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**Abstract**

We exploit a unique monthly dataset of bank balance sheets to document the lending behaviour of euro area banks that were subject to the EBA's 2011/12 Capital Exercise. This exercise was announced in October 2011 and required large European banking groups to meet a higher Tier 1 capital ratio by June 2012, after accounting for an unprecedented temporary buffer against exposure to sovereign debt. Given the unexpected nature of the EBA Exercise and the short time frame during which banks had to increase their capital buffers, this episode comes close to a natural experiment and provides a valuable insight into the capital-lending relationship. 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 between 1.2 and 1.6 percentage points lower than for banks in groups that did not have to increase their capital ratio. We also look at aggregate effects at the country level and find 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 Supervisor in advance of its Asset Quality Review due in November 2014.

JEL Classification: C21, E51, G21, G28.

Keywords: bank capital ratios, credit supply, EBA, euro area, asset quality review.

**Résumé**

Nous exploitons une nouvelle base de données de bilans bancaires pour la zone euro pour évaluer le comportement de prêt des banques de la zone euro soumises à l'exercice de recapitalisation imposé par l'EBA en 2011-2012. Cet exercice, annoncé en octobre 2011, imposait aux grands groupes bancaires européens d'atteindre un ratio de capital pondéré core tier 1 d'au moins 9% avant fin juin 2012 et de constituer un coussin de capital additionnel reflétant les risques associés à la détention de titres souverains européens. En contrôlant de la demande de prêt au niveau du pays de résidence et des caractéristiques de bilan des banques individuelles, nous trouvons qu'une banque appartenant à un groupe contraint d'augmenter son ratio de capital de 1 point de pourcentage a, en moyenne, accru ses prêts de 1,2 à 1,6 points de pourcentage de moins qu'une banque appartenant à un groupe déjà suffisamment capitalisé sur les 9 mois de l'exercice. Nous trouvons également que l'exercice a eu un impact négatif sur l'offre de prêt au niveau agrégé, suggérant que les banques non concernées par l'effort de recapitalisation n'ont pu se substituer aux banques contraintes. Nos résultats sont particulièrement pertinents dans la perspective des décisions à venir du Mécanisme de Supervision Européen à l'issue de sa revue de la qualité des actifs bancaires, attendue pour novembre 2014.

Classification JEL: C21, E51, G21, G28.

Mots-clés: ratios de capital bancaires, offre de crédit, EBA, zone euro, AQR.

## Non technical summary

We investigate the impact of a decision by the European Banking Authority (EBA) to increase regulatory capital requirement for large European banks on the supply of credit by those banks. This Capital Exercise was announced in October 2011, during a critical period in the euro area sovereign debt crisis and amid concerns over banks' exposure to the bonds of stressed euro area countries. The aim of the EBA's exercise was to reassure market participants over the ability of European banks to withstand further credit shocks. At the same time, there were growing concerns that the crisis was negatively impacting European banks' ability to provide credit to the real economy, potentially aggravating recessions in several countries. The possibility that the EBA's exercise would be countercyclical and aggravate this situation led to some criticism of the timing of the decision.

Our study makes use of EBA data on banking groups' capital levels as well as a unique Eurosystem dataset of individual banks' balance sheets. We match individual banks to banking groups and test whether banks in groups with a capital shortfall had lower credit growth over the course of the Capital Exercise compared with banks in groups with a capital surplus. We find that this was indeed the case: a Core Tier 1 capital shortfall of 1pp was associated with lending growth that was 1.2pps to 1.6pps lower than banks that did not face a capital constraint. Furthermore, we establish that information on bank balance sheets released as part of the Capital Exercise did not give rise to large changes in banks' CDS spreads. This allows us to discard the hypothesis that the observed weakness in credit growth for capital-constrained banks was due to increased funding stress following information revelation by the EBA.

While we etablish that capital-constrained banks had a lower level of lending growth over the course of the EBA's Capital Exercise, we note that the magnitude of the difference is contained. Indeed, our estimated coefficient is at the lower end of the range in the existing literature on the relationship between bank capital and lending growth. We suggest two reasons why this may be the case. Firstly, the EBA and national supervisors exerted significant pressure on banks not to increase their capital ratios by reducing loan supply. Secondly, the ECB undertook exceptional liquidity-providing measures during this period, possibly reducing deleveraging pressure on banks.

# 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 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. At the same time, many observers were 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 between 1.2 and 1.6 percentage points lower than for banks that were in groups that did not have to increase their capital ratios. Moreover, looking at the variation of banks' CDS spreads around EBA announcements, we provide evidence that this credit contraction indeed reflects forced balance sheet adjustment and not tighter funding conditions due to information revelation about the creditworthiness of banking groups monitored by the EBA. 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 those that had to increase their capital ratios. This suggests that the Capital Exercise had procyclical macroeconomic effects of similar orders of magnitude.

[1] A prominent example of such criticism is a 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."

