How do European banks cope with macroprudential capital requirements?*

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Abstract

This paper studies the effect of macroprudential requirements on capital ratios for a sample of euro area banks. We first document that banks' capital ratios are typically above minimum regulatory levels. The banks in our sample differ in their degree of systemic importance and once we split the banks according to this criterion, we find that non-systemically important banks build up capital buffers to a higher extent than systemically important banks and in excess of minimum requirements. The main channel through which these banks enhance their capital ratios is the optimization of risk-weighted assets (RWA), in particular by rebalancing portfolios towards safer assets.

JEL classification: G21, G28.

Keywords: European banks; macroprudential requirements; capital ratios; risk weighted assets

1. Introduction

The most recent financial crisis brought about an unprecedented regulatory reform which has resulted in an increase in the quantity and quality of prudential requirements applicable to banks worldwide. This strengthening of banking requirements is partly explained by the introduction of a macroprudential policy toolkit, comprising, most notably, capital surcharges (buffers) for institutions deemed systemically important at the global and/or domestic level; and the (broad-based) countercyclical capital buffer.[1]

In the European Union, the Capital Requirements Directive (CRD IV)[2] and the Capital Requirements Regulation (CRR)[3,] in place since January 2014 (although still subject to certain phase-in arrangements), envisage several capital-based measures to enhance the resilience of the financial system and limit the build-up of vulnerabilities. In this context, our paper aims to provide a threefold contribution to the existing literature. First, we study to what extent euro area (EA) banks boost their capital ratios when complying with these new macroprudential requirements. Next, we analyze whether this enhancement is achieved by increasing the numerator of the targeting capital ratio (i.e., the Core Equity Tier 1, CET1) or diminishing the denominator (i.e., total Risk-Weighted Assets, RWA). The optimization method is key to the framing of our second contribution, which elaborates on the effects on the bank credit supply and its investments. Importantly, these analyses are undertaken distinguishing between Systemically Important Institutions (SII) and, the remaining group of institutions with no systemic importance, known as Non-Systemically Important Institutions (Non-SII). Given that business models and regulatory treatments across these institutions are different, they may opt to optimize their capital ratios in different ways. Thus, we provide new evidence regarding how the previous types of banks deal with the macroprudential standards.

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[1] See BCBS (2010) for an overview of the Basel Committee's reforms to strengthen global capital rules with the goal of promoting a more resilient banking sector.
[2] EU Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013, on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC.
[3] Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012.

Under the current regulatory framework, capital-based measures take the form of capital buffers that banks have to fulfill above the minimum bank capital requirements. Capital buffers are designed to address some potential drivers or amplifiers of systemic risk. The CRR/CRD IV defines the following instruments: i) countercyclical capital buffer (CCyB); ii) capital conservation buffer (CCoB); iii) systemic risk buffer (SyRB); and iv) capital buffers for global and other SII. The new capital regulation offers flexibility at different application levels to operationalize the whole framework. This flexibility is particularly visible in the following aspects: i) most buffers can be applied at national discretion; ii) some buffers can be applied to all banks while others applied to a subset; iii) some buffers are calibrated at bank-level; iv) the implementation timetable of some buffers is fixed at national discretion –although the new framework should be fully implemented as of January 2022–. All these aspects provide an adequate degree of heterogeneity among the different banks under study depending on their level of systemic importance and the country in which they operate.

However, the implementation of stricter capital requirements, in the form of macroprudential policy buffers, are not necessarily accompanied by a bank's effort to accommodate its capital ratios. Consistent with Berger et al. (2008) and Brei and Gambacorta (2016), we observe that, in practice, banks voluntarily hold capital ratios in excess of the ones required at the time in which the macroprudential framework is announced. Importantly, unlike the minimum capital requirements, which have to be kept even under severe economic conditions, macroprudential buffers may be used during episodes of systemic stress. In particular, macroprudential buffers are designed to ensure that banks have enough capital in a systemic event, hedging banks for dipping into their minimum capital requirements. According to the regulation, if a bank breaches the macroprudential buffers, it will automatically have to limit or stop payments of dividends or bonuses until the buffer is replenished. Although it has been widely documented that the consequence of stricter capital requirements is the adjustment of capital ratios (see Bridges et al., 2014; Gropp et al., 2018, among others), little is actually known about the effect of macroprudential measures on overall capital ratios, especially in a context in which the banks exhibit already high capital ratios ex-ante. We find that after controlling for bank and country characteristics, banks facing higher macroprudential buffers do not adapt their capital ratios accordingly.

As discussed in Bridges et. al (2014), setting a macroprudential policy regime may have different implications on the way in which banks adjust their capital ratios as compared to the microprudential requirements or requirements on a subgroup of banks. This is because contrary to microprudential requirements, macroprudential ones are transparent, publicly communicated well in advance, apply to all banks and not just to specific banks and contain information on the macroprudential policy stance.[4] Due to these specifics, the effect of macroprudential requirements might be difficult to anticipate. For instance, a system-wide increase in capital requirements might hamper the simultaneous issuance of new equity. On the other hand, a synchronised increase of capital requirements might mitigate the signalling problem associated with raising new equity. Furthermore, the banks in our sample face different capital requirements and have different business models which could lead them to adopt different strategies to optimize their capital ratios. Thus, we find that although the average capital ratios of both SII and Non-SII increase due to macroprudential requirements, the magnitude of this average increase differs across them, being much higher for Non-SII. In addition, the latter group is the only one in which banks that face higher macroprudential buffers also increase their capital ratios to a higher extent, whereas the increase associated to all SII is of a similar magnitude with independence of the specific buffer that each individual institution faces. This is consistent with Cohen and Scatigna (2016) who document for the period 2009-2012 that smaller (i.e., non-systemic) banks held higher capital ratios compared to the systemic banks. In addition, our results illustrate that the enhancement of Non-SII capital ratios is achieved through the optimization of risk weights (i.e., via the denominator of the capital ratio).

As summarised by Brei and Gambacorta (2016) and explained by Myers (1984), Marcus (1984), Berger et al. (2008), and Jokipii and Milne (2008); there are three reasons to explain a capital ratio in excess of the regulatory threshold. First, banks might stockpile capital above the requirements as a hedge against having to raise new equity on a short notice. Second, the excess capital serves as a good signal to the market and will help banks to obtain funds quickly and at a low cost in the case that the bank faces unexpected profit opportunities. Third, business models and bank size may play a significant role in explaining capital ratios. Non-SII are less diversified in terms of the

[4] Note that all banks are at least subject to one macroprudential buffer.

business model and cross-border activity and more exposed to specific shocks. Therefore, they may prefer to have capital in excess of the requirements and use this extra capital to absorb the costs associated with unexpected shocks, especially in a context such as the current one in which capital is scarce and expensive. In addition, the bailouts of SII could exacerbate their moral hazard but non-systemic or smaller banks might discount a lower expected bailout probability conditional on default and so prefer to hold larger capital ratios. In fact, according to Kim (2016), the conditional bailout probability for small banks and large banks are 35.69% and 76.20%, respectively.

The way in which RWA are optimized is fundamental to understand the effects on the real economy. Hence, although higher capital requirements enhance financial stability and make bank lending more stable over time, they could also hamper credit supply leading to a significant credit contraction.[5] Our results add to the previous literature by documenting the channel through which the enhancement of capital ratios harms credit supply: regulatory deleveraging. Our results show that those banks that aim to optimize their capital ratios through lowering RWA (i.e., Non-SII), tend to reduce the supply of credit. This reaction to capital requirements by Non-SII could have implications on overall lending in Europe and, as a consequence, on investment activity. In fact, although Non-SII are in general smaller than the other two groups of banks, they accounted for around 30% of the total stock of credit of our sample banks in December 2013.

