Changes in liquidity regulation and bank credit growth

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Abstract

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JEL classification: G21, G28

Keywords: Bank lending, Bank risk, Liquidity ratio, European banks, Liquidity regulation,

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Abstract

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1. Introduction

Liquidity regulation is designed to ensure that banks have sufficient liquidity in times of uncertainty. The Liquidity Coverage Ratio (LCR) introduced by the Basel Committee on Banking Supervision (BCBS) in 2013 aims to improve banks' short-term resilience to liquidity risk. It requires banks to hold a minimum amount of high-quality liquid assets (HQLA) that can be converted into cash easily to meet their liquidity needs for a 30-calendar day liquidity stress scenario. Since the announcement of such new standards, there has been an ongoing debate on the potential impact of such a requirement on bank traditional activities such as lending. One major concern is that enforcing high liquidity requirements might result in banks holding more low-yield liquid assets and long-term maturity funds. It heightens the incentive to tilt banks' portfolio composition towards government bonds to lower risk resulting in a downward pressure on bank profitability (Blundell-Wignall & Atkinson 2010). Another concern is that the ratio may not account for the unique circumstances of individual banks. The LCR is a one-size-fits-all approach to liquidity regulation regardless of banks' business models or risk profiles ((Dietrich et al., 2014; Kauko, 2017).

So far, the few empirical papers on this important subject have produced mixed results as far as the impact of liquidity regulations on lending is concerned. One strand of evidence is that liquidity regulation has no significant impact on lending and only carries a negative impact on short-term wholesale funding and interbank borrowings (Banerjee & Mio, 2018). Some papers show that liquidity regulation positively affects bank lending (Ananou et al., 2021 and Chen et al. (2022)). Other research highlights that liquidity requirements cause a decline in bank lending (Curfman & Kandrac, 2021).

The most common approach used by previous empirical studies to assess the impact of liquidity regulation on bank lending is to examine how positive regulatory shocks (more stringent constraints) affect bank behavior. In this paper, we take the opposite stand. We examine how a regulatory change which leads to the relaxation of liquidity constraints for some banks, but not all, impacts bank lending. Specifically, we take advantage of a harmonization rule introduced in Europe in 2015 regarding the definition of the LCR which made banks in some European countries better off than in other European countries. This provides us with a quasi-experiment to overcome identification issues to establish a causal link between changes in regulation and changes in bank lending.

Our empirical investigation covers 207 commercial banks from 2011 to 2019 across 17 European countries by performing difference-in-differences estimations. In September 2015, the ECB announced a new rule allowing central bank reserve balances of commercial banks to be treated as eligible for high-quality liquid assets throughout the Eurozone. The new rule introduced a change in certain countries where national supervisory authorities considered this asset class ineligible for LCR purposes. Banks in these countries form our treatment group. Indeed, for these banks, the new rule meant, for practical reasons, a relaxation of the LCR. The LCR of banks in such countries mechanically increased at the date of announcement. Our control group is made up of banks from countries that already treated reserves as eligible for LCR purposes. This setup diminishes any self-selection bias concern since the criteria for treatment is the country of residence.

In our first set of tests, as a first step, we examine the impact of the 2015 LCR harmonization rule on lending. We find that banks that benefitted from the harmonization rule increased lending relatively to control banks. The mechanical increase in the LCR for treated banks positively impacted their lending activities. This result is robust and consistent under various specifications and alternative measures of lending and credit growth. Our results complement Curfman & Kandrac (2021) who show that a more stringent liquidity regulation negatively affects lending. If stringency causes a decline, then harmonization which is akin to relaxation should have the opposite effect on banks' lending. Our findings are however not directly comparable to those of Ananou et al. (2021) and Chen et al. (2022) who show that the introduction of liquidity regulation leads to higher lending as more liquidity is translated into higher credit growth. As a second step, we examine the sensitivity of the positive relationship between the relaxation of the LCR and lending to the initial liquidity levels of the treated banks. We find a strong positive and significant relationship between LCR relaxation and lending for banks which already have a relatively high LCR (above the median) before the treatment. On the contrary, we show that for banks with a relatively low LCR (below the median), the treatment does not firmly lead to an increase in lending. Such banks tend to even reduce the share of loans in their balance sheet relative to banks in the control group. Such a finding complements those of Sundaresan & Xiao (2024), who show, in the case of the US, that banks that have lower realized LCR than minimum required LCR lend less.

In our next set of tests, we exploit the harmonization rule to examine the consequences of balance sheet adjustments. We find that, on the liability side of the balance sheet, the relaxation

of the rule led to an increase in short-term wholesale funding and total wholesale funding. In the post-treatment period, treated banks appear to increase funding from the wholesale market relatively to control banks. The other important sources of funding such as, for example, deposits neither increase nor decrease following harmonization. Moreover, the harmonization rule appears not to have impacted the level of Tier 1 capital differently for treated and control banks. On the asset side of the balance sheet, we find that in addition to increasing lending, harmonization of the LCR led to an increase of high-quality liquid assets for treated banks compared to control banks. This is consistent with previous studies that show that bank liquidity requirements affect banks' demand for assets that become eligible ((Kedan & Veghazy, 2021; Rezende et al., 2021). Specifically, we find a substantial increase in central bank reserve balances for treated banks relative to control banks in the post-harmonization period. Our results show that liquidity regulation can affect reserve balances when they become eligible for the LCR.

In addition, we find that small treated banks as well as more highly capitalized treated banks show stronger lending growth relative to the control group whereas, for less capitalized banks or large banks, we find no statistically significant impact on lending growth. The positive impact on lending growth is also only observable for highly diversified banks. Moreover, treated banks which have a higher likelihood to increase lending are those that exhibit lower deposit productivity. This is possibly because banks that are in a stronger position to collect stable funds such as deposits are less likely to be affected by changes in liquidity regulation. Our main results are robust to various additional tests including a placebo test and alternative matching of the treated and the control group to ensure that they have close characteristics.

After establishing the impact of the harmonization of LCR rules on lending, we further explore its implications for risk. We consider treated banks' idiosyncratic risk and default risk respectively. Prior literature predicts a positive relationship between bank risk and lending activities (Rajan, 2006). We find that following the harmonization of LCR rules, idiosyncratic risk increases for treated banks relatively to control banks but solely for small banks i.e. those that experience an actual increase in lending. Hence the increase in lending for small treated banks has consistently led to higher risk exposure.

In a further step, for large banks, we analyze how debt markets have reacted to the implementation of the new rule. Specifically, to gauge the market's perception of treated banks' default risk, we consider the reaction of banks' Credit Default Swap (CDS) spreads. We show that the announcement of the harmonization of the LCR leads to a significant negative

abnormal return for CDS for treated banks relative to control banks over the same maturities and event windows. The CDS reaction contrasts our result for idiosyncratic risk where relatively small treated banks show an increase in risk. Conversely, relatively large banks, which are not affected by the treatment in terms of lending growth are perceived as less risky following the implementation of the harmonization rule.

Overall, our findings have several implications regarding the impact of liquidity regulations on lending activities. In particular, we uncover the role that diversification, productivity, capitalization and size play in banks' responses to liquidity regulations. The literature on bank liquidity regulation documents that the LCR reduces fire-sale risk but with an adverse effect on bank loan growth, as well as on liquidity creation (Roberts et al., 2023). Raz et al., (2022) document a positive relationship between liquidity regulation and opacity. They find that, in the case of the U.S., the implementation of the liquidity coverage rule has led to a decrease of about 2.2% in the quality of disclosure and an increase of 10.8% in risky assets. This is due to the tendency of banks to search for higher returns by investing in opaque assets to compensate for lower yield on highly liquid assets following the implementation of the rule. Cornett et al., (2011) and Ivashina & Scharfstein (2010) find that the liquidity crunch during the global financial crisis of 2007-2008 reduced banks' flexibility in making balance sheet adjustments, resulting in lower credit supply. Our paper contributes to the ongoing efforts to empirically examine the effect of liquidity regulation by showing how the relaxation of the LCR potentially affects lending and balance sheet adjustments. Furthermore, we provide evidence on how diversification, productivity, liquidity and size impact the responses to such relaxation. We show that the relaxation of the LCR is associated with an increase in lending but only under very specific conditions.

The rest of this paper proceeds as follows. Section 2 describes the institutional setting. Section 3 presents the data and variables. Section 4 discusses our empirical strategy and reports the results. Section 5 provides robustness tests. Section 6 concludes.

2. Institutional Background

In 2013, the European Banking Authority published regulations regarding the reporting and treatment of banks' excess reserve deposits at central banks. The publication L 176 under Article 416 stipulates the following:

"*Reporting on liquid assets: Institutions shall report the following as liquid assets unless excluded by paragraph 2 and only if the liquid assets fulfill the conditions in paragraph 3: (a) cash and exposures to central banks to the extent that these exposures can be withdrawn at any time in times of stress. As regards deposits held with central banks, the competent authority and the central bank shall aim at reaching a common understanding regarding the extent to which minimum reserves can be withdrawn in times of stress…."*

The implementation of this regulation gave individual national supervisory authorities in the European monetary zone some freedom regarding the treatment of banks' reserve deposits at central banks. As a result, the inclusion of excess reserves for the calculation of the LCR in the euro area was far from uniform. Some member countries treated these reserve deposits at central banks as eligible for LCR purposes. Other member countries, however, treated these reserves as non-eligible for LCR purposes. The group of countries that treated excess reserves as non-eligible comprises Austria, Belgium, Cyprus, Finland, France, Germany, Luxembourg, and Italy. The other group consists of Estonia, Ireland, Latvia, Malta, Netherlands, Portugal, Spain, Slovakia, and Slovenia where reserves were already classified as high-quality liquid assets eligible for the LCR. This created a two-tier system within the Eurozone. However, in September 2015, the European Central Bank (ECB) took steps to harmonize the treatment of reserves as far as the LCR is concerned. The ECB published a Commission delegated regulation (EU) no. 2015/61 to provide a common rule for the treatment of reserves concerning liquidity coverage requirements for Credit Institutions[2]. The ECB requires that the central bank recognizes reserves held by banks as level 1 assets in the liquidity coverage ratio (LCR). The rule to be applied in the calculation of the LCR as of 1 October 2015[3] is as follows:

[2] https://www.bankingsupervision.europa.eu/press/letterstobanks/shared/pdf/2015/150930/150930communication_LCR_treatment_of_central_bank_reserves_for_LSIs.en.pdf?377e7b5daeb653f8d6ce1d580883f737

[3] https://www.bundesbank.de/en/tasks/banking-supervision/individual-aspects/liquidity/treatment-of-central-bank-reserves-in-the-lcr/treatment-of-central-bank-reserves-in-the-lcr-622900

"On each day t, the reserve balance in excess of the average daily requirement is to be considered for Level 1 assets. The average daily requirement defines as the amount of the minimum reserves to be held over a reserve maintenance period, divided by the number of days of a reserve maintenance period. If balances are below the average daily required reserves, the amount considered for the Level 1 assets is zero".

3. Data and Variables

This section describes our data sources and the construction of our main variables.

3.1 Data

The bank level data which comprise both income statement data and balance sheet data are retrieved from Orbis BankFocus from 2011 to 2019. We do not include data beyond 2019 to avoid confounding factors such as COVID-19 and all the government interventions that were carried out. We eliminate any bank with missing data for total assets for the sample period. We consider seventeen countries within the European Union: Austria, Belgium, Cyprus, Finland, France, Germany, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia, and Spain. To prevent any confounding event, we exclude Greece due to the severe sovereign debt crisis that occurred and persisted during the sample period. Macroeconomic data such as GDP growth rate and inflation are sourced from the World Bank and WDI. To eliminate the influence of outliers we winsorize our data at 1% and 99%.

