The missing link: Exploring the role of asset quality on Euro area banks' behaviour *

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May 31, 2018

Abstract

JEL Classification: G20, G21, G01
Keywords: NPLs, non-performing loans, bank lending, asset quality, AQR

*Preliminary and incomplete, please do not circulate. Earlier drafts of this paper were circulated with the title "Bad loans and resource allocation in crisis years: Evidence from European banks". E-mails: brunella.bruno@unibocconi.it; immacolata.marino@unina.it.

1 Introduction

Non-performing loans (NPLs) are still an important problem in Europe, in particular in the euro area, standing at nearly 900 billion euros at the end of 2016 in banks directly supervised by the ECB. Such a stock of problem loans represents nearly 9% of the gross domestic product (GDP) and 6% of all loans in the euro area, with large variety across banks and countries (Constâncio 2017). As is well known, high NPLs are likely to have several negative micro and macro-prudential effects (Aiyar and Monaghan 2015). Among them, the ECB President has recently outlined the potential negative impact of NPLs on credit growth (Draghi 2017). In fact, poor loan portfolio quality is likely to affect banks' profitability, funding costs, and capital ratios. NPLs may undermine banks' profits because of reduced revenues and higher provisioning needs and operating costs, due to the increased amount of human resources employed in the workout process. A high level of NPLs tend to increase banks' opacity (Kishan and Opiela 2012) and depress market valuation, which may reduce investors' willing to lend to banks and lead to higher funding costs, with a further negative impact on banks' ability to generate profits. Clearly, NPLs are risky assets attracting higher risk weights than performing loans. Thus, a large bulk of NPLs also ties up banks' capital. All these effects mutually reinforce each other and may dampen credit supply (European Parliament 2016).

Notwithstanding numerous reports published so far, most of the extant analyses on NPLs are either descriptive or mainly focused on the determinants, rather than the consequences, of problem loans (see among the others Nkusu, 2011 and Klein, 2013).[1] In particular, there is little robust empirical evidence on the effect of high NPLs on bank lending in a multi-country setting (see Angelini 2018 who casts doubts on the thesis that NPLs have a direct and causal effect on credit growth). To fill this gap, we take a close look at micro-level bank data in Europe to uncover how poor asset quality relates to the way banks adjust balance sheets. We proceed in two steps. We first focus on a large sample of euro area banks and measure how asset quality is associated to asset, lending and securities growth, and to changes in the loan to asset and securities to asset ratios.

[1] In this proposal, we use NPLs, NPEs, impaired, troubled, and problem loans as synonyms, although we are aware of the fact that, across jurisdictions and even across banks, there might be different meanings associated to these definitions (BCBS, 2017).

We use several indicators to measure asset quality: the share of NPLs to total assets (our preferred indicator), the Texas ratio, and the share of NPLs to total loans. In this first part of our analysis, we find that poorer asset quality is associated to reduced asset and loan growth rate. Because banks shrink asset and loans by the same proportion, the ultimate effect of deleveraging strategy, in terms of banks asset composition, is a higher share of securities to total assets. These findings are confirmed regardless of the indicator of asset quality used in the analysis. In an attempt to identify the channels through NPLs influence banks behavior, we look at the relationship between asset quality and balance sheet adjustments in low capitalized and low profitable banks, as well as in those with a limited base of customer deposits. We find that the negative association between NPLs and asset growth rate is statistically more significant in weaker banks, namely, those at the bottom quartile of the distribution of Tier 1 ratio and ROE. We also uncover that the negative relationship between NPLs and lending growth rate is even more accentuated in banks less relying on customer deposits (i.e., those at the bottom quartile of the distribution of customer deposit to total asset ratio). These findings are suggestive of the fact that the main transmission channels through which NPLs affect banks behavior are via capital and profitability, as for the decision to shrink asset, and via cost of funding (or funding structure), as for the decision to reduce credit supply. We also aim to understand whether the way poor asset quality relates to balance sheet adjustments is different in banks protected by particularly high levels of provisions and capital. We first focus on banks with a high level of coverage ratio (the share of loan loss reserves over gross NPLs). As contended by many (see, among the others, Constncio 2017), NPLs are no more a risk to banks balance sheet as long as they are adequately covered. In fact, we find that the negative influence on NPLs on banks behavior is neither mitigated in banks with high coverage ratios nor in those holding a high level of common equity tier 1 (as a percentage of NPLs). To rule out that our results are driven by other confounding factors, we insert dummy variables to account for the banking crisis years (2008-2009) and the euro sovereign crisis (2010-2012). This is important because our analysis runs over a period comprising two subsequent crises, which have depressed the economic growth and, possibly, credit demand. As such, banks might have decided to adjust their balance sheets independently from asset quality consideration. Our results confirm that, over and beyond the impact of