Capital requirements have been the cornerstone of modern banking regulation since the late 1980s. Since then, proposals for increasing requirements have been contentious, with the financial industry generally claiming that higher requirements would force them to substantially reduce lending to the real economy, at least temporarily.[2] According to this line of argument, the costs of higher requirement could therefore outweigh the potential financial stability benefits, which are generally put forward by regulators. In spite of an abundant empirical literature over the course of more than two decades, 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.[3]

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.[4] 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 challenges in a rather satisfying way. First, a remarkable feature of the EBA Capital Exercise was that it was largely unexpected, with the EBA announcing its exercise just a few months after having drawn relatively benign conclusions from its own June 2011 stress tests. This surprise effect limits the odds that 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

[2]See IIF (2010), a think tank representing large international banks, for an alarming view of the possible consequences of the Basel III capital package on credit supply and growth, and Admati et al. (2011) for a critical survey of the fallacies often associated with the claim that raising capital requirements would be detrimental to lending to the real economy.

[3]See for instance Hanson, Kashyap and Stein (2010) for a recent and rather consensual survey of the empirical evidence on the short-run capital-lending relationship.

[4]For example, while Furfine (2000) claims that higher capital ratios (or the associated tougher monitoring by supervisors) were responsible for slower lending growth in the 1990s in the US, Berger and Udell (1994) tend to dismiss the role of Basel regulations in contributing to this slowdown.

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.[5] 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 comes close to a natural experiment and provides us with a rare opportunity to observe an 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 and the presence of foreign subsidiaries of European banking groups in our sample, 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, suggesting that we correctly control for demand at the country-of-residence level.

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

[5] Under Basel II, the required minimum CET1-to-RWA ratio was 2 percent. The Basel III regulation set this minimum at 4.5%. An additional capital buffer of 2.5%, a countercyclical buffer of up to 2.5%, and a capital surcharge for global systemic institutions (G-SIFIs) were also included in the package. However, 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.

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

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 comparable studies using bank balance sheet data. 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. These corrections are basically the same as those implemented by Eurosystem statisticians when computing the growth rates of credit aggregates at the country level. The IBSI dataset also includes detailed meta-information about mergers and acquisitions, sales and buy-backs of securitized loans. We can therefore explicitly control for such events when constructing our measure of bank loan growth. We are thus able to construct quite clean measures of bank-level credit growth to the non-financial sector.

From a policy perspective, we view our findings as providing a useful benchmark for the new European Single Supervisor, as the decisions it will have to take when completing the Comprehensive Assessment (launched in October 2013) 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 (the horizon of the measured effect in this study is 9 months) 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. Our findings could therefore represent an upper bound of the expected macroeconomic effects of such a shock, as in more normal times healthier banks would presumably be better able to substitute for the reduction in credit supplied by capital-constrained banks.[7] At the same time, the magnitude of our estimated effect lies at the lower range of estimates available from comparable recent studies, which we survey below. There are two period-specific factors that may have contributed to dampening the consequences of the capital shock arising from the EBA's exercise. First, in early De-

[6]Cf. 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).

[7]Although, at least in the short run, asymmetries of information only alleviated by relationship lending could limit such substitution. Cf. Bernanke (1983) for his seminal study of the impact of destroyed relationship lending on the severity of the US Depression, and Gambacorta et al. (2012) for a recent study showing that relationship lending helped shield Italian firms from the effects of the 2007-2008 liquidity freeze on wholesale funding markets tapped by their Italian banks.

cember 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 the Capital Exercise covered banking groups in the whole EU, whereas our dataset of individual bank balance sheets is limited to euro area banks. 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 reviews some of the relevant literature on the relationship between bank capital shocks and credit supply. Section 3 summarizes the timeline and the requirements of the EBA Capital Exercise. We provide details on our dataset and our methodology in Section 4. Section 5 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 6, we outline a series of robustness tests that we undertake on our baseline results. Section 7 presents results of our analysis on country aggregates while Section 8 concludes.

# 2 Literature Review

The theoretical literature on the relationship between bank capital and credit supply suggests that banks will respond to a shock that increases their capital constraint by reducing credit supply. In the long run, the consensus view is that the Modigliani and Miller (1958) theorem should apply and ensure that the quantity of loans granted by banks is largely disconnected from their capital structure. However, as far as short run adjustments are concerned, notably in crisis times, a series of standard arguments based on informational frictions in the market for bank equity point to reasons why issuing more equity capital

can be costly for banks, thus departing from the Modigliani and Miller world.[8] Faced with difficulty in raising new equity to meet their capital requirements (be they imposed by investors or by regulators), banks are incentivized to deleverage their balance sheet or, if the binding constraint is expressed in proportion to risk-weighted assets, to shift their assets from investments with a higher capital weight (like corporate loans) to investments with a lower one (like, under current Basel rules, government bonds of developed economies).[9]

