

DID THE EBA CAPITAL EXERCISE CAUSE A CREDIT CRUNCH IN THE EURO AREA?*

Jean-Stéphane Mésonnier[†] and Allen Monks[‡]

This version: December 4, 2014.

Abstract

We exploit a unique monthly dataset of euro area bank balance sheets to document the impact of the EBA's 2011/12 Capital Exercise on bank lending. We find that banks in a banking group forced to increase its CT1 capital ratio by 1 percent have had an annualized loan growth (over nine months) that was 1.2% lower than for banks in unconstrained groups. We also find at the country level that banks that did not have to recapitalize did not substitute for more constrained lenders. Our results are of particular relevance for the decisions facing the new European Single Supervisory Mechanism.

JEL Classification: C21, E51, G21, G28.

Keywords: bank capital ratios, credit supply, EBA, euro area, SSM.

*We thank Jose Berrospide, Marcello Bofondi, Guillaume Horny, Mathias Lé, Fabio Panetta, John Thanassoulis and John Williams, the Editor, for useful comments, as well as seminar participants at Banca d'Italia, Banque de France, EEA-ESEM 2014 (Toulouse), FEBS 2014 (Surrey), IFABS 2014 (Lisbon) and the 2014 Annual IJCB Conference hosted by the Federal Reserve Bank of Philadelphia. Aurélie Touchais provided very helpful assistance with the data. The views expressed herein are those of the authors and do not necessarily reflect those of the Banque de France, the Central Bank of Ireland or the Eurosystem.

[†]Corresponding author. Banque de France, Financial Research Division, 41-1391 RECFIN, 39 rue Croix des Petits-Champs, 75001 Paris, France. Email: jean-stephane.mesonnier@banque-france.fr.

[‡]Central Bank of Ireland. Allen Monks was on secondment from the Central Bank of Ireland at the Banque de France at the time of this writing.

1 Introduction

In October 2011 the European Banking Authority (EBA), the institution charged with setting harmonized supervisory standards for banks in EU Member States, announced that major European banking groups would have to increase their Core Tier 1 capital ratios to 9% of their risk-weighted assets (RWA) by June 2012. These groups were also required to hold a new temporary capital buffer to cover risks linked to sovereign bond holdings. The announcement came largely as a surprise, as the EBA had just conducted rigorous stress tests in the Summer of 2011 and already released detailed information on the exposure of European banks to sovereign risk. The announcement also came at a time when the euro area was still perceived as extremely fragile, following a tumultuous summer on the sovereign debt markets of several Member States. Many observers were then concerned that impaired bank balance sheets were leading to weak credit supply and aggravating the recession in several countries. Unsurprisingly, the timing of the EBA's Capital Exercise therefore soon came under fire from critics for having contributed to a "credit crunch" in the euro area.¹

In this paper, we evaluate the impact of this unexpected increase in regulatory capital requirements on bank lending to the euro area real economy. We do this using information released by the EBA on measured capital shortfalls for some 60 banking groups in addition to a novel dataset compiled by the Eurosystem of monthly balance sheets for some 250 large individual banks resident in the euro area (the IBSI database in the following). Controlling for bank characteristics and demand at the level of country of residence, we find that banks in a banking group that had to increase its capital by 1 percent of risk-weighted assets tended to have annualized loan growth (over the 9 month period of the exercise) that was 1.2 percentage points lower than for banks in groups that did not have to increase their capital ratios. Although comparable with the findings of other empirical studies on the bank capital-lending relationship, our results are at the lower end of available estimates, which may reflect the difficulty in disentangling the effects of this regulatory capital shock from other events happening during this period of turmoil, like the long-term liquidity injections of the Eurosystem (LTROs). Whatever, we also collapse our dataset at the country level in

¹Cf. this statement by ECB President Mario Draghi in response to questions by journalists on January 12, 2012: "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."

order to assess aggregate effects and find that banks that were not constrained to recapitalize did not substitute for those that had to increase their capital ratios. This suggests that the Capital Exercise had tangible procyclical macroeconomic effects.

Capital requirements have been the cornerstone of modern banking regulation since the late 1980s. Since then, proposals for increasing requirements have been contentious and the role of tightened capital regulations in aggravating recessionary episodes has been widely discussed.² The theoretical literature on the relationship between bank capital and credit supply indeed suggests that banks may respond to a shock that increases their capital constraint by reducing credit supply, at least temporarily.³ However, in spite of an abundant empirical literature, the magnitude (if not the sign) of the short term response of loan supply to a shock increasing bank capital requirements remains a much-debated issue.⁴

Indeed, any attempt to evaluate the impact of a capital requirement shock on lending supply faces several challenges. First, new regulations, such as Basel I to III, have generally been announced well ahead of their implementation explicitly in order to allow banks to smoothly adjust their balance sheets. This makes the task of identifying an unexpected shock to capital requirements and measuring the short-term impact on loan supply quite difficult.⁵ Second, as with the 2007-2009 subprime crisis, regulators may increase requirements on account of a deterioration in the credit quality of borrowers during a downturn. Similarly to the difficulty of measuring the impact of a bank capital shock more generally, disentangling demand and supply effects is therefore not straightforward. Third, changes to bank regulations tend to affect all large banks of a given country at the same time, making it difficult to construct appropriate control groups of untreated but similar institutions.

The characteristics of the EBA's exercise and of our dataset allow us to address these

²See e.g. IIF (2010), a think tank representing large international banks, for an alarming perspective on the possible consequences of the recent Basel III capital package on credit supply and growth, and Admati et al. (2011) for a contradictory view.

³Standard arguments based on informational frictions in the market for bank equity point to reasons why issuing more equity capital can be costly for banks, at least in the short run thus departing from the Modigliani and Miller (1958) theorem. Cf. notably the pecking order theory of Myers and Majluf (1984) and the debt overhang problem of Myers (1977).

⁴Bernanke and Lown (1991), Peek and Rosengreen (1997), Hancock and Wilcox (1994) are classic references here. More recent examples, with varied methodological approaches and varied degree of granularity of the data used are Aiyar et al. (2014), Albertazzi and Marchetti (2010), Basset and Covas (2012), Berrospide and Edge (2010), Bridges et al. (2014), Brun et al. (2014), Francis and Osborne (2009), Maurin and Toivanen (2012) and Puri et al. (2011). See also Hanson, Kashyap and Stein (2010) for a recent and rather consensual survey.

⁵For example, the role of Basel I capital regulations in contributing to the slowdown in the US in the early 1990s is still debated. See e.g. Furfine (2000) vs Berger and Udell (1994).

challenges in a rather satisfying way. First, a remarkable feature of the EBA Capital Exercise was that it was largely unexpected. Importantly, the EBA announced its exercise just a few months after having drawn relatively tough conclusions from its own July 2011 Stress Tests, although none of the 8 banking groups which failed the Stress Tests were part of the Exercise. This surprise effect limits the odds that participating banks could have preemptively adjusted their balance sheets, which would bias downward the estimated effect on lending. Furthermore, the level of the new required Core Tier 1-to-RWA ratio was substantially higher than that planned under the transition to Basel III and explicitly not related to the level of risks of any particular banking group, but rather to ensure that all large European banks accumulated sufficient capital cushions to withstand a further deterioration in the sovereign debt crisis. The horizon set by the EBA to meet the higher requirement (about eight months) was also remarkably short compared to, for example, the pace of the Basel process, making it more plausible that the observed change in lending over the period was a consequence of the capital requirement shock. All of these elements mean the Capital Exercise provides us with a rare opportunity to observe a rather neat exogenous regulatory shock to bank capital.

Second, an attractive feature of our dataset is that while we observe the capital shock at the banking group level, we measure the response of credit at the level of constituent banks, which may be located in different euro area countries. For the non-financial sector of a given country, we can therefore compare the change in credit received from resident banks belonging to the same group and from resident banks belonging to different groups facing different EBA requirements and, possibly, headquartered in different countries. This disaggregated information about banking groups, as well as the multinational nature of the Capital Exercise, allows us to improve upon the type of controls for credit demand typically used in similar studies. Indeed, our results are robust to the inclusion of alternative measures of country-specific effects, including country dummies.

Third, the design of both the EBA sample of European banking groups and of the IBSI sample of euro area banks allows us the possibility of constructing a representative sample of euro area lending institutions and of designing credible control groups. Indeed, while the EBA dataset has a wide coverage of large European banking groups, including all the European G-SIFIs, the IBSI dataset includes many individual banks of similar size and scope, which may or may not belong to groups monitored by the EBA. In our baseline analysis, we restrict ourselves to only using banks that were part of groups subject to the Capital Exercise. However, we show that our results are robust to enlarging the control

group to include banks in groups not subject to the EBA exercise.

From a policy perspective, we view our findings as providing a useful benchmark for the new European Single Supervisory Mechanism (the SSM, which took over the direct supervision of all major euro area banking groups in November 2014), as the decisions it will have to take may include higher capital requirements and new regulatory capital weights imposed on sovereign debt holdings.⁶ Indeed, our study is the first to provide an assessment of the effect on bank credit of a well-identified regulatory capital shock at the euro area level. Clearly, our results best illustrate the likely consequences of a regulatory tightening in the short run and, importantly, of a tightening implemented in a period of financial market stress. Indeed, the sovereign debt crisis was raging in late 2011, with many concerns related to possible feedback loops between banks' and sovereigns' credit quality.⁷ At the same time, the magnitude of our estimated elasticity of loan growth to a regulatory capital tightening (-1.2% for a tightening by 1 percentage point) lies at the lower end of available estimates from comparable recent micro studies, which range between roughly -1% and -10%.⁸ This contained estimated effect may reflect that a lot of action was going on in late 2011 around the event that we study. Indeed, at least two period-specific factors may have contributed to dampening the consequences of the capital shock arising from the EBA's exercise. First, in early December 2011, the Eurosystem launched its three-year Long Term Refinancing Operations (LTROs), thus injecting in two waves (in late December 2011 and early March 2012) some one trillion euros at very favorable rates into the euro area banking system. Although the amounts borrowed by each bank was not public information, this move led to a general loosening of funding conditions on financial markets (as measured for instance by the CDS spreads and equity returns of major banks), thus possibly improving the ability of banking groups to raise new equity. We have no way of controlling for this contrarian LTRO effect, however, as all the individual banks we observe

⁶Cf. the interview of Danièle Nouy, Head of the SSM, with the Financial Times of February 10, 2014 (available at: <http://www.ecb.europa.eu/press/inter/date/2014/html/sp140210.en.html>).