The adjustment of RWA to improve capital ratios is consistent with the line of research that supports the idea that, under certain circumstances, capital requirement is effective in controlling risk-taking incentives (Furlong and Keeley, 1989; Rochet, 1992; Repullo, 2004; Berger and Udell, 1994; and Albertazzi and Marchetti, 2010; or De Haan and Klomp, 2012). We provide additional evidence to this strand of the literature by documenting that as a consequence of the adjustment of RWA, Non-SII substitute credit by safe assets that, at the same time, have zero risk weights: sovereign bonds and loans.

[5] See Francis and Osborne (2009), Cosimano and Hakura (2011), Hyun and Rhee (2011), Aiyar, Calomiris, and Wieladek (2014, 2016), Bridges et. al, (2014), Schoenmaker and Peek (2014), Fraisse, Lé, and Thesmar (2015), Mésonnier and Monks (2015), or De Jonghe, Dewachter, and Ongena (2016), among others.

Overall, our results suggest a trade-off between the effectiveness of macroprudential requirements in terms of financial stability and the ultimate effects on the real economy. This trade-off is more evident in a context of excessive capital buffers built up by banks which rely to a larger extent on capital either for signaling purposes, for absorbing shocks, or for their proper functioning in periods of stress. However, it may be premature to get the full picture given that the negative effect of macroprudential policies on credit in the short term could be overcome in the medium-term by a safer and sounder banking system that is able to withstand turbulences and stabilize the supply of credit through the business cycle.

2. Capital requirements overview

The ultimate objective of macroprodential policy is to prevent and mitigate systemic risks thereby contributing to financial stability. To operationalize macroprudential policy, the European Systemic Risk Board (ESRB) has identified a list of intermediate objectives and defined a set of instruments linked to each objective. The intermediate objectives aim to limit: i) excessive credit growth and leverage; ii) excessive maturity mismatch and market illiquidity; iii) direct and indirect exposure concentrations; and iv) misaligned incentives and moral hazard.

The macroprudential toolkit provides a number of instruments to enable competent or designated authorities to achieve their objective of financial stability. These can be grouped in three categories: i) capital-based measures (i.e., provisions requiring enough capital to absorb unexpected losses derived from a systemic shock); asset-based measures (i.e., direct restrictions on the quantity of credit granted based on the borrower characteristics) and liquidity-based measures (i.e., provisions requiring a steady funding level to weaken bank's dependence on short-term funding).[6] These instruments provide different degrees of national flexibility in their application. While instruments under the CRD IV are to be transposed into national law, those provided from the CRR become EU law with immediate effect.

The aim of this paper is to study the impact of the macroprudential capital-based measures in the form of capital buffers defined as CET1 over RWA. However, regulators might also require additional buffers to individual financial institutions under

[6] See ESRB (2014a, 2014b) or ECB (2016b) for further details on the macroprudential instruments.

Pillar 2 based on either a macro- or micro-prudential perspective. The analysis of these additional buffers is beyond the scope of this paper for two reasons. First, the use of Pillar 2 for macroprudential purposes is rare and not publicly disclosed, what goes against of the principles of transparency and communication which govern macroprudential regimes. Second, the impact of microprudential capital requirements has already been documented by Bridges et. al (2014) and Aiyar, Calomiris, and Wieladek (2014). However, we acknowledge that these additional capital buffers might affect the banks willingness to improve capital ratios and as a consequence we deal explicitly with these issues in a robustness check.

Figure 1 summarizes the capital requirements under the CRR/CRD IV. Firstly, the banks should maintain a minimum capital requirement defined as the CET1 over the RWA. On the top of this minimum requirement, banks should satisfy the following buffers:

- Capital conservation buffer (CCoB): Instrument under the CRR whose primary objective is to avoid breaches of minimum capital requirements during periods of stress when losses are incurred. It can be also used to address excessive credit growth and leverage; exposures concentrations; and misaligned incentives and moral hazard. It represents a buffer of up to 2.5% of a bank's total exposures and applies equally to all banks in each country. The capital used to meet this required level must be the one with the highest quality (i.e. CET1 capital). The phasing-in arrangement to reach 2.5% of RWA by 2019 is as follows: 25% (2016), 50% (2017), 75% (2018), 100% (2019), but an earlier introduction is permitted.[7]
- Countercyclical capital buffer (CCyB): Instrument envisaged in the CRD IV whose primary objective is to counter pro-cyclicality in the financial system. It is used to address excessive credit growth and leverage. It is a buffer that ranges from 0% to 2.5% of total risk exposure, but this can be set at a higher level if certain procedures are followed. The CCyB is a bank-specific requirement and its calculation is based on the weighted average of the

[7] Estonia, Italy, Luxemburg, Latvia and Slovakia adopted a fully loaded CCoB in 2014 while Cyprus, Finland and Lithuania adopted it in 2015. Portugal adopted a fully loaded CCoB in 2016 and revokes its decision in May 2016. In a similar fashion, Cyprus and Italy revokes their decision and require the transitional CCoB from January 2017 onwards.

countercyclical buffer rates set by the authorities in those countries where an institution's credit exposures are located.[8]

- Global systemically important institutions (G-SII) buffer: Instrument foreseen in the CRD IV that is applied on mandatory basis on those banks identified as G-SII. Its primary aim is to reduce the misaligned incentives and moral hazard created by the implicit state support using taxpayer money. It is a buffer that ranges from 1% to 3.5% of total risk exposure amount, depending on the degree of systemic importance of an institution. The phasing-in arrangement is as follows 25% (2016), 50% (2017), 75% (2018), 100% (2019).
- Other systemically important institutions (O-SII) buffer: Instrument under the CRD IV that enables competent or designated authorities to impose capital charges to domestically important institutions. As in the G-SII buffer, its primary aim is to reduce the misaligned incentives and moral hazard created by the expectation of implicit state support using taxpayer money. It is a buffer that ranges from 0% to 2% of total risk exposure amount, depending on the degree of systemic importance of an institution.[9] The timeline of implementation of the O-SII buffer is discretionary although a number a countries follow the same phase-in calendar as for the G-SII buffer.
- Systemic risk buffer (SyRB): Instrument under the CRD IV to mitigate structural systemic risks not addressed by the G-SII/O-SII buffers. It may be used to tackle excessive credit growth and leverage; concentration exposures and; misaligned incentives and moral hazard. Relevant authorities may decide on the scope of its application. It is a buffer of up to 5% of the total risk exposure amount, but can be set at a higher level if certain procedures are followed. The SyRB is discretionary and can be applied from January 2016 onwards. The CRD IV establishes that whenever a SyRB is applicable on the same basis as the G-SII and O-SII buffers, then the highest of the three rates

[8] By 2017-Q1 (end of our sample) only the Czech Republic, and Sweden (and, within the EEA, Norway) had set a positive CCyB rate. UK briefly set a positive rate in 2016 (which was later undone).
[9] Although the CRD IV allows this buffer to be 0%, it does not apply to the euro area since 2017 because of the introduction of floors to the O-SII buffers by the European Central Bank (see ECB, 2016).

applies. This means that the SyRB shall not be used as an "add-on" to top up the SII buffers.[10]

3. Data

The source of data on detailed bank's balance-sheet information and capital adequacy on the euro area banks used in our analysis, both at consolidated level, is SNL Financial. The sample of banks used in this paper is determined by the sample of banks that are contained in the Individual Balance Sheet Items (IBSI) dataset. IBSI contains balance-sheet information of a sample of euro area banks, which has been individually transmitted on a monthly basis from the national central banks to the ECB since July 2007. The sample of banks that form part of the IBSI dataset should fulfil any the following three criteria: i) banks should belong to the 150 "largest banks" stipulated in the ECB's Governing Council request; ii) banks should have an active participation in monetary policy operations (e.g., participation in the 3-year Long-Term Refinancing Operations or other ECB deposit facilities); iii) selected banks should ensure the representativeness of the panel at national level for lending to the non-financial private sector.[11] We use SNL Financial instead of IBSI information to ensure the same consolidation criteria on the balance-sheet and the capital adequacy information, which is only available at consolidated basis.