3.2 Variables

3.2.1 Dependent variables

Our dependent variables are the three following measures: a) the log of gross loans denoted as LOG (LOAN) b) the ratio of gross loans to lag total assets denoted as $LOAN\_TTLA_{t-1}$; c) the growth of gross loans measured as $\frac{GROSSLOAN_t - GROSSLOAN_{t-1}}{GROSSLOAN_{t-1}}$ and denoted as LOANGROWTH.

3.2.2 Liquidity Coverage Ratio (LCR)

The LCR imposes a minimum requirement on the amount of unencumbered high-quality liquid assets (HQLA) that would allow banks to survive a supervisory 30-day liquidity stress scenario. It is defined as:

$$\text{LCR} = \frac{\text{Stock of HQLA}}{\text{Total and net cash outflows over the next 30 calender days}} \geq \underline{100\%}$$

We extract the LCR from the BankFocus database.

3.2.3 Control variables

The lending activities of banks are influenced by bank-specific characteristics such as capital, size, profitability, diversification and funding structure (Bai & Elyasiani, 2013; Chu et al., 2019; González et al., 2016) and macroeconomic factors. To account for the potentially confounding effects of bank-specific factors on lending, we employ the following set of control variables: For bank size, we use the natural logarithm of total assets denoted as LOG (TOTAL ASSET) in our specification. The impact of size on lending is ambiguous. For large banks, the higher probability of a government bailout can lead to moral hazard problems and consequently risky lending behaviors. Large banks are also known to have diversified asset portfolios and are therefore less likely to reduce the size of their loan portfolio in the event of a negative shock (Angelini et al., 2011; Jiménez et al., 2012). Small banks are more focused on traditional banking activities and are relatively less diversified. This increases the likelihood of a decline in lending following liquidity stress for smaller banks (Berger & Udell, 1995; Petersen & Rajan, 1994). Capital is proxied by TIER1 and is the ratio of equity capital to total assets. According to the risk absorption theory, better-capitalized banks can lend more because of their higher risk-bearing capacity (Mehran & Thakor, 2011). Košak et al., (2015) find that capital enables banks to withstand periods of financial distress and maintain or even increase their lending activity. Highly capitalized banks can efficiently absorb negative shocks to loan portfolios and hence are expected to extend more loans when faced with stricter liquidity requirements. Profitability is proxied by the return on assets (ROA) which is calculated as the ratio of net income to total assets. Banks may engage in earning management to keep shareholders satisfied. For example, they might reduce excessive bank lending in the upswing of the business cycle and adopt credit crunches in the downswing (Albertazzi & Gambacorta, 2009). The funding structure is proxied by DEPOSITS calculated as total deposits divided by total assets. A high share of customer deposits has a positive and significant influence on credit growth (Košak et al., 2015). Deposits constitute the major share of banks' funding. Hence, banks that can secure more deposits are financially more capable of expanding loans at a greater scale. Customer deposits also provide a stable source of funding for banks (Song & Thakor,

2007; Stepanyan & Guo, 2011). LOAN LOSS which is defined as the ratio of loan loss provisions to total assets controls for the quality and riskiness of banks' loan portfolios.

The economic conditions in which a bank conducts its business operations also impact its lending activities. For instance, in a period of economic boom, there is a high demand for credit, while in a recession, credit plummets (Dell'Ariccia & Marquez, 2006). We control for macroeconomic conditions by adding GDP growth and the inflation rate in our regressions. We also control for bank-fixed effects and year-fixed effects to address possible differences in bank operations and changes in economic conditions through time.

[Insert Table 1]

3.3 Descriptive statistics

Table 2 provides descriptive statistics for our main variables. We consider the full sample of banks and the two subsamples of treated banks and control banks. The subsample of treated banks (Treated group) includes all banks from Austria, Belgium, Cyprus, Finland, France, Germany, Luxembourg, and Italy. The subsample of control banks (Control group) consists of banks from Estonia, Ireland, Latvia, Malta, Netherlands, Portugal, Spain, Slovakia, and Slovenia. In total, the sample contains 207 commercial banks across Europe. Our variable of interest, the LCR, shows significant variation. The average bank in our sample has an LCR of 209%. This implies that the average bank is more than twice above the minimum regulatory requirement of 100%. However, the standard deviation (144%) indicates a high variation in the sample. For example, treated banks appear to have on average a lower LCR than control banks, 186% against 250%. The mean difference is statistically significant and can pose a challenge to our identification strategy. To address this concern, we consider alternative estimation techniques such as propensity score matching where we match control banks with treated banks based on some selected bank characteristics variables.

[Figure 1]

Figure 1 shows that throughout the sample period, the ratio of deposits to total assets and Tier 1 to total assets remain fairly stable. The two ratios do not exhibit any signs of high variations. Deposits appear to be the main source of funding for banks over the sample period. For an average bank, deposits fund total assets by about 54%. However, the sample exhibits substantial variation with a standard deviation of about 0.26. Wholesale funding is another major source of funding for banks. In our sample, the ratio of wholesale funding to total assets is on average about 31%. The average bank in the sample appears to engage in substantial

wholesale market activities predisposing it to high funding risk. The average bank in the sample has a ROA (return on assets) of 0.0062 with a standard deviation of 0.17. On average, lending grows by about 4.8% from 2011 to 2019 (LOANGROWTH) but at a higher rate for treated banks (5.3%) than for banks from the control group (3.4%). We however observe no statistical difference between the two groups. The banks in our sample have a ratio of Tier 1 capital to total assets of about 9.6%. Control banks are on average better capitalized (10%) than treated banks on average (9.01%) but with no significant difference between the two groups. The ratio of loan loss provisions to gross loans is around 0.4% with a standard deviation of 0.01. Table 3 presents the correlation matrix of our variables. Overall, we observe no serious potential multicollinearity issues that could affect our results.

[Insert table 2]

[Insert table 3]

4. Empirical strategy and results

This section lays out the empirical strategy and reports the main results. We first show the effects of the 2015 LCR European harmonization rule on bank lending.

4.1 Harmonization of the LCR and bank lending

Figure 3 shows a difference in gross loans between treated banks and control banks in the post-treatment period. The plot shows a decline in lending for the control group in 2016 and a steady increase in lending for treated banks. This is indicative of a possible relationship between the harmonization of reserve treatment across Europe and the lending activities of treated banks. To examine this deeper and isolate the causal effect of harmonization on banks' lending, we employ a difference-in-difference research design considering the following specifications:

$$\mathrm{Y_{it}} = \alpha_{\mathrm{it}} + \beta_1 \mathrm{TREAT_i} + \beta_2 \mathrm{POST}_t + \beta_3 \mathrm{POST_t x TREAT_i} + \beta_4 X_{it-1} + \beta_5 Country_{it-1} + \varepsilon_{it} \quad (1)$$

Where $\mathrm{Y_{it}}$ is one of our three measures of lending activities; LOG (LOAN), $\mathrm{LOAN\_TTLA_{t-1}}$ and LOANGROWTH. $\mathrm{Post_t}$ is an indicator that equals 1 for the years after 2015 and zero otherwise. TREAT is a dummy variable that equals 1 for a bank in a country where the harmonization of LCR resulted in a change in the treatment of reserves for LCR purposes and

zero otherwise. Our target variable is the interaction term POST x TREAT and its coefficientβ_3. β_3 measures the effect of the harmonization on lending for treated banks, controlling for any observable or unobservable. If treated banks increase lending relative to the control group as a result of improved LCR following the harmonization of reserve treatment, the coefficient β_3 will be positive. The vector X_{it-1} contains lagged bank-level control variables, to ensure that β_3 does not capture differences in bank characteristics that may correlate with loan lending behavior. We control for bank size, funding, profitability, risk, and capital as previously indicated. We also account for heterogeneity in macroeconomic conditions and demand side effects by adding the lagged GDP growth rate and lagged inflation rate to our specifications. Standard errors are clustered at the bank level.

A fundamental assumption of our identification strategy is that both treated and control banks have similar pre-treatment behavior. Specifically, lending should not exhibit significantly different trends for the two groups.

[Figure 3]

Figure 3 shows that until 2015, the date of the treatment, the trends are, on average, quite similar for treated and control banks. The two groups show similar growth patterns indicating that the parallel trend assumption is satisfied and hence our research design allows us to compare the changes in lending of treated banks relative to those of control banks.

[Insert table 4]

We start by exploring whether the harmonization rule leads to an increase in lending for treated banks. The underlying assumption is that, as a result of the harmonization rule, treated banks will have more regulatory liquidity on their balance sheet which could be used to extend more loans. Table 4 reports the results. In Column [1], we present the results with LOG (LOAN) as the dependent variable. The interaction term POST x TREAT is positive and statistically significant at the 1% level. This is consistent with the crowding-out hypothesis which predicts an adverse impact of stringent liquidity regulation on lending. Indeed, a mandatory liquidity requirement is an implicit tax by which the private and social costs of liquidity transformation are aligned (Sundaresan & Xiao, 2024). Furthermore, LCR as a means of mitigating liquidity risk is costly because liquid assets generate low returns. Consequently, a policy that lessens the liquidity requirement burden should improve lending activities. A study on US banks Roberts et al., (2023) find that banks subjected to the LCR tighten lending standards.

As for the economic significance of our results, we observe that treated banks experienced on average a 13.5% increase in credit growth relative to control banks. In column (2) where the dependent variable is the ratio of gross loans to lag total assets and denoted as $GLOAN\_TTLA_{t-1}$ we find similar results. The coefficient of the interaction term POST x TREAT is both positive and statistically significant. This implies that the relaxation of the LCR ratio due to the harmonization treatment leads to an increase in the share of total loans in the balance sheets of treated banks compared to banks in the control group. Finally, column [3] presents the results for LOANGROWTH. The coefficient on POST x TREAT is again also positive but with a lower significance level (10%).

The above results confirm our hypothesis that the harmonization of the LCR across Europe has positively affected bank lending in countries where the rules have become less stringent.

Next, we investigate if the extent to which the harmonization rule has positively impacted lending is not influenced by banks' actual level of LCR at the time of the treatment. Indeed, as shown earlier, the banks in our sample exhibit important variations in the level of the LCR and such variation may impact the response of treated banks.

[Insert table 5]

To this end, we investigate whether treated banks with relatively low regulatory liquidity ratios behave similarly to those with relatively high ratios. Specifically, we construct two sub-samples for treated banks, one strictly comprising banks with below median LCR (low LCR) and the other restricted to banks with above median LCR (high LCR) respectively. For each sample, we construct control groups with the same criteria as for the treated group.

In Table 5 (A) we present the results in columns [1], [2] and [3] of Table 5 for high LCR. The coefficient of POST x TREAT is positive and significant for all our three measures of lending activities for high LCR-treated banks. This indicates that treated banks with high LCR (above median LCR) increase lending compared to banks in the control group. In terms of economic significance, our results show that harmonization increases lending for high-liquid banks. This increase ranges between 5.5% and 19.6% depending on the lending growth measure used. . For low LCR banks, the results are presented in columns [4], [5] and [6]. We find that the coefficient of POST x TREAT is not significant for all three specifications. This implies that for banks with a relatively low LCR, the relaxation of the LCR constraint does not affect their lending activities.

On the whole, our findings suggest that the harmonization of the LCR rule has, on average, allowed banks which could benefit from the inclusion of reserves balances in the computation of the liquidity constraint, to extend their lending activities. Nevertheless, such a result only holds for such banks which already exhibited relatively high liquidity ratios at the time when the harmonization rule was introduced. For banks with relatively low regulatory liquidity ratios, the less stringent liquidity constraint did not stimulate lending in the period following the regulatory change.