Since the early 1990s, and following the inception of the first comprehensive regulatory package on capital requirements for large international banks set up by the Basel Committee, the role of tightened capital regulations in aggravating recessionary episodes has been widely discussed. Early empirical studies, like Bernanke and Lown (1991), assess the impact of bank capital constraints on lending during a recessionary episode by regressing loan growth on the pre-crisis level of each bank's capital. They confirm that less capitalized banks tend to lend less after a shock that is likely to have made the regulatory constraint more binding. However, they reject the hypothesis of a widespread credit crunch during the 1990-1991 recession in the US. In a similar vein, Peek and Rosengreen (1997) use the Japanese crisis as a natural experiment and regress lending by branches of Japanese banks in the US on the capital ratio of their parent institutions, which is arguably exogenous to the level of economic activity in individual US states. With this neat empirical setup, they find that a 1 percentage point decline in lending by the parent's capital leads to a reduction in the US branch by 6 percent.

A second set of studies postulate that banks adjust their lending to changes in a capital buffer, defined as the gap between their actual and desired capital ratios, instead of reacting to changes in the capital ratio per se. In such a framework, the desired capital ratio is generally assumed to reflect both regulatory demands and investors' concerns about the bank's solvency. Changes in this target ratio do not, therefore, necessarily reflect changes to regulatory capital requirements alone. Assuming that the desired ratio relates in a simple (linear) way to banks' characteristics and the macro outlook and that banks can only adjust gradually their capital ratio to their desired level, this target ratio is easily filtered out from observed capital ratios. Following Hancock and Wilcox (1994), several recent papers

[8]The pecking order theory (Myers and Majluf, 1984) points to an adverse selection problem due to the opacity of banks' assets. Issuing equity could thus send the signal that the bank is in distress, which would prompt investors to require a lower price for buying new shares, thus diluting existing shareholders. Moreover, highly leveraged banks may face a debt overhang problem (Myers, 1977), preventing new shareholders to step in as all future profits are likely to be absorbed by incumbent debt-holders.

[9]Cf. for instance Thakor (1996).

implement such a partial adjustment model on a panel of banks, as Berrospide and Edge (2010) do for the US, Maurin and Toivanen (2012) for the euro area and Francis and Osborne (2009) for the UK. The latter find, for instance, that a one percentage point increase in UK banks' capital requirements in 2002 would have reduced their lending by 1.2% on average after four years, a magnitude that compares well with our findings.

A shortcoming of studies based on partial adjustment models of bank capital to an unobservable target ratio is that the results are strongly dependent on the assumptions underlying the measure of the target ratio. Another limitation relates to the granularity of the information used, as most papers using such models run panel regressions of loans on capital at the bank level for a given country, which limits the possibility to adequately control for changes in credit demand.[10] Other strands in the empirical literature thus explore such avenues as using different measures of the capital constraint, using more disaggregated data (like loan-level information), or exploiting bank-specific regulatory changes in countries where this information is available (such as in UK).

As an example of the first strand of papers, Basset and Covas (2012) assess the capital constraint faced by US banks by using banks' own assessment of their capital adequacy, as revealed in their responses to the Fed's Senior Loan Officer Opinion Survey (SLOOS). After correcting for some classification errors, they find that a one-standard-deviation increase in the probability that a bank tightened standards because it was concerned about its capital translates into a 1.3 to 1.7 percentage point reduction in the annualized growth rate of loans over the subsequent quarter relative to a bank that also tightened standards but did not become more capital constrained.

Second, since the seminal contributions of Khwaja and Mian (2008) and Paravisini (2008), a number of recent papers have explored anew longstanding issues in empirical banking using very disaggregated information, either at the loan level or at the level of the exposure of individual banks to individual firms, as recorded in the credit registers of some countries. Including firm and time fixed effects in panel regressions run at the level of firm-bank credit exposures does indeed allow for a convincing control of credit demand effects when enough firms have multiple banks. In this vein, Puri et al. (2011) provide evidence that German Landesbanken that were exposed to the US subprime market (and thus suffered a sharp capital depletion over 2007-2008) did ration credit to retail borrowers. Albertazzi and Marchetti (2010) look at the change in credit supplied by Italian banks to local firms

[10] Implicitly, all banks are supposed to face the same intensity of demand, as summarized by, for example, measures of the country's business cycle

over the six months of turmoil that followed the Lehman collapse. They find evidence of a contraction of credit supply, associated with low bank capitalization. Furthermore, among less-capitalized banks, they find that larger banks reallocated loans away from riskier firms, thus contributing to credit procyclicality.