the 2008-2009 and the 2010-2012 crises, poorer asset quality is associated to lower asset growth; we also uncover that deleveraging occurs at the expense of the lending business, since banks cut back loans proportionally by more than assets, while expanding the securities portfolio. In the second part of the analysis, we take a step forward and try to measure the causal and direct impact of NPLs on banks behavior. In fact, a different causal nexus is also plausible, since high NPLs are in many European countries the legacy of prolonged recession, which may have reduced both demand and supply of credit (see Mohaddes et al. 2017 and the references therein for a review of the literature on the role of cyclical factors in affecting NPLs). Reduced credit supply might have triggered defaults, which in turn may have led to the rise of NPLs. To identify the impact of poorer asset quality on banks' asset and lending growth, and asset composition, we exploit the first ECB Asset Quality Review (AQR) exercise as a quasi-natural experiment (see Accornero et al. 2017 for a similar approach). The AQR was one of the two pillars of the comprehensive assessment undertaken by the ECB for the first time in 2014, in view of the introduction of the Single Supervisory Mechanism (SSM). Precisely, it was a point-in-time assessment of the accuracy of the carrying value of banks' assets as of 31 December 2013, based on a uniform methodology and harmonized definitions; for example, the ECB applied for the first time a common definition of non-performing exposure (NPE).[2] The exercise resulted into increased NPLs (NPEs) of nearly euro 140 billion (+18.4%) and higher provisions for euro 45 million (+ 12%) (ECB 2014).

We aim to identify the effect of higher NPLs induced by the AQR using a difference-in-difference strategy. We compare AQR banks vis--vis Non-AQR banks over the immediately pre (2010-2012) and immediately post (2013-2015) AQR period. This approach enables us to examine if banks directly subject to the supervision adjusted their balance sheets differently from similar banks not subject to the AQR. The strategy is not new to the literature. Fiordelisi et al. (2017) exploit the shock induced by the launch of SSM to see whether banks expecting to fall under the ECB direct supervision act differently from smaller banks expecting to remain under the national supervisor. They find that the former reduce lending by more than the latter, as an undesired effect of stricter regulation. In the

[2] According to the harmonized definition, an NPE is an exposure that is 90 days past due (quantitative criteria) or unlikely to be paid without collateral realisation (qualitative criteria), even if it is not recognised as defaulted or impaired for capital or accounting purposes.

same vein, Eber and Minoiu (2016) exploit a discontinuity in the assignment mechanism of the ECB comprehensive assessment and find that banks adjust to stricter supervision by reducing leverage. They also find that most of the adjustments stems from asset shrinkage rather than from raising equity and that securities are adjusted more strongly that loans. Gropp et al. (2018) use the 2011 EBA capital exercise and show that treated banks increased capital ratios by more than untreated banks and that they do this by reducing lending rather than increasing equity. More closely to our research, Accornero et al. (2017) exploit the supervisory interventions associated to the 2014 AQR to identify exogenous variations in Italian banks' NPLs and measure their impact on lending. They find that exogenous emergence of new troubled loans can cause a negative adjustment in credit, probably motivated by the higher level of provisions.

Similarly to their study, we focus on NPLs and exploit the first AQR (i.e. the first phase of the comprehensive assessment run in 2014) to identify how treated banks adjust their balance sheet (in particular the loan portfolio) to higher NPLs. As stated by the ECB (2014) the stock of NPEs was significantly increased by the AQR, both through the consistent application of the EBA simplified approach to defining NPEs, as well as through the credit file review. Unlike Accornero et al. (2017), we look at a large sample of euro area banks rather than a sample of banks from a single country. This enables us to further exploit bank and country heterogeneity and possibly provide stronger and more comprehensive evidence of the influence of poor asset quality on banks' allocation strategies. Second, we do not only focus on bank lending, but we also investigate how banks choose to adjust the overall asset side of their balance sheet. Third, we run several robustness checks to rule out that results are driven by other confounding effects.