Our final sample consists of 144 banks with available information in SNL Financial at 2013-Q4 and 2017-Q1.[12] Our sample consists not only of parent institutions but also includes national and foreign subsidiaries and foreign branches operating in a given country. Note that, as described in Section 2, all these institutions are at least subject to the CCoB. Furthermore, the inclusion of foreign branches and subsidiaries adds additional variability to the macroprudential capital requirements at country level as while foreign branches are subject to the CCoB of their home country, foreign subsidiaries are subject to the one set by the authority of the host country. The distribution of the number of banks by country and category are summarised in Table 1.

[10] Where an authority sets the SyRB only to domestic exposures, it should be cumulative with the G-SII or the O-SII buffer.
[11] See Bojaruniec and Morandi (2015) for further details.
[12] A total of 179 banks contained in the IBSI dataset are not used in our analysis because of the lack of information on several variables of interest used in our analysis or the lack of information on capital ratios in SNL Financial.

Our sample consists of banks domiciled in 17 countries of the euro area, with Germany (27), Italy (18), Spain (16) and France (19) being the countries with the higher number of banks in the sample. These four countries combined account for more than 50% of the banks in the sample. The table also summarises the bank category in terms of their systemic treatment as of 2017-Q1. Importantly, the category O-SII includes those banks with either a positive O-SII buffer or a positive SyRB buffer.[13] Our sample consists of 7 G-SII (of which three have headquarters in France and one in Germany, Italy, the Netherlands, and Spain).[14] Our sample also includes a total of 37 O-SII as of 2017-Q1 whereas the remaining 100 banks are classified in the category Non-SII. All countries, with the exception of Estonia, in which all the institutions in the sample are O-SII, have at least one Non-SII.

[Insert Table 1 here]

Table 2 summarizes the average change in the CET1 ratio requirements faced by the banks in each country and category between 2013-Q4 and 2017-Q1. Within each country, we observe that due to the systemic capital buffers, the increase in CET1 ratio requirements faced by G-SII and O-SII are, on average, similar and both higher than the ones faced by Non-SII. The capital requirements differ not only among the three categories of banks but also across countries. Thus, the capital requirement faced by the Non-SII is 1.25% in those countries that used a progressive adjustment of the CCoB. However, the requirements are much higher in those countries that did not adjust those buffers progressively but did so all at once. The difference in the adjustment process also leads to differences across countries within the G-SII or the O-SII categories. In addition, in the latter group of institutions, the dispersion is even higher because contrary to the G-SII buffer, the O-SII buffer is set at national discretion.

[Insert Table 2 here]

Based on the differences in terms of capital requirements faced by the different groups of institutions and the dispersion across countries, we depict in Figure 2 the changes in capital ratios and the changes in the numerator and denominator of these

[13] This definition does not consider as O-SIIs those institutions designated as O-SIIs by the competent or designated authority but with an O-SII buffer equal to cero.

[14] Only one of the G-SIIs in the euro area at that date is not considered in our analysis because the information on the capital held by Groupe BPCE is not available at a consolidated level.

ratios for each group. The change in capital ratios varies considerably among the three bank categories. For instance, G-SII do not alter their capital ratios probably due to the better diversification. The group of O-SII enhance their capital ratio to a higher extent than G-SII but less than Non-SII. The average change in the CET1 capital ratio of Non-SII is around 2.5 percentage points, well above the requirements summarised in Table 2.

For a better understanding of whether banks enhance their capital ratios through the recapitalization or the optimization of RWA, we depict the change in the ratio of RWA over total assets and CET1 over total assets in the adjacent figures. The adjustment through the numerator seems to be negligible and the improvements in capital ratios of O-SII and Non-SII seem to have been done through the denominator. However, the fact that the RWA over total assets diminishes for the two previous groups of banks could be due to a decrease in total assets and not necessarily to the lower risk weights.

The evidence shown in Figure 2 is unconditional on other bank characteristics that could explain this pattern. For this reason, in the next section we perform several regression analyses in which we study the effect of macroprudential capital requirements by category of banks on the capital ratios conditional on other bank characteristics that are summarised in Table 3. One feature of the banks in our sample that is very relevant in the interpretation of the later regression analyses is the level of the CET1 capital ratio. The average capital ratios in 2013-Q4 for G-SII, O-SII and Non-SII are equal to 11.4%, 14.9%, and 13.2%, respectively. All these figures are well above the minimum capital requirement faced by G-SII, O-SII, and Non-SII not only at the beginning but also at the end of our sample period (6.5%, 6.8%, and 5.8%, respectively). In fact, the 10th percentile of the three bank groups (10%, 10.7%, and 8.6%, respectively) is above that figure. It suggests that there is no urgency on the part of the banks in our sample to increase their CET1 capital ratios to comply with the macroprudential buffers. Given that this variable is the target of macroprudential requirements we use an alternative measure of banks' financial situation in the later regression analyses: Tier 1 capital over total assets. Non-SII exhibit the higher ratio followed by O-SII and G-SII.

[Insert Table 3 here]

G-SII are the largest banks; their size is around 7.2 times (15.5) times larger than that of O-SII (Non-SII). In fact, the size is one of the dimensions used to classify banks as systemic, jointly with their interconnectedness, substitutability, complexity, and cross-jurisdictional activity. In terms of ROA, the group of O-SII is, on average, the most profitable. Both O-SII and G-SII exhibit a similar average proportion of NPL but this ratio is much higher in the case of Non-SII. This could be due to several individual institutions given that the differences are much lower if one attends to the median.

Lastly, Table 4 reports the country information available in 2013-Q4 relative to the annual change of the GDP growth and the sovereign CDS 5-year maturity. We observe a high degree of heterogeneity in terms of country characteristics.

[Insert Table 4 here]

4. Macroprudential buffers and the CET1 capital ratio

In this section we first study whether banks adjust their capital ratio to the macroprudential capital requirements and to what extend they do so. We next conduct the same analysis by splitting the banks in different categories according to their level of systemic importance (i.e., G-SII, O-SII, and Non-SII).