Finally, a series of studies take advantage of proprietary datasets on bank-specific changes to capital requirements imposed by supervisors, allowing for a better identification of the capital regulation tightening shock. Aiyar et al. (2012) and Bridges et al. (2014) exploit the time-varying minimum capital requirements (so-called 'trigger ratios') imposed by the Bank of England (formerly the FSA) at the level of individual banks in the 1990s and 2000s. In both cases, they control for demand using information about the industrial sector of the borrowers. Aiyar et al. (2012) find that a rise of one percentage point in the trigger ratio induces a cumulative reduction in the growth rate of bank lending of between 6 and 9 percentage points. Bridges et al. (2014), who also use "clean" measures of credit flows instead of changes in stocks, find that banks respond to increases in capital requirements in the first year by restricting credit supply (notably with respect to secured lending to households and non-real estate loans to firms) and growing their capital base. Thereafter, banks increase their capital resources until they have restored the capital buffers (above regulatory requirements) they were holding before the increase in capital requirements and, therefore, stop constraining lending supply after the first year. Their estimates point to a reduction in loan growth in the first quarter of 2 percentage points for corporate loans following a increase in trigger ratios by 1 percentage point. Finally, a recent paper of Brun et al. (2013) exploits French loan level data and detailed supervisory information about banks' internal model choices in their transition from Basel I to Basel II, which directly impacts on the tightness of the capital constraint they face. Looking at the intensive margins (changes to existing exposures), they find that a 1 percentage point increase in bank-specific capital requirements leads to a reduction in lending by 5 to 10 percent, depending on the precise specification of the dependent variable. These results provide an upper bound to available estimates.

# 3 The EBA Capital Exercise

## 3.1 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 tem-

porary 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".[11] 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. It followed the July 2011 EU-wide stress tests, which had recommended capital strengthening for banks with a Core Tier 1 ratio below 5% and for those with significant holdings of stressed sovereign debt.[12] 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.[13] 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.[14] The final report, including end-June 2012 detailed balance sheet information for all participating banks, was published on 3 October 2012.

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

[11] A 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 instuments (common equity, i.e. ordinary shares or similar instruments), but also some government suppport 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.

[12] The EBA used the same population of banks for the EU-wide stress tests and the Capital Exercise, although some small, non cross-border banks were excluded from the latter.

[13] The 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". Plans were also not requested from 6 Greek banks, which were being recapitalised in the context of an EU-IMF Programme. One bank that submitted a plan subsequently entered intensive restructuring and exited the exercise.

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

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 as 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% or 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 | - | 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 | - | Publication of bank-by-bank shortfall: total of €115bn for 37 banks. Ten of these banks subsequently exited the exercise. |
| | - | Submission of recapitalisation plans by 20 January 2012. |
| 9 February 2012 | - | Publication of preliminary assessment of banks' capital plans: 27 banks to fill a total shortfall of €76bn. |
| 11 July 2012 | - | Publication of preliminary report on the implementation of the capital requirements; "vast majority" of banks meet 9% Core Tier 1 ratio. |
| 3 October 2012 | - | Publication of final report and end-June balance sheet data. |

# 4 Data and methodology

## 4.1 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 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. Price series over the period of interest are available for 43 banking groups in the EBA sample. 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.

## 4.2 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 (not for an assesment of the share of each credit insitution 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.[15]

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

[15]Many 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.[16] 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.

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.

[16]We 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.

Table 3: Representativeness of Data Sample

| Country | % Euro Area Bank Lending | % Loans in Sample | | Banks in Sample | | % of Shortfall Banks | |
|---|---|---|---|---|---|---|---|
| | | EBA Banks | All Banks | EBA Banks | All Banks | EBA Banks | All Banks |
| 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% |
| | 100% | 46% | 60% | 124 | 198 | 53% | 33% |

We calculate lending growth rates based on stock and adjusted flow data in the IBSI dataset. [17] The one-month growth rate of loans ($I^1$) is calculated as per the following formula:

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

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

We clean these data for the impact of 84 M&A and 9 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:

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

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-liabilites-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

[17] Loan flow data are adjusted for loan reclassifications, exchange rate movements and other revauluations.
[18] These figures are converted to logs when used in our regression analysis.

group that we cannot control for by simply adding relevant bank-specific covariates in our regression. [19]

Table 5 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.

## 4.3 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:

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

$Y_{i,j,k}$ 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

[19] In the terms of the matching literature, these descriptive statistics suggest that the 'treatment' and 'control' 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.

[20] Although 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.

[21] We examine the change in credit supplied by individual banks between these two dates, therefore col-