⁷The macroeconomic effects of such a regulatory shock could be dampened in more normal times, as healthier banks would then presumably be better able to substitute for the reduction in credit supplied by capital-constrained banks. Nevertheless, asymmetries of information only alleviated by relationship lending could also limit such substitution.

⁸At the lower end, Francis and Osborne (2009) find a reduction of -1.2% on average after four years and Bridges et al. (2014) an elasticity of -2% in the first quarter, both for the UK. At the higher end of available estimates, Aiyar et al. (2014), also for the UK, find coefficients of between -6 and -9. For France, Brun et al. (2014) find coefficients of similar magnitude. Note also that the meta-analysis run by the Macroeconomic Assessment Group of the Basel Committee (2010) finds a median contraction of loan growth by -1.4% over 18 months.

are located in the euro area, and thus equally entitled to bid at the Eurosystem’s facility. Second, the EBA explicitly called for an adjustment of capital ratios with minimal resort to deleveraging and discussions with regulators, in particular in some stressed countries, lead us to conclude that national supervisors exerted moral suasion upon the managers of major domestic banks in order to minimize the impact of the required adjustment on lending to the real economy.

The rest of the paper is organized as follows. Section 2 summarizes the timeline and the requirements of the EBA Capital Exercise. We provide details on our dataset and our methodology in Section 3. Section 4 presents the results of our baseline regression at the bank level and provides evidence that the estimated impact of the Capital Exercise on credit provision is not related to information revelation by the EBA, confirming our interpretation. In Section 5, we outline a series of robustness tests that we undertake on our baseline results. Section 6 presents results of our analysis on country aggregates while Section 7 concludes.

2 The EBA Capital Exercise

2.1 Overview

The EBA announced its capital exercise (referred to hereafter as the Capital Exercise) on 26 October 2011, requiring banks to “strengthen their capital positions by building up a temporary capital buffer against sovereign debt exposures” and to raise their Core Tier 1 capital ratio to 9% “after accounting for [this] additional buffer against sovereign risk holdings”.⁹ These targets were to be met by June 2012. The exercise was undertaken with the aim of building confidence in the ability of euro area banks to withstand credit shocks, including those arising from their holdings of sovereign bonds.

The Capital Exercise followed closely the July 2011 EU-wide stress tests. As a result of

⁹A bank’s capital shortfall/surplus was calculated using the following formula:

$$Shortfall_{Sept2011} = (0.09 \times RWA_{Sept2011} - CoreTier1_{Sept2011}) + (SovereignBuffer_{Sept2011})$$

Eligible Core Tier 1 capital was defined in a methodological note of 8 December 2011 as the same used in the previous EBA-led stress tests. Capital comprised the highest quality capital instruments (common equity, i.e. ordinary shares or similar instruments), but also some government support measures and some types of newly issued contingent convertibles (CoCos), as detailed in the EBA’s documentation. The sovereign buffer was calculated by removing prudential filters on sovereign assets in available-for-sale portfolios and by using a conservative valuation of sovereign debt exposures in held-to-maturity and loans and receivables portfolios, whereby banks were required to build a capital buffer against the difference between the book value of these assets and their market value as of 30 September 2011.

these tests, the EBA had urged national regulators to “promptly” require a capital strengthening for banking groups which failed the tests, i.e. banks with a Core Tier 1 ratio below 5% at the end 2012 horizon under the most adverse scenario. Note that for the Capital Exercise, the EBA used a sub-sample of the population of banking groups participating in the stress tests. Importantly, however, none of the 8 banking groups which failed the tests were included in the following Capital Exercise. Furthermore, only 9 out the 16 groups which narrowly passed the test and were urged as a consequence to take “specific steps to strengthen their capital position” were finally included in the Capital Exercise.¹⁰⁾ Finally, the level of the new required Core Tier 1-to-RWA ratio was substantially higher than that planned under the transition to Basel III and explicitly not related to the level of risks of any particular banking group.¹¹ As a result, it is fair to assume that the heightened requirement came as a surprise for most of the banking groups involved.

The EBA published an initial country-level estimate of required capital-raising on 26 October 2011. On 8 December 2011, it published a formal Recommendation with bank-level figures based on September 2011 balance sheet data. Twenty seven banks were identified as having an aggregate capital shortfall of €76bn and were required as a consequence to submit capital plans to the EBA through their national supervisory authorities by 20 January 2012.¹² The EBA published a preliminary assessment of the plans on 9 February 2012, emphasizing that the measures were not “viewed as having a negative impact on lending into the real economy”. On 11 July 2011, the EBA published its preliminary report on the Capital Exercise, stating that the “vast majority” of banks had met the capital requirement.¹³ The final report, including end-June 2012 detailed balance sheet information for all participating banks, was published on 3 October 2012.

¹⁰These were “banks whose CT1R is above but close to 5% [under the adverse scenario], and which have sizeable exposures to sovereigns under stress”. We show below that accounting for the case of these weaker banks, who might have anticipated their recapitalisation before the launch of the Capital Exercise, does not affect our baseline results.

¹¹The minimal level of CT1 ratio under stress required to pass the July 2011 Stress Test was 5% while the required minimum CET1-to-RWA ratio under Basel II was 2%. The Basel III regulation set this minimum at 7%. A countercyclical buffer of up to 2.5%, and a capital surcharge for global systemic institutions (G-SIFIs) are also included in the package, but the phasing in of the new requirements was planned to be progressive, with a first mandatory increase of the minimal CET1 ratio from 2 to 3.5% in January 2013 and a gradual implementation of the additional CET1 buffer after this date.

¹²The capital exercise covered 71 banks, 37 of which showed an aggregate shortfall of €115bn. Three of these banks were not required to submit capital-raising plans as they were undergoing “deep restructuring” (Dexia, Volksbank AG and West LB) . Plans were also not requested from 6 Greek banks, which were being recapitalised in the context of an EU-IMF Programme. One bank (Bankia) that submitted a plan subsequently entered intensive restructuring and exited the Capital Exercise. Cf. EBA, Press release of 11 July 2012.

¹³At this time, government backstops were being put into place for 4 of the 27 banks .

The timing of the Capital Exercise was criticized by a number of commentators for potentially aggravating a credit crunch in the euro area. However, in its communication, the EBA consistently emphasized the need for banks to address capital shortfalls without constraining credit provision to the real economy. For example, the Recommendation of 8 December 2011 outlined a hierarchy of capital-raising measures, emphasizing the use of liability management and stating that national authorities could only agree to asset disposals if they did not “lead to a reduced flow of lending to the EU’s real economy”. Furthermore, the EBA and national authorities were to ensure that capital targets were “not achieved through excessive deleveraging, disrupting lending into the real economy”.

In total, the 27 banks increased their capital by €115.7bn. According to the EBA’s final report, €83.2bn of this related to direct capital measures, while €32.5bn related to the impact of RWA measures. Contributing to the latter figure was a fall in RWAs of €42.9bn (0.87% of total RWAs as at September 2011) arising from reductions in lending. The EBA concluded: “In line with the Recommendation, capital plans have not led directly to a significant reduction of lending into the real economy. A deleveraging process had already started before the capital exercise and will need to continue in an orderly fashion”.

Table 1: Timeline of EBA Announcements

26 October 2011	<ul style="list-style-type: none"> - Announcement of Capital Exercise requiring banks to build up a temporary capital buffer against sovereign exposures and to establish a Core Tier 1 capital ratio of 9% by June 2012. - Publication of estimated country-level capital shortfall based on June 2011 balance sheet data (total shortfall of €106bn). - Final shortfall scheduled to be published in November 2011 based on end-September data. - Banks initially expected to submit recapitalisation plans by end-2011.
8 December 2011	<ul style="list-style-type: none"> - Publication of bank-by-bank shortfall: total of €115bn for 37 banks. Ten of these banks subsequently exited the Capital Exercise. - Submission of recapitalisation plans by 20 January 2012.
9 February 2012	<ul style="list-style-type: none"> - Publication of preliminary assessment of banks’ capital plans: 27 banks to fill a total shortfall of €76bn.
11 July 2012	<ul style="list-style-type: none"> - Publication of preliminary report on the implementation of the capital requirements; “vast majority” of banks meet 9% Core Tier 1 ratio.
3 October 2012	<ul style="list-style-type: none"> - Publication of final report and end-June balance sheet data.

3 Data and methodology

3.1 Data Sources

The data used in our analysis come from three sources. Firstly, we use consolidated banking group balance sheet data published by the EBA as part of its Capital Exercise. These data, which are available on the EBA's website, are available for three dates: September 2011, December 2011 and June 2012. The data contain the capital shortfall/surplus calculated by the EBA. The Capital Exercise initially covered 71 banking groups but 10 of these exited the exercise before its completion due to restructuring. Using these data, we calculate a ratio of the group's capital shortfall to its risk-weighted assets (Shortfall-to-RWA) as of September 2011. This ratio is truncated at zero for banks with a capital surplus.

Secondly, we use a unique dataset of the monthly balance sheets of individual Monetary Financial Institutions (MFIs) collected by the Eurosystem for the purpose of conducting more in-depth analyses on the transmission mechanism of monetary policy during the sovereign debt crisis. This dataset covers 247 MFIs, or "banks", which were selected from the total population of euro area MFIs in order to create a sample that would be representative of euro area bank lending activity. For example, the sample includes the 150 largest MFIs (by main assets) as well as most of the banks that report to the ECB's Bank Lending Survey. MFIs from all euro area countries are included in the dataset, which consists of monthly stock and flow data for 24 balance sheet items beginning (for the majority of banks) in August 2008. These balance sheet items were selected in order to allow for the analysis of bank lending to the non-financial private sector (firms and households) as well as the funding activity of banks. Credit to the general government sector and bank' holdings of sovereign debt is also covered.