To study the effect of macroprudential requirements on the banks capital ratios, we first perform a regression analysis in which the dependent variable ($\Delta CET1_{bc}$) is the variation in each bank b CET1 ratio from December 2013 to March 2017 and it is regressed on the capital buffers applied to each specific bank during the same time period (MPB_b). We also use a set of control variables at bank level ($ControlVar_b$) that include: the leverage measured as Tier 1 capital over total assets, the profitability (ROA), and the ratio of non-performing loans over total loans and use three dummy variables indicating whether the bank is a G-SII, an O-SII or a Non-SII (α_{b-SII}). Note that the dummy variables indicating the bank's systemic importance can be considered as proxies for the size among other dimensions reflecting the complexity and the importance of the bank for the financial system. In addition, we include two control variables at country level ($CControlVar_c$) to deal with the economic situation: GDP growth and 5-year sovereign CDS spread. All the control variables are defined according to their values as of December 2013:

$$\Delta CET1_{bc} = \alpha_{b-SII} + \beta MPB_b + \gamma BControlVar_b + \delta CControlVar_c + \varepsilon_{bc} \qquad (1)$$

where the coefficient of interest β indicates the variation in banks CET1 capital ratio given an increase of 1% in macro prudential buffers. The standard errors are robust to heteroskedasticity.

The proposed regression analysis is based on a cross-section instead of a panel. The reason supporting this model is that buffers were publicly announced well in advance, and thus, banks may opt for very different strategies to accommodate the new requirements. These strategies range from not modifying their current ratios since they already satisfy the requirements in 2013-Q4 to the adjustment of the ratios either smoothly or abruptly.

Results are reported in column (1) of Table 5. We observe that although β is positive, it is not statistically different from zero. It implies that banks facing higher macroprudential buffers do not adapt their capital ratios accordingly. One potential explanation for this is that the capital ratios were above the ones required and as consequence; there was no need for an immediate adjustment. This and the differences of macroprudential policies and standard capital requirements could explain that, on average, banks appear not to react to macroprudential requirements.

[Insert Table 5 here]

However, the banks used in the previous analysis are very diverse and in fact, as it was previously described, they are exposed to different macroprudential buffers depending on whether they are considered as G-SII, O-SII or Non-SII. In addition, the business models of these three types of banks vary substantially, which in the end is reflected in the degree of diversification and also on the tools available to enhance their capital ratios. For this reason, we split the sample of banks in three groups according to the previous definition and interact the variable of interest (i.e., macroprudential buffers) with the dummy that defines each of the three types of banks. The following regression helps us disentangle whether the banks react differently to capital requirements:

$$\Delta CET1_{bc} = \alpha_{b-SII} + \beta_1 MPB_b xGSII_b + \beta_2 MPB_b xOSII_b + \beta_3 MPB_b xNon - SII_b + \gamma BControlVar_b + \delta CControlVar_c + \varepsilon_{bc} \quad (2)$$

where *G-SII*, *O-SII*, and *Non-SII* indicate the type of bank according to its systemic treatment.[15] The results are reported in column (2) of Table 5. We observe that banks do not respond to the same extent to the new macroprudential buffers. In fact, the only banks that increase their capital ratios given a higher buffer within a given systemic category are the ones in the category Non-SII. More specifically, an increase of 1 percentage point (pp) in the capital requirements to these smaller banks leads to an increase of 2.5 pp in the CET1 capital ratio. In fact, coefficient β_3 is statistically significantly higher than 1, which indicates that the increase of the capital ratio is significantly higher than the one required by macroprudential policies. This overreaction to macroprudential buffers could be explained by the lower diversification of this type of banks which makes them more exposed to specific shocks. Thus, those banks could prefer to have capital in excess of the requirements and use these buffers to absorb the costs associated to these unexpected shocks, especially in a context as the current one in which the capital is scarce and expensive. In addition, they could use capital ratios as a signal to the market that could help them to obtain funds quickly and a low cost in case the bank faces unexpected profit opportunities. Finally, the bailouts of large banks could exacerbate their moral hazard but Non-SII, which are usually smaller, might discount a lower expected bailout probability conditional on default and so, prefer larger capital buffers.

The previous results are indicative that within each group of banks, only Non-SII increase their capital accordingly to the buffers they face. However, it does not imply that the other two groups of banks do not react to macroprudential buffers and keep their capital ratio unchanged. For a better understanding of the average reaction within each group of banks and the specific reaction to different macroprudential buffers within each group, we propose the following variation of equation (2):

[15] We consider as O-SII those classified as such by the competent or designated authorities but with a positive buffer. Thus, even when an authority classifies a financial institution as an O-SII, it is not treated as such in our analysis if the O-SII buffer is zero. However, similar results are obtained when we classify as O-SII those that are designated as such by the competent or designated authority, independently on whether the O-SII buffer is positive or zero.

$$
\begin{aligned}
\Delta CET1_{bc} = {} & \omega_1 \text{Avg MPB}_{\text{G-SII}} xGSII_b + \omega_2 \text{Avg MPB}_{\text{O-SII}} xOSII_b \\
& + \omega_3 \text{Avg MPB}_{\text{Non-SII}} xNon-SII_b + \beta_1 \text{Excess MPB}_{\text{G-SII},b} xGSII_b \\
& + \beta_2 \text{Excess MPB}_{\text{O-SII},b} xOSII_b \\
& + \beta_3 \text{Excess MPB}_{\text{Non-SII},b} xNon-SII_b + \gamma BControlVar_b \\
& + \delta CControlVar_c + \varepsilon_{bc}
\end{aligned} \tag{3}
$$

where $\text{Avg MPB}_{\text{G-SII}}$, $\text{Avg MPB}_{\text{O-SII}}$, and $\text{Avg MPB}_{\text{Non-SII}}$ are the average macroprudential buffers faced by G-SII, O-SII, and Non-SII, respectively. Coefficients ω_1, ω_2, and ω_3 can be interpreted as the average variation in the CET1 ratio given a 1 pp increase in the macroprudential buffers faced by each of the three previous types of banks. $\text{Excess MPB}_{\text{O-SII},b} xOSII_b$, $\text{Excess MPB}_{\text{O-SII},b} xOSII_b$, and $\text{Excess MPB}_{\text{O-SII},b} xOSII_b$ refer to the buffers faced by a given bank b in excess of the average buffers faced by the banks in each group. Thus, coefficients β_1, β_2, and β_3 are equivalent to the analogous coefficients in equation (2). The estimated coefficients are reported in column (3) of Table 5.

Consistently with Figure 2, we find that the average capital ratios of the three types of institutions increase due to macroprudential requirements but to a different extent. For instance, given an average macroprudential buffer of 1 pp, the average capital ratio of G-SII (O-SII) exhibits an increase of 0.3 pp (0.8 pp). A buffer of a similar magnitude leads to an average increase much larger for the case of Non-SII (1.7 pp), which is also significantly higher than the buffer (1 pp). In addition, the latter group of banks is the only one in which banks that face higher macroprudential buffers also increase their capital ratios to a higher extent.

We recall that the group of G-SII consists of seven banks and that G-SII may be designated as O-SII since these designations are the outcome of independent processes. That is, while the G-SII are designated by the Financial Stability Board (FSB) – an international body that monitors and makes recommendations about the global financial system – O-SII are designated by the competent or designated national authority. From a capital requirements perspective, SII have to hold the highest of the three buffers designed to be applied on SII: SyRB, G-SIIB and O-SIIB; and so, the fundamental distinction arises between SII and non-SII institutions. For this reason, in the subsequent analyses we consider just one category of SII independently on whether they are G-SII or O-SII. We first estimate the analogous table to Table 5 which is obtained from the estimation of the corresponding regression analyses but with just two groups of banks SII (i.e., both G-SII and O-SII) and Non-SII.

The results are contained Table 6. The coefficients for the new group of systemic institutions (SII) reported in columns (2) and (3) are similar to those obtained for the group of O-SII given the higher number of banks within this category as compared to the G-SII category. The coefficients for the group of Non-SII are very similar to those reported in Table 5 and support the overreaction of this type of financial institutions to macroprudential buffers.