We find that AQR banks have shrunk their balance sheets by more than Non-AQR banks, primarily by downsizing the securities portfolios. In line with Eber and Minoiu (2016), we uncover that resources allocated to loans as a percentage of total assets have increased at the expense of securities. To rule out the possibility that such an effect is not driven by the AQR per se (e.g., as a consequence of stricter supervision), but by the increase of NPLs induced by the AQR exercise, we run further tests to find out how poorer asset quality in treated banks also affects banks' allocation strategies during the treatment period. First, we find only weak evidence that a deterioration of asset quality leads to

a negative change in banks' total assets, with no differential impact, in AQR banks vs. Non-AQR banks, of increased NPLs on asset composition. These findings are confirmed in banks from High NPL countries as well as in Non-High NPL countries. Results partially change when we exploit the discrepancy across euro area banks in terms of asset quality. In an extension to our difference-in-difference analysis, we find a negative impact on banks' balance sheet only in High NPLs banks. Precisely, when we focus on banks featured by a high level of NPL ratios, we find that the AQR shock over the treatment period (2013-2015) triggers a negative change of assets size, at the expense of lending, with no effect on the securities portfolio. Results are confirmed in a further test run on a smaller sample of AQR banks that exclude those that have suffered a capital shortfall, as a consequence of the comprehensive assessment. Overall, our analysis contributes to the debate on the effect of NPLs by providing new evidence on whether and the extent to which poor asset quality influences allocation policies in euro area banks. The main finding from the fixed effect analysis is that there is strong evidence of a negative correlation between asset quality and asset and lending growth. The negative nexus between asset quality and asset growth is even more accentuated in low capitalized and low profitable banks, while poorer asset quality translate into lower lending particularly in banks with a small share of customer deposits. We interpret these findings as suggestive of the main channels through which the negative influence of NPLs is transmitted to banks balance sheets. Conversely, we find no evidence supporting the narrative that the NPL stock is no longer a risk as long as it is adequately covered (Constancio 2017); precisely, we find that there are no differences, as for how higher NPLs relate to changes in assets, loans and securities, in banks featured by high level of coverage ratio and CET1 to NPLs ratio, relative to the average sample bank. Moreover, we uncover that a direct effect of higher NPLs on banks balance sheet adjustments can be found in banks plagued by high level of problem loans, from High-NPL countries. In terms of policy implications, from a macro-prudential perspective our results confirm the urgency of resolving troubled assets, if not in all, at least in those banks plagued by high stocks of NPLs, particularly, if these banks are located in countries where the phenomenon of poor asset quality is significant. Our findings also raise some concerns about the effectiveness of recent measures as those meant to increase provisions (see, for example, the ECB addendum and the European commissions rules released in March

2018). While these measures might have several advantages favoring banks soundness, it remains far from being proven that they can mitigate the negative influence of NPLs on credit supply.

The paper proceeds as it follows. Section 2 describes our data and provides some stylized facts about asset quality and allocation strategies of euro area banks over 2006-2015. Sections 3 and 4 discuss our two-step empirical approach and present results. First, we conduct a preliminary fixed effects investigation, then we implement our quasi-experimental strategy to address the main endogeneity issues. Section 5 illustrate robustness checks and Section 6 concludes.

2 Data and Facts

This section describes our data and provides some stylized facts about asset quality and allocation strategies of euro area banks over 2006-2015. These stylized facts help understand the correlations present in the data at the aggregate level as well as the additional insights that can be gained by exploiting the variation present in the bank-level data.

2.1 Sample and Descriptives

Our main source of bank-level data is ORBIS Bank Focus, a comprehensive commercial database of banks' financial statements provided by Bureau van Dijk Electronic Publishing (BvD). We start with the full sample of euro area banks, by collecting consolidated balance sheet information over 2006-2015.[3] We collect information from this source on a broad range of bank characteristics: bank size, funding structure, capitalization, liquidity, loan quality, loan volumes, and asset composition. The information in ORBIS is suitable for international comparisons because BvD harmonizes the data. Then, we identify banks that were subject to the first AQR exercise based on the results published by the ECB after the 2014 supervision.