Finally, we use daily CDS prices and stock prices for all large European banking groups. We consider 5-year maturity modify-to-modify CDS contracts, which are generally viewed as the most standard and liquid contracts. CDS price series over the period of interest are available for 42 banking groups in the EBA sample, stock prices for only 41 of them. We take this information from Bloomberg and use it to test whether the effect of the Capital Exercise on bank lending can be explained by information revealed about the creditworthiness of European banks at the time of the first EBA releases.

3.2 Preparation of Dataset

The first step of our analysis consists of a mapping of individual banks (IBSI dataset) and banking groups (EBA dataset). This allows us to divide the IBSI dataset into three categories: 1) banks in banking groups identified as having a capital surplus; 2) banks in banking groups identified as having a capital shortfall; and 3) banks that were not part of banking groups included in the Capital Exercise. Using information on banking groups in the IBSI dataset, we are also able to identify whether banks in the third category are standalone banks or members of a group. Since the data at hand does not allow for a full reconstruction of group-level balance sheets (and therefore we cannot compute the share of each credit institution in total lending by its banking group), we must assume that an identified capital shortfall at the group level has a uniform impact on the lending growth of all entities within the group (conditional on their measurable characteristics). Such an assumption implies two important but quite standard hypotheses: 1) bank credit policy is set at the group level; and 2) internal capital markets exist within banking groups.¹⁴

Table 2: Count of EBA Groups and IBSI Banks

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

Of the 247 banks in the IBSI dataset, 14 fall out of the sample as they are part of the 10 groups that exited the EBA exercise. We also exclude 24 banks that had loan books that were less than 5% of total assets in September 2011, 7 non-resident banks in Luxembourg

¹⁴Many empirical studies vindicate the hypothesis that internal capital markets matter, so that the holding company is the appropriate level of observation: Ashcraft (2008), Ehrman and Worms (2004), Houston et al. (1997) to quote a few.

and Ireland, and 4 banks with omitted data points over the period of the capital exercise.¹⁵ Following this stage of data cleaning, we are left with a sample of 198 banks (see Table 2) in 118 banking groups, 50 of which are banking groups subject to the Capital Exercise. The list of the 118 selected banking groups is detailed in Appendix A.2. Note that the banking groups monitored by the EBA are headquartered in the European Union, while the observed individual banks are resident in the euro area.¹⁶

Table 3 presents data on the distribution of bank lending in the euro area, the percentage of total bank credit captured by our sample, the number of banks in our sample, and the proportion of these banks that are part of a banking group with a capital shortfall. For the latter three categories, we present figures for our baseline sample (124 banks that were part of banking groups subject to the Capital Exercise) and for the larger sample containing all banks in the IBSI dataset (198 banks). These figures show that our baseline sample of 124 banks covers 46% of total bank lending in the euro area, while this rises to 60% when we include all 198 banks. Of these 124 banks, 66 (53%) showed a capital shortfall. While this proportion varies across countries, only 5 small euro area countries (excluding Greece) have no resident banks with a capital shortfall. Importantly, even in the smaller sample that we consider for our baseline regression, both shortfall and non-shortfall banks are present in most countries, making it possible to identify country-specific demand effects.

Finally, a nice feature of the IBSI dataset is that we can observe “true” net flows of bank credit instead of approximating them with the changes in credit outstanding at the start and the end of the Capital Exercise, as is typical in most comparable studies using bank balance sheet data.¹⁷ These credit flows represent changes in credit stocks corrected for various sources of statistical noise, including write-offs, exchange rate effects, reporting changes and reclassifications. Note that these corrections are basically the same as those implemented by Eurosystem statisticians when computing the growth rates of credit aggregates at the country level. We then calculate lending growth rates based on stock and adjusted flow data. The one-month growth rate of loans (I^1) is calculated as follows:

¹⁵We exclude the following banks resident in Luxembourg: BGL BNP Paribas, ING Luxembourg S.A., Société Générale Bank & Trust, Deutsche Bank Luxembourg S.A., UniCredit Luxembourg S.A. and DZ Privatbank S.A.. Other non-resident banks in Luxembourg fall out of the sample as their loans-to-assets ratios were less than 5% in September 2011. We also exclude Depfa Bank AS, which is resident in Ireland.

¹⁶This explains the presence of e.g. UK groups (country label: GB), like Barclays or HSBC, which may have subsidiaries located for instance in France or Germany.

¹⁷A noticeable exception is Bridges et al. (2014), which also use “clean” growth rates of credit.

Table 3: Representativeness of the Sample of Selected Individual Banks

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.

$$I_t^1 = \frac{F_t^M}{L_{t-1}} \quad (1)$$

where F^M represents the one month adjusted flow of lending and L represents the outstanding stock of loans.

We clean these monthly growth rates for the impact of 84 identified M&A and 9 identified securitization operations over the full IBSI sample (August 2007 to June 2013) and winsorize the remaining data at the 2nd and 98th percentiles. We then calculate annualized 9-month growth rates using the following formula, based on the methodology described in the ECB's Monthly Bulletin:

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

Table 4 presents some summary statistics for the banks in our sample as at September 2011, i.e., immediately prior to the announcement of the Capital Exercise. These summary statistics are presented at the aggregate level (for all 198 banks in the sample) as well as for the three groupings of banks. These figures show that we have a large range of bank sizes in our sample.¹⁸ The average annualized loan growth during the period of the Capital Exercise was quite small, reflecting the generally subdued economic environment during this period. The average figure is smaller for those banks in banking groups with a capital shortfall. The range for this figure is large for all three groups of banks. The incidence of very high interbank-liabilities-to-assets ratios probably reflects the fact that some banks were highly reliant on Eurosystem liquidity at this time (central bank borrowings are included in the interbank liabilities figure). Note also that the capital variable in the IBSI dataset is very broadly defined and encompasses Tier 1 and Tier 2 capital as well as some additional reserves, which explains why the average capital to assets ratio displayed in Table 4 is much higher than usual measures of raw leverage based on Tier 1 capital.

Last but not least, a comparison between shortfall and surplus banks within the sample of banks belonging to EBA groups shows that the average institution has a similar balance-sheet profile in both groupings. This suggests that there is limited scope for selection bias in the treatment group that we cannot control for by simply adding relevant bank-specific covariates in our regression.¹⁹

¹⁸These figures are converted to logs when used in our regression analysis.

¹⁹In the terms of the matching literature, these descriptive statistics suggest that the 'treatment' and 'con-

Table 4: Summary Statistics of Banks in Sample (September 2011, in percent unless otherwise stated)

	Mean	SD	p10	p90
All Banks (N=198)				
Main Assets (Millions)	84,797	131,795	5,860	218,047
Loan Growth - EBA Exercise	1.46	7.53	-7.55	9.71
Loans/A.	47.44	21.68	17.55	71.78
Capital/A.	7.80	4.80	2.58	12.82
Liquid Assets/A.	16.92	17.35	2.48	37.98
Deposits/A.	35.16	24.15	0.58	67.95
Interbank Liabilities to Assets	0.20	0.19	0.02	0.44
Deposits / Loans	0.90	1.48	0.02	1.34
Sov. Bonds/A.	0.05	0.06	0.00	0.14
Shortfall Banks (N=66)				
Main Assets (Millions)	117,276	163,319	10,149	371,538
Loan Growth - EBA Exercise	0.43	8.01	-8.05	11.08
Loans/A.	46.73	22.02	16.29	74.85
Capital/A.	8.08	4.04	2.82	13.26
Liquid Assets/A.	17.03	12.73	3.85	34.54
Deposits/A.	29.79	22.73	0.16	62.90
Interbank Liabilities to Assets	0.28	0.24	0.07	0.68
Deposits / Loans	0.67	0.52	0.01	1.32
Sov. Bonds/A.	0.06	0.06	0.00	0.14
Surplus Banks (N=58)				
Main Assets (Millions)	98,100	150,171	5,192	320,733
Loan Growth - EBA Exercise	2.12	7.24	-7.83	10.37
Loans/A.	42.60	23.77	13.17	79.65
Capital/A.	7.91	6.83	1.13	14.13
Liquid Assets/A.	20.91	23.35	1.14	69.48
Deposits/A.	31.58	24.19	1.68	65.84
Interbank Liabilities to Assets	0.18	0.18	0.01	0.43
Deposits / Loans	1.14	2.32	0.06	1.62
Sov. Bonds/A.	0.04	0.05	0.00	0.14
Non-EBA Banks (N=74)				
Main Assets (Millions)	45,403	53,377	4,915	103,566
Loan Growth - EBA Exercise	1.86	7.31	-5.92	9.13
Loans/A.	51.86	18.90	21.41	69.72
Capital/A.	7.45	3.33	3.54	11.23
Liquid Assets/A.	13.69	14.81	2.48	27.70
Deposits/A.	42.76	23.71	1.49	73.78
Interbank Liabilities to Assets	0.15	0.13	0.02	0.29
Deposits / Loans	0.93	1.17	0.12	1.30
Sov. Bonds/A.	0.06	0.05	0.01	0.13

Table 5: Summary Statistics of the 50 EBA Banking Groups in Sample (Sept 2011)

	mean	sd	min	max
Number of Banks in Group	2.4	1.9	1	10
Number of Countries of Location	1.7	1.2	1	6
Shortfall-to-RWA:				
<i>All 50 Selected Groups</i>	-0.3	3.8	-14.8	7.1
<i>24 Groups with Positive Shortfall</i>	2.4	1.8	0.2	7.1

Table 5 finally presents some summary statistics on the 50 EBA banking groups in our sample, including the number of banks in each group and the number of countries that the group is present in. The heterogeneity in terms of capital positions in September 2011 is remarkably large, as the least capitalized group shows a shortfall of 7.1% while the best capitalized one enjoys a surplus of close to 15% of RWA. For the 24 banking groups with a capital shortfall that we kept in our sample, the average shortfall amounts to 2.4% of RWA. On average, the selected banking groups are linked to 2.4 IBSI subsidiaries which are present in 1.7 countries.

3.3 Methodology

The aim of our analysis is to test whether banks that were obliged to increase their capital buffers as part of the Capital Exercise (treatment group) exhibited significantly different lending behavior over the recapitalization period (October 2011 to June 2012) compared to banks that were not obliged to increase their capital buffers (control group).²⁰ For our baseline analysis, we restrict these two groups to only include banks that were part of banking groups subjected to the Capital Exercise, i.e., 124 banks. In our robustness analysis, we will explore whether any difference in behaviour can be observed when we expand the control group to include banks in banking groups that were not subject to the Capital Exercise and, therefore, did not face a higher capital requirement.