[Insert Table 6 here]

5. Capital ratio adjustments and asset reallocation

5.1. How do banks improve their capital ratios?

We next study how Non-SII improve their CET1 ratio to be compliant with the macroprudential buffers. They can achieve this goal by adjusting capital ratios through recapitalizing (i.e., increasing core equity capital), de-risking (i.e., reducing risk-weighted assets), or deleveraging (i.e., decreasing total assets). For a better understanding of this issue, we split the CET1 ratio in its two components relative to total assets and perform for each of them the following regression to study their variation between December 2013 and March 2017:

$$\begin{aligned}\Delta CET1\_Comp_{bc} &= \alpha_{b-SII} + \beta_1 MPBuffer_b x SII_b \\ &+ \beta_2 MPBuffer_b x Non-SII_b + \gamma BControlVar_b \\ &+ \delta CControlVar_c + \varepsilon_{bc}\end{aligned} \tag{4}$$

where *CET1_Comp*, which refers to the specific CET1 ratio component, denotes the use of either the CET1 relative to total assets (column (2) of Table 7) or the RWA relative to total assets (column (3) of Table 7). We find that the CET1 relative to total assets has not suffered significant changes in response to regulatory requirements in any of the two types of banks. However, both SII and Non-SII attempt to optimize the ratio of RWA over total assets. Taken together with the results reported in column (2) of Table 6, which are contained in column (1) of Table 7 for comparability reasons, it suggests that the only significant effect of capital requirements on the CET1 ratio takes place through the optimization of the RWA in the case of Non-SII.

[Insert Table 7 here]

The enhancement of the capital ratio via the denominator could be done either through a decrease in bank total assets or through the optimization of the risk weights. To analyze if there is also an adjustment through total assets, we repeat the analysis in equation (4) using as the dependent variable the change in the logarithm of total assets between December 2013 and March 2017. Results are reported in column (4) of Table 7 and confirm that there is not a significant variation in the bank total assets of Non-SII, confirming that the enhancement in capital ratios is through a de-risking strategy. This analysis also helps us to shed more light on the non-significant effect of macroprudential buffers on the capital ratio of SII in spite of the decrease in their ratio of RWA over total assets. We find that the decrease observed in the ratio of RWA over total assets is due to the increase of total assets.

The higher capital ratio of Non-SII obtained through an optimization of RWA could have implications for their lending and investment policies that could ultimately affect the real economy in case banks cut lending to invest instead in assets subject to lower risk weights. To study how lending and investment policies are affected by this de-risking strategy, we predict from equation (4) the change in RWA over total assets that is due to the macroprudential requirements. Particularly, for each group of banks we predict the change in their RWA over total assets ratio due to macroprudential requirements multiplying coefficient β_1 and β_2 times the values corresponding to the capital buffers applied to each specific bank depending on the type of bank and country in which it operates. Given that the capital buffers are always positive and that the coefficients are negative, the product of the two would indicate the decrease in RWA over total assets given an increase of 1pp in capital buffers. For a proper interpretation of the results in the next stage, we multiply the predicted changes by minus one and interpret it as the effort in adjusting RWA due to regulation and use it as a regressor in the next section to explain the variation in credit, non-performing loans, and exposure to sovereign sector by the different banks depending on their effort to comply with capital requirements.

5.2. RWA optimization and asset reallocation

To study the effect of the effort to enhance capital ratios through the optimization of RWA on bank lending activity, we regress the variation in loans over total assets on the predicted regressor (described in Section 5.1), *RWA_Ind*, which measures the change in RWA over total assets induced by the macroprudential requirements tackled by each individual bank (recall that a positive value of the variable indicates that the bank incurs in an effort to diminish its RWA) and several controls according to the following specification:

$$\Delta Loan\_TA_{bc} = \alpha_{b-SII} + \beta_1 \Delta RWA\_Ind_b x SII_b + \beta_2 \Delta RWA\_Ind_b x Non-SII_b \qquad (5)$$
$$+ \gamma BControlVar_b + \delta CControlVar_c + \varepsilon_{bc}$$

where $\Delta Loan\_TA$ refers to the variation in the ratio of bank b loans over total assets between December 2013 and March 2017. Results are reported in column (1) of Table 8. We observe that Non-SII, which diminish their RWA to a higher extent to comply with macroprudential requirements, reduce their lending to a higher extent. In a context of low, even negative, interest rates; the lower profitability obtained from their loan portfolio could affect ultimately the capacity of this group of banks to further build capital organically through the profits obtained from their lending. In this scenario, banks aiming to increase their capital ratios could opt by a change in the structure of their balance and cut lending to enhance the quality of their capital through the purchase of safe assets such as sovereign debt.

[Insert Table 8 here]

Therefore, for a better understanding of banks' efforts to improve capital ratios by reducing lending, we try to study whether the funds that are not dedicated to lending are used for increasing their exposure to safe assets. More specifically, we focus on those assets that could benefit from zero risk weights: exposures to sovereign bonds and loans. Exposures to the sovereigns are not available in SNL Financial and so, we use the information in the IBSI dataset. To overcome the mismatch of the consolidation level, we aggregate the expositions of all institutions belonging to the same group available in the dataset. The IBSI dataset contains information on the holdings of sovereign debt and the loans granted to central governments in the euro area whose risk weight is equal to zero. These assets could help banks to improve capital ratios but they could crowd out credit. We extend the regression in equation (5) using as the dependent variable the variation in the exposure to the sovereign sector relative to total assets ($\Delta SovDebt\_TA_b$):

$$\begin{aligned}\Delta SovDebt\_TA_b \\ &= \alpha_{b-SII} + \beta_1 \Delta RWA\_Ind_b xSII_b \\ &+ \beta_2 \Delta RWA\_Ind_b xNon - SII_b + \gamma BControlVar_b \\ &+ \delta CControlVar_c + \varepsilon_{bc}\end{aligned} \tag{6}$$

The dependent variable is the total exposure of a given bank b to euro area central governments relative to its total assets and the corresponding results are contained in column (2) of Table 8. The results are consistent with a preference by Non-SII towards those assets with zero risk weights. The preference towards sovereign debt, both domestic and foreign, casts about the necessity of having zero risk weight assets to help banks to comply with macroprudential requirements. In this respect, the advent of a safe asset in Europe could offer a valuable tool for banks to optimize their capital ratios when needed at a relatively low cost.

6. Robustness tests

In this section we conduct a series of additional checks to support the robustness of our results. We first deal with the potential mechanic adjustment in the RWA due to the migration from a Standardised approach (SA) to an Internal Ratings-Based (IRB) approach. We next account for the requirements of additional buffers in the context of the Pillar 2. Then, we investigate whether the previously documented increase in the CET1 capital ratio could be explained not only by the macroprudential buffers but also by the stricter definition of capital introduced by the CRR/CRD IV.

6.1. Dealing with the IRB and Standardised Approaches

The estimation of the RWA is conducted through either the Standardised or the IRB approaches. The adoption of the IRB approach could help banks to optimize their RWA decreasing the capital needs to cover their expositions (see Pérez Montes et al., 2016). In fact, Non-SII are the natural candidates to migrate from a Standardised to an IRB approach and to optimize their capital ratios thanks to the adoption of the latter approach. Thus, the previously documented changes in RWA could be due to the migration from SA to IRB.