Our initial sample contains all 130 AQR banks and 1,080 Non-AQR euro area commercial, cooperative and savings banks from the ORBIS Bank universe. Since the AQR

[3]We obtain all data from the ORBIS Bank Focus web interface, and collect consolidated balance sheets (C1, C2, and U1) of commercial, cooperative, and saving banks (using the Specialization variable available in the dataset).

supervision was conducted at the highest level of consolidation, we consider banks that in our database are classified as: GUO (global ultimate owner), independent companies, and single location banks. In the sample of "Non-AQR banks" we exclude from the analysis small banks (those with average total assets, over 2006-2015, below the median bank of its own country), and banks with gross loans to total asset ratio below the 10%. We first present some stylized facts and discuss the evolution of our main variables over 2006-2015, then we focus on the period 2010-2015. The resulting sample spans from 2010 to 2015 and comprises 872 banks in the euro area: 105 AQR banks, and 767 Non-AQR banks.

In Table 1 we present descriptive statistics over the entire sample [2006-2015] of the variables used in the empirical analysis. Our dependent variables are the growth of gross loans, the growth of assets, the growth of total securities, the change in gross loans to total asset ratio, and the change in the total securities to total asset ratio. The average loan growth rate between 2006 and 2015 is 4.3% with a lower median of 3.6%. On average, total loans amount to 65% of total assets and the average total securities to total asset ratio is 24%. The average bank in our sample is, therefore, a traditional commercial bank, whose core business is lending and whose main source of funds are core deposits (on average nearly 56% of total assets). The average bank in our sample is medium-sized, its assets amounting to 13 billion euro. There is however considerable cross-sectional variability within the sample, as indicated by the large between standard deviation of total assets (the median bank is instead small with total assets lower than 1 billion euro).

Looking at our main explanatory variables, the average NPL to total asset ratio is around 5% and the average coverage ratio, i.e. the share of loan loss reserves on NPLs is nearly 47%, with important heterogeneity across countries and over time as for both indicators. These numbers are comparable to those reported in aggregate statistics (IMF 2015; ECB 2016). Our first indicator of bank capital is Tier 1 regulatory capital ratio, which averages close to 13%, well above the 6% minimum requirement set up by Basel III. Note that the EU banking sector has taken a number of steps to strengthen its resilience since the onset of the euro debt crisis. After the 2011 stress test, the EBA issued a capital recommendation for all banks to raise their capital levels to 9% (right above the 8.5% fully loaded capital requirements, including the capital conservation buffer). Since then onwards, major EU banks have significantly strengthened their capital position. Another

indicator of a bank's asset quality that we consider for robustness checks is the Texas ratio. This is commonly used as a measure of a bank's likelihood of failure as it indicates whether a bank has enough buffers (made of either loan loss reserves or capital) to deal with its troubled loans. Thus, banks with a higher Texas ratio have limited buffers against further credit losses.[4] The average (revised) Texas ratio in our sample is above 44%, but the riskiest banks (corresponding to the top 10 percentile of the distribution) have a Texas ratio of 93%.

2.2 Stylized Facts

Figure 1 tracks the evolution of total assets, NPLs and the NPLs to total asset ratio in our sample over the entire period (2006-2015). The top figure shows how total assets have overall increased between 2007 and 2015. It also shows that banks have deleveraged in the immediate aftermath of the banking crisis in 2009, and then have expanded their balance sheet, to deleverage again at the end of the euro sovereign crisis in 2012. The middle figure shows that the total amount of NPLs increased during the crisis years, but stayed almost constant after the 2012, reaching about the 20% of the 2010 level. The dynamic of the two variables is reflected in the bottom figure, which depicts a dramatic increase in the NPLs to total asset ratio since the banking crisis and up to the euro sovereign crisis.

We explore the extent and consequences of bad loans on credit growth, asset growth, securities growth, and asset allocation (gross loans vs. securities), by considering as main proxy for bank's asset quality the NPLs to total asset ratio. The first evidence that emerge from the data is a negative contemporaneous correlation between credit growth and NPLs incidence to total assets. Figure 2 reports evidence on this relation between growth of gross loans (delta log of gross loans) and NPLs to total asset ratio in 2007-2015. The figure also suggests an ambiguous association in the period after the global financial crisis: if we exclude from the sample the 2007-2008 years, the correlation turn to be close to zero.