4.2 Harmonization of the LCR and transmission channel

To further explore the impact of harmonization on treated banks, we focus on the possible impact on bank balance sheet adjustments. We examine the various transmission channels by considering the liability side of the balance sheet. We consider balance sheet components such as short-term wholesale funding, total wholesale funding, and finally deposits. Specifically, we consider the following specification similar to the baseline:

$$\mathrm{Y_{it}} = \alpha_{\mathrm{it}} + \beta_1 Treat_i + \beta_2 Post_t + \beta_3 \mathrm{POST_t\ x\ TREAT_i} + \beta_4 X_{it-1} + \beta_5 Country_{it-1} + \varepsilon_{it} \quad (2)$$

The dependent variable $\mathrm{Y_{it}}$ is a transformation of each of the liability variables, short-term wholesale funding, total wholesale funding, deposits and finally, Tier 1 capital: (1) LOG(VARIABLE) variable; (2) VARIABLE_TTLA$_{t-1}$ and (3) ΔVARIABLE/VARIABLE$_{t-1}$. We add all the bank control variables considered so far and we account for bank-fixed effects and country-fixed effects.

[Insert table 6]

Table 6 presents the results for the four bank liability variables. The coefficient of the interaction term POST x TREAT is positive and significant for short-term wholesale funding and total wholesale funding respectively. The result indicates that in the period following the harmonization of the LCR, treated banks increase their reliance on both short-term and total wholesale funding compared to control banks. Following the harmonization of the LCR, treated banks might possibly feel safer which encourages them to increase wholesale activities. The results contrast with banks' response to tightening liquidity regulation. Banerjee & Mio (2018) observe that banks subject to stringent liquidity regulatory requirements tend to reduce their dependence on less stable short-term wholesale funding. Table 6 shows that deposits at treated banks remain stable and do not change relative to control banks following the harmonization

of the LCR. All three measures of deposits are shown to be statistically insignificant. Again the existing literature indicates that banks react to more stringent liquidity regulation by substituting less stable sources of funding to more stable deposits (Banerjee & Mio, 2018). Overall, treated banks adjust the structure of their liabilities in the post-treatment period. Specifically, they increase their reliance on wholesale funding following the regulatory change and such an increase is higher for short-term funding than for long-term funding.

So far, our analysis has been on the liability side of the balance sheet. We now turn to examine the asset side of the balance sheet and specifically focus on liquid assets, high-quality liquid assets (HQLA) and reserve balances.

[Insert table 7]

Table 7 presents the results for the three variables we focus on in our investigation. We find that the coefficient of the interaction term POST x TREAT is always insignificant for liquid assets, except at the 10% level in column (3) of panel (A). On average treated banks do not adjust their overall liquid assets differently than control banks. However, treated banks do behave differently than control banks in terms of HQLA adjustment. Specifically, they increase their holdings of HQLA compared to control banks. The coefficient of the interaction term POST x TREAT is indeed significantly positive at the 5% level in two out of the three specifications (columns (1) and (2) of Panel (B)). Such an increase in HQLA for treated banks could be explained by the fact that central bank reserves become eligible for such assets as a result of the treatment. The final liability asset class is central bank reserve balances. The coefficients of POST x TREAT are positive and highly significant (at the 1% level) in all the specifications of the panel (C). Such a result is not surprising because treated banks have stronger incentives to accumulate such holdings when they become eligible for the computation of the LCR. Prior studies show that banks that are more oriented on short-term loans accumulate more HQLA when liquidity regulation becomes stringent especially when they are not highly capitalized (Banerjee & Mio, 2018).

On the whole, we observe that treated banks respond by adjusting both the assets and liabilities sides of their balance sheet relative to the control group.

4.3 Further Analysis

We now examine several additional factors that could also have an impact on how lending growth is influenced by the harmonization of the LCR. We also look into how harmonization was perceived by the market on the day of the announcement of the rule and how it affected banks' riskiness.

4.3.1 Bank Size

Several studies have emphasized that in general, large banks tend to lend to large, informationally transparent firms using their comparative advantages in lending technologies based primarily on hard quantitative information. Small banks tend to lend to small, informationally opaque firms and mainly rely on soft qualitative information such as personal knowledge about the subjective circumstances of the firm, its owner, and its management (Berger et al., 2005; Cole et al., 2004; Distinguin et al., 2013, among others). In addition, larger banks tend to be more strictly monitored by regulators and are therefore under greater compliance pressure. Thus, the ability of banks to manage their assets and liabilities can vary with their size.

In this section, we examine whether the treatment affects large banks differently than small banks. For this purpose, we create two subsamples of banks by considering those with total assets above 10 billion euros as large banks and those below this threshold as small banks similarly to Baros et al., (2023). We apply the same criteria for the control group.

The results are presented in Table 8 Panel A. Most coefficient values are positive and statistically significant for the subsample of small banks but not for the subsamples of large banks. POST x TREAT has a significance level of 1% in two of our lending measures for small banks but none of the coefficients show significance for large banks. This suggests that because smaller banks might be more constrained in terms of LCR they are the ones that show an actual loan response to the harmonization policy. As previously mentioned, banks with lower liquidity ratios experienced an improvement in their regulatory liquidity position as a result of harmonization, which eventually led to an increase in loan growth. Another possible explanation is that since regulators are less stringent with smaller banks, the latter feel safer and respond by increasing lending because they are less worried about possible regulatory pushbacks. As for large banks, these typically hold more regulatory liquidity, which could explain why they are not affected by the harmonization rule. Our result is robust to a change in the definition of size as shown in Panel B where we split the sample on the basis of the median of total assets.

[Insert Table 8]

4.3.2 Bank Capitalization

We also similarly investigate the role played by the level of capitalization on treated banks' lending activities in the post-harmonization period. On the one hand, the key benefit of holding more capital is to create buffers to absorb future losses. On the other hand, this leads to lower liquidity creation (Van den Heuvel, 2008) and reduced credit supply (De Nicolò et al., 2014). It is not clear however how credit supply is effectively affected. French et al., (2010) suggest limited negative effects of higher bank capital requirements on credit supply and output. Begenau & Salomao, (2019) posits that higher capital requirements can increase credit supply by lowering the cost of funding for banks, which translates into banks' balance sheet expansion. Thus, the ability of banks to manage their assets and liabilities can vary with their size.

To determine the possible influence of bank capitalization on treated banks' reactions, we divide our sample into two subsamples. The first subsample is restricted to banks with above-median Tier 1 capital (Highly capitalized) and the second subsample is to banks with below-median Tier 1 capital (Low capitalized). We apply this criterion for both the treated and control groups.

[Insert table 9]

Table 9 shows the results. Columns [1, 2& 3] present the results LOG (LOAN), $LOAN\_TTLA_{t-1}$ and LOANGROWTH respectively for highly capitalized banks and columns [4], [5] and [6] for lowly capitalized banks. The coefficient of the interaction term POST x TREAT is only significant and positive for columns 1 and 2 at the 1% significance level. This indicates that the positive impact of the relaxation of the LCR rule on lending is driven by banks which are highly capitalized. Indeed, our results show that for banks which are not highly capitalized the treatment has no effect. Our result aligns with Carlson et al., (2013) who show that banks with higher capital ratios tend to have stronger loan growth. They find the effect to be fairly strong during financial crises which is consistent with other works (Brei et al., 2013; Cornett et al., 2011).

4.3.3 Bank Productivity

So far, we have shown that treated banks exhibit higher lending growth compared to control banks. However, many studies show that various outcome variables are very different for banks that exhibit differences in terms of organizational structure, product mix, funding sources, service quality, and customer focus (DeYoung et al., 2004; DeYoung & Rice, 2004). Some banks are good at collecting savings, while others are good at making loans, dispensing advice,

and bringing value to firms. Banks exhibit different strengths and are therefore heterogeneous in terms of productivity. This implies potential variations in productivity among commercial banks. For example, commercial banks good at collecting deposits and savings will have high deposit productivity which captures their efficiency in raising deposits. Other commercial banks have a relative advantage in underwriting loans or trading securities, selecting markets to operate in, and in other factors (Egan et al., 2022).

[Insert table 10]

Motivated by these studies, we examine whether the response of treated banks to the harmonization rule might be influenced by their productivity. We measure productivity following Egan et al. (2022). We specify our model by considering important variables that enable banks to efficiently attract deposits from customers, such as the deposit interest expense and the number of bank branches[4]. We estimate the following regression:

$$\text{Deposits}_{it} = \alpha_{it} + \beta_1 \text{Deposit rate}_{it} + \beta_2 X_{it} + \delta_t + \mu_i + \varepsilon_{it} \quad (3)$$

Where X is a vector of variables consisting of the number of branches, number of employees and noninterest expense. The coefficients β_1 and β_2 measure the effectiveness of banks in transforming these inputs into services valued by consumers. Following Egan et al. (2022), our specification includes year-fixed effects (δ_t) and bank-fixed effects (μ_i) to account for persistent differences in a bank's ability to collect deposits[5]. The deposit productivity of a bank is the sum of the bank's fixed effect μ_i and its residual ε_{it}. We investigate the role played by productivity in Table 10. Columns (1) (2), and (3) of panel A present the results for the subsample of banks with above median deposit productivity. The coefficients on POST x TREAT are insignificant. This implies that following harmonization high deposit productivity banks do not behave significantly differently than highly productive control banks in terms of

[4] We measure deposit interest expense as total interest expense on deposits, divided by total deposits. Other controls included in our specifications are banks' noninterest expenditures, number of employees, and number of branches. Noninterest expenditure is a proxy for investments made by banks in ensuring higher quality services to consumers, such as better ATMs or online services. Furthermore, the number of branches and number of employees for a bank may be an important consideration for consumers in choosing a depository institution.

[5] All else equal, a bank with a higher fixed effect collects more deposits for a fixed set of deposit-related expenses and inputs. The term μ_i reflects within bank variation in its ability to collect deposits over time. Deposit productivity of bank j at time t is then the sum of the bank's fixed effect μ_j and it's residual. A major concern for the specification above is the endogeneity of prices, which are deposit rates. The term μ_j in represents an unobserved bank-time-specific shock. If banks observe ε_{it} prior to setting deposit rates, the offered deposit rate will be correlated with the unobservable term, ε_{it}. For example, suppose bank j experiences a demand shock so that ε_{it} is positive. It will then optimally offer a lower deposit rate. The study employs LIBOR as instruments to account for the endogeneity of deposit rates. More specifically, we construct instruments from the bank-specific pass-through of annual Libor into deposit rates.

credit growth. This could be explained by the fact that for highly productive banks, the benefits following the harmonization of LCR for treated banks are not strong enough to differentiate them from their peers in the control group. However, for the subsample of banks with below median productivity (panel (B) the results show highly significant coefficients for the interaction term POST x TREAT. For such banks and only for such banks the treatment is effective in terms of lending growth. A possible explanation is that less productive banks are less skilled in collecting deposits at low cost and hence more constrained in terms of funding and liquidity. Therefore, one would expect that relaxation of the rule would have a greater impact on less productive banks than on more productive banks.