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) | 84,798 | 131,796 | 5,860 | 218,047 |
| Annualised Loan Growth (Recap Period) | 1 | 8 | -8 | 10 |
| Loans / Assets | 47 | 22 | 18 | 72 |
| Capital / Assets | 8 | 5 | 3 | 13 |
| Liquid Assets / Assets | 17 | 17 | 2 | 38 |
| Interbank Liabilities / Assets | 20 | 19 | 2 | 44 |
| Deposits / Loans | 90 | 148 | 2 | 134 |
| Sovereign Bonds / Assets | 5 | 6 | 0 | 14 |
| **Shortfall Banks (N=66)** | | | | |
| Main Assets (Millions) | 117,277 | 163,319 | 10,149 | 371,538 |
| Annualised Loan Growth (Recap Period) | 0 | 8 | -8 | 11 |
| Loans / Assets | 47 | 22 | 16 | 75 |
| Capital / Assets | 8 | 4 | 3 | 13 |
| Liquid Assets / Assets | 17 | 13 | 4 | 35 |
| Interbank Liabilities / Assets | 28 | 24 | 7 | 68 |
| Deposits / Loans | 67 | 52 | 1 | 132 |
| Sovereign Bonds / Assets | 6 | 6 | 0 | 14 |
| **Surplus Banks (N=58)** | | | | |
| Main Assets (Millions) | 98,100 | 150,171 | 5,192 | 320,733 |
| Annualised Loan Growth (Recap Period) | 2 | 7 | -8 | 10 |
| Loans / Assets | 43 | 24 | 13 | 80 |
| Capital / Assets | 8 | 7 | 1 | 14 |
| Liquid Assets / Assets | 21 | 23 | 1 | 69 |
| Interbank Liabilities / Assets | 18 | 18 | 1 | 43 |
| Deposits / Loans | 114 | 232 | 6 | 162 |
| Sovereign Bonds / Assets | 4 | 5 | 0 | 14 |
| **Non-EBA Banks (N=74)** | | | | |
| Main Assets (Millions) | 45,403 | 53,378 | 4,915 | 103,566 |
| Annualised Loan Growth (Recap Period) | 2 | 7 | -6 | 9 |
| Loans / Assets | 52 | 19 | 21 | 70 |
| Capital / Assets | 7 | 3 | 4 | 11 |
| Liquid Assets / Assets | 19 | 15 | 8 | 35 |
| Interbank Liabilities / Assets | 14 | 15 | 2 | 28 |
| Deposits / Loans | 93 | 117 | 12 | 130 |
| Sovereign Bonds / Assets | 6 | 5 | 1 | 13 |

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

| | N | mean | sd | min | max |
|---|---|---|---|---|---|
| Number Banks in Group | 50 | 2.40 | 1.90 | 1 | 10 |
| Shortfall-to-RWA | 50 | -0.003 | 0.038 | -0.148 | 0.071 |
| Groups with Positive Shortfall-to-RWA | 24 | 0.024 | 0.018 | 0.002 | 0.071 |
| Number Countries | 50 | 1.720 | 1.161 | 1 | 6 |

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.

# 5 Results

Figure 1 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 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 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 the degree of slack

lapsing 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).

[22]We 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.

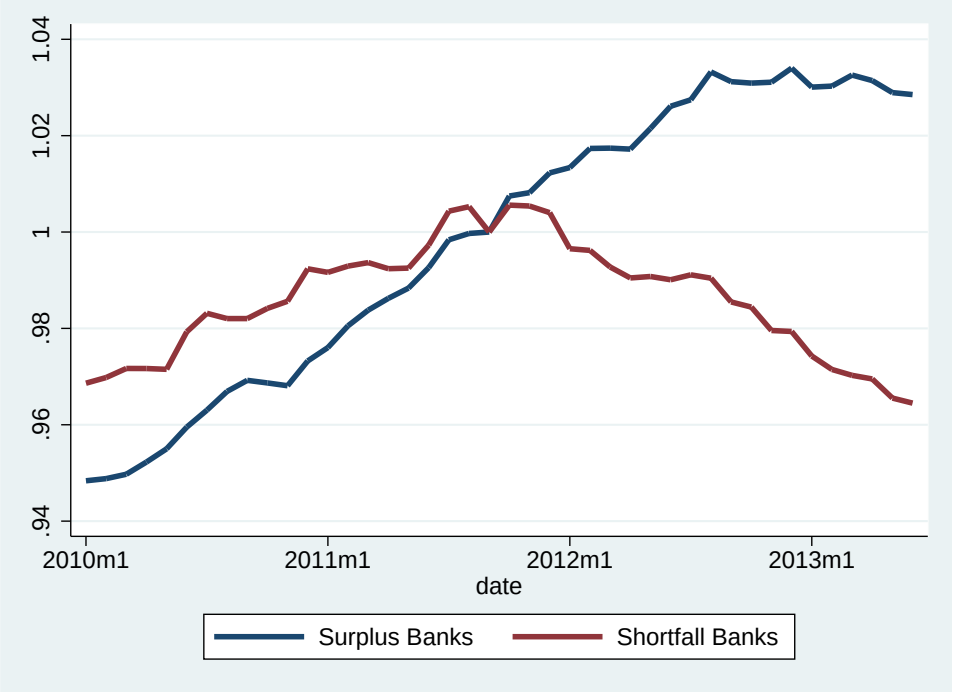


Figure 1: Total loans outstanding (Sept. 2011=100): cumulated over control vs. treated groups.

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 we add the variable Truncated Surplus-to-RWA, which measures the intensity of the capital surplus for banks in the control group. This variable in 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. Finally, Column 6 replaces the credit demand proxies with country fixed effects, while retaining the bank characteristics that are statistically significant in specifications of Columns 4 and 5.[24] All specifications use clustering methods to correct standard errors for possible correlation of innovations for banks belonging to the same banking group.