To provide further evidence of the significant heterogeneity across banks (both within and between countries) in terms of asset quality, Figure 3 shows the average NPLs to total assets (and the NPLs to gross loans) ratio by country over the 2010-2015. The figure

[4]Precisely, the Texas ratio is commonly calculated as the ratio of NPLs to loan loss reserves and tangible equity. Due to lack of data for the tangible equity variable, we use a revised version of the Texas ratio, by replacing tangible equity capital with Tier 1 capital.

reports for each country in our sample the average NPLs/TA (green dots) and NPLs/GL ratios (red); the horizontal red line correspond to the 10% and allow us to identify high NPLs/GL ratio according to the ECB parameter. The NPLs/GL ratio range between the almost 1% of the Finland to the near 20% of the Slovenia. Summarizing, the main stylized facts emerging from this preliminary analysis are the following:

1. NPLs in European banks have increased over time since the global financial crisis and even more so since the euro crisis, such an evidence is consistent with the economic cycle being a major driver of NPLs fluctuation over time, as emerged in several empirical studies on the determinants of troubled loans (see Nkusu 2011, Klein 2013, and Mohaddes 2017);

2. NPL ratios differ greatly from one country to another;

3. Overall, there is a negative nexus between loan growth rate and bad loans; in line with main institutional reports on NPLs in Europe (e.g., ESRB 2017 or European Parliament 2016).

3 Banks asset quality and balance sheet adjustments

3.1 Preliminary Investigation

We want to test whether higher stocks of NPLs (as percentage of total assets) affect the growth of gross loans, the growth of total assets, the growth of securities, as well as the asset composition (gross loans and securities as percentage of total assets) in euro area banks. We assume that our outcome for a bank i in country j at time t can be specified in the following linear form:

$$y_{ij,t} = \alpha_0 + \beta_1 NPL_{ij,t-1} + \theta_1 X_{ij,t-1} + \mu_{j,t} + \lambda_{ij} + \epsilon_{ij,t} \tag{1}$$

where $y_{ij,t}$ is the bank balance sheet item; $NPL_{ij,t-1}$ is the percentage of non-performing loans relative to total assets in the balance sheet of bank i in year $t-1$. The regression also includes several bank-level controls $X_{ij,t-1}$, country-year fixed effects $\mu_{j,t}$, and bank fixed effects λ_{ij}. The key coefficient of interest β_1 indicates whether banks with high

NPLs/TA have lent less over 2006-2015, controlling for other striking time-varying bank characteristics.

We control for bank characteristics that according to the bank lending channel literature may affect credit supply (see Bruno et al. 2018 for a review of this literature), namely the bank's size, capitalization (Tier 1 ratio), profitability (ROE), liquidity (the liquid asset to total assets ratio), and the funding structure (customer deposits to total assets ratio). We also control for the coverage ratio to proxy the bank's provisioning policies. The coverage ratio is the ratio of the loan loss reserves (i.e. the stock at a given year of loan loss provisions) to impaired loans. Loan loss provisions are the periodical accounting deductions, corresponding to the amount the bank expect to lose on a given loan. In general, it is desirable for banks to have provisioning commensurate with the expected recovery on loans. If this is not the case, the bank is exposed to the risk that larger losses than expected may reduce net profitability and possibly bring bank capital close or below the minimum requirement. It follows that higher coverage ratios should (at least in principle) mitigate the negative effect of NPLs, as they should improve asset transparency, and reduce the negative impact of NPLs on bank profitability in the future, either because a relatively large amount of provisions have been already made or because of reduced losses in case of a disposal of the NPL portfolio.

We also include the Tier 1 regulatory capital ratio that, together with the coverage ratio, may work as a buffer to absorb unexpected losses. The empirical evidence has largely shown that bank capital matters in the propagation of shocks to the bank credit supply (see Kishan and Opiela 2000 and Gambacorta and Mistrulli 2004 among the others). We measure bank capital in terms of Tier 1 regulatory capital ratio because this indicator, better than a pure (non-risk based) leverage ratio, is more sensitive to either mitigate or exacerbate the role played by risky loans on lending, and ultimately to motivate a substitution effect between risky loans and zero-risk weighted assets such as euro sovereign bonds (Altavilla et al. 2017; Berger and Udell 1994).