4.3.4 Diversification

Prior literature indicates that bank diversification has important implications for bank lending. First, diversification reduces the bank's idiosyncratic risk and stabilizes earnings while improving lending resilience. Goetz et al., (2016) show that diversification reduces the impact of idiosyncratic local market shocks. Second, diversification provides better access to funding, especially during times of crisis (Jiang et al., 2020). We argue that since diversification allows for better access to new funding, for example to wholesale deposits, and improves profitability, a diversified bank might undertake more lending activities in the post-harmonization period, than a non-diversified treated bank. We measure diversification by the ratio of non-interest income to operating revenue. We consider two subsamples by following the same criteria as before a subsample restricted to banks with above-median diversification and a subsample limited to banks with below-median diversification. We apply this for both treated and control banks. Table 11 presents the results and shows that the coefficient of the interaction term is only significant for highly diversified banks (columns [4], [5] and [6]). Overall, such results indicate that diversification plays an important role in the treatment. Highly diversified treated banks have a higher likelihood of increasing lending than less diversified treated banks compared to their non-treated peers.

[Insert table 11]

4.3.5 Loan Type

[Insert table 12]

Finally, we also run the baseline regression (equation (1)) by disaggregating the dependent variable into three loan categories. We consider retail lending, corporate lending and mortgage lending. In Table 12 panel A, we report the results for retail loans in columns [1], [2] and [3] by considering the log of retail loans, the ratio of retail loans to lagged total assets, and the growth rate of retail loans. The coefficients on POST x TREAT are positive and significant except for column [3]. This implies that treated banks increase retail lending relatively to control banks.

Next, we consider the results for corporate loans. In Table 12 Panel B, the coefficients on POST x TREAT are positive and significant in each specification.

Table 13 panel C which presents the results for mortgage lending shows different results. The coefficient of POST x TREAT is negative in all three specifications and significant in columns [2] and [3]. This implies that treated banks decrease lending relative to control banks. The share of mortgage lending in total assets decline by 7.7% compared to control banks. Similarly, the growth in mortgage lending declines by 6.8% for treated banks in comparison with control banks. All in all, the disaggregated measures of lending indicate that the increase in lending experienced by treated banks relative to control banks is essentially driven by retail and corporate lending.

On the contrary, mortgage lending is negatively affected. This is possible because treated banks might be reacting by increasing short-term loans to a greater extent than long-term loans or because they are targeting riskier loans. Treated banks might also be reshuffling the structure of their loan portfolio to achieve such different goals (maturity and/or risk).

4.3.6 Risk Implication and Market Reaction

We also examine the implication of the harmonization of the LCR rule on bank risk. We analyze the impact of the new rule on idiosyncratic risk and also look into how the announcement is perceived by the market on the day of the announcement of the rule.

We first look at the impact of the LCR harmonization rule on idiosyncratic risk. Because lending is positively affected by the harmonization rule for treated banks one could expect a change in risk as well. Because not all the banks in our sample are publicly listed on the stock market our measure of idiosyncratic risk follows Gelman et al.,(2023) who use a setting inspired by the standard market model and applicable to firms whose stocks are not publicly traded. We consider the bank's annual accounting return and an estimate of the banking sector's

overall annual returns (weighted by bank assets). The return measures we use are the annual returns on assets (ROA) and the annual returns on equity (ROE). Specifically, we consider the following specification at the bank level:

$$Y_{ijt} = X\_country_{jt} + \alpha_i + \epsilon_{it} \text{---------- (4)}$$

Where Y_{ijt} is the annual return proxied by either the ROA or the ROE of bank i from country j at year t. $X\_country_{it}$ is the annual average return of banks in country j at year t. The first step is to extract the residuals from the estimation. We then use the standard deviations of the estimated residuals to calculate each bank's return volatility from which we extract the idiosyncratic risk measures. To address potential noise, we calculate the idiosyncratic risk measure over a two-year window. These idiosyncratic risk measures are then used in the difference-in-difference setup similarly to the baseline specification.

[Insert table 13]

Table 13 Panel A shows the results for specifications in which either the ROA or the ROE is considered to extract the residuals. The coefficients of the interaction term POST x TREAT are significantly positive when we consider the idiosyncratic risk measure based on the ROA (Columns [1] and [2]). They are however not significant when the ROE is used to extract the idiosyncratic risk. Asset risk increases but because banks might hold more capital when they increase their asset risk the impact on ROE might be offset. Indeed, as asset risk goes up banks have to remain compliant with the capital requirements. Overall, our findings support the existing literature according to which a stronger reliance on wholesale funding is associated with higher idiosyncratic and systemic risks (Xu et al., 2019).

In our previous results, we observed that the increase in lending was strictly driven by small banks. We hence investigate whether idiosyncratic risk evolves similarly for large and small banks. By doing so, we focus on the idiosyncratic risk measure based on the ROA. Panel B in Table 13 reports the results for the subsamples of small and large banks based on the threshold we used in our previous investigations (10 billion euros). We note that only small banks show a significant increase in their idiosyncratic risk relative to control banks. This is reflected in the positive and statistically significant coefficient for POST x TREAT at the 1% level. For large banks none of the coefficients are significant. We observe a similar result when we split the sample into two subsamples based on the median of total assets (see Panel C). Such findings are coherent; because the increase in lending is only observed for small banks the latter are the only ones to exhibit higher risk.

We also consider the reaction of the credit market to the announcement of the harmonization of the LCR by specifically looking at the reaction of CDS spreads (see the appendix for a detailed presentation of the event study methodology). Because the CDS market is primarily made up of large banks our findings only apply to large banks.

[Insert table 14]

Table 14 presents the results of the reaction of CDS spreads to the announcement of the harmonization rule. The CDS spreads appear to effectively react to the harmonization of the LCR rule since the CDS cumulative average abnormal returns (CDS_CAAR) are statistically significant for all event windows and all maturities for treated banks. Overall, we find a decrease in CDS returns that is statistically significant for both 5-year, 7-year and 10-year maturities for the cumulative abnormal returns CDS_CAAR. The event windows range from [-1; 1] to [-5; 5].

On average, we observe an abnormal return of -1.93 %, and -1.8% for 5-year and 7-year maturities respectively. However, for the same event windows and maturities, we find no statistically significant abnormal returns for the control banks. Krettek (2023) shows that credit risk regulation leads to higher CDS spreads for European banks, indicating heightened risk. In our case, the lower CDS spreads signal lower risk perception among creditors.

On the whole, we observe that, along with its impact on lending, the standardization of the LCR consistently affects bank risk. Idiosyncratic risk rises following harmonization but only for small banks, i.e. those that exhibit an actual reaction in terms of lending. For large banks, the idiosyncratic risk remains stable and default risk as measured by CDS spreads tends to decrease. This is consistent with the fact that it is mainly the small treated banks that take advantage of the harmonization rule to increase their lending. For large treated banks, the market may be responding positively because the harmonization rule places these banks further from regulatory non-compliance.

5. Robustness Checks

A major advantage of our identification strategy is the short period between the announcement of the LCR harmonization rule and the effective implementation date. The transition period allowed for banks in Europe was just one month. This eliminates concerns that the shock was anticipated allowing banks to gradually adjust. If this was the case our results would be biased

since treated banks would increase their lending relative to control banks in both the pre-treatment and the post-treatment periods. In this section, we perform several robustness checks. In particular, we perform a placebo test. If our baseline is truly capturing the effects of the treatment, we would expect to find insignificant effects in the pre-treatment period. To accomplish this task, we move the post-treatment period to 2014 in our baseline model. We use the same baseline model but where the post-treatment dummy is equal to 1 from the year 2014 instead of 2015. Panel A of Table 15 presents the results. We find that the interaction term POST x TREAT is not significant for any of our three measures of lending. The findings are in line with our expectations and confirm our earlier results.

[Insert Table 15]

Another potential concern is that treated and control banks may be different in terms of bank-level characteristics. It could hence be argued that the observed change in behavior is capturing this difference rather than the average treatment effects. To address this concern, we construct a matched sample of treated and control banks based on some variables. Propensity score matching allows us to match sets of treated and control subjects who share a similar value of the propensity score (Rosenbaum & Rubin, 1983, 1985). In our case, we consider some variables that show a significant mean difference between treated and control groups in Table 2.

We perform propensity score matching of treated and control banks on the following variables; LCR, LOG(TOTALASSET), LOG (DEPOSIT), $WhFUNDS\_TTLA_{t-1}$, Short-term wholesale funds to total assets ($StWhFUNDS\_TTLA_{t-1}$) and finally, LOANLOSS. We use common support criteria in the propensity score matching as the selection criteria. The common support estimates a range of scores for which a match is found between a treatment and a control individual. If there is no overlap in their score then there is no matching. We then run our baseline regression on this matched sample of treated and control banks. Panel B of Table 15 presents the result of the matched sample. We find a positive relationship between POST x TREAT and credit growth. The results are similar to the ones obtained with the unmatched sample.

6. Conclusion

Bank liquidity regulation is recent in its implementation relative to capital regulation and very few papers have so far investigated its impact on bank lending. In this work, we take advantage of a change that occurred in the computation of regulatory liquidity for some banks but not all, to examine its impact on bank lending. Specifically, we exploit the rule announced in 2015 to harmonize the treatment of reserves for the Liquidity Coverage Ratio (LCR) in Europe as an identification strategy. Conversely, to previous studies our setting allows us to investigate the impact of a relaxation of liquidity requirements instead of that of more stringent rules. We find that treated banks, i.e. those that benefitted from harmonization, increased lending compared to their peers which were not affected by the change. However, such findings are mostly effective for treated banks that were already highly liquid, well-diversified and relatively small. Treated banks that increase their lending also exhibit an increase in idiosyncratic risk in comparison to their unaffected peers. For large banks, default risk as captured by CDS spreads tends to diminish. This is possibly because the harmonization rule places such banks further from regulatory non-compliance since, conversely to small banks, they do not take advantage of the rule to increase their lending. Such findings have important policy implications since they show that while lowering liquidity requirements might increase loan supply it might also lead to higher risk in the banking industry.

Figures and Tables

Table 1: Definition of variables

Variables	Definitions
LOG(LOAN)	The log of gross loans
LOAN_TTLA$_{t-1}$	Gross loan to lag of total assets
LOANGROWTH	$\frac{\text{Grossloan}_t - \text{Grossloan}_{t-1}}{\text{Grossloan}_{t-1}}$
LOG(TIER$_1$)	The log of Tier1 capital
TIER1 _TTLA$_{t-1}$	The ratio of Tier1 captial to lagged total assets
ΔTIER1	$\frac{\text{TIER1}_t - \text{TIER1}_{t-1}}{\text{TIER1}_{t-1}}$
LOG(DEPOSIT)	The log of total deposits
DEPOSIT_TTLA$_{t-1}$	The ratio of deposit to lagged total assets
ΔDEPOSIT	$\frac{\text{Deposit}_t - \text{Deposit}_{t-1}}{\text{Deposit}_{t-1}}$
LOG(RESERVE)	The log of reserve
RESERVE_TTLA$_{t-1}$	The ratio of reserve to lagged total assets
ΔRESERVE	$\frac{\text{Retail}_t - \text{Retail}_{t-1}}{\text{Retail}_{t-1}}$
LOG(WhFUNDS)	Log of wholesale funding
WhFUNDS_TTLA$_{t-1}$	The ratio of wholesale funding to lagged total assets
ΔWhFUNDS	$\frac{\text{wholesale}_t - \text{wholesale}_{t-1}}{\text{wholesale}_{t-1}}$
LOG(HQLA)	The log of High quality liquid assets
HQLA_TTLA$_{t-1}$	The ratio of hqla to lagged total assets
ΔHQLA	$\frac{\text{HQLA}_t - \text{HQLA}_{t-1}}{\text{HQLA}_{t-1}}$
LOG(ShtWhFUNDS)	The log of short-term wholesale funding
ShtWhFUNDS_TTLA$_{t-1}$	The ratio of shorterm wholesale funding to lagged total assets
ΔShtWhFUNDS	$\frac{\text{Shortterm wholsale}_t - \text{Shortterm wholesale}_{t-1}}{\text{Shortterm wholesale}_{t-1}}$
LOG(RETAIL LOAN)	log of total retail loans
RETAIL LOAN_ TTLA$_{t-1}$	The ratio total retail loan to lag total asset
ΔRETAIL LOAN	$\frac{\text{Retail}_t - \text{Retail}_{t-1}}{\text{Retail}_{t-1}}$
LOG(CORPORATE LOANS)	log of total corporate loans
CORPORATE LOAN_TTLA$_{t-1}$ (%)	The ratio of total corporate loan to lag total assets
ΔCORPORATE LOAN	$\frac{\text{Corporate loan}_t - \text{Corporate loan}_{t-1}}{\text{Corporate Loan}_{t-1}}$
LOG (MORTGAGE LOAN)	log of total mortgage loans
MORTGAGE LOAN_TTLA$_{t-1}$ (%)	total mortgage loan to lag total assets
ΔMORTGAGE LOAN	$\frac{\text{Mortgage}_t - \text{Mortgage}_{t-1}}{\text{Mortgage}_{t-1}}$
LCR (%)	Basel III Liquidity coverage ratio (LCR) (as reported)(1%)