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

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

In all of these specifications, the coefficient for the variable Truncated Shortfall-to RWA is statistically significant. We view the results of Columns 4, 5 and 6 as coming from our best-identified specifications, leading us to conclude that a shortfall-to-RWA of 1pp was associated with an annualized 9-month rate of loan growth that was between 1.2pp and 1.6pp lower than for banks in the control group. 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 the 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 exercise.

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 from the existing literature, as surveyed above in Section 2. A number of factors may have dampened the magnitude of the impact in the present study, however. Most significantly, as discussed in section 3, 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, possibly reducing deleveraging pressure on banks.

Interpreting our results as indicating that the tightening in capital requirements induced the reduction in lending requires requires that we first discard 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 test, the conclusions of which were communicated

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** | -1.06* | -1.36** | -1.19** | -1.23** | -1.20** | -1.61* |
| | (0.58) | (0.59) | (0.54) | (0.53) | (0.47) | (0.51) | (0.83) |
| Stressed Country | | -0.04** | | -0.01 | | | |
| | | (0.01) | | (0.02) | | | |
| Unemployment | | | -0.25** | | -0.05 | -0.05 | |
| | | | (0.11) | | (0.12) | (0.12) | |
| Size | | | | 0.00 | 0.00 | 0.00 | |
| | | | | (0.00) | (0.00) | (0.00) | |
| Liquid Assets / Assets | | | | 0.10 | 0.10 | 0.10 | |
| | | | | (0.06) | (0.06) | (0.06) | |
| Deposits / Assets | | | | 0.03 | 0.03 | 0.03 | |
| | | | | (0.03) | (0.03) | (0.03) | |
| Loans / Assets | | | | 0.03 | 0.03 | 0.03 | |
| | | | | (0.04) | (0.04) | (0.05) | |
| Sov. Bonds / Assets | | | | 0.46*** | 0.47*** | 0.47*** | 0.69*** |
| | | | | (0.14) | (0.14) | (0.13) | (0.16) |
| Dom. Sov. Bonds / Assets * Stressed Country | | | | -0.55* | -0.61*** | -0.61*** | -0.77** |
| | | | | (0.32) | (0.20) | (0.19) | (0.37) |
| Surplus/RWA | | | | | | 0.05 | |
| | | | | | | (0.41) | |
| Country FEs | No | No | No | No | No | No | Yes |
| N | 124 | 124 | 124 | 124 | 124 | 124 | 124 |
| r2 | 0.06 | 0.12 | 0.09 | 0.23 | 0.23 | 0.23 | 0.35 |

Columns 1-7 present the results of our baseline regression specifications. Column 1 is a simple regression of annualised loan growth during the Capital Exercise on the *Truncated Shortfall-to-RWA* ratio. Columns 2 and 3 add country control measures. Columns 4 and 5 add a number of bank characteristics. Column 6 adds a control for banks in groups with a capital surplus. Column 7 replaces the country control measures with country fixed effects, while only retaining the bank characteristics that were statistically significant in Columns 4 and 5. 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 ***.

to the pubic 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 of EBA banking groups over the date of the EBA disclosure in December 2011, when the EBA 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 over windows of 1 to 3 days around the event date. The results, presented in Table 7, show that this announcement had a statistically significant impact on CDS spreads, especially at a 3-day horizon. The magnitude of this impact is very limited, however. While the CDS spread of the average bank in the sample increased by 36bps over the three days following the announcement, a bank with a shortfall-to-RWA of 1pp saw its CDS rise by just 3bps 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: Impact of EBA Announcement on CDS Spreads: 8 December 2011

| | 1-day | 2-day | 3-day |
|---|---|---|---|
| Shortfall to RWA | 1.30*** | 2.24*** | 3.14*** |
| | (0.37) | (0.65) | (0.78) |
| Constant | 12.82*** | 22.15*** | 36.04*** |
| | (1.92) | (2.96) | (4.10) |
| N | 43 | 43 | 43 |
| r2 | 0.14 | 0.18 | 0.17 |

Robust standard errors in parentheses

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

# 6 Robustness Tests

In this section, we present the results of a number of robustness tests. The aim of these tests is twofold: firstly, to test 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.[25] 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 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 stress tests (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”

[25]This assumption is often denoted the ”common or parallel trends” hypothesis. See Angrist and Pischke (2009, section 5.2).

groups as neither were subject to a regulatory capital adjustment. Table 9, which repeats our baseline regression specifications using this increase 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 regression 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 statstical 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.[26] 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.