Our baseline model is as follows:

trol' groups share a common support. This would not be the case if shortfall banks had, for instance, low deposit-to-assets ratios while surplus banks had high deposit ratios. In such a situation, identifying the effect of the Capital Exercise on lending conditional on banks' deposit ratio would not be feasible.

²⁰Although the EBA did not published finalised capital shortfall/surplus figures until 8 December 2011, it is possible that banking groups were able to predict their results at the time of the announcement of the Capital Exercise (26 October 2011) and start adjusting their balance sheet at that time. We therefore set the adjustment period as being equal to the entire length of the Capital Exercise.

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

$Y_{i,j,k}$ is the annualized growth of total (domestic) loans for bank i belonging to banking group j and located in country k , over the 9-month period from September 2011 (before the exercise) to June 2012 (completion of the exercise).²¹ Shortfall_j is the ratio of the capital shortfall (in euros) to the group's risk-weighted assets (equal to zero for banks in our control group), X_i is a matrix of bank characteristics, S_k is variable that controls for loan demand at the level of country k , and $\varepsilon_{i,j,k}$ is the residual. The results of our regressions are presented in the next section.

4 Results

Figure 1 provides an intuition for our results. It shows the evolution of the adjusted stock of loans for our control group (banks in “surplus” EBA banking groups) and our treated group (banks in “shortfall” EBA banking groups), indexed at the value of one in September 2011.²² This graphical analysis shows that the evolution of lending was broadly similar for the two groups prior to the announcement of the Capital Exercise in October 2011. There is a sharp divergence following the announcement, however, with banks in the control group continuing to increase their stock of loans during and following the Capital Exercise, while banks in the treated group started to reduce their stock of loans almost immediately after the announcement of the exercise.

This relationship is borne out in a multivariate regression analysis. Table 6 shows the results from our baseline regressions. Column 1 is a simple regression of annualized loan growth during the Capital Exercise on the Truncated Shortfall-to-RWA ratio. Column 2 and 3 add alternative control measures for credit demand at the country level: a dummy that takes the value of one for “stressed” euro area countries and a variable equal to the unemployment rate in the bank's country of residence in September 2011, in order to proxy for

²¹We examine the change in credit supplied by individual banks between these two dates, therefore collapsing the time dimension instead of for instance running a panel regression on monthly growth rates over the two years 2011-2012. This has the advantage that the standard errors associated with our estimator of the “treatment” are robust to the problems of autocorrelation of the residuals pointed out by Bertrand, Duflo and Mullainathan (2004) when the regressor of interest is very persistent (like a step variable).

²²We calculate the adjusted loan stock figures using the actual loan stock at the start of the IBSI sample (August 2007) and adding on a cumulated monthly flow figure derived from our monthly growth rates. These adjusted stock figures therefore reflect the data cleaning described in Section 4.2 and are consistent with our subsequent regression analysis.

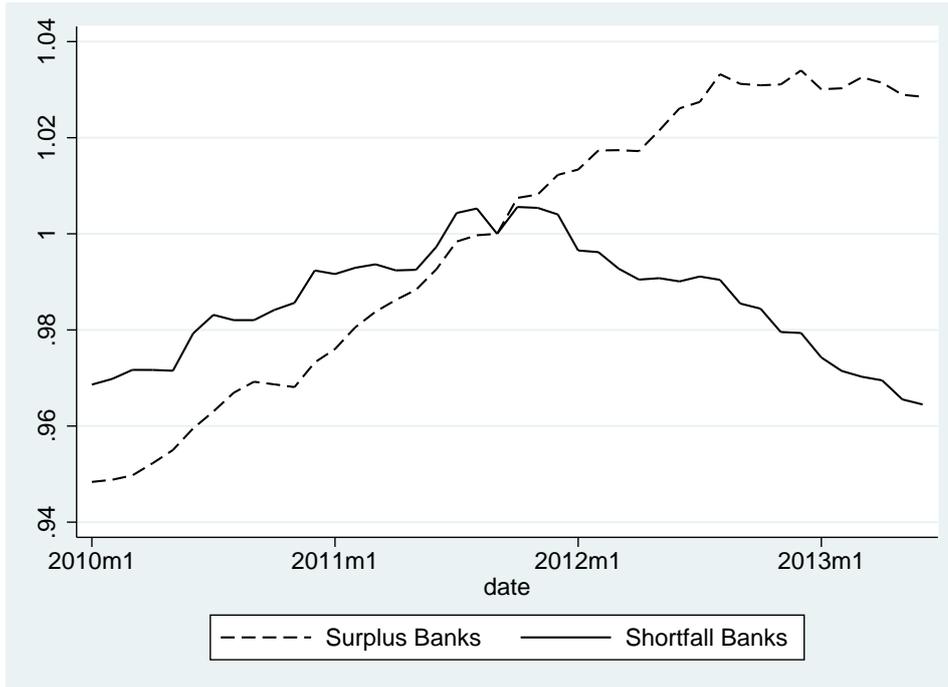


Figure 1: Total loans outstanding (Sept. 2011=100): cumulated over control vs. treated groups.

the degree of slack in domestic economic activity.²³ Columns 4 and 5 add a number of bank characteristics to the specifications contained in Columns 2 and 3. The inclusion of such variables allows for a better control of the bank characteristics that may have contributed to lending behaviour over this period.

In Column 5 of Table 6 we first add the variable *Truncated Surplus-to-RWA*, which measures the intensity of the capital surplus for banks in the control group. This variable is included in order to investigate whether banks in the control group changed their lending behaviour as a result of the Capital Exercise. Evidence of such a change in behaviour would violate the assumption that the control group would have the same behaviour in the counterfactual of no treatment event. Second, we also control for the possible bias which may be associated with the presence of banks from groups which only narrowly passed the July 2011 stress tests. In our selection of banking groups, this is the case for nine individual banks belonging to 7 different EBA groups.²⁴ Among these 9 banks, 8 show a “capital

²³We define 7 euro area countries as having been stressed at the time of the Capital Exercise: Cyprus, Greece, Ireland, Italy, Portugal, Slovenia and Spain.

²⁴These 7 EBA groups are : Marfin popular bank (CY), Norddeutsche Lbk (DE), HSH Nordbank (DE), Banco Popular (ES), BCP (PT), Espirito Santo (PT) and Nova Ljubljanska banka (SI).

shortfall” as of September 2011 under the definition of the Capital Exercise. Such banks may have started to adjust their capital ratio (and therefore may have started to deleverage) before the launch of the Capital Exercise. Furthermore, part of the adjustment they underwent over the period of the Capital Exercise may be in fact due to the consequences of the Stress Tests, not of the Capital Exercise per se. In column 5, we thus add a dummy for banks belonging to these 7 “fringe” groups.²⁵ The coefficients associated with both this dummy and the *Truncated Surplus-to-RWA* are close to zero and not significant, while the main coefficient of interest is still negative and significant.

Finally, Column 6 replaces the credit demand proxies with country fixed effects, while retaining the bank characteristics that are statistically significant in the specifications of Columns 4 and 5.²⁶ All specifications use clustering methods to correct standard errors for possible correlation of innovations for banks belonging to the same banking group.

In all of these specifications, the coefficient for the variable *Truncated Shortfall-to RWA* is statistically significant. We view the results of Column 4 as coming from our best-identified specification, and take it as our baseline. This leads us to conclude that a shortfall-to-RWA of 1pp was associated with an annualized 9-month rate of loan growth that was 1.2pp lower than for banks in the control group.

As intuition would suggest, banks resident in “stressed” countries also tended to have lower lending growth. Of the bank characteristics included in the regression, only the two variables describing the bank’s holdings of sovereign bonds are significant. This is perhaps unsurprising, given that exposure to euro area sovereigns was one of the drivers of the level of the capital shortfall, via the “sovereign buffer”. It is interesting to note that none of the other bank characteristics included in the regression are statistically significant, highlighting similarities in the business models of banks included in the EBA’s Capital Exercise. Also of note, the coefficient on the variable *Truncated Surplus-to-RWA* is not significant, indicating that banks in the control group did not change their behaviour as a result of the Capital Exercise.

Overall, these results suggest a limited impact of a reduction in leverage on lending growth in the short term, with a coefficient that is at the lower end of the range of estimates

²⁵We also ran the baseline regressions on a reduced sample where we excluded the nine fringe banks. Again, the results are qualitatively unchanged, and look even slightly stronger across all specifications, which might reflect the fact that one bank within a fringe group with a capital shortfall was an outlier that showed a relatively strong credit expansion.

²⁶Note that the lower degrees of freedom due to the inclusion of country fixed effects implies that the coefficient of interest is less precisely estimated.