Deposit Productivity	summation of residual and fixed effects of deposit from equation 1
POST	Is a dummy which equals 1 for years after 2015 or 0 otherwise
TREATED	Is a dummy which equals 1 for banks in treated countries or otherwise
Bank Characteristics	
LOG(TOTAL ASSETS)	log of total assets
LOG (INTEREST EARNING_ASSETS)	log of assets excluding securities, cash and balance at central bank
DEPOSITS_TTLA	The ratio of total customer deposits to total assets
LEVERAGE_TTLA	The ratio total debt to total asset
ROA	The ratio of net income to total asset
ROE	The ratio of equity to total asset
OPERATING EXPENSE_TTLA	total operating expenses to total asset
LOAN LOSS_TTLA (%)	loan loss provision to total asset
Number of branches	The number of branches
Number of employees	The number of employees
SD_IntIncome	two year rolling standard deviation of interest income
DEPOSIT RATE	The ratio of total interest paid on customer to total customer deposits
Macro Conditions	
INFLATION	annual inflation rate
GDP_growth	annual gdp growth

Figure 1: Deposits and Tier1 capital

Note: A plot of DEPOSITS to total assets and TIER1 capital for sample banks for the period 2011-2019.

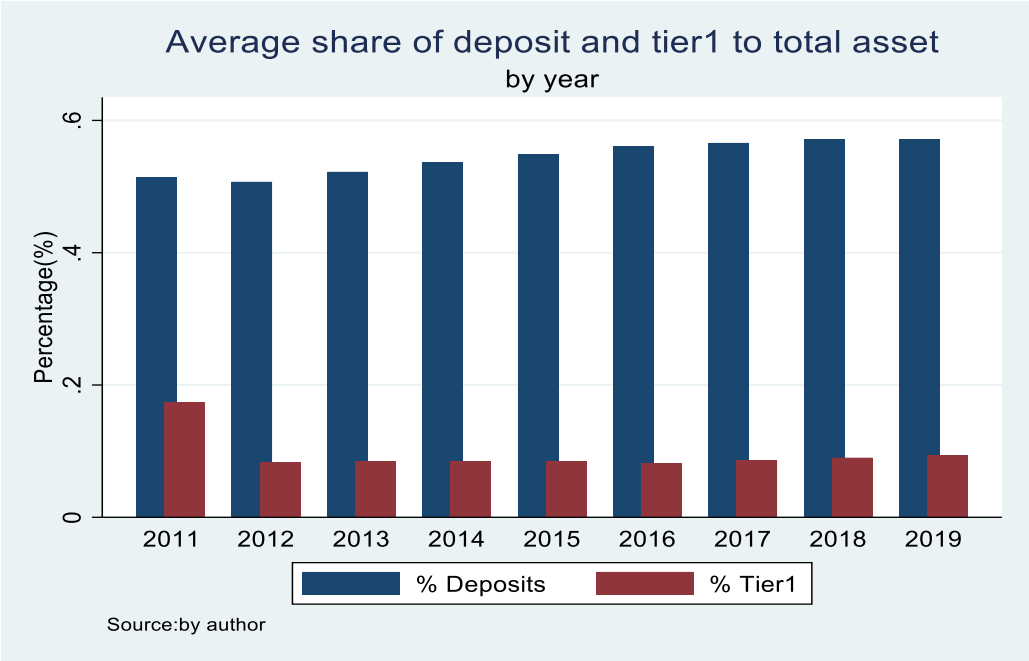
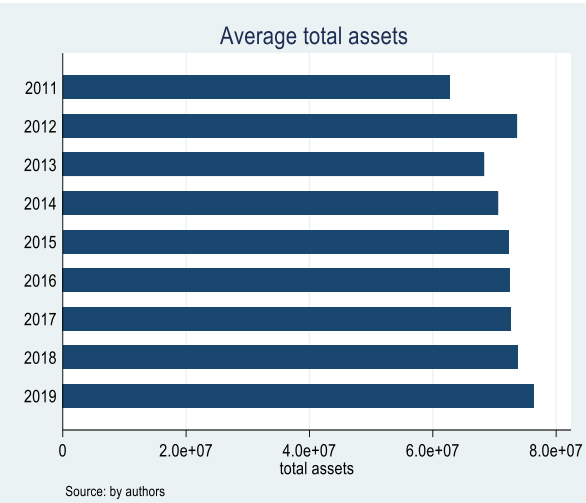


Figure 2: Total assets and Leverage

Note: Panel (a) plots the distribution of average total assets for the period 2011-2019. Panel (b) plots the 2011-2019 leverage

a) Total assets



b) debt

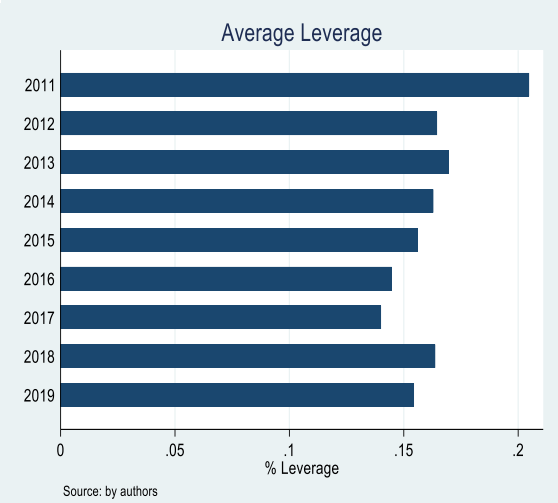


Figure 3: Parallel trend analysis

Note: Figure 3 plots LOG(LOAN) for the period 2011 to 2019 for both control and treated banks in the sample. The event year is 2015. The graphic representation shows a similar pre-treatment trend for the two groups.

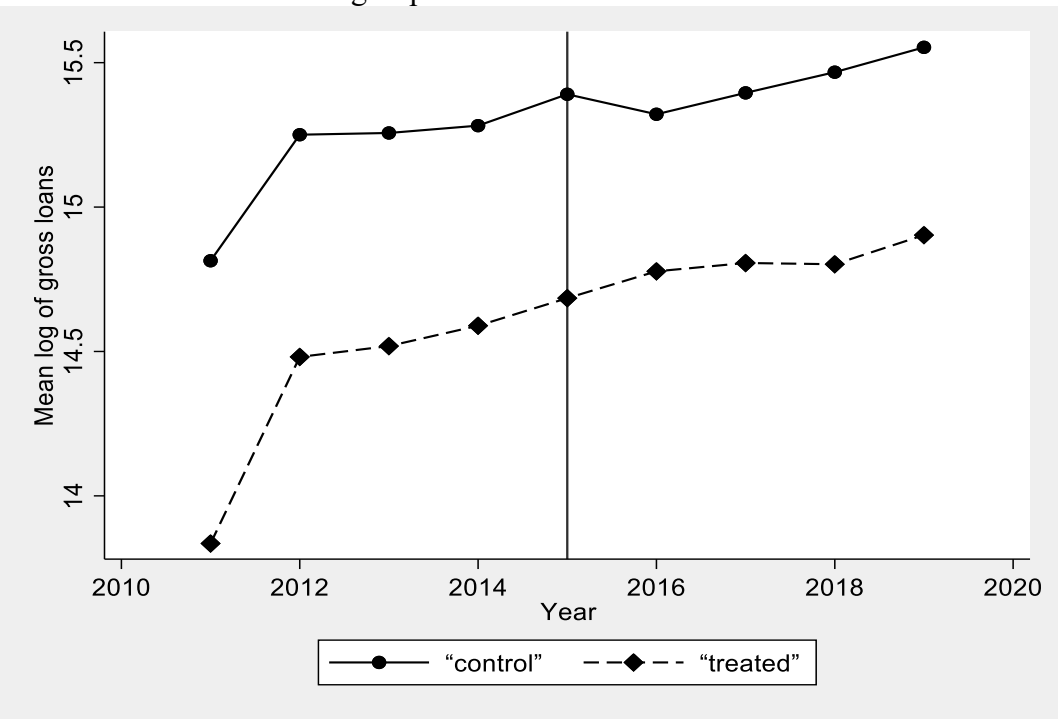


Table 2: Descriptive Statistics

Notes: The table reports descriptive statistics for bank holding companies over the period 2011-2019. LCR is the Basel III Liquidity coverage ratio (LCR) (as reported), ROA is the return on average assets, log total assets is the log transformation of total assets, log interest income, operating expense is the total annual operating expense, loan loss is the ratio of total loan loss provision to total assets, tier1_total assets is the ratio of regulatory tier1 capital to total assets. Deposit is the total customer deposit to total assets, wholesale funding is the log of annual total wholesale funding. Leverage is the ratio of total debt to total assets, deposit rate is the ratio of total interest paid on customer deposits to total deposits.