Size (log of total assets) is a common proxy for banks' ability to access external source of funds, with smaller banks (especially if illiquid and poorly capitalized) that are found unable to bypass a deposit shock and preserve lending by raising new funds (Kashyap and Stein 2000; Kishan and Opiela 2000). To capture the role played by the bank's funding

structure, we focus on the customer deposit to total asset ratio to measure the relevance of stable source of funds for the bank in crisis times. Indeed, the global financial crisis has emphasized that banks more relying on core deposits were less prone to contract lending, relative to banks dependent on unstable wholesale sources of funding (Cornett et al. 2011; Ivashina and Scharfenstein 2010). We also control for the ROE, as a profitability measure, and for the share of liquid assets (cash and due from banks) that could act as a buffer to expand credit in presence of a shock on banks' liabilities (Kashyap and Stein 2000). The global financial crisis has reinforced the view of the relevance of asset liquidity, because banks with more illiquid asset on their balance sheet hoarded liquidity and reduced lending in bad times more than liquid banks (Cornett et al. 2011). We use a restrictive measure of liquid assets (which only includes cash and due from banks) because securities that have proven marketable in pre-crisis times (including Government bonds), may turn illiquid during crisis years. Finally, we control for 1-year lagged measures of our dependent variables on asset composition (i.e., the share of gross loans and securities over total assets).

Table 2 presents our basic results for the preliminary investigation of the relation between asset quality and balance sheet size and composition. Estimates show that banks with a poorer loan portfolio quality reduce their loan growth rate, as well as their asset growth (columns 1 and 2). Moreover, in banks with a higher level of NPLs the resources allocated to securities, in percentage of total assets, tend to increase (column 5). In line with our expectations, we find evidence of a strong positive correlation between profitability (ROE) and capitalisation (Tier1Ratio) and asset and lending growth rate, with no relation with the change in the share of loans or securities to total assets. Finally, we include a set of fixed effects to allow for unobserved time varying country effects as well for banks' structural factors that can influence credit supply, such as changes in credit demand.[5]

[5]Only bank-borrower level dataset would enable us to disentangle the supply vs. the demand channel. Given the limitation of our data in this sense, the cross-country analysis helps us when controlling for country-year fixed effects and bank fixed effects together. Indeed, all specifications include country-year fixed effects that absorb the impact on lending of changing country conditions and allow us to consider a " within country-year"type of analysis. We also include bank fixed effects as a further proxy for differences in bank's demand conditions.

3.1.1 Trasmission channels

In this section, we aim to shed some light on the transmission channels through which higher NPLs plausibly turn into reduced asset and lending growth.

In principle, this may happen for three main reasons. First, a higher stock of NPLs mechanically reduce risk-based regulatory capital ratios. In fact, troubled loans have attached higher risk-weights than performing loans. This, *ceteris paribus*, increases risk-weighted assets (the denominator of capital ratios). Second, persistently high NPLs, by reducing fees and interest revenues and by increasing operating and provisioning costs, depress banks profits and possibly erode bank capital (the numerator of the ratios). Both effects contribute to a reduction of capital ratios. Therefore, capital constrained banks are more likely to undertake a deleveraging process with reduction of credit supply, as predicted by the capital crunch hypothesis (Peek and Rosengren, 1995; Kishan and Opiela, 2000).

A second way poor asset quality can influence banks' balance sheet adjustment is via a "cost of fund" channel (Angelini, 2018). First, a heavy burden of troubled loans may be taken by investors as a symptom of poor management and higher idiosyncratic risk; market valuation may decrease consistently and the cost of funding may increase. Second, a large stock of NPLs increases banks' opacity (Kishan and Opiela, 2012), making it harder for investors to assess the banks' asset value and to exercise market discipline. NPLs is, in fact, an aggregate embracing exposures featured by different risk level. This is especially true in European banks, where NPLs have been defined and reported differently across banks and countries until very recently.[6] Moreover, some of the exposures labeled as NPLs are adequately collateralized while others are not. The size and quality of the collateral clearly affect the loan portfolio value, the recovery rate depending on the type of the enforcement procedure and on the strength of the legal and judicial framework. These factors may vary across banks and countries, and discrepancies exist even within each country.[7] As such, because problem loans are difficult to value, holding a large stock of NPLs can threaten banks' ability to raise funds in the markets, which in turn can be

[6] See Bholat et al. (2016) on the divergences in the definitions of NPLs.