Table 6: Impact of EBA Capital Exercise on Annualised Lending Growth: Oct 2011 - June 2012 (Baseline Estimates)

	1	2	3	4	5	6	7
Shortfall/RWA	-1.48** (0.58)	-1.06* (0.59)	-1.36** (0.54)	-1.19** (0.53)	-1.23** (0.47)	-1.43** (0.54)	-1.61* (0.83)
Stressed		-0.04** (0.01)		-0.01 (0.02)			
Unemployment			-0.25** (0.11)		-0.05 (0.12)	-0.04 (0.12)	
Size				0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	
Liquid Assets/A.				0.10 (0.06)	0.10 (0.06)	0.10 (0.06)	
Deposits/A.				0.03 (0.03)	0.03 (0.03)	0.03 (0.03)	
Loans/A.				0.03 (0.04)	0.03 (0.04)	0.03 (0.05)	
Sov. Bonds/A.				0.46*** (0.14)	0.47*** (0.14)	0.47*** (0.13)	0.69*** (0.16)
Dom. Bonds/A. * Stressed Country				-0.55* (0.32)	-0.61*** (0.20)	-0.62*** (0.20)	-0.77** (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
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. This table presents the results of OLS regressions at the level of individual banks, where the dependent variable is the annualized rate of growth of loans to customers over the 9-month period of the CE, from September 2011 to June 2012. *Shortfall/RWA* is the consolidated capital shortfall, truncated at zero, as measured by the EBA at the banking group level in September 2011. *Unemployment* is the rate of unemployment in the country of location in September 2011. *Stressed* is a dummy variable indicating whether the bank is located in a country under financial stress in 2011-2012 (GIIPS countries, plus Cyprus and Slovenia). All other bank controls are measured at the unconsolidated level of the individual banking institutions at end September 2011. Definitions are detailed in the Appendix. *Surplus/RWA* is the consolidated capital surplus, truncated at zero. *July '11 ST Fringe* is a dummy variable which takes the value of one if the bank belongs to one of the 7 banking groups that nearly failed the July 2011 EBA Stress Tests (with a CT1 ratio under stress between 5 and 6%). Column 7 replaces the country control measures with country fixed effects, while only retaining the bank characteristics that were statistically significant in Columns 4 to 6. A constant is included but not shown. Standard errors (in parenthesis) are clustered at the level of banking groups. Stars refer to the P-values as follows: $p < 0.10$ if *, $p < 0.05$ if **, $p < 0.01$ if ***.

from the existing literature, as mentioned above in the introduction section. A number of factors may have dampened the magnitude of the impact in the present study, however. Most significantly, as discussed in section 2, the EBA and national supervisors exerted pressure on banks to increase their capital ratios mainly through measures targeting their liabilities. Banks in a number of countries were also subject to other forms of “moral suasion” not to reduce lending at this time, notably from national politicians. The ECB also undertook exceptional liquidity-providing measures during this period (the LTROs), possibly reducing deleveraging pressure on banks.

Interpreting our results as indicating that the tightening in capital requirements induced the reduction in lending requires that we first qualify an alternative reading related to potential information revelation by the EBA about the credit status of surveyed banks. Indeed, one may suppose that the main effect of the disclosure of detailed bank information by the EBA was to shed light on the fragility of some institutions, thus deterring potential investors and increasing the funding stress faced by these institutions. We provide evidence that this was not the case.

First, as previously stated, the banking groups included in the Capital Exercise were a subsample of the European banking groups already subject to the EBA stress tests in 2010 and 2011. In particular, the 2011 Stress Tests, the conclusions of which were communicated to the public in the summer of 2011, already revealed most of the relevant information, including detailed exposures of participating institutions to sovereign debt holdings.

More formally, we conduct a small event study of the variation in CDS spreads and stock returns of EBA banking groups over the day of the EBA disclosure on 8 December 2011, when the EBA first published bank-level results based on balance sheet data from end-September 2011. We find evidence that the market largely foresaw the degree of capital constraints faced by banks. More precisely, we calculate the Shortfall-to-RWA ratio using data released on this date and use this as the independent variable in a regression explaining the change in banks’ CDS spreads or banks’ stock returns over a window of 2 days around the event date. The results, presented in Table 7, show that this announcement had a statistically significant impact on CDS spreads, but no visible impact on equity returns. The magnitude of the impact on CDS spreads is quite limited, however. While the CDS spread of the average banking group in the sample increased by 23bps over the three days following the announcement, a bank with a shortfall-to-RWA of 2.4pp (the average for shortfall groups) saw its CDS rise by just 5.4bps more. This confirms that the relevant story is not one of information about the situation of banks being revealed, and the markets

penalizing these banks, but one where some banks faced a heightened regulatory capital constraint and adjusted their balance sheet accordingly over a short period.

Table 7: Event study: impact of EBA Announcement on Bank CDS Spreads and Equity Returns on a two-days window around December 8, 2011

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

Robust standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note. This Table presents the results of OLS regressions, where the dependent variable is either the change in CDS price (col. 1-2) or the stock return of individual banking groups (col. 3-4). *Stressed country (headqu.)* is a dummy which takes the value of one if the country where the banking group is headquartered is under financial stress in 2011. 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.

5 Robustness Tests

In this section, we present the results of a number of robustness tests. The aim of these tests is twofold: firstly, to check the statistical robustness of our baseline results and, secondly, to determine whether the observed difference in loan growth rates between our two groups is really driven by the Capital Exercise.

A fundamental assumption of models such as ours is that outcomes for the treated and the control groups would have been the same in the absence of the treatment.²⁷ In our case, we can state this hypothesis as follows: banks in groups identified as having capital shortfalls would not have had lower average loan growth over the period of the Capital Exercise if they had not been subject to higher regulatory capital requirements as part of this exercise. It is, of course, impossible to test whether this hypothesis is true as we

²⁷This assumption is often denoted the “parallel trends” hypothesis. See e.g. Angrist and Pischke (2009, section 5.2).

cannot observe the counterfactual for treated groups. However, the robustness tests that we undertake in this section, such as a placebo test and a change to our definition of the control group, provide evidence that this is indeed the case.

Our first robustness test is what is commonly referred to as a *placebo test*. Such a test undertakes the same regression specifications but on a different (non-overlapping) period in the sample in order to test whether the model identifies a statistically significant relationship during this period. Such a relationship would be difficult to interpret and would undermine the validity of our baseline results. Indeed, while the lower level of lending growth observed for our treated group may be due to deleveraging on the part of banks required to meet a higher regulatory capital requirement, it is also possible that weakly-capitalized banks would have undertaken necessary deleveraging even had the EBA exercise not taken place. We look at the 9-month window prior to the announcement of the Capital Exercise (January 2011 - September 2011). The results of this regression (displayed in Table 8, which has the same structure as Table 6) show that the coefficient on the Truncated Shortfall-to-RWA ratio is not significant for this period. In contrast, a number of bank characteristics (the deposit-to-asset ratio and the ratio of sovereign bond holdings to assets) do have a statistically significant relationship with lending growth during this period. While the coefficient on the variable Truncated Surplus-to-RWA is significant in the results shown in Column 6, this is not the case in the specification using country fixed effects (Column 7). Overall, the results of our placebo test support the hypothesis that the extra deleveraging observed by banks in our treatment group during the period of the Capital Exercise was due to the higher capital requirements imposed by this exercise.

Our second robustness test changes the composition of banks in our control group. In our baseline regression, we only include banks in banking groups that were subject to the Capital Exercise. However, it can be argued that banks in banking groups that were not subject to the Capital Exercise should exhibit similar lending behavior to banks in “surplus” groups as neither were subject to a regulatory capital adjustment. Table 9, which repeats our baseline regression specifications using this increased sample, shows that this was indeed the case, with the coefficient on the variable Shortfall-to-RWA remaining of a similar order of magnitude. Moreover, a dummy variable indicating whether a bank is in a banking group subject to the Capital Exercise is not statistically significant (in Columns 4-7), suggesting that the use of this enlarged control group is justified. Overall, these regressions show that our baseline results are robust to the size and composition of the control group.

Given the wide range of bank sizes in our sample, it is possible that our baseline regres-

sion results are skewed by the growth rates of small banks. We use weighted OLS analysis in order to test whether the results are robust to small banks being given a lower weight. Table 10 presents the results of this regression specification, with the size of the banks' loan books used as the weighting factor. While the size of some of the coefficients for the Shortfall-to-RWA ratio change, they remain of a similar order of magnitude. Moreover, the statistical significance of the coefficient does not change, indicating that our results are robust to the size of banks in the sample.

Our final robustness test attempts to correct for the possibility of correlation between the observations for banks in the same banking group. In our baseline analysis, we account for the possibility of such correlation by correcting our standard errors using clustering methods. Another method is to average observations at a group level. We therefore collapse our dataset into 118 groups by averaging the variables in our regression specification. We also construct a variable *Lending to Stressed Countries*, corresponding to the proportion of each group's lending in "stressed" euro area countries.²⁸ The results of these regressions are shown in Table 11 and indicate that our results are robust to correlation among banks in groups. However, while the coefficient on our Shortfall-to-RWA variable remains significant, its magnitude decreases somewhat.

²⁸It is important to note our dataset does not allow us to recreate consolidated group balance sheets by aggregating constituent banks' balance sheets. This is due to the fact that the IBSI dataset does not necessarily contain data for all banks in a banking group.

Table 8: Placebo: Impact of EBA Capital Exercise on Annualised Lending Growth: Jan 2011 - Sept 2011

	1	2	3	4	5	6	7
Shortfall/RWA	-0.67 (0.49)	-0.45 (0.56)	-0.61 (0.48)	-0.44 (0.54)	-0.47 (0.50)	-0.44 (0.61)	-1.20 (0.79)
Stressed		-0.02 (0.02)		-0.00 (0.03)			
Unemployment			-0.23* (0.14)		-0.12 (0.18)	-0.10 (0.18)	
Size				-0.00 (0.01)	-0.00 (0.01)	-0.01 (0.01)	
Liquid Assets/A.				0.01 (0.07)	0.02 (0.08)	0.00 (0.08)	
Deposits/A.				0.05* (0.02)	0.04 (0.03)	0.04 (0.03)	0.02 (0.02)
Loans/A.				-0.04 (0.06)	-0.03 (0.06)	-0.05 (0.07)	
Sov. Bonds/A.				0.19 (0.14)	0.20* (0.11)	0.17 (0.12)	0.08 (0.15)
Dom. Bonds/A. * Stressed Country				-0.25 (0.47)	-0.25 (0.33)	-0.22 (0.31)	
Surplus/RWA						-0.68** (0.32)	-0.36 (0.40)
July '11 ST Fringe						-0.04* (0.02)	
Country FEs	No	No	No	No	No	No	Yes
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. This table presents the results of OLS regressions at the level of individual banks, where the dependent variable is the annualized rate of growth of loans to customers over the 9-month period prior to the CE, from December 2010 to September 2011. *Shortfall/RWA* is the consolidated capital shortfall, truncated at zero, as measured by the EBA at the banking group level in September 2011. *Unemployment* is the rate of unemployment in the country of location in December 2010. *Stressed* is a dummy variable indicating whether the bank is located in a country under financial stress in 2011-2012 (GIIPS countries, plus Cyprus and Slovenia). All other bank controls are measured at the unconsolidated level of the individual banking institutions at end December 2010. Definitions are detailed in the Appendix. *Surplus/RWA* is the consolidated capital surplus, truncated at zero. *July '11 ST Fringe* is a dummy variable which takes the value of one if the bank belongs to one of the 7 banking groups that nearly failed the July 2011 EBA Stress Tests (with a CT1 ratio under stress between 5% and 6%). Column 7 replaces the country control measures with country fixed effects, while only retaining the bank characteristics that were statistically significant in Columns 4 to 6. A constant is included but not shown. Standard errors (in parenthesis) are clustered at the level of banking groups. Stars refer to the P-values as follows: $p < 0.10$ if *, $p < 0.05$ if **, $p < 0.01$ if ***.