	Full sample			Treated group		Control group		Difference	
Variable	Obs	Mean	Sd.	Mean	Sd	Mean	Sd	Mean	P -VALUE
LCR	767	209.4	144.9	186.86	128.3	251.6	162.4	64.81	0.000
ΔTIER1	1855	0.084	0.634	0.095	0.778	0.063	0.249	-0.033	0.200
$TIER1\_TTLA_{t-1}$	1855	0.096	0.126	0.091	0.13	0.104	0.112	0.012	0.027
LOG(TIER1)	1855	13.62	2.039	13.61	2.2	13.62	1.713	0.01	0.906
LOG(LOAN)	2750	14.77	2.701	14.58	2.79	15.29	2.31	0.713	0.000
$LOAN\_TTLA_{t-1}$	2750	0.57	0.303	0.557	0.316	0.587	0.259	0.02	0.019
LOANGROWTH	2750	0.048	0.295	0.053	0.303	0.034	0.268	-0.019	0.138
LOG(DEPOSITS)	2670	14.83	2.637	14.58	2.79	15.53	1.97	0.94	0.000
$DEPOSITS\_TTLA_{t-1}$	2670	0.543	0.266	0.518	0.269	0.615	0.219	-0.097	0.302

ΔDEPOSITS	2670	0.127	0.515	0.135	0.542	0.103	0.429	-0.03	0.135
LOG(WhFUNDS)	2755	14.00	2.928	13.98	3.03	14.07	2.617	0.091	0.439
WhFUNDS_TTLA$_{t-1}$	2755	0.319	0.277	0.35	0.289	0.233	0.214	-0.117	0.000
ΔWhFUNDS	2755	0.014	0.718	0.003	0.77	-0.062	0.526	-0.065	0.047
LOG(ShtWhFUNDS)	2658	13.487	2.931	13.46	3.03	13.55	2.627	0.09	0.421
ShtWhFUNDS_TTLA$_{t-1}$	2658	0.227	0.227	0.247	0 .262	0.168	0.198	0.079	0.000
ΔShtWhFUNDS	2658	-0.072	0.954	-0.042	10.30	-0.155	0.78	0.48	0.011
RESERVE_TTLA$_{t-1}$	2658	0.98	20.66	1.29	801.8	0.125	0.78	-1.17	0.222
LOG(RESERVE)	2658	12.034	3.069	11.7	19.23	12.9	0.77	1.195	0.000
ΔRESERVE	2658	11.967	3.051	11.65	19.23	12.8	2.33	1.151	0.000
LOG(HQLA)	2312	11.074	3.367	10.76	16.50	11.81	2.34	1.047	0.000
HQLA_TTLA$_{t-1}$	2312	-0.155	6.713	-0.105	51.32	-0.287	0.07	-0.181	0.562
ΔHQLA	2312	0.602	2.117	0.63	16.54	0.53	7.69	-0.094	0.602
LOG(TOTAL ASSETS)	2786	15.675	2.271	15.54	20.94	16.03	1.95	0.48	0.000
LEVERAGE_TTLA	2086	0.163	0.185	0.179	0.958	0.122	1.95	-0.056	0.000
ROA	2716	0.006	0.17	0.005	0.17	0.006	0.016	0.001	0.511

LOAN LOSS_TTLA	2529	0.004	0.009	0.004	0.068	0.005	1.65	0.0013	0.005
GDP growth	2990	1.569		1.417	9.608	2.03	0.01		
INFLATION	2990	1.354	0.959	1.31	6.533	1.46	1.99		

Table 3: Correlation Matrix of Variables

Note: The table reports bivariate correlations between the variables used in the regressions. The three measures of credit growth dependent as follows: LOG (LOAN) is the natural logarithm of gross loan at the individual bank level, LOAN_TTLA$_{t-1}$ is the ratio of gross loan to total assets, and LOANGROWTH is the annual growth rate of gross loans. The liquidity covered ratio is defined as follows: The bank-specific control variables are defined as follows: TOTAL ASSETS for size, is the ratio of equity capital to total assets, ROA is the return on assets, return on assets which is calculated as the ratio of net income to total assets, DEPOSITS_TTLA the amount of total deposits divided by total assets, WhFUNDS is the total wholesale funding, and LOAN LOSS is the loan loss provisions. All variables are trimmed at the 1st and 99th percentiles.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) LCR	1.000															
(2) ΔTIER1	0.113	1.000														
(3) TIER_TTLA$_{t-1}$	0.132	0.074	1.000													
(4) LOG(TIER1)	-0.338	-0.040	-0.094	1.000												
(5) LOG(LOAN)	-0.349	-0.063	-0.430	0.852	1.000											
(6) LOAN_TTLA$_{t-1}$	-0.120	0.053	-0.101	-0.010	0.350	1.000										
(7) LOANGROWTH	-0.025	0.081	-0.095	-0.129	-0.010	0.276	1.000									
(8) DEPOSIT_TTLA$_{t-1}$	0.140	-0.077	-0.022	0.080	0.015	0.120	0.161	1.000								
(9)LOG(WhFUNDS)	-0.382	-0.053	-0.276	0.849	0.823	0.118	-0.083	0.026	1.000							
(10) WhFUNDS_TTLA$_{t-1}$	-0.090	0.052	-0.128	0.042	0.038	0.195	0.130	0.141	0.366	1.000						
(11) ΔWhFUNDS	-0.031	0.184	0.002	-0.068	-0.017	0.102	0.194	-0.006	0.074	0.149	1.000					
(12) ΔShtWhFUNDS	-0.069	0.144	0.001	-0.055	-0.018	0.079	0.155	0.076	0.059	0.136	0.751	1.000				
(13) LOG(TOTAL ASSETS)	-0.334	-0.059	-0.496	0.881	0.902	0.038	-0.065	0.014	0.833	0.018	-0.023	-0.016	1.000			
(14)LEVERAGE	0.028	-0.050	0.275	0.230	0.087	0.046	-0.073	0.017	0.287	0.571	0.012	-0.099	0.008	1.000		
(15) ROA$_{t-1}$	0.019	-0.082	0.059	-0.028	-0.123	-0.059	0.099	0.017	-0.102	-0.038	0.028	-0.018	-0.050	-0.036	1.000	
(16) LOAN LOSS	-0.006	0.041	0.458	0.045	-0.055	0.136	-0.117	-0.012	-0.010	0.014	-0.014	0.007	-0.163	0.198	-0.276	1.000

Table 4: Effects of Harmonization of LCR on Lending

Note: The table reports the results obtained estimating equation (1). The dependent variables are column [1] LOG (LOAN) column [2] LOAN_TTLA$_{t-1}$ column [3] LOANGROWTH respectively. TREAT is a dummy variable equal to 1 for banks in the treated group where the harmonization of reserve treatment leads to the relaxation of LCR and zero otherwise. POST is a dummy equal to 1 for years after 2015 or zero otherwise. The control group are banks based in countries where existing reserve treatment for LCR purposes is similar to harmonization rules. We control for bank individual characteristics such as *size* measured as the log of total assets, profitability is roa, deposit is the ratio of total deposit to total assets, and leverage is total debt to total assets and, loanloss is the loan loss provisions to total assets to account for loan quality and capital is measured as Tier1 capital to total assets. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year-fixed effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ∗∗∗, ∗∗, and ∗ indicate statistical significance at the 1, 5, and 10%, respectively.

Dependent :	(1) LOG(LOAN)	(2) LOAN_TTLA$_{t-1}$	(3) LOANGROWTH
POST x TREAT	0.1354***	0.0301**	0.0339*
	(0.0390)	(0.0153)	(0.0187)
ROA$_{t-1}$	0.0568***	0.0251***	0.0340***
	(0.0186)	(0.0068	(0.0095)
TIER1_TTLA$_{t-1}$	1.1993	-0.1921	-0.1112
	(0.8721)	(0.1587)	(0.2820)
LEVERAGE$_{t-1}$	0.9670***	0.3466***	-0.0223
	(0.1756)	(0.0606)	(0.1111)
DEPOSITS_TTLA$_{t-1}$	1.4201***	0.5066***	0.1024
	(0.1193)	(0.0350)	(0.0657)
LOG(TOTAL ASSET $_{t-1}$)	1.0215***	0.0007	-0.0138***
	(0.0090)	(0.0030)	(0.0038)
LOANLOSS$_{t-1}$	15.5931***	6.2984***	-1.2102
	(2.3694)	(0.8969)	(1.0735)
GDP_growth	-0.0064	-0.0068*	-0.0063
	(0.0097)	(0.0040)	(0.0046)
INFLATION	-0.0105	-0.0089	-0.0044
	(0.0172)	(0.0070)	(0.0109)
_cons	-1.9895***	0.2006***	1.1965***
	(0.2589)	(0.0747	(0.0889)
No of obs	1030	1030	1030
Year FE	YES	YES	YES
Country FE	YES	YES	YES
R-square	0.9641	0.3646	0.0623

Table 5: Effects of Harmonization of LCR on lending (Liquidity position)

Note: This table reports results of subsamples of high-liquid banks and low-liquid banks. The dependent variables are column [1] LOG(LOAN*)* column [2] $LOAN\_TTLA_{t-1}$ column [3] LOANGROWTH respectively. Panel A presents the results for the high LCR banks which is a sample of treatment banks with above-median LCR. Treated is a dummy variable equal to 1 for banks in the treated group where the harmonization of reserve treatment leads to the relaxation of LCR and zero otherwise. Post is a dummy equal to 1 for years after 2015 or zero otherwise. The control group are banks based in countries where existing reserve treatment for LCR purposes is similar to harmonization rules. Panel B shows estimates for the bank with LCR below the median LCR. We control for bank individual characteristics such as *size* measured as the log of total assets, profitability is roa, deposit as the ratio of total deposit to total assets, and leverage is total debt to total assets and, loanloss is the loan loss provisions to total assets to account for loan quality and capita*l* is measured as Tier1 capital to total assets. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year-fixed effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ***, **, and * indicate statistical significance at the 1, 5, and 10%, respectively.

	High LCR			**Low LCR**		
Dependent :	(1)	(2)	(3)	(4)	(5)	(6)
	LOG(LOAN)	$LOAN\_TTLA_{t-1}$	LOANGROWTH	LOG(LOAN)	$LOAN\_TTLA_{t-1}$	LOANGROWTH
	(A)			(B)		
POST x TREAT	0.1966***	0.0554**	0.0517*	-0.1401	-0.0420	0.0023
	(0.0577)	(0.0218)	(0.0299)	(0.0954)	(0.0287)	(0.0238)
_cons	-1.7446***	0.2989***	1.0788***	5.5481**	0.4876***	1.2534***
	(0.3144)	(0.1098)	(0.1269)	(2.2935)	(0.1765)	(0.1718)
No of obs	800	800	800	285	285	285
Bank Control	YES	YES	YES	YES	YES	YES
Country Control	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-square	0.935	0.201	0.071	0.956	0.456	0.144

Table 6: Effects of Harmonization of LCR on Balance Sheet Adjustment (LIABILITIES)

Note: This table reports the effects of harmonization on changes to balance sheet items on the liability side. Panel A presents the results for the dependent variable, Column [1] LOG(ShtFUNDS), LOG(WhFUNDS) Column [2] The dependent variable is ShtFUNDS_TTLA$_{t-1}$ Column [3] ΔShtFUNDS. Panel B Presents results where the dependent variable Column [1] LOG(WhFUNDS) is the dependent variable Column [2] WhFUNDS_TTLA$_{t-1}$ is the dependent variable Column[3] is ΔWhFUNDS. Panel C presents results for Deposits. Column [1] We use LOG (DEPOSITS) as the dependent variable Column [2] the dependent variable is DEPOSITS_TTLA$_{t-1}$ and Column [3] is the ΔDEPOSITS. TREAT is a dummy variable equal to 1 for treated banks. POST is a dummy equal to 1 for years after 2015 or zero otherwise. We control for bank individual characteristics such as *size* measured as the log of total assets, profitability is roa, deposit as the ratio of total deposit to total assets, and leverage as total debt to total asset and, loan loss is the loan loss provisions to total assets to account for loan quality and capita*l* is measured as Tier1 capital to total assets. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year-fixed effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ∗∗∗, ∗∗, and ∗ indicate statistical significance at the 1, 5, and 10%, respectively.