[7] See Schiantarelli et al. (2016) for an analysis of the effect of the different degree of local judicial efficiency in Italy.

reflected into lower asset and lending growth. We contend, in particular, that banks more relying on wholesale funding are indeed more exposed to investors judgement, vis-à-vis banks with a larger base of customer deposits. Hence, we expect that, all things being equal, poorer asset quality is more likely to be associated to asset and credit reduction in banks with a limited base of customer deposits than in banks with a more stable source of funding.

Finally, higher NPL ratios tend to reduce banks profitability due to lower fees and interest revenues, growing operating costs for loan workout and higher provisioning commonly associated to problem loan portfolios. Losses on the loan portfolio (in case of a resolution via loan sales or securitisation) are also more likely. Lower profitability induced by a deteriorated loan portfolio can ultimately turn into capital shortage with negative effects on lending and asset growth.

To test which one of these transmission channels are at work, we enrich the baseline model and include in Table 3 the interaction terms between our measure of asset quality (NPL over total assets) and the "Low capitalization", "Low deposits", and "Low profitability" bank dummies, which equal 1 when the level of the Tier 1 ratio, the customer deposit to total asset ratio, and the ROE, respectively, is below a given threshold.[8] We find that in banks with particularly low levels of capitalization and profitability (i.e., in the lower quartile of the distribution of Tier 1 ratio and ROE), the negative relation between asset quality and changes in asset growth is even more accentuated than for the whole sample. We also find a differential behavior in non-customer deposit based banks (i.e., banks in the bottom quartile of the distribution of the customer deposit to total asset ratio), as in these banks a deterioration of asset quality is, on average, associated to a stronger credit contraction than for banks in the whole sample.

These finding support the view that NPLs can influence banks' balance sheets indirectly, via capital/cost of funds and profitability channels. Interestingly, however, the coefficient of the NPL to total asset ratio remain negative and strongly significant even after the inclusion of the interaction terms. This result suggests that although a larger

[8]Specifically, we include the interaction of our asset quality indicator with three indicator variables: LowCap (=1 if bank's Tier1 regulatori capital ratio is below the median or the p25 of the distribution), LowProf (=1 if bank's ROE is below the median or the p25 of the distribution), LowDep (=1 if bank's Customer deposits to total asset ratio is below the median or the p25 of the distribution).

stock of NPLs in more vulnerable banks make them more prone to either deleverage or cut back lending, the "transmission channel narrative" does not fully explain the reasons why a deterioration in bank asset quality tend to turn into balance sheet adjustments.

3.1.2 Protection tools

In this section, we aim to understand whether banks react differently to increased NPLs depending on the level of provisions and common equity tier 1. Both instruments can work as buffer to dampen and even neutralize the negative influence of NPLs.

NPLs and Coverage ratio

At least in principle, NPLs may not be such a risk to banks' balance sheet as long as they are adequately covered. According to recent statistics (see Constancio 2017 and references in there), more than 80% of problem loans in the euro area are covered by either loan loss allowances (amounting to about 46% of the stock of NPLs) or collateral (covering a further 36% of banks total exposure). Access to collateral, however, is often lengthy and costly, eroding its net present value, which makes provisions, rather than collateral, a more effective type of protection to banks' balance sheets. If this is the case, one may expect that banks with high coverage ratio adjust their balance sheet, in response to higher NPLs, in a different way than less provisioned banks. To test this assumption, we extend our baseline analysis by including the interaction terms between our measure of asset quality and the "High coverage ratio" bank dummy that equals 1 in banks with coverage ratio levels above a given threshold. Table 4 shows that banks with a coverage ratio above the median value seem to adopt a more prudent behavior than the average sample banks, as the former reduce asset growth by more than the latter when NPLs increase. Such a strategy, however, comes at the expense of the securities, rather than loan, portfolio. The result, in terms of asset composition, is a relatively larger share of assets allocated to loans, in banks with a coverage ratio above the median value. This result, that can be interpreted as a mild form of protection to lending, is not confirmed in banks featured by a very high level of coverage ratios (i.e., at the top quartile of the distribution). These banks do not behave differently from the average sample bank as for the way they adjust their balance sheet in correspondence of increased NPLs.

