disaggregated bank-level data for cross-country banking groups allows for country of residence fixed effects as control for demand.
  - Increase in capital requirements did not apply to all monitored bank groups => can construct a credible control group.
- Eurosystem data includes adjusted credit flows (as per monthly ECB data release), allowing us to observe "true" net flows of bank credit.

Overview of Findings

- Banks in banking groups with capital shortfall had lower lending growth during recapitalisation period (October 2011 - June 2012).
- Significant but contained negative impact: + 1pp capital shortfall/RWA implies -1.2pp loan growth (annualized).
- Size of effect at lower end of estimates in the literature:
  - Role of moral suasion by EBA and national supervisors?
  - Dampening role of ECB's 3-year LTROs?
- No evidence of substitution by healthy banks: contraction in lending is also observed at country level.

Literature Review on bank capital and lending

- Modigliani & Miller (1958) may hold in long term but shocks to bank capital constraint have negative impact on credit supply in short term (information assymetries); by how much?

- Different identification strategies:
  - Regressions of lending growth during recessionary episodes on pre-crisis capital levels (Bernanke & Lown, 1991, Peek & Rosengreen, 1997).
  - Partial adjustment models of bank leverage to an unobservable target ratio (Francis & Osborne, 2009, Berrospide & Edge, 2010).
  - Identification using loan-level or bank-firm data (Puri et al., 2011, Albertazzi & Marchetti, 2010)
  - Proprietary regulatory datasets of bank-specific capital requirements (Aiyar et al, 2012, Bridges et al., 2014, Brun et al., 2013).

Overview of EBA Capital Exercise

- EBA Capital Exercise announced on 26 October 2011.
- Aimed to strengthen confidence in European banks, in context of euro area sovereign debt crisis, by reinforcing capital positions.
- Increased capital requirements to 9% (after taking account of buffer for sovereign exposures), to be reached by June 2012.
- Core Tier 1 used as capital measure (common equity + retained earnings + some government support measures).
- Sovereign buffer = book value less market value (HTM bond portfolio) + removal of prudential filters (AFS bond portfolio).

Dataset

- Study uses two sources of bank balance sheet data:
  - EBA data for **61 European banking groups**;
  - Eurosystem database of monthly balance sheets for **247 individual banks** (IBSI database).
- Mapping of EBA banking groups and IBSI individual banks.
  - NB: Mix of *Shortfall* and *Surplus* individual banks in all large countries (periphery **and** core).
- Linking banking group capital with individual bank lending growth implies two hypotheses:
  - Bank credit policy set at group level;
  - Internal capital markets exist within groups (Ashcraft, 2008, Houston et al., 1997, etc.).

Representativeness of Sample (Sept 2011)

Country	% EA Loans	% Smpl Loans		# Banks		% Shortfall Bks	
		EBA	All	EBA	All	EBA	All
AT	3	25	38	4	8	100	50
BE	2	52	77	6	9	33	22
CY	0	46	55	2	4	100	50
DE	23	38	49	29	56	55	29
EE	0	92	92	4	4	0	0
ES	17	30	67	9	23	78	30
FI	2	48	48	5	6	0	0
FR	19	56	68	22	28	68	54
GR	2	-	-	-	-	-	-
IE	2	67	73	9	10	0	0
IT	15	43	53	14	23	57	35
LU	1	13	18	1	2	0	0
MT	0	74	82	2	4	0	0
NL	8	81	90	5	8	40	25
PT	3	70	70	5	5	100	100
SI	0	48	58	4	5	75	60
SK	0	55	55	3	3	67	67
Euro area	100	46	60	124	198	53	33

Note. Countries are the euro area countries where individual banks are located. Note that the country of nationality of the banking groups to which these individual banks belong can be different and that all EBA banking groups are headquartered in the EU but not necessarily in the euro area. Col. 3, 5 and 7 refer to banks in EBA groups. Col. 4, 6 and 8 refer to all selected banks.