We deal with this issue performing a regression analysis based on a variation of equation (4). In particular, we conduct this analysis on a subsample of banks for which we have information on the density of RWA which is defined as the ratio of RWA to total credit risk exposure measured at 2013-Q4 (i.e., the beginning of our sample period). Column (1) of Table 9 reports the results obtained from the baseline estimation of equation (4) (column (3) of Table 7) for comparability.

[Insert Table 9 here]

In column (2) we include as an additional regressor the density of RWA to deal with the role of the two approaches. The implicit assumption is that banks with higher density are more likely to migrate from SA to the IRB approach. Our results still confirm the significant role of macroprudential requirements on the enhancement of capital ratios by Non-SII and support the hypothesis that the rebalancing in the banks' portfolios is driven by the macroprudential policies. Interestingly, the density of RWA performs a negative and significant effect, suggesting that those banks who optimised their RWA to a lower extent at the beginning of the sample period (i.e., higher density at December 2013) are ones that exhibit a higher decrease in their RWA over total assets.

6.2. Dealing with additional buffers under Pillar 2

Besides macroprudential buffers, regulators might require additional buffers under Pillar 2 (supervisory review) based on either a macro- or micro-prudential perspective. Although the use of Pillar 2 for macroprudential purposes is rare and not publicly disclosed, these capital buffers might also affect the banks willingness to improve capital ratios. To deal with this issue, we estimate a variation of equation (2) for two groups of banks (i.e., SII and Non-SII) in which we account for any additional capital requirement requested in the context of Pillar 2. More especially, we include a dummy variable that takes value one for those countries with an active macroprudential use of Pillar 2. The results are reported in column (2) of Table 10 and are very similar to those obtained under the baseline specification, reported in column (1).

[Insert Table 10 here]

In addition, further capital requirements in the context of a microprudential use of Pillar 2 are expected to be required to those individual institutions with a low CET1 capital ratio under an adverse scenario in the stress testing exercise. So, banks in that situation are likely to be required to implement these buffers. To further confirm that the enhancement of the capital ratio by Non-SII is due to the macroprudential buffers and not to the use of Pillar 2, we perform a new variation of equation (2) in which we include the CET1 ratio under the adverse scenario estimated in the EU-wide stress testing 2014 (*CET1 Adverse*). Results are reported in column (3) of Table 10. The variable *CET1 Adverse* is not statistically different from zero and the effect of the macroprudential buffers on the CET1 capital ratio is statistically significant for the group of Non-SII. .

6.3. Dealing with the quality of CET1

The CRR/CRD IV introduced a stricter definition of the capital that can be used to absorb unexpected shocks, and thus, to fulfil capital ratios. In this context, the previously documented increase in CET1 capital ratios could be explained not only by the macroprudential buffers but also by the quality of capital. To disentangle the effect of macroprudential policies from that associated to the quality of capital, we first focus on those banks for which the stricter quality of capital ratios is not an issue. Thus, we first perform the analysis for a subsample of 65 banks for which the CET1 ratio is equal to the Tier 1 capital ratio at 2013Q4 and so, the increases in the quality of capital would not be binding. If the CET1 ratio is exactly equal to the Tier 1, then the new capital quality requirements would not affect to these banks capital ratios. Results are reported in column (1) of Table 11. The results confirm that macroprudential requirements solely affect the CET1 ratio of Non-SII.

[Insert Table 11 here]

In columns (2) – (4) we deal with alternative distances between the CET1 and Tier 1 ratios. Thus, in columns (2) and (3) we include those banks for which the difference between their Tier 1 and CET1 capital ratios is equal or lower to 0.25 and 0.5 pp, respectively, whereas in column (4) we include all the banks. Independently on the difference between the two capital ratios, the results are consistent with those obtained under the stricter analysis (i.e., column (1)).

7. Conclusions

This paper analyses banks' responses to the increase in capital requirements as part of the macroprudential policy toolkit that was established to enhance the resilience of the financial system and to limit the build-up of vulnerabilities. Given that the sample of banks is very diverse and not all of them internalize the concept of capital buffers in the same way, we split banks depending on their degree of systemic importance. We document that although the average capital ratios of both SII and Non-SII increase due to macroprudential requirements, the magnitude of this average increase differs across them, being much higher for Non-SII. In addition, the latter group is the only one in which banks that face higher macroprudential buffers also increase their capital ratios to a higher extent. In fact, the increase in capital ratios of Non-SII is significantly higher than the one required by macroprudential policies.

This last group of banks enhance their capital ratio through the optimization of risk weights. To understand the consequences of this de-risking strategy for enhancing capital ratios, we elaborate on its effects on the bank credit supply and its investments. Thus, we find that the RWA optimization conducted by Non-SII leads to a decrease in their credit supply. Non-SII substitute credit for safe assets subject to zero risk weights (i.e., sovereign bonds and loans).

These results suggest a trade-off between the effectiveness of macroprudential requirements with regard to financial stability and the ultimate effects on the real economy. This trade-off is more evident in a context of excessive capital buffers built by banks that depend to a larger extent on capital for signaling purposes for absorbing shocks, or for their proper functioning in periods of stress. In addition, our results contribute to the debate on the magnitude of the "optimal" macroprudential requirements for the SII. Our results suggest that increases of capital requirements to those institutions are not necessarily translated into variations of capital ratios of the same magnitude.

However, it may be too early to be able to see the full picture given that the negative effect of macroprudential policies on credit in the short term could be overcome in the medium-term by a safer and sounder banking system, able to withstand turbulences and to stabilize the credit supply through the upturns and downturns of the business cycles.

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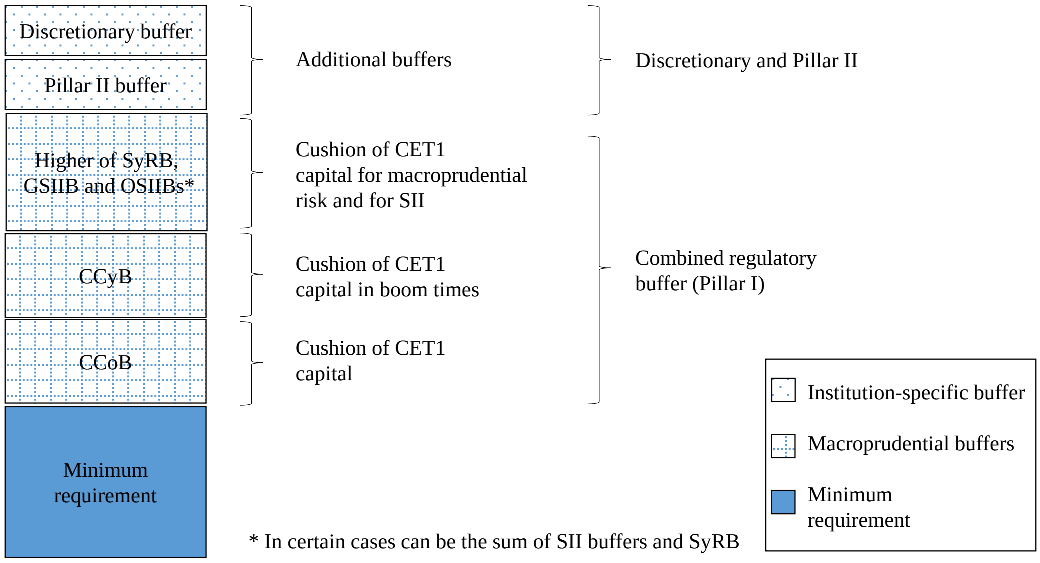
Figures

Figure 1: CRR/CRD IV Capital Requirements Overview



Source: ESRB (2014a)

Figure 2: Changes in CET1 ratio and its components

This figure illustrates the distribution of the changes in the CET1 ratio, CET1 to total assets and RWA to total assets between December 2013 and March 2017. The mean is denoted by a circle whereas the median, the 25th, and the 75th percentiles are denoted by the three corresponding horizontal lines in each box. The 10th and 90th percentiles correspond to the lines in the two extremes.