Table 9: Impact of EBA Capital Exercise on Annualised Lending Growth: Oct 2011 - June 2012 (All IBSI Banks)

	1	2	3	4	5	6	7
Shortfall/RWA	-1.36** (0.53)	-1.02** (0.51)	-1.25*** (0.46)	-1.13** (0.50)	-1.20** (0.46)	-1.45*** (0.49)	-0.98* (0.56)
Stressed		-0.04*** (0.01)		-0.01 (0.02)			
Unemployment			-0.31*** (0.07)		-0.14* (0.09)	-0.14 (0.09)	
Size				0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	
Liquid Assets/A.				0.05 (0.06)	0.05 (0.06)	0.05 (0.06)	
Deposits/A.				0.08*** (0.03)	0.08*** (0.03)	0.08*** (0.03)	0.08*** (0.03)
Loans/A.				-0.02 (0.04)	-0.02 (0.04)	-0.01 (0.05)	
Sov. Bonds/A.				0.26** (0.12)	0.28** (0.12)	0.28** (0.12)	0.37** (0.17)
Dom. Bonds/A. * Stressed Country				-0.24 (0.25)	-0.31** (0.15)	-0.31** (0.15)	-0.31 (0.33)
EBA Banking Group				0.01 (0.02)	0.01 (0.02)	0.01 (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
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. This table presents the results of OLS regressions at the level of individual banks, where the dependent variable is the annualized rate of growth of loans to customers over the 9-month period of the CE, from September 2011 to June 2012, and the sample is extended to include all selected IBSI banks. *Shortfall/RWA* is the consolidated capital shortfall, truncated at zero, as measured by the EBA at the banking group level in September 2011. *Unemployment* is the rate of unemployment in the country of location in September 2011. *Stressed* is a dummy variable indicating whether the bank is located in a country under financial stress in 2011-2012 (GIIPS countries, plus Cyprus and Slovenia). All other bank controls are measured at the unconsolidated level of the individual banking institutions at end September 2011. Definitions are detailed in the Appendix. *EBA Banking Group* is a dummy variable which takes the value of one if the bank belongs to a banking group monitored by the EBA. *Surplus/RWA* is the consolidated capital surplus, truncated at zero. *July '11 ST Fringe* is a dummy variable which takes the value of one if the bank belongs to one of the 7 banking groups that nearly failed the July 2011 EBA Stress Tests (with a CT1 ratio under stress between 5 and 6%). Column 7 replaces the country control measures with country fixed effects, while only retaining the bank characteristics that were statistically significant in Columns 4 to 6. A constant is included but not shown. Standard errors (in parenthesis) are clustered at the level of banking groups. Stars refer to the P-values as follows: $p < 0.10$ if *, $p < 0.05$ if **, $p < 0.01$ if ***.

Table 10: Impact of EBA Capital Exercise on Annualised Lending Growth: Oct 2011 - June 2012 (Weighted OLS)

	1	2	3	4	5	6	7
Shortfall/RWA	-2.57*** (0.59)	-1.56** (0.65)	-2.20*** (0.66)	-1.76*** (0.64)	-1.86*** (0.65)	-2.14*** (0.73)	-1.62** (0.78)
Stressed		-0.05*** (0.01)		-0.03 (0.02)			
Unemployment			-0.20 (0.14)		0.03 (0.14)	0.02 (0.12)	
Liquid Assets/A.				0.04 (0.06)	0.04 (0.06)	0.06 (0.07)	
Deposits/A.				0.08* (0.04)	0.09** (0.04)	0.09** (0.04)	0.05 (0.03)
Loans/A.				-0.01 (0.06)	-0.02 (0.06)	-0.02 (0.06)	
Sov. Bonds/A.				0.45*** (0.12)	0.49*** (0.12)	0.51*** (0.12)	0.31*** (0.11)
Dom. Bonds/A. * Stressed Country				-0.31 (0.30)	-0.71*** (0.23)	-0.67*** (0.24)	-0.20 (0.30)
Surplus/RWA						0.10 (0.37)	
July '11 ST Fringe						0.04* (0.02)	
Country FEs	No	No	No	No	No	No	Yes
N	124	124	124	124	124	124	124
R ²	0.21	0.31	0.23	0.41	0.40	0.42	0.52

Note. This table presents the results of WLS regressions at the level of individual banks, where the dependent variable is the annualized rate of growth of loans to customers over the 9-month period of the CE, from September 2011 to June 2012. Individual bank observations are weighted according to the bank's outstanding amounts of customer loans. *Shortfall/RWA* is the consolidated capital shortfall, truncated at zero, as measured by the EBA at the banking group level in September 2011. *Unemployment* is the rate of unemployment in the country of location in September 2011. *Stressed* is a dummy variable indicating whether the bank is located in a country under financial stress in 2011-2012 (GIIPS countries, plus Cyprus and Slovenia). All other bank controls are measured at the unconsolidated level of the individual banking institutions at end September 2011. Definitions are detailed in the Appendix. *Surplus/RWA* is the consolidated capital surplus, truncated at zero. *July '11 ST Fringe* is a dummy variable which takes the value of one if the bank belongs to one of the 7 banking groups that nearly failed the July 2011 EBA Stress Tests (with a CT1 ratio under stress between 5 and 6%). Column 7 replaces the country control measures with country fixed effects, while only retaining the bank characteristics that were statistically significant in Columns 4 to 6. A constant is included but not shown. Standard errors (in parenthesis) are clustered at the level of banking groups. Stars refer to the P-values as follows: $p < 0.10$ if *, $p < 0.05$ if **, $p < 0.01$ if ***.

Table 11: Impact of EBA Capital Exercise on Lending Growth: Oct 2011 - June 2012 (Group Averages)

	1	2	3
Shortfall/RWA	-1.21*** (0.42)	-0.70* (0.40)	-0.71* (0.38)
Exposure to Stressed Countries		-0.04*** (0.01)	-0.02 (0.01)
Size			-0.00 (0.01)
Liquid Assets/A.			0.05 (0.09)
Deposits to Assets/A.			0.11** (0.05)
Loans/A.			-0.12* (0.07)
Sovereign Bonds/A.			-0.02 (0.15)
July '11 ST Fringe			0.01 (0.02)
EBA Banking Group			-0.01 (0.01)
N	118	118	118
R ²	0.05	0.14	0.29

Note. This table presents the results of OLS regressions at the level of banking groups, where the dependent variable is the annualized rate of growth of loans to customers over the 9-month period of the CE, from September 2011 to June 2012. Individual bank observations have been averaged at the banking group level. *Shortfall/RWA* is the consolidated capital shortfall, truncated at zero, as measured by the EBA at the banking group level in September 2011. *Exposure to Stressed Countries* is the the proportion of groups' lending activity in euro area countries under financial stress in 2011-2012 (GIIPS countries, plus Cyprus and Slovenia). All other bank controls are measured at the unconsolidated level of the individual banking institutions at end September 2011. Definitions are detailed in the Appendix. *July '11 ST Fringe* is a dummy variable which takes the value of one if the group nearly failed the July 2011 EBA Stress Tests (with a CT1 ratio under stress between 5 and 6%). *EBA Banking Group* is a dummy variable which takes the value of one if the group is monitored by the EBA. A constant is included but not shown. Robust standard errors are in parenthesis. Stars refer to the P-values as follows: $p < 0.10$ if *, $p < 0.05$ if **, $p < 0.01$ if ***.

6 Looking for Aggregate Effects

The results presented in Section 4 indicate that the increase in regulatory capital requirements as part of the EBA’s Capital Exercise led to lower rates of loan growth during the period of the exercise for banks identified as having a capital shortfall. It is possible, however, that this reduced rate of loan growth by shortfall banks was compensated for by other banks, resulting in little or no impact on overall loan growth at a country or euro area level. We investigate this hypothesis by collapsing our dataset at a country level and constructing the variable *Weighted Shortfall-to-RWA*, which is equal to the weighted average of banks’ Shortfall-to-RWA ratios (weighted by the size of banks’ loan books) during the period of the Capital Exercise and zero otherwise. We compute credit growth rates as the country equivalent of the “clean” growth rates we computed for individual banks present in a given country.²⁹

The results of this analysis are presented in Table 12. Column 1 is a simple regression of monthly growth rates of credit at the country level on the weighted shortfall-to-rwa and lagged unemployment. Column 2 adds (lagged) aggregated bank characteristics (at a country level) while Column 3 adds a lag of the dependent variable.³⁰ All three specifications use country and time fixed effects while standard errors are clustered at the banking group level as a straightforward way to correct for possible correlation (including auto-correlation in the time dimension) between observations in the same country. The coefficients for the variable *Weighted Shortfall-to-RWA* are significant across all 3 specifications and are also of a similar magnitude as at the micro level, indicating that the Capital Exercise did indeed have a negative impact on country-level lending growth over the horizon of the exercise.

²⁹More precisely, we sum clean loan flows over all banks in a country and divide by the sum of all loan stocks to get clean monthly growth rates at the country level. An alternative could be to look at aggregate growth rates of domestic credit to the non-financial private sector from country-level monetary statistics releases. As banks in our sample form the bulk of credit in most countries, the results would be qualitatively unchanged.

³⁰The presence of both lagged dependent variables and fixed effects causes a well-known bias in the coefficient of the lagged dependent variable. However, since we include more than 30 monthly observations and as our sample of countries is small, standard fixed effects remains preferable to Generalised Method of Moments (GMM). Besides, preliminary checks showed that monthly credit growth rates are barely autocorrelated at the country level (with correlation coefficients between 0 and 0.3). Cf. Judson and Owen (1999) for a formal justification.