Calculation of "clean" Annualised 9-Month Growth Rates

- Calculation of (adjusted) 1-month growth rates:

$$l_t^1 = \frac{F_t^M}{L_{t-1}} \tag{1}$$

- Impact of 84 M&A and 9 Securitization operations on 1-month growth rates regressed out using dummies in IBSI data.
- Adjusted 1-month growth rates winsorized at 2nd and 98th percentiles.
- Calculation of adjusted annualised 9-month growth rates follows methodology outlined in ECB's Monthly Bulletin for aggregate monetary statistics.

$$l_t^9 = \left[\left(\prod_{i=0}^{8} \left(1 + \frac{F_{t-i}^M}{L_{t-1-i}} \right) \right)^{\frac{12}{9}} - 1 \right]. \tag{2}$$

Summary Statistics for Banks in Sample (Sept 2011)

	All Banks	Shortfall	Surplus	Non-EBA
Number	198	66	58	74
Main Assets (Millions)	84,798	117,277	98,100	45,403
Annual. Loan Growth	0.01	0.00	0.02	0.02
Loans to Assets	0.47	0.47	0.43	0.52
Capital to Assets	0.08	0.08	0.08	0.07
Liquid Assets	0.22	0.23	0.25	0.19
Deposits to Assets	0.35	0.30	0.32	0.43
Interbank Liabilities to Assets	0.20	0.28	0.18	0.15
Sovereign Bonds to Assets	0.05	0.06	0.04	0.06

Methodology

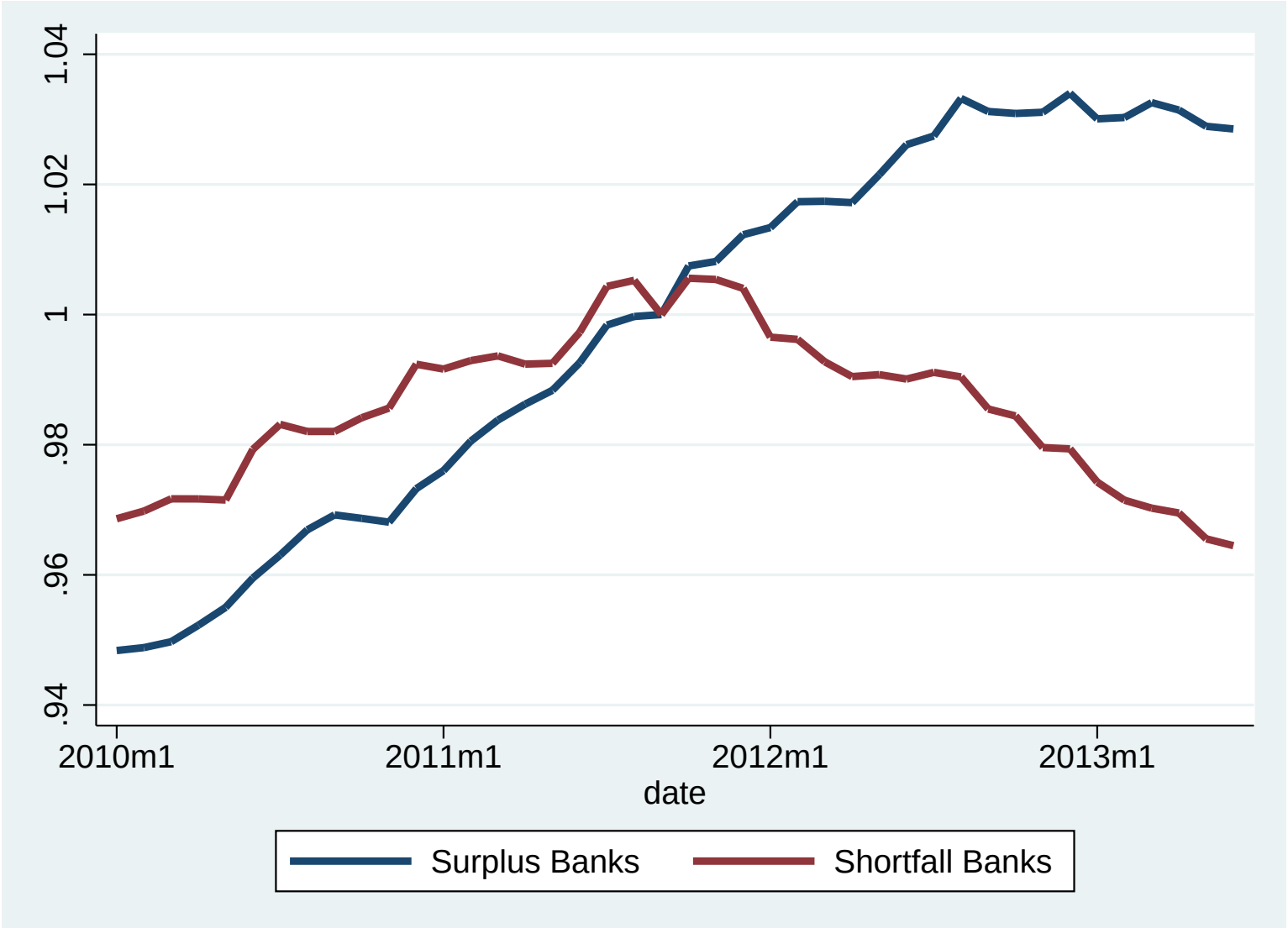
- **Treated** group = banks in EBA groups with capital shortfall.
- **Control** group = banks in EBA groups with capital surplus (**+** banks in non-EBA banking groups, for robustness).
- Test whether banks in treated group exhibited different lending behaviour compared to banks in the control group over the recapitalisation period:

$$Y_{i,j,k} = \alpha + \beta_1 Shortfall_j + \beta_2 X_{i,j,k} + S_k + \varepsilon_{i,j,k} \quad (3)$$

- *Shortfall* is the CET1 shortfall-to-RWA ratio for the banking group of each bank (zero for banks in control group).
- Control for bank characteristics (X) and country of residence demand factors (S).

Stock of Loans: Control vs. Treated Groups

September 2011 = 100



Regression Results: Annualised 9-Month Loan Growth

EBA Capital Exercise: October 2011 - June 2012

	1	2	3	4	5	6	7
Shortfall/RWA	-1.48**	-1.06*	-1.36**	-1.19**	-1.23**	-1.43**	-1.61*
	(0.58)	(0.59)	(0.54)	(0.53)	(0.47)	(0.54)	(0.83)
Stressed		-0.04**		-0.01			
		(0.01)		(0.02)			
Unemployment			-0.25**		-0.05	-0.04	
			(0.11)		(0.12)	(0.12)	
Deposits/A.				0.03	0.03	0.03	
				(0.03)	(0.03)	(0.03)	
Sov. Bonds/A.				0.46***	0.47***	0.47***	0.69***
				(0.14)	(0.14)	(0.13)	(0.16)
Dom. Sov. Bonds/A. * Stressed Country				-0.55*	-0.61***	-0.62***	-0.77**
				(0.32)	(0.20)	(0.20)	(0.37)
Surplus/RWA						0.04	
						(0.41)	
July '11 ST Fringe						0.03	
						(0.02)	
Country FEs	No	No	No	No	No	No	Yes
Other bank controls	No	No	No	Yes	Yes	Yes	No
N	124	124	124	124	124	124	124
R^2	0.06	0.12	0.09	0.23	0.23	0.23	0.35

Note. Other bank controls include size, as well as liquid assets, and loans to total assets (all not significant). All specifications include a constant. Standard errors are clustered at the level of bank groups. Stars refer to the P-values as follows: p<0.10 if *, p<0.05 if **, p<0.01 if ***.

Deleveraging constraint or information revelation?

Little impact of EBA release on CDS prices:

	CDS	CDS	Equity	Equity
Shortfall to RWA	2.26***	2.15***	-0.04	-0.11
	(0.66)	(0.56)	(0.15)	(0.19)
Stressed country (headqu.)		6.72		1.66
		(6.43)		(1.14)
Constant	22.48***	20.18***	-1.62***	-2.30***
	(3.01)	(2.98)	(0.36)	(0.57)
N	42	42	41	41
R^2	0.18	0.21	0.01	0.11

Note. Results of OLS regressions of either the change in CDS price (col. 1-2) or the stock return of individual banking groups (col. 3-4). Included banking groups are the sample banking groups for which these market prices were available. Changes in CDS and stock prices are computed over a window of two-days surrounding the event (from December 7 to December 9, 2011). Changes to CDS prices are expressed in basis points, stock returns in percentage points. Robust standard errors in parentheses.