Dependent :	**Short-term wholesale-funding**			**Total wholesale-funding**			**Deposits**		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
		(A)			**(B)**			**(C)**	
POST x TREAT	0.4008***	5.5270	0.2010***	0.2134***	0.0199*	0.0647*	0.0653	-0.0061	-0.0194
	(0.1041)	(5.1014)	(0.0761)	(0.0645)	(0.0102)	(0.0375)	(0.0404)	(0.0096)	(0.0232)
_cons	2.0054	1.7475	-0.4895**	-0.0696	0.9437***	-0.2638*	-2.3573***	0.179***	0.5356***
	(2.3717)	(2.9722)	(0.2460)	(0.2735)	(0.0696)	(0.1470)	(0.3013)	(0.0578)	(0.1514)
No of obs	1012	1012	1012	1030	1030	1030	1030	1030	1030
Bank Control	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Control	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-square	0.9527	0.0662	0.0510	0.9315	0.5841	0.0533	0.9462	0.8419	0.0488

Table 7: Effects of Harmonization of LCR on Balance Sheet Adjustment (ASSETS)

Note: This table reports the effects of harmonization on changes to balance sheet items on the asset side. Panel A presents the results with liquid assets as the dependent variable, Column [1] presents liquid assets as the dependent variable Column [2] The dependent variable is liquid assets to lag total assets Column [3] presents results with the growth rate of liquid assets as dependent variable. Panel B presents results with HQLA as the dependent variable. Column [1] presents results with the log of HQLA as the dependent variable Column [2] The dependent variable is HQLA to lag total assets Column [3] is the growth rate of HQLA. Panel C presents results with Reserve balance as the dependent variable. Column [1] shows the log of reserve balance as the dependent variable Column [2] The dependent variable is a ratio of reserve balance to lag total assets Column [3] is the growth rate of reserve balance. TREAT is a dummy variable equal to 1 for banks in the treated group. POST is a dummy equal to 1 for years after 2015 or zero otherwise. We control for bank individual characteristics such as *size* measured as the log of total assets, profitability is roa, deposits as the ratio of total deposits to total assets, and leverage as total debt to total assets and, loanloss is the loan loss provisions to total assets to account for loan quality and capital is measured as Tier1 capital to total assets. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year-fixed effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ***, **, and * indicate statistical significance at the 1, 5, and 10%, respectively.

Dependent :	**Liquid assets**			**HQLA**			**Reserve Bal.**		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
		(A)			**(B)**			**(C)**	
POST x TREAT	0.1364	0.0079	-0.1106*	0.6888**	0.0115**	0.2208	0.5560***	0.0204***	0.3121***
	(0.1278)	(0.0170)	(0.0616)	(0.3383)	(0.0046)	(1.2204)	(0.0932)	(0.0039)	(0.0946)
_cons	4.9922***	1.275***	-0.3105	2.5988	0.2213	-0.2638*	3.4096	0.0899	-4.6336*
	(1.5558)	(0.4073)	(0.4492)	(7.6329)	(0.4524)	(0.1470)	(3.1630)	(0.2919))	(2.7320)
No of obs.	1012	1012	1012	1030	1030	1030	1012	1012	1012
Bank Control	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Control	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-square	0.971	0.862	0.928	0.932	0.584	0.053	0.934	0.756	0.934

Table 8: Effects of Harmonization of LCR on lending (SIZE)

Note: This table studies the impact of size on post-harmonization lending of treated banks. The dependent variables are column [1] LOG(LOAN*)* column [2] $LOAN\_TTLA_{t-1}$ column [3] LOANGROWTH respectively. In Panel A we created two samples by following Baros et al., (2023) in defining banks with total assets above 10 billion Euros as large banks and banks below as small banks. In Panel B we split our sample into above and below the median of total assets for large and small banks respectively. Treated is a dummy variable equal to 1 for banks in the treated group where the harmonization of reserve treatment leads to the relaxation of LCR and zero otherwise. Post is a dummy equal to 1 for years after 2015 or zero otherwise. We control for bank and country in all the panels. Year-fixed effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ∗∗∗, ∗∗, and ∗ indicate statistical significance at the 1, 5, and 10%, respectively.

Panel A

	Large Banks			**Small Banks**		
	(1)	(2)	(3)	(1)	(2)	(3)
Dependent :	LOG(LOAN)	$LOAN\_TTLA_{t-1}$	LOANGROWTH	LOG(LOAN)	$LOAN\_TTLA_{t-1}$	LOANGROWTH
		(A)			(B)	
POST x TREAT	0.0399	-0.0212	0.0099	0.3358^{***}	0.1349^{***}	0.0315
	(0.0494)	(0.0185)	(0.0159)	(0.0861)	(0.0325)	(0.0331)
_cons	-2.0497^{***}	0.5672^{***}	0.0992	-0.5299	0.3534^{*}	0.2458
	(0.4321)	(0.1473)	(0.1145)	(0.5185)	(0.1834)	(0.1976)
No of obs.	640	640	640	442	442	442
R-square	0.9271	0.4010	0.1928	0.7991	0.2146	0.1176

Panel B:

	Large Banks			**Small Banks**		
	(1)	(2)	(3)	(1)	(2)	(3)
Dependent :	LOG(LOAN)	$LOAN\_TTLA_{t-1}$	LOANGROWTH	LOG(LOAN)	$LOAN\_TTLA_{t-1}$	LOANGROWTH
		(A)			(B)	
POST x TREAT	0.0972^{*}	-0.0083	0.0221	0.3088^{***}	0.1508^{***}	0.0121
	(0.0550)	(0.0189)	(0.0176)	(0.0902)	(0.0387)	(0.0373)
_cons	-2.1826^{***}	0.4402^{***}	-0.0286	-0.7010	0.2515	0.1590
	(0.3840)	(0.1206)	(0.1099)	(0.5209)	(0.2235)	(0.2235)
No of obs.	763	763	763	319	319	319
Bank Control	YES	YES	YES	YES	YES	YES
Country Control	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-square	0.9128	0.3130	0.1207	0.8293	0.2272	0.1511

Table 9: Effects of Harmonization of LCR on lending (CAPITAL)

Note: This table studies the impact of the level of capitalization on post-harmonization lending of treated banks. The dependent variables are; column [1] LOG(LOAN) column [2] $LOAN\_TTLA_{t-1}$ column [3] LOANGROWTH respectively. Panel A presents the results for the Highly Capitalized which is a group of treatment banks above median Tier1 capital. Treated is a dummy variable equal to 1 for banks in the treated group. Post is a dummy equal to 1 for years after 2015 or zero otherwise. The control group are banks based in countries where existing reserve treatment for LCR purposes is similar to harmonization rules. Panel B shows estimates for the bank with Tier 1 Capital below the median. We control for bank individual characteristics such as *size* measured as the log of total assets, profitability is roa, the deposit is the ratio of total deposits to total assets, and leverage is total debt to total assets and, loanloss is the loan loss provisions to total assets to account for loan quality and capita*l* is measured as Tier1 capital to total assets. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year-fixed effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ***, **, and * indicate statistical significance at the 1, 5, and 10%, respectively.

	Highly Capitalized			**Lowly Capitalized**		
Dependent :	(1) LOG(LOAN)	(2) $LOAN\_TTLAt_{-1}$	(3) LOANGROWTH	(4) LOG(LOAN)	(5) $LOAN\_TTLAt_{-1}$	(6) LOANGROWTH
		(A)			(B)	
POST x TREAT	0.2787***	0.0936***	0.0232	0.0720	-0.0064	0.0217
	(0.0665)	(0.0238)	(0.0252)	(0.0627)	(0.0263)	(0.0192)
_cons	-2.0981***	-0.0357	-0.0638	-2.1096***	0.4126***	0.0196
	(0.3802)	(0.1298)	(0.1400)	(0.3389)	(0.1188)	(0.1024)
No. of obs	508	508	508	575	575	575
Bank Control	YES	YES	YES	YES	YES	YES
Country Control	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-square	0.919	0.281	0.143	0.954	0.289	0.169

Table 10: Effect of Harmonization of LCR on lending (DEPOSIT PRODUCTIVITY)

Note: This table studies the impact of productivity on post-harmonization lending of treated banks. The dependent variables are column [1] LOG (LOAN*)* column [2] LOAN_TTLA$_{t-1}$column [3] LOANGROWTH respectively. TREAT is a dummy variable equal to 1 for banks in countries where harmonization of reserve treatment leads to the relaxation of LCR and zero otherwise. POST is a dummy equal to 1 for years after 2015 or zero otherwise. Control groups are banks based in countries where reserve treatment for LCR purposes is similar to harmonization rules. High productivity is a sample of banks with above median deposit productivity score -and below median deposit productivity. We control for bank individual characteristics such as *size* measured as the log of total assets, profitability is roa, deposit as the ratio of total deposit to total asset, and leverage as total debt to total asset and, loanloss is the loan loss provisions to total assets to account for loan quality and capital is measured as Tier1 capital to total assets. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year-fixed effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ∗∗∗, ∗∗, and ∗ indicate statistical significance at the 1, 5, and 10%, respectively.

	High Productivity			**Low Productivity**		
Dependent :	(1) LOG(LOAN)	(2) LOAN_TTLA$_{t-1}$ (A)	(3) LOANGROWTH	(1) LOG(LOAN)	(2) LOAN_TTLA$_{t-1}$ (B)	(3) LOANGROWTH
POST x TREAT	0.0145	-0.0040	-0.0272	0.4550***	0.1315***	0.0685
	(0.0339	(0.0175)	(0.0248)	(0.1052)	(0.0377)	(0.0462)
_cons	3.7881**	2.4738***	4.2027***	-1.6174***	0.4157***	0.2269
	(1.5782)	(0.7633)	(1.2954)	(0.4504)	(0.1346)	(0.1717)
No of obs.	767	767	767	315	315	315
Bank Control	YES	YES	YES	YES	YES	YES
Country Control	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-square	0.993	0.864	0.419	0.942	0.323	0.118

Table 11: Effects of Harmonization of LCR on lending (DIVERSIFICATION)

Note: This table studies the impact of diversification on post-harmonization lending of treated banks. The dependent variables are column [1] LOG (LOAN) column [2] $LOAN\_TTLA_{t-1}$ column [3] LOANGROWTH respectively. Treated is a dummy variable equal to 1 for banks in countries where harmonization of reserve treatment leads to the relaxation of LCR and zero otherwise. Post is a dummy equal to 1 for years after 2015 or zero otherwise. Control groups are banks based in countries where reserve treatment for LCR purposes is similar to harmonization rules. The measure of diversification is non-interest income. We classify banks with above median non-interest income as having a high diversification and banks with below median non-interest income as low diversification. We control for bank individual characteristics such as size measured as the log of total assets, profitability is roa, deposit is the ratio of total deposit to total assets, and leverage is total debt to total assets and, loanloss is the loan loss provisions to total assets to account for loan quality and capital is measured as Tier1 capital to total assets. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year-fixed effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ***, **, and * indicate statistical significance at the 1, 5, and 10%, respectively.

	High Diversification			**Low Diversification**		
Dependent :	(1) LOG(LOAN)	(2) $LOAN\_TTLA_{t-1}$	(3) LOANGROWTH	(4) LOG(LOAN)	(5) $LOAN\_TTLA_{t-1}$	(6) LOANGROWTH
POST x TREAT	0.2533***	0.0655**	0.0672**	0.0900*	0.0243	-0.0082
	(0.0807)	(0.0286)	(0.0287)	(0.0531)	(0.0215	(0.0153)
_cons	-2.5143***	0.0757	0.0498	-1.1669***	0.5653***	-0.0328
	(0.4162)	(0.1252)	(0.1193)	(0.3120)	(0.1285)	(0.1129)
No of obs.	590	590	508	492	492	492
Bank Control	YES	YES	YES	YES	YES	YES
Country Control	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-square	0.941	0.254	0.097	0.968	0.218	0.194

Table 12: Effects of Harmonization of LCR on Lending (LOAN TYPES)

Note: Panel A: The dependent variables are column [1] LOG (RETAIL) column [2] RETAIL_TTLt-1 is the retail loan to total assets column [3] ΔRetail loan is the growth rate of the retail loan. The treated is a dummy variable equal to 1 for treated banks. Post is a dummy equal to 1 for years after 2015 or zero otherwise. The control group are banks based in countries where reserve treatment for LCR purposes is similar to harmonization rules. We control for bank individual characteristics. Size, roa, deposits, and leverage loan loss provisions to account for loan quality and capital. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year fixed-effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ∗∗∗, ∗∗, and ∗ indicate statistical significance at 1, 5, and 10%, respectively.