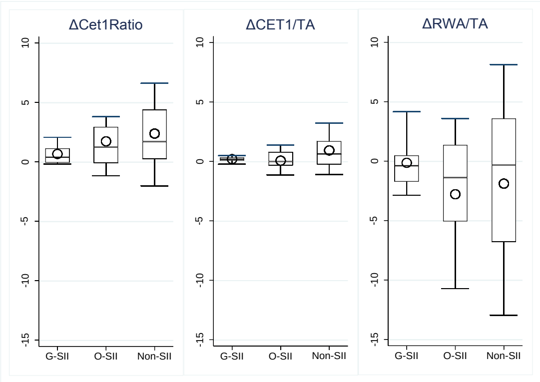


Table 1: Number of banks by country and category

This table summarizes the distribution of the number of banks used in our analysis according the country in which they operate and their category (i.e., G-SII, O-SII, and Non-SII).

Country	# Total	# G-SII	# O-SII	# Non-SII
Austria	9	0	6	3
Belgium	5	0	4	1
Cyprus	3	0	0	3
Estonia	2	0	2	0
Finland	6	0	2	4
France	19	3	1	15
Germany	27	1	10	16
Greece	4	0	0	4
Ireland	8	0	0	8
Italy	18	1	0	17
Latvia	2	0	0	2
Malta	4	0	2	2
Netherlands	6	1	3	2
Portugal	4	0	0	4
Slovakia	4	0	3	1
Slovenia	7	0	0	7
Spain	16	1	4	11

Table 2: Macroprudential capital requirements up to 2017Q1

This table summarizes the average change in the CET1 ratio requirements faced by the banks in each country and category between 2013Q4 and 2017Q1.

Country	# G-SII	# O-SII	# Non-SII
Austria		1.75	1.25
Belgium		2.00	1.25
Cyprus			1.25
Estonia		5.50	
Finland		3.75	2.50
France	1.92	1.38	1.25
Germany	2.25	1.55	1.25
Greece			1.25
Ireland			1.25
Italy	1.75		1.25
Latvia			2.50
Malta		2.13	1.25
Netherlands	2.75	2.42	1.25
Portugal			1.25
Slovakia		4.50	2.50
Slovenia			1.25
Spain	1.75	1.44	1.25

Table 3: Descriptive statistics of banks characteristics by category of banks

This table contains descriptive statistics (mean, median, standard deviation, 10th percentile and 90th percentile) as of 2013-Q4 of the banks characteristics that are used as explanatory variables in the later econometric analysis for each group of banks.

	Units	Mean	Median	SD	P10	P90
Panel A: G-SII						
CET1 Ratio	%	11.44	11.71	0.92	9.96	12.83
Tier1/TA	%	4.01	3.97	1.24	2.16	5.53
Size	Millions €	1,269,168	1,214,193	393,165	787,566	1,810,522
ROAA	%	-0.01	0.19	0.69	-1.55	0.44
NPL ratio	%	5.94	5.97	2.62	2.83	10.41
Panel B: O-SII						
CET1 Ratio	%	14.87	13.50	6.12	10.66	19.08
Tier1/TA	%	6.10	5.33	3.53	3.01	9.40
Size	Millions €	175,691	147,324	170,111	8,932	385,398
ROAA	%	0.41	0.33	0.71	-0.03	1.19
NPL ratio	%	5.71	4.10	4.77	1.01	11.72
Panel C: Non-SII						
CET1 Ratio	%	13.15	11.97	4.47	8.61	18.74
Tier1/TA	%	8.83	5.44	26.34	2.97	10.14
Size	Millions €	81,824	38,206	127,919	4,932	215,264
ROAA	%	-0.28	0.14	1.78	-1.65	0.80
NPL ratio	%	10.83	6.71	11.93	1.57	29.68

Table 4: Country characteristics

This table contains the real GDP growth and the 5-year CDS spread for each country with banks in our sample at the beginning of the sample period (December 2013).

	Real GDP Growth (2013)	CDS 5y (2013)
Austria	0	37.37
Belgium	0.2	47.28
Cyprus	-5.9	838.89
Estonia	1.9	62.24
Finland	-0.8	22.51
France	0.6	53.73
Germany	0.5	25.49
Greece	-3.2	627.35
Ireland	1.6	119.68
Italy	-1.7	167.15
Latvia	2.6	114.91
Malta	4.6	208.36
Netherlands	-0.2	36.77
Portugal	-1.1	344.25
Slovakia	1.5	83.61
Slovenia	-1.1	233.12
Spain	-1.7	152.96

Table 5: Macro prudential buffers and the CET1 capital ratio I

Column (1) of this table contains the results obtained from the regression analysis summarised in equation (1) in which we regress the variation in each bank CET1 ratio from December 2013 to March 2017 on the capital buffers applied to each specific bank during the same period (MPB) and a series of bank and country control variables. All the control variables are defined according to their values as of December 2013. In column (2) we report the results obtained from the estimation of equation (2) in which we split the sample of banks in three groups (i.e., G-SII, O-SII, and Non-SII) and interact the dummy denoting each of these groups with MPB. In column (3) we report the coefficients obtained from the estimation of equation (3) in which the macroprudential buffers enter as (i) the average buffers faced by G-SII, O-SII, and Non-SII (AvgMPB) and (ii) the buffers faced by each bank *b* in excess of the average buffers faced by the banks in that group (ExcessMPB). Standard errors, in brackets, are robust to heteroskedasticity. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Variables	ΔCET1 Ratio	ΔCET1 Ratio	ΔCET1 Ratio
MPB	0.426		
	[0.339]		
G-SII x MPB		0.093	
		[0.822]	
O-SII x MPB		0.108	
		[0.312]	
Non-SII x MPB		2.533**	
		[1.008]	
G-SII x Excess $MPB_{G\text{-}SII}$			0.093
			[0.822]
O-SII x Excess $MPB_{O\text{-}SII}$			0.108
			[0.312]
Non-SII x Excess $MPB_{Non\text{-}SII}$			2.533**
			[1.008]
G-SII x Avg. $MPB_{G\text{-}SII}$			0.314*
			[0.189]
O-SII x Avg. $MPB_{O\text{-}SII}$			0.821***
			[0.237]
Non-SII x Avg. $MPB_{Non\text{-}SII}$			1.713***
			[0.438]
Bank Control Variables	Yes	Yes	Yes
Country Control Variables	Yes	Yes	Yes
Bank Type Dummy Variables	Yes	Yes	-
Observations	144	144	144
R-squared	0.083	0.314	0.314