[26]It 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 | -0.45 | -0.61 | -0.44 | -0.47 | -0.82 | -1.20 |
| | (0.49) | (0.56) | (0.48) | (0.54) | (0.50) | (0.56) | (0.79) |
| Stressed Country | | -0.02 | | -0.00 | | | |
| | | (0.02) | | (0.03) | | | |
| Unemployment | | | -0.23* | | -0.12 | -0.09 | |
| | | | (0.14) | | (0.18) | (0.17) | |
| Size | | | | -0.00 | -0.00 | -0.01 | |
| | | | | (0.01) | (0.01) | (0.01) | |
| Liquid Assets / Assets | | | | 0.01 | 0.02 | 0.01 | |
| | | | | (0.07) | (0.08) | (0.08) | |
| Deposits / Assets | | | | 0.05* | 0.04 | 0.04 | 0.02 |
| | | | | (0.02) | (0.03) | (0.03) | (0.02) |
| Loans / Assets | | | | -0.04 | -0.03 | -0.04 | |
| | | | | (0.06) | (0.06) | (0.07) | |
| Sov. Bonds / Assets | | | | 0.19 | 0.20* | 0.17 | 0.08 |
| | | | | (0.14) | (0.11) | (0.12) | (0.15) |
| Dom. Sov. Bonds / Assets * Stressed Country | | | | -0.25 | -0.25 | -0.23 | |
| | | | | (0.47) | (0.33) | (0.32) | |
| Surplus/RWA | | | | | | -0.69** | -0.36 |
| | | | | | | (0.32) | (0.40) |
| Country FEs | No | No | No | No | No | No | Yes |
| N | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| r2 | 0.01 | 0.03 | 0.03 | 0.10 | 0.10 | 0.13 | 0.27 |

Columns 1-7 present the results of our regression specifications using observations for the 9-month period prior to the Capital Exercise. Column 1 is a simple regression of annualised loan growth during the Capital Exercise on the *Shortfall-to-RWA* ratio. Columns 2 and 3 add country control measures. Columns 4 and 5 add a number of bank characteristics. Column 6 adds a control for banks in groups with a capital surplus. Column 7 replaces the country control measures with country fixed effects, while only retaining the bank characteristics that were statistically significant in Columns 4 and 5. 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** | -1.02** | -1.25*** | -1.13** | -1.20** | -1.22** | -0.98* |
| | (0.53) | (0.51) | (0.46) | (0.50) | (0.46) | (0.49) | (0.56) |
| Stressed Country | | -0.04*** | | -0.01 | | | |
| | | (0.01) | | (0.02) | | | |
| Unemployment | | | -0.31*** | | -0.14* | -0.14 | |
| | | | (0.07) | | (0.09) | (0.09) | |
| Size | | | | 0.00 | 0.00 | 0.00 | |
| | | | | (0.00) | (0.00) | (0.00) | |
| Liquid / Assets | | | | 0.05 | 0.05 | 0.05 | |
| | | | | (0.06) | (0.06) | (0.06) | |
| Deposits / Assets | | | | 0.08*** | 0.08*** | 0.08*** | 0.08*** |
| | | | | (0.03) | (0.03) | (0.03) | (0.03) |
| Loans / Assets | | | | -0.02 | -0.02 | -0.02 | |
| | | | | (0.04) | (0.04) | (0.05) | |
| Sov. Bonds / Assets | | | | 0.26* | 0.28** | 0.28** | 0.37** |
| | | | | (0.12) | (0.12) | (0.12) | (0.17) |
| Dom. Sov. Bonds / Assets * 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) | |
| Country FEs | No | No | No | No | No | No | Yes |
| N | 198 | 198 | 198 | 198 | 198 | 198 | 198 |
| r2 | 0.04 | 0.10 | 0.09 | 0.19 | 0.20 | 0.20 | 0.27 |

Columns 1-7 present the results of our baseline regression specifications using the entire IBSI sample of banks. Column 1 is a simple regression of annualised loan growth during the Capital Exercise on the *Shortfall-to-RWA* ratio. Columns 2 and 3 add country control measures. Columns 4 and 5 add a number of bank characteristics and a dummy indicating whether the bank was in a banking group subject to the Capital Exercise. Column 6 adds a control for banks in groups with a capital surplus. Column 7 replaces the country control measures with country fixed effects, while only retaining the bank characteristics that were statistically significant in Columns 4 and 5. 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*** | -1.56** | -2.20*** | -1.76*** | -1.86*** | -1.79** | -1.62** |
| | (0.59) | (0.65) | (0.66) | (0.64) | (0.65) | (0.67) | (0.78) |
| Stressed Country | | -0.05*** | | -0.03 | | | |
| | | (0.01) | | (0.02) | | | |
| Unemployment | | | -0.20 | | 0.03 | 0.03 | |
| | | | (0.14) | | (0.14) | (0.14) | |
| Liquid Assets | | | | 0.04 | 0.04 | 0.05 | |
| | | | | (0.06) | (0.06) | (0.07) | |
| Deposits / Assets | | | | 0.08* | 0.09** | 0.09** | 0.05 |
| | | | | (0.04) | (0.04) | (0.04) | (0.03) |
| Loans / Assets | | | | -0.01 | -0.02 | -0.02 | |
| | | | | (0.06) | (0.06) | (0.06) | |
| Sov. Bonds / Assets | | | | 0.45*** | 0.49*** | 0.50*** | 0.31*** |
| | | | | (0.12) | (0.12) | (0.12) | (0.11) |
| Dom. Sov. Bonds / Assets * Stressed Country | | | | -0.31 | -0.71*** | -0.71*** | -0.20 |
| | | | | (0.30) | (0.23) | (0.23) | (0.30) |
| Surplus/RWA | | | | | | 0.11 | |
| | | | | | | (0.36) | |
| Country FEs | No | No | No | No | No | No | Yes |
| N | 124 | 124 | 124 | 124 | 124 | 124 | 124 |
| r2 | 0.21 | 0.31 | 0.23 | 0.41 | 0.40 | 0.40 | 0.52 |