Table 12: Impact of Shortfall Banks on Country-Level Loan Growth: Jan 2010 - Dec 2012

	1	2	3
Weighted Shortfall-to-RWA	-1.04** (0.46)	-1.30*** (0.33)	-1.47*** (0.33)
Unemployment	-1.08** (0.37)	-0.68* (0.36)	-0.83* (0.41)
Size		-0.02 (0.08)	-0.01 (0.08)
Liquid Assets / Assets		0.19 (0.15)	0.22 (0.14)
Deposits / Assets		0.85** (0.40)	0.86* (0.42)
Loans / Assets		-0.58** (0.27)	-0.55* (0.29)
For. Sov. Bonds / Assets		0.58 (0.67)	0.66 (0.71)
Dom. Sov. Bonds / Assets		-0.67 (0.69)	-0.67 (0.75)
Lagged dep. var.			-0.12* (0.06)
Country FEs	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes
N	548	548	548
R ²	0.39	0.42	0.43

Note. This table presents the results of country-level OLS regressions where the aggregate annualised 1-month loan growth is the dependent variable. *Weighted Shortfall/RWA* is the average Shortfall-to-RWA of the group of each individual bank resident in the country weighted by the size of the banks' outstanding customer loans. *Unemployment* is the rate of unemployment in the country of location, lagged by one month. Individual bank balance sheet items have been summed at the level of the country of residence and balance sheet ratios are computed using these collapsed bank data. All these bank balance sheet controls are lagged by one month. A constant is included but not shown. Robust standard errors are in parenthesis. Stars refer to the P-values as follows: $p < 0.10$ if *, $p < 0.05$ if **, $p < 0.01$ if ***.

7 Conclusions

We use the EBA’s recapitalization exercise of 2001-2012 as a quasi-natural experiment to test the impact of a regulatory shock tightening bank capital requirements on lending to the real economy. For this purpose, we exploit a new dataset of monthly balance sheets of some 250 individual banks (representative of credit provision at both the euro area and Member States’ levels) and map it onto data for the banking groups monitored by the EBA. Controlling for individual bank characteristics and demand at the level of country of residence, we find that forcing a banking group to increase its Core Tier 1 capital by 1 percent of risk-weighted assets was associated with a decrease of 1.2 percentage points (annualized) in credit supplied by banks in the same group over the 9-month period of the Capital Exercise. We also collapse our dataset at the country level in order to assess aggregate effects and find that banks that were not constrained to recapitalize did not substitute for more constrained lenders. This confirms that the Capital Exercise had procyclical macroeconomic effects on credit supply. At the same time, the magnitude of the effects that we find are at the lower range of the effects of regulatory capital shocks on credit supply found in the empirical literature. This may be accounted for by the expansionary measures implemented by the Eurosystem over the same period of time. Also, this may suggest that moral suasion by supervisors and governments was indeed instrumental in convincing major banking groups with a capital shortfall to limit their shedding of risk weighted assets.

Two words of caution are nevertheless of the essence when interpreting these results. First, we emphasize that our study only documents the *short run* contractionary effect of an *unexpected* tightening of capital requirements on bank lending. Second, we confirm that the EBA Capital Exercise was badly timed and therefore procyclical, as it took place in a context of depressed activity and declining lending trends. However, our findings should not be interpreted as pointing to permanent contractionary effects of heightened capital requirements or as suggesting that even short run effects would be as large if the tightening was imposed during more benign times. At the same time, our findings tend to strengthen the case for a gradual implementation of stricter bank regulations, thus allowing banks to meet heightened capital ratios mostly by the accumulation of retained earnings. Lastly, comparing the EBA Exercise to the SCAP recapitalization program of the US Federal Reserve in 2009 (as a result of the stress tests), we can also view our results as highlighting the potential benefits of bank recapitalization programs that are targeted at capital levels (or in “euros”) rather than at capital ratios, especially when this equity adjustment has to

happen in crisis times.³¹

Last but not least, our study sheds some useful light on decisions facing the ECB in its new role as the euro area's Single Supervisory Mechanism (SSM). Indeed, demanding that banks hold capital against their sovereign assets, as outlined recently by the new head of the SSM, amounts to a regulatory tightening that is very similar to the EBA Exercise. To the extent that these new capital weights lead to capital requirements in excess of the capital buffer already held by banks, and supposing that monetary policy remains as accommodative as it currently is, our estimates could provide an upper bound of the expected short run negative effects on credit supply in the euro zone.

³¹The case for recapitalization objectives targeted at “dollars” of capital instead of capital ratios is made by Hanson, Kashyap and Stein (2011). They notably point out that in the few months following the release of the SCAP results, the banks involved were able to raise over \$125 billion of new equity, without apparent negative impact on credit supply. As they emphasize, the tough hand of the regulator, which left no room for discretionary action, made this issuance easier for banks by removing the usual moral hazard problem à la Myers and Majluf (1984).

A Data

A.1 Definition and sources of bank variables

Statistic	Description
Size	Total Assets of banks (in euros). These figures are converted to logs when used in our regression analysis.
Annualised Loan Growth (Recap Period)	Annualised 9-month loan growth over the period of the Capital Exercise (October 2011 to June 2012).
Loans to Assets	Total loans to the real economy (sum of Loans to Households and Loans to Non-financial Corporates) divided by Total Assets.
Capital to Assets	Capital divided by Total Assets. The capital figure in the IBSI dataset is a broad measure of banks' capital, including equity capital raised, undistributed profits, and provision against loans and other types of assets.
Liquid Assets	Interbank Assets divided by Total Assets. Interbank Assets include liquidity deposited with the Eurosystem.
Deposits to Assets	Real economy deposits (sum of Deposits from Households and Deposits from Non-financial Corporates) divided by Total Assets.
Interbank Liabilities to Assets	Borrowings from other banks (Interbank Loans) divided by Total Assets. Interbank Loans include borrowing from the Eurosystem,
Desposits to Loans	Total deposits from the real economy (sum of Deposits from Households and Deposits from Non-Financial Corporates) divided by total loans to the real economy (sum of Loans to Households and Loans to Non-Financial corporates). We report the inverse of the more commonly used Loans-to-Deposits ratio due the presence of non deposit taking banks in our sample.
Sovereign Bonds to Assets	Sum of Domestic and Foreign Sovereign Bond Holdings divided by Total Assets.

A.2 List of Banking Groups in Sample

Nationality	Head ID Code	EBA ID Code	Bank Group Name	Number Banks
AT	AT14000		BAWAG P.S.K. Bank für Arbeit und Wirtschaft und Österreichische Postsparkasse Aktiengesellschaft	1
AT	AT15000		Oberbank AG	1
AT	AT20100	AT001	Erste Group Bank (EGB)	3
AT	AT31000	AT002	Raiffeisen Zentralbank Österreich (RZB)	2
AT	AT32000		Raiffeisenlandesbank Niederoesterreich-Wien AG	1
AT	AT34000		Raiffeisenlandesbank Oberösterreich Aktiengesellschaft	1
BE	BEARSPBE22		N.V. Argenta Spaarbank	1
BE	BEARTEBEBB		Belfius Banque SA	1
BE	BEKREDBEBB	BE005	KBC BANK	2
CY	CY110002	CY007	Bank of Cyprus Public Company Ltd	1
CY	CY110003		Co-operative Central Bank Ltd (CY110003) and Co-operative credit institutions [aggregated]	1
CY	CY110005		Hellenic Bank Public Company Ltd	1
CY	CY110010	CY006	Marfin Popular Bank Public Co Ltd	1
DE	DE00001	DE017	Deutsche Bank Aktiengesellschaft	7
DE	DE00003	DE018	Commerzbank AG	3
DE	DE00091		Oldenburgische Landesbank Aktiengesellschaft	1
DE	DE00316	DE019	Landesbank Baden-Wuerttemberg	1
DE	DE00317	DE021	Bayerische Landesbank	2
DE	DE00319	DE026	Landesbank Hessen-Thüringen Girozentrale	2
DE	DE00320	DE022	Norddeutsche Landesbank-Girozentrale	3
DE	DE00325		Nassauische Sparkasse	1
DE	DE00561		Stadtsparkasse Muenchen	1
DE	DE00637	DE027	Landesbank Berlin AG	2
DE	DE00724		Sparkasse Hannover	1
DE	DE00835		Stadtsparkasse Essen	1
DE	DE00897		Sparkasse KoelnBonn /	2
DE	DE01094		Sparkasse Suedholstein	1
DE	DE01108		Die Sparkasse Bremen AG	1
DE	DE01109		Hamburger Sparkasse AG	1
DE	DE01121	DE020	DZ Bank AG Dt. Zentral-Genossenschaftsbank	3
DE	DE01127	DE029	WGZ Bank AG Westdt. Geno. Zentralbk, Ddf	2
DE	DE01135		Deutsche Apotheker- und Ärztebank eG	1
DE	DE01244		Volksbank Pforzheim eG.	1