Table 6: Macro prudential buffers and the CET1 capital ratio II

Column (1) of this table contains the results obtained from the regression analysis summarised in equation (1) based on two groups of banks (i.e., SII and Non-SII) in which we regress the variation in each bank CET1 ratio from December 2013 to March 2017 on the capital buffers applied to each specific bank during the same period (MPB) and a series of bank and country control variables. All the control variables are defined according to their values as of December 2013. In column (2) we report the results obtained from the estimation of equation (2) in which we split the sample of banks in two groups (i.e., SII and Non-SII) and interact the dummy denoting each of these groups with MPB. In column (3) we report the coefficients obtained from the estimation of equation (3) for two groups of banks in which the macroprudential buffers enter as (i) the average buffers faced by SII and Non-SII (AvgMPB) and (ii) the buffers faced by each bank *b* in excess of the average buffers faced by the banks in that group (ExcessMPB). Standard errors, in brackets, are robust to heteroskedasticity. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1) ΔCET1 Ratio	(2) ΔCET1 Ratio	(3) ΔCET1 Ratio
MPB	0.447		
	[0.332]		
SII x MPB		0.137	
		[0.301]	
Non-SII x MPB		2.517**	
		[1.007]	
SII x Excess MPB_{SII}			0.137
			[0.301]
Non-SII x Excess $MPB_{Non\text{-}SII}$			2.517**
			[1.007]
SII x Avg. MPB_{SII}			0.741***
			[0.214]
Non-SII x Avg. $MPB_{Non\text{-}SII}$			1.705***
			[0.434]
Bank Control Variables	Yes	Yes	Yes
Country Control Variables	Yes	Yes	Yes
Bank Type Dummy Variables	Yes	Yes	-
Observations	144	144	144
R-squared	0.083	0.310	0.310

Table 7: Macro prudential buffers and capital ratio adjustments

The results reported in this table aim to provide evidence on the way in which the banks improve their capital ratios. Columns (2) and (3) of Table 7 report the results obtained from the estimation of equation (4) that represent a variation of equation (2), whose results are reported in columns (1), in which the dependent variables are the CET1 and the RWA over total assets, respectively. In column (4) we report the results obtained when the dependent variable is the percentage change in total assets. Standard errors, in brackets, are robust to heteroskedasticity. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1) ΔCET1 Ratio	(2) ΔCET1/TA	(3) ΔRWA/TA	(4) Δlog(TA)
SII x MPB	0.137	-0.287	-1.500**	0.057**
	[0.301]	[0.194]	[0.704]	[0.022]
Non-SII x MPB	2.517**	-0.261	-3.670*	0.022
	[1.007]	[0.829]	[2.068]	[0.082]
Bank Control Variables	Yes	Yes	Yes	Yes
Country Control Variables	Yes	Yes	Yes	Yes
Bank Type Dummy Variables	Yes	Yes	Yes	Yes
Observations	144	144	144	144
R-squared	0.310	0.160	0.097	0.091

Table 8: RWA optimization and asset reallocation

Column (1) of this table reports the results obtained from the estimation of equation (5) in which the dependent variable is the variation in the ratio of bank's loans over total assets between December 2013 and March 2017. Column (2) reports the results obtained from the estimation of equation (6) in which the dependent variable is the variation in the exposure to central governments in the euro area between December 2013 and March 2017 relative to total assets. To study the effect of the effort to enhance capital ratios through the optimization of RWA on the bank lending activity (column (1)) and the holdings of sovereign bonds (column (2)), we regress the dependent variables on a predicted regressor (ΔRWA_Ind) that measures the changes in RWA over total assets induced by the macroprudential requirements that the bank faces and the same control variables used in the baseline specification. A positive value of ΔRWA_Ind indicates that the bank incurs in an effort to diminish its RWA. Standard errors, in brackets, are robust to heteroskedasticity. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1) ΔLoan/TA	(2) ΔGovExp
SII x ΔRWA_Ind	-0.646	0.017
	[0.694]	[0.722]
Non-SII x ΔRWA_Ind	-1.299***	1.735***
	[0.437]	[0.574]
Bank Control Variables	Yes	Yes
Country Control Variables	Yes	Yes
Bank Type Dummy Variables	Yes	Yes
Observations	144	144
R-squared	0.212	0.108

Table 9: RWA adjustment and the estimation model

This table reports the reported in column (1) correspond to the baseline specification (column (3) of Table 7). In column (2) we report the results obtained when we include as an additional regressor in equation (4) the density of RWA which is defined as the ratio of RWA to total credit risk results obtained from a variation of equation (4) in which we deal with the potential effect of the estimation method (i.e., standardised vs. internal rating based approaches) on the computation of RWA. Results exposure measured at 2013-Q4. Standard errors, in brackets, are robust to heteroskedasticity. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(3)
Variables	ΔRWA/TA	ΔRWA/TA
SII x MPB	-1.500**	-0.130
	[0.704]	[1.379]
Non-SII x MPB	-3.670*	-2.998*
	[2.068]	[1.602]
Density		-0.199*
		[0.116]
Bank Control Variables	Yes	Yes
Country Control Variables	Yes	Yes
Bank Type Dummy Variables	Yes	Yes
Observations	144	64
R-squared	0.097	0.250

Table 10: Macroprudential buffers and Pillar 2

This table reports the results obtained for a variation of equation (2) for two groups of banks (i.e., SII and Non-SII) in which we account for any additional capital requirement requested in the context of Pillar 2. Results reported in column (1) correspond to the baseline specification (column (2) of Table 6). Column (2) reports the results obtained for an additional variation of equation (2) in which we included a dummy variable (Dum. MP Pillar 2) that takes value of one for those countries with an active macroprudential use of Pillar 2. The results contained in column (3) are obtained from another variation of equation (2) which includes the CET1 ratio under the adverse scenario estimated in the EU-wide stress testing 2014 (CET1 Adverse). Standard errors, in brackets, are robust to heteroskedasticity. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
Variables	ΔCET1 Ratio	ΔCET1 Ratio	ΔCET1 Ratio
SII x MPB	0.137	0.154	-0.474
	[0.301]	[0.307]	[0.779]
Non-SII x MPB	2.517**	2.515**	1.503*
	[1.007]	[0.996]	[0.811]
Dum. MP Pillar 2		0.777	
		[1.026]	
CET1 Adverse			-0.079
			[0.134]
Bank Control Variables	Yes	Yes	Yes
Country Control Variables	Yes	Yes	Yes
Bank Type Dummy Variables	Yes	Yes	Yes
Observations	144	144	64
R-squared	0.310	0.313	0.426

Table 11: Macroprudential buffers and CET1 / Tier1 capital ratios

This table reports the results obtained from the estimation of equation (2) for different subsamples of SII and Non-SII. The subsample used to estimate the coefficients in column (1) consists of those banks whose CET1 capital ratio is exactly equal to the Tier 1 capital ratio at 2013-Q4. In columns (2) – (4) we deal with alternative distances between the CET1 and Tier 1 ratios. Thus, in columns (2) and (3) we include those banks for which the difference between their Tier 1 and CET1 capital ratios is equal or lower to 0.25% and 0.5%, respectively whereas in column (4) we include all the banks. Standard errors, in brackets, are robust to heteroskedasticity. *, ** and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Variables	(1)	(2)	(3)	(4)
	ΔCET1 Ratio	ΔCET1 Ratio	ΔCET1 Ratio	ΔCET1 Ratio
Distance	0%	<0.25%	<0.5%	All
SII x MPB	0.507	0.572	0.489	0.137
	[1.033]	[0.686]	[0.578]	[0.301]
Non-SII x MPB	2.472***	2.645***	2.704***	2.517**
	[0.863]	[0.820]	[0.836]	[1.007]
Bank Control Variables	Yes	Yes	Yes	Yes
Country Control Variables	Yes	Yes	Yes	Yes
Bank Type Dummy Variables	Yes	Yes	Yes	Yes
Observations	65	98	118	144
R-squared	0.376	0.349	0.332	0.310