Robustness Tests

- Two reasons for undertaking robustness tests in a "'diff-in-diff style"' setting:
  - Test for ex ante parallel trends between treated and control groups;
  - Test for statistical robustness of coefficients with alternative samples.
- Placebo Test: Undertake regressions on different time period.
- Include Non-EBA Banks: Increase size of control group.
- Also (not shown here): weighted OLS, group-level averages...

Robustness 1: Placebo Test

Annualised 9-Month Loan Growth: January 2011 - September 2012

	1	2	3	4	5	6	7
Shortfall/RWA	-0.67	-0.45	-0.61	-0.44	-0.47	-0.44	-1.20
	(0.49)	(0.56)	(0.48)	(0.54)	(0.50)	(0.61)	(0.79)
Stressed		-0.02		-0.00			
		(0.02)		(0.03)			
Unemployment			-0.23*		-0.12	-0.10	
			(0.14)		(0.18)	(0.18)	
Deposits/A.				0.05*	0.04	0.04	0.02
				(0.02)	(0.03)	(0.03)	(0.02)
Sov. Bonds/A.				0.19	0.20*	0.17	0.08
				(0.14)	(0.11)	(0.12)	(0.15)
Dom. Sov. Bonds/A. * Stressed Country				-0.25	-0.25	-0.22	
				(0.47)	(0.33)	(0.31)	
Surplus/RWA						-0.68**	-0.36
						(0.32)	(0.40)
July '11 ST Fringe						-0.04*	
						(0.02)	
Country FEs	No	No	No	No	No	No	Yes
Other bank controls	No	No	No	Yes	Yes	Yes	No
N	120	120	120	120	120	120	120
R^2	0.01	0.03	0.03	0.10	0.10	0.15	0.27

Note. Other bank controls include size, as well as liquid assets, and loans to total assets (all not significant). All specifications include a constant. Standard errors are clustered at the level of bank groups. Stars refer to the P-values as follows: p<0.10 if *, p<0.05 if **, p<0.01 if ***.

Robustness 2: including Non-EBA Banks

Annualised 9-Month Loan Growth: October 2011 - June 2012

	1	2	3	4	5	6	7
Shortfall/RWA	-1.36**	-1.02**	-1.25***	-1.13**	-1.20**	-1.45***	-0.98*
	(0.53)	(0.51)	(0.46)	(0.50)	(0.46)	(0.49)	(0.56)
Stressed		-0.04***		-0.01			
		(0.01)		(0.02)			
Unemployment			-0.31***		-0.14*	-0.14	
			(0.07)		(0.09)	(0.09)	
Deposits/A.				0.08***	0.08***	0.08***	0.08***
				(0.03)	(0.03)	(0.03)	(0.03)
Sov. Bonds/A.				0.26**	0.28**	0.28**	0.37**
				(0.12)	(0.12)	(0.12)	(0.17)
Dom. Sov. Bonds/A. * Stressed Country				-0.24	-0.31**	-0.31**	-0.31
				(0.25)	(0.15)	(0.15)	(0.33)
EBA Banking Group				0.01	0.01	0.01	
				(0.02)	(0.02)	(0.02)	
Surplus/RWA						-0.04	
						(0.41)	
July '11 ST Fringe						0.03	
						(0.02)	
Country FEs	No	No	No	No	No	No	Yes
Other bank controls	No	No	No	Yes	Yes	Yes	No
N	198	198	198	198	198	198	198
R^2	0.04	0.10	0.09	0.19	0.20	0.20	0.27

Note. Other bank controls include size, as well as liquid assets and loans to total assets (all not significant). All specifications include a constant. Standard errors are clustered at the level of bank groups. Stars refer to the P-values as follows: p<0.10 if *, p<0.05 if **, p<0.01 if ***.

Looking for aggregate effects

- Possibility that reduction in lending by "shortfall" banks was compensated for by other banks.
- Investigate by collapsing data at country level:
  - Monthly loan growth rates;
  - Weighted average of Shortfall-to-RWA (by size of loan book of individual resident banks);
- Results suggest that the size of the shortfall had impact on lending growth at country level => limited substitution effect.