Panel A: Retail Loans

	(1) LOG(RETAIL)	(2) RETAIL_TTLA$_{t-1}$	(3) ΔRETAIL LOAN
POST x TREAT	3.0145***	0.1481**	0.0182
	(0.6592)	(0.0662)	(0.0176)
_cons	1.2992	0.5204	0.3158
	(2.5738)	(0.4637)	(0.2964)
No. of obs	841	841	821
Bank control	YES	YES	YES
Macro control	YES	YES	YES
Year FE	YES	YES	YES
Country-year FE	YES	YES	YES
R-square	0.766	0.342	0.229

Note: In panel B the dependent variables are column [1] LOG (CORPORATE LOAN_TTLA$_{t-1}$) [2] is the ratio of ΔCORPORATE LOAN to total assets [3] year-on-year difference to total assets. The Treated is a dummy variable equal to 1 for treated banks. Post is a dummy equal to 1 for years after 2015 or zero otherwise. The control group are banks based in countries where existing reserve treatment for LCR purposes is similar to harmonization rules. We control for bank individual characteristics. Size, roa, deposits, and leverage loan loss provisions to account for loan quality and capital. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year fixed-effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ∗∗∗, ∗∗, and ∗ indicate statistical significance at 1, 5, and 10%, respectively.

Panel B: Corporate Loans

	(1) LOG(CORPORATE LOAN)	(2) CORPORATELOAN /_TTLA$_{t-1}$	(3) ΔCORPORATE LOAN
POST x TREAT	2.7317***	0.4976***	0.0585***
	(0.9450)	(0.0729)	(0.0192)
_cons	-9.7199	-0.1376	0.0350
	(6.2765)	(0.5057)	(0.1236)
No. of obs	506	506	487
Bank control	YES	YES	YES
Country control	YES	YES	YES
Year FE	YES	YES	YES
Country-Year FE	YES	YES	YES
R-square	0.669	0.660	0.417

Note: Panel C: The dependent variables are Column [1] log of mortgage difference mortgage to total assets Column [2] the ratio of mortgage to total assets and Column [3] the growth of mortgage Treated is a dummy variable equal to 1 for banks in countries where harmonization of reserve treatment lead to the relaxation of LCR and zero otherwise. Post is a dummy equal to 1 for years after 2015 or zero otherwise. The control group are banks based in countries where existing reserve treatment for LCR purposes is similar to harmonization rules. We control for bank individual characteristics. Size, roa, deposits, loan loss provisions and capital. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year fixed-effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ∗∗∗, ∗∗, and ∗ indicate statistical significance at 1, 5, and 10%, respectively.

Panel C: Mortgage

	(1) LOG(MORTGAGE LOAN)	(2) MORTGAGE LOAN_TTLA$_{t-1}$	(3) ΔMORTGAGE LOAN
POST x TREAT	-3.7282	-0.0773**	-0.0680***
	(2.6009)	(0.0318)	(0.0258)
_cons	-0.9918	0.1972***	0.2275***
	(1.5286)	(0.0263)	(0.0206)
No. of obs	562	547	547
Bank control	YES	YES	YES
Country control	YES	YES	YES
Year FE	No	No	No
Year-country FE	YES	YES	YES
Macro control	YES	YES	YES
R-square	0.756	0.325	0.319

Table 13: The effects of Harmonization of LCR on Idiosyncratic risk

Note Panel A: The table presents the result of the impact of harmonization rules on the level of idiosyncratic risk for treated banks. Idiosyncratic risk measures are based on annual ROA) and (ROE) using Equation (4). Panel B presents results for idiosyncratic risk measures using ROA with a sample split below and above 10 billion euros. Panel C presents results with a sample split below and above the median of total assets for small and large banks respectively. Treated is a dummy variable equal to 1 for banks in countries where harmonization of reserve treatment leads to the relaxation of LCR and zero otherwise. Post is a dummy equal to 1 for years after 2015 or zero otherwise. Control groups are banks based in countries where reserve treatment for LCR purposes is similar to harmonization rules. Standard errors (in parentheses) are clustered at the bank level. ***, **, and * indicate statistical significance at 1, 5, and 10%, respectively.

Panel A

	(1) Idiosyncratic risk (ROA)	(2) idiosyncratic risk (ROA)	(3) Idiosyncratic risk (ROE)	(4) Idiosyncratic risk (ROE)
POST x TREATED	0.2145**	0.2627***	-0.0111	-0.0233
	(0.0906)	(0.0911)	(0.0199)	(0.0206)
No. of obs	1284	1277	1284	1277
Bank control	Yes	Yes	Yes	Yes
Country control	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-square	0.6612	0.6613	0.4656	0.4959

Panel B

	Small Banks		**Large Banks**	
	(1)	(2)	(1)	(2)
POST x TREATED	0.4629***	0.4934***	0.0070	0.0774
	(0.1641)	(0.1691)	(0.0981)	(0.0835)
_cons	2.0338	1.9436	0.5295	0.2822
	(2.3230)	(2.3309)	(2.6094)	(2.2045)
No. of obs.	618	618	691	648
Bank Control	Yes	Yes	Yes	Yes
Country Control	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-square	0.6681	0.6690	0.6916	0.6999

Panel C

	Small Banks		**Large Banks**	
	(1)	(2)	(1)	(2)
POST x TREATED	0.6859***	0.6868***	0.0465	0.0792
	(0.2085)	(0.2169)	(0.0767)	(0.0644)
_cons	1.4656	1.4291	1.0343	0.5195
	(2.8002)	(2.8110)	(1.9885)	(1.6550)
No. of obs	472	472	838	794
Bank control	Yes	Yes	Yes	Yes
Country control	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-square	0.6916	0.6925	0.6850	0.6880

Table 14: CDS Market reaction to the announcement of Harmonization of LCR

Note: The table presents the results of the credit market reaction to the announcement of the new harmonization rules. Our variable of interest is the CDS_CAAR (the cumulative average abnormal returns in CDS spread) over the event windows between (−1, 1) and (-5, 5). The event date is 1st October 2015. Panel A presents results for CDS with maturity 5-year maturity, and Panel B presents results for CDS with a 7-year maturity, Panel C presents results for CDS with a 10-year maturity. Superscripts ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

Panel A: The impact of harmonization of LCR on bank CDS spread of treated banks returns (5-year maturity).

	Control				Treated			
Event window	Banks	CAAR	Patell	Boehmer	Banks	CAAR	Patell	Boehmer
[-1;1]	33	-.00408			30	-.01817	**	**
[-2;2]	33	-.00626	*		30	-.01046	***	***
[-5;5]	33	-.01151	*	*	30	-.02736	***	***
[-5;-1]	33	-.01090			30	-.02133	***	***

Panel B: The impact of harmonization of LCR on bank CDS spread of treated banks returns (7-year maturity).

	Control				Treated			
Event window	Banks	CAAR	Patell	Boehmer	Banks	CAAR	Patell	Boehmer
[-1;1]	33	-0.0105			30	-0.0141	**	**
[-2;2]	33	-0.0118			30	-0.0134	***	***
[-5;5]	33	-0.0151			30	-0.0280	***	***
[-5;-1]	33	0.0010			30	-0.0174	***	***

Table 15: Robustness of impact of Harmonization of LCR on lending

Note: The dependent variables are column [1] LOG(LOAN) column[2] LOAN_TTLAt-1 column [3] LOANGROWTH respectively. Treat is a dummy variable equal to 1 for banks in countries where harmonization of reserve treatment leads to the relaxation of LCR and zero otherwise. Post is a dummy equal to 1 for years after 2015 or zero otherwise. Control groups are banks based in countries where reserve treatment for LCR purposes is similar to harmonization rules. Panel A presents the results where the post is a dummy which to 1 if the year is 2014 or above. Panel B presents results for where controls are matched using propensity score matching. We control for bank individual characteristics. Size, roa, deposits, loan loss provisions, capital. All bank-level controls are included as lag variables. We control for country macro conditions and demand side effects by including GDP growth and INFLATION rate. Year fixed-effects are included to control for time trends. Standard errors (in parentheses) are clustered at the bank level. ***, **, and * indicate statistical significance at 1, 5, and 10%, respectively.

Panel A: Placebo Test

Dependent:	(1) LOG(LOAN)	(2) $LOAN\_TTLA_{t-1}$	(3) LOANGROWTH
POST x TREAT	0.0248	0.0041	0.0240
_CONS	(0.0916)	(0.0364)	(0.0663)
No of obs.	1030	1030	1030
Bank Control	YES	YES	YES
Country Control	YES	YES	YES
Year FE	YES	YES	YES
R-square	0.993	0.874	0.062

Panel B: Regression with Propensity Score Matching

Dependent:	(1) LOG(LOAN)	(2) $LOAN\_TTLA_{t-1}$	(3) LOANGROWTH
POST x TREAT	0.2702^{***}	0.0711^{***}	0.0343
	(0.0709)	(0.0237)	(0.0282)
No of obs.	933	933	933
Bank Control	YES	YES	YES
Country Control	YES	YES	YES
Year FE	YES	YES	YES
R-square	0.938	0.386	0.122

Appendix

To conduct our event study, we use a sample that includes daily information on CDS spreads from 01/03/2014 to 12/29/2017 obtained from Bloomberg. Our sample includes public European-treated banks comprising 30 banks from treated countries. Our measure of market return is the itraxx CDX for Europe. The indices trade 3-, 5-, 7- and 10-year maturities and a new series is determined based on liquidity every six months. The benchmark index comprises 125 equally weighted European firms. The indices measure the performance of the on-the-run itraxx CDX contracts. For this study, we focus on the 5, 7, and 10-year maturities.

We measure the CDS spread reaction to the announcement of the harmonization of the LCR by considering the cumulative average abnormal returns of treated banks over a particular event window. To achieve this, we consider the abnormal return AR_{it} of treated banks on each date t of the event window. The abnormal return is the excess between the realised CDS spread return and an expected return $\widehat{R_{it}}$. The expected return is the expected return on a normal trading day absent the announcement of harmonization of the LCR rule

We estimate the daily return of the CDS spread as $R_{it} = \log\left(\frac{S_{it}}{S_{it-1}}\right)$;

Where R_{it} is the daily return for Bank i CDS in day t and S_i is the daily CDS spread for Bank (i) for a specific maturity contract.

We estimate the daily market returns for a given maturity as $R_{mt} = \log\left(\frac{S_{mt}}{S_{mt-1}}\right)$;

where R_{mt} is the daily return market indices return for a given CDX maturity at day t. S_{mt} is the daily market spread of the index CDX for a given maturity at day t.

Our methodology relies on a single-factor market model over a 120-trading day window.

$$R_{it} = \alpha_0 + \beta_1 R_{mt} + \varepsilon_{it}$$

We follow Bekaert et al. (2014) for the estimation of the abnormal returns. The abnormal return (*AR*) due to the harmonization announcement of bank *i* for day *t* is calculated as

$$AR_{it} = R_{it} - (\widehat{\alpha_0} + \widehat{\beta_1} R_M)$$

We then proceed to estimate the average abnormal return on day *t* for all n banks in our sample as:

$$CDS\_AAR_t = \frac{\sum_{i=1}^{N} AR_{it}}{N}$$

Finally, we calculate for each bank *i,* the cumulative average abnormal return $\mathrm{CDS\_CAAR_t}$ as the sum of the average abnormal returns for all days t in the event window as:

$$CDS\_CAAR_i = \sum_{t=1}^{t=t} AR_{it}$$

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