Nationality	Head ID Code	EBA ID Code	Bank Group Name	Number Banks
DE	DE01291		Volksbank Stuttgart eG	1
DE	DE01364		Muenchner Bank eG	1
DE	DE01400		Berliner Volksbank eG	1
DE	DE01436		Frankfurter Volksbank eG	1
DE	DE01521		Hannoversche Volksbank eG	1
DE	DE01776		Sparda-Bank Suedwest eG	1
DE	DE03249		Deutsche Pfandbriefbank AG	1
DE	DE03250		Muenchener Hypothekenbank eG	1
DE	DE03402		Volkswagen Bank Gesellschaft mit beschränkter Haftung	1
DE	DE03472		Aareal Bank AG	1
DE	DE05695		Landeskreditbank Baden-Wuerttemberg - Foerderbank -	1
DE	DE05740		NRW. Bank	1
DE	DE05749	DE025	HSH Nordbank AG	1
DE	DE06261		Ostsaechsische Sparkasse Dresden	1
DE	DE06273		Stadt- und Kreissparkasse Leipzig	1
DK	DK003000	DK008	Danske Bank	4
ES	ES0049	ES059	Banco Santander S.A.	6
ES	ES0075	ES064	Banco Popular Español, S.A.	1
ES	ES0081		Banco de Sabadell, S.A.	1
ES	ES0128		Bankinter, S.A.	1
ES	ES0182	ES060	Banco Bilbao Vizcaya Argentaria, S.A.	1
ES	ES1000		Instituto de Crédito Oficial	1
ES	ES2048		Liberbank, S.A	1
ES	ES2085		Ibercaja Banco, S.A	1
ES	ES2095		Kutxabank, S.A.	1
ES	ES2100		CaixaBank, S.A	1
ES	ES2103		Unicaja Banco, S.A	1
ES	ES2108		Banco de Caja España de Inversiones, Salamanca y Soria, SA	1
ES	ES3058		Cajas Rurales Unidas	1
ES	frob		FROB	4
FI	FI0199207	FI012	OP-Pohjola Group	2
FI	FI21817028		Aktia Bank Abp (FI21817028) and Savings banks [aggregated]	1
FR	FR10278		Targobank AG & Co. KGaA	1
FR	FR11808		Banque Fédérative du Crédit Mutuel	3
FR	FR12548		AXA Bank Europe SA	1
FR	FR16188	FR015	BPCE	10
FR	FR19460		Sofax banque	1
FR	FR ² 0041		La Banque Postale	1
FR	FR30003	FR016	Societe Generale	4
FR	FR30004	FR013	BNP Paribas	5
FR	FR30006	FR014	Credit Agricole	6
GB	GB0570	GB090	Barclays plc	4
GB	GB1805	GB089	HSBC Holdings plc	2
GB	GB2600	GB088	Royal Bank of Scotland Group plc	2
IE	IEAIBPLC	IE037	Allied Irish Banks PLC	1
IE	IEANGLOI		Irish Bank Resolution Corporation Limited	1

Nationality	Head ID Code	EBA ID Code	Bank Group Name	Number Banks
IE	IEBKIREL	IE038	THE Governor and Company of the Bank of Ireland	2
IE	IEIRPERM	IE039	Irish Life and Permanent PLC	1
IT	IT01030	IT042	BancaA Monte dei Paschi di Siena Spa	2
IT	IT02008	IT041	Unicredit Banca Spa	4
IT	IT03032		Credito Emiliano Spa	1
IT	IT03069	IT040	Intesa Sanpaolo Spa	4
IT	IT03111	IT044	Unione di Banche Italiane SCPA (UBI Banca)	2
IT	IT05035		Veneto Banca Holding Societa' Cooperativa per Azioni	1
IT	IT05387		Banca Popolare dell'Emilia Romagna	1
IT	IT05584		Banca Popolare di Milano	1
IT	IT05696		Banca Popolare di Sondrio Societa Cooperativa per Azioni	1
IT	IT05728		Banca Popolare di Vicenza Societa Cooperativa per Azioni	1
IT	IT06055		Banca delle Marche Spa	1
IT	IT06175		Banca Carige Spa - Cassa di Risparmio di Genova e Imperia	1
IT	IT10631		Mediobanca - Banca di Credito Finanziario Spa	1
LU	LUB00001	LU045	Banque et Caisse d'Epargne de l'Etat, Luxembourg	1
LU	LUB00009		Banque Raiffeisen	1
MT	MTCIAPSB		APS Bank Ltd	1
MT	MTCILBMA		Lombard Bank Malta plc	1
MT	MTCIVALL	MT046	Bank of Valletta plc	1
NL	NL120		F. van Lanschot Bankiers N.V.	1
NL	NL149	NL049	ABN Amro Bank N.V.	1
NL	NL163	NL047	ING Bank NV	6
NL	NL399		Achmea Bank Holding N.V	1
NL	NL512		The bank of Tokyo - Mitsubishi UFJ Ltd	1
NL	NL578	NL050	SNS Bank N.V.	1
NL	NL600	NL048	Rabobank Nederland	4
NL	NL680		Bank Nederlandse Gemeenten N.V.	1
PT	PT10	PT056	Banco BPI, SA	1
PT	PT33	PT054	Banco Comercial Português, SA	1
PT	PT35	PT053	Caixa Geral de Depósitos, SA	1
PT	PT7	PT055	Banco Espírito Santo, SA	1
SE	SE11102	SE085	Skandinaviska Enskilda Banken AB (publ) (SEB)	2
SE	SE11123	SE086	Svenska Handelsbanken AB (publ)	1
SE	SE11145	SE084	Nordea Bank AB (publ)	2
SE	SE11200	SE087	Swedbank AB (publ)	1
SI	SI5026024		Abanka Vipa D.D.	1
SI	SI5860571	SI057	Nova Ljubljanska Banka D.D., Ljubljana	1
SI	SI5860580	SI058	Nova Kreditna Banka Maribor D.D.	1

References

- [1] Admati, A.R., P.M. DeMarzo, M.F. Hellwig, and P. Pfleiderer (2010), Fallacies, Irrelevant Facts, and Myths: Why Bank Equity is not Expensive, mimeo, Stanford and Bonn.
- [2] Albertazzi, U. and D.J. Marchetti (2010), credit supply, flight to quality and evergreening: an analysis of bank-firm relationships after Lehman, *Temì di discussione* 756, Bank of Italy.
- [3] Angrist, J. D. and J-S Pischke (2009), *Mostly harmless econometrics an empiricists companion*, Princeton: Princeton University Press.
- [4] Ashcraft, A.B. (2008), Are Bank Holding Companies a Source of Strength to Their Banking Subsidiaries?, *Journal of Money, Credit and Banking*, vol. 40(2-3), pages 273-294, 03.
- [5] Aiyar, S., Calomiris , C.W., and T. Wieladek (2014), Does macropru leak? Evidence from a UK policy experiment, *Journal of Money, Credit and Banking*, vol. 46(s1), pages 181-214.
- [6] Basel Committee on Banking Supervision (2010), Assessing the impact of the transition to stronger capital and liquidity requirements. Report of the Macroeconomic Assessment Group, BIS-BCBS, August.
- [7] Bassett, W., and F. Covas (2012), A new look at the relationship between capital constraints and bank lending. *Mimeo*, Federal Reserve Board.
- [8] Berrospide, J., and R. E. Edge (2010), The effects of bank capital on lending : What do we know? And, what does it mean?, *International Journal of Central Banking*, 6 (4), 5–55.
- [9] Bernanke, B.S., and C. Lown (1991), The credit crunch, *Brookings Papers on Economic Activity*, 2, 205-247.
- [10] Bridges, J., Gregory, D., Nielsen, M., Pezzini, S., Amar, R. and M. Spaltro (2014), The Impact of Capital Requirements on Bank Lending, Bank of England Working Paper No. 486.

- [11] Brun, M., Fraise, H., and D. Thesmar (2014), The effects of bank capital requirements, Autorité de Contrôle Prudentiel et de Résolution, Working Paper.
- [12] Bertrand, M., Duflo, E. and S. Mullainathan (2004), How Much Should We Trust Differences-in-Differences Estimates?, *The Quarterly Journal of Economics*, MIT Press, vol. 119(1), pages 249-275, February.
- [13] Ehrmann, M. and A. Worms (2004), Bank Networks and Monetary Policy Transmission, *Journal of the European Economic Association*, MIT Press, vol. 2(6), pages 1148-1171, December.
- [14] Francis, W.B., and M. Osborne (2009), Bank regulation, capital and credit supply: Measuring the Impact of Prudential Standards, Occasional Papers 36, Financial Services Authority.
- [15] Francis, W.B., and M. Osborne (2012), Capital requirements and bank behaviour in the UK: are there lessons for international capital standards?, *Journal of Banking and Finance*, 36, 803-816.
- [16] Hancock, D., and J. A. Wilcox (1993), Has there been a “capital crunch” in banking? The effects on real estate lending of real estate conditions and bank capital shortfalls. *Journal of Housing Economics* 3 (1), 31–50.
- [17] Hancock, D., and J. A. Wilcox (1994), Bank capital and the credit crunch: The roles of risk-weighted and unweighted capital regulations. *American Real Estate and Urban Economics Association Journal* 22 (1), 59–94.
- [18] Hanson, S.G., A.K. Kashyap and J.C. Stein (2010), An Analysis of the Impact of “Substantially Heightened” Capital Requirements on Large Financial Institutions, mimeo.
- [19] Hanson, S.G., A.K. Kashyap and J.C. Stein (2011), A Macroprudential Approach to Financial Regulation, *Journal of Economic Perspectives*, vol. 25(1), pages 3-28, Winter.
- [20] Houston, J., C. James, and D. Marcus (1997), Capital Market Frictions and the Role of Internal Capital Markets in Banking. *Journal of Financial Economics* 46: 135–64.

- [21] Institute of International Finance (IIF, 2010) “Interim Report on the Cumulative Impact on the Global Economy of Proposed Changes in the Banking Regulatory Framework.”
- [22] Judson, R.A. and A.L. Owen (1999), Estimating dynamic panel data models: a guide for macroeconomists, *Economics Letters*, vol. 65(1), pages 9-15, October.
- [23] Khwaja, A., and A. Mian (2008), Tracing the impact of bank liquidity shocks. *American Economic Review*, 98 (4), 1413-42.
- [24] Maurin, Laurent & Toivanen, Mervi, 2012. Risk, capital buffer and bank lending: a granular approach to the adjustment of euro area banks, Working Paper Series 1499, European Central Bank.
- [25] Modigliani, F., and M. H. Miller (1958), The Cost of Capital, Corporation Finance, and the Theory of Investment, *American Economic Review* 48, 162 – 197.
- [26] Myers, S.C. (1977), Determinants of corporate borrowing, *Journal of Financial Economics*, Elsevier, vol. 5(2), pages 147-175, November.
- [27] Myers, S.C. and N.S. Majluf (1984), Corporate Financing and Investment Decisions When Firms Have Information that Investors Do Not Have, NBER Working Papers 1396.
- [28] Paravisini, D. (2008), “Local Bank Financial Constraints and Firm Access to External Finance” , *The Journal of Finance*, 63(5), pp. 2161-2193.
- [29] Peek, J and Rosengren, E S (1997), The international transmission of financial shocks: the case of Japan, *American Economic Review*, 87:4, pp. 495-505.
- [30] Puri, M., J. Rocholl and S. Steffen (2009), “Global Retail Lending in the Aftermath of the US Financial Crisis: Distinguishing between Supply and Demand Effects” , *Journal of Financial Economics*, 100, pages 556-578.