Looking for aggregate effects

Impact of Shortfall Banks on Monthly Country-Level Loan Growth: Jan 2010-Dec 2012

	1	2	3
Weighted Shortfall-to-RWA	-1.04**	-1.30***	-1.47***
	(0.46)	(0.33)	(0.33)
Unemployment	-1.08**	-0.68*	-0.83*
	(0.37)	(0.36)	(0.41)
Deposits / Assets		0.85**	0.86*
		(0.40)	(0.42)
Loans / Assets		-0.58**	-0.55*
		(0.27)	(0.29)
Lagged dep. var.			-0.12*
			(0.06)
Country FEs	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes
Other bank controls	No	Yes	Yes
N	548	548	548
R^2	0.39	0.42	0.43

Note. Other bank controls include size, liquid assets, and sovereign bond holdings to assets (all not significant). Weighted Shortfall-to-RWA is the average Shortfall-to-RWA of each bank in the country weighted by the size of banks'loanbooks (zero for all months outside the 9-month of the CE). Standard error (in parenthesis) are clustered at the country level. Stars refer to the P-values as follows: $p < 0.10$ if $*$, $p < 0.05$ if $**$, $p < 0.01$ if $***$.

Conclusions

- Robust evidence that banks in groups identified as having a capital shortfall had lower lending growth during the recapitalisation period of EBA's Capital Exercise.
- Exercise also appears to have had an effect on lending growth at the country level.

Conclusions

- Important to emphasise that study looks at short-term impact of exogenous regulatory shock in an environment of stressed capital market conditions and subdued economic sentiment.
- Results suggest that timing matters: market conditions at time of announcement and length of implementation period.
- Substitution effect between banks could be greater (and recessionary impact smaller) in more benign conditions.
- Results underline potential benefits of targeting capital levels and not ratios (Hanson, Kashyap, Stein, 2011).

Annex I: Results from Comparable Studies

Study	Berrospide and Edge (2010)	Francis and Osborne (2009)	MAG* (2010)	Bridges et al. (2014)	Brun, Fraisse, and Thesmar (2013)	Aiyar et al. (2011)
Method-ology	Partial adjustment model with US data (1992-2009)	Partial adjustment model with UK data (1996-2007)	Median of national estimates	Panel reg with proprietary UK regulatory data (1990-2011)	Panel reg with French data and firm-level controls (2006-2011)	Panel reg with UK data (1998-2007)
Capital Measure	Equity to asset ratio	Risk-weighted capital ratio	Regulatory requirement	Regulatory Requirement	Regulatory requirement	Regulatory requirement
Impact of 1pp rise in capital ratio on lending growth	Total lending -0.25pp per annum	Total lending -0.8pp per annum	Total lending -1.4pp (after 18 quarters)	Corporate Loans -3.9pp	Corporate Loans -5pp	Total lending -6pp to -9pp

** Basel Committee on Banking Supervision*

Annex II: Timeline of EBA Announcements

26 October 2011

- Announcement of Capital Exercise: banks to build up a temporary capital buffer against sovereign exposures and establish Core Tier 1 capital ratio of 9% by June 2012.

8 December 2011

- Publication of bank-by-bank shortfall: total of €115bn for 37 banks. Ten of these banks subsequently exited the exercise.

9 February 2012

- Preliminary assessment of capital plans: 27 banks to fill a total shortfall of €76bn.

11 July 2012

- Preliminary report: "vast majority" of banks meet ratio.

3 October 2012

- Publication of final report and end-June balance sheet data.

Annex III: Count of IBSI Banks and EBA Banking Groups in Sample

Banking Groups in Capital Exercise	61
IBSI Banks	247
- of which in EBA	142
- of which not in EBA	105
Mapped but no EBA data	(14)
Mapped but no IBSI data	(4)
IBSI with small loan books	(24)
Non-resident banks in Luxembourg & Ireland	(7)
Sample of Banks	**198**
- of which in EBA	124
- of which not in EBA	74
Sample of Bank Groups	**118**
-of which in EBA	50
-of which not in EBA	68