Columns 1-7 present the results of our baseline regression specifications using weighted OLS. Banks' total loans are used as the weighting factor. Column 1 is a simple regression of annualised loan growth during the Capital Exercise on the *Truncated Shortfall-to-RWA* ratio. Columns 2 and 3 add country control measures. Columns 4 and 5 add a number of bank characteristics. Column 6 adds a control for banks in groups with a capital surplus. Column 7 replaces the country control measures with country fixed effects, while only retaining the bank characteristics that were statistically significant in Columns 4 and 5. 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*** | -0.70* | -0.65* |
| | (0.42) | (0.40) | (0.39) |
| Exposure to Stressed Countries | | -0.04*** | -0.02 |
| | | (0.01) | (0.01) |
| Size | | | -0.00 |
| | | | (0.01) |
| Liquid Assets / Assets | | | 0.05 |
| | | | (0.09) |
| Deposits / Assets | | | 0.11** |
| | | | (0.05) |
| Loans / Assets | | | -0.12* |
| | | | (0.07) |
| Sov. Bonds / Assets | | | -0.03 |
| | | | (0.15) |
| EBA Banking Group | | | -0.00 |
| | | | (0.01) |
| N | 118 | 118 | 118 |
| r2 | 0.05 | 0.14 | 0.29 |

Columns 1-3 present the results of our regression specifications using variables that have been averaged at the banking group level. Column 1 is a simple regression of annualised loan growth during the Capital Exercise on the *Shortfall-to-RWA* ratio. Column 2 adds the vairable *Exposure to Stressed Countries*, which represents the proportion of groups' lending activity in euro area countries experiencing stress on their sovereign bond market. Column 3 adds a number of bank characteristics. Robust standard errors in parenthesis. Stars refer to the P-values as follows: $p < 0.10$ if *, $p < 0.05$ if **, $p < 0.01$ if ***.

# 7 Looking for Aggregate Effects

The results presented in Section 5 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 average of the "clean" growth rates we computed for individual banks present in a given country.[27]

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 unemployment. Column 2 adds aggregated bank characteristics (at a country level) while Column 3 adds a lag of the dependent variable.[28] 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.

[27] 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 account for the bulk of credit in most countries, the results would be qualitatively unchanged.

[28] The 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** | -1.14** | -1.31*** |
| | (0.46) | (0.41) | (0.44) |
| Unemployment | -0.98** | -0.98*** | -1.22*** |
| | (0.34) | (0.29) | (0.36) |
| Size | | 0.04 | 0.05 |
| | | (0.04) | (0.05) |
| Liquid Assets / Assets | | 0.33* | 0.34* |
| | | (0.17) | (0.18) |
| Deposits / Assets | | 0.08 | 0.18 |
| | | (0.30) | (0.35) |
| Loans / Assets | | 0.41 | 0.42 |
| | | (0.24) | (0.27) |
| For. Sov. Bonds / Assets | | 0.43 | 0.57 |
| | | (0.54) | (0.58) |
| Dom. Sov. Bonds / Assets | | -0.18 | -0.20 |
| | | (0.64) | (0.66) |
| Lagged dep. var. | | | -0.14** |
| | | | (0.06) |
| Country FEs | Yes | Yes | Yes |
| Date FEs | Yes | Yes | Yes |
| N | 564 | 564 | 548 |
| r2 | 0.39 | 0.40 | 0.41 |

Columns 1-3 present the results of country-level regressions with annualised 1-month loan growth as the dependent variable. $Weighted\ Shortfall-to-RWA$ is the average Shortfall-to-RWA of each bank in the country weighted by the size of banks' loanbooks. This variable is equal to zero for all months outside the 9-month period of the Capital Exercise. Column 1 is a simple regression using weighted Shortfall-to-RWA and unemployment. Column 2 adds a number of aggregated bank characteristics. Column 3 adds a lag of the dependent variable. All three specifications contain country and time fixed effects. 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 ***.

# 8 Conclusions

We use the EBA's recent recapitalization exercise as a 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 between 1.2 and 1.6 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 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.[29]

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) when it comes to draw lessons for its ongoing Asset Quality Review of the balance sheets of large euro area bank holding companies. 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 negative effects on credit supply in the zone.

[29]The 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 | FI01999207 | 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 | FR20041 | | 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 |

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