NPLs and Common equity Tier1

As is well known, capital is the most effective buffer against risks faced by banks. The highest quality type of capital, as for the ability to absorb unexpected losses, is common equity. To test whether well capitalized banks react differently from banks with lower level of NPLs when asset quality deteriorates, we extend our baseline model by interacting our asset quality variable with High common equity bank dummy that equal 1 in banks with a common equity to NPLs ratio above a given threshold. Table 5 shows that banks with high to very high level of common equity (as a percentage of NPLs) do not behave differently from the average sample banks when asset quality deteriorates.

4 The 2014 AQR and bank's balance sheet adjustments

4.1 Identification strategy

In this section we aim to take a step forward from our previous analysis, and investigate the causal effect between poor asset quality and asset growth and credit supply in euro area banks. To deal with endogeneity concerns, we exploit the AQR, conducted by the ECB in 2014, as a quasi-natural experiment. We employ a difference-in-difference strategy to examine how banks subject to an exogenous variation in NPLs to total asset ratio (induced by the AQR) adjust their balance sheets compared to a control group of banks with no such a variation. In this section, we firstly set out the institutional background and present some descriptive statistics; based on this, we then illustrate the identification strategy and results.

4.2 The 2014 EBA Asset Quality Review as quasi-experiment

The AQR is one of the two pillars (with the stress tests) of the comprehensive assessments (CAs) that the ECB has periodically carried out since 2013 to enhance the transparency of bank exposures and improve comparability across banks. The first CA was carried out by the ECB between November 2013 and October 2014; It was an important step in preparing the SSM, which entailed a financial health check of 130 banks in the euro area,

covering approximately 82% of total bank assets, and involving 26 national supervisors. The SSM was agreed in December 2012 and the significance criteria were disclosed. The choice of the banks assigned to the CA (and, hence, under AQR) was based on significance criteria, primarily on banks' asset size, with a selection threshold of euro 30bn. Each of these banks was examined under the AQR, as well as in the stress test exercise conducted by the ECB in cooperation with the EBA.

The AQR was a point-in-time assessment of the accuracy of the carrying value (including the adequacy of asset and collateral valuation and related provisions) of banks' assets as of 31 December 2013 and provided a starting point for the stress test. Within the AQR, a detailed asset-level review was performed for over 800 specific portfolios making up 57% of the banks' risk-weighted assets. This resulted in the detailed analysis of more than 119,000 borrowers. This in-depth review employed over 6,000 experts. In order to maintain consistency and equal treatment across both the AQR and stress test, central ECB teams independently performed quality assurance on the work of the banks and NCAs. The ECB was in close contact with NCAs, responding to over 8,000 methodology and process questions. The ECB reviewed and challenged outcomes from an SSM-wide perspective using comparative benchmarking, as well as engaged with NCAs to investigate specific issues that arose. Over 100 experts from the ECB along with external support professionals were involved in this quality assurance activity.

The AQR resulted in aggregate adjustments of 47.5 billion euros to participating banks' asset carrying values as of 31 December 2013. These adjustments originated primarily from accrual accounted assets, particularly adjustments to specific provisions on non-retail exposures. Additionally, non-performing exposure (NPE) stocks were increased by 135.9 billion across the in-scope institutions, as NPE definitions were moved onto a harmonised and comparable basis, including the examination of forbearance as a trigger of NPE status.[9] Notoriously, NPE definitions vary across the SSM and a reasonable level of standardisation was required so that asset quality results were comparable. To this end, the EBA simplified NPE definition was applied across all banks. According to this simplified approach any debtor with one or more facilities that fulfil any of the following

[9] "NPLs" is generally used as a shorthand term. However, in technical terms, the EBA introduced the definition of non-performing exposures (NPEs). "NPL" and "NPE" are used interchangeably within our study.

criteria was marked as non-performing: every material exposure that is 90 days past-due even if it is not recognised as defaulted or impaired; every exposure that is impaired (respecting specifics of GAAP vs. IFRS banks); every exposure that is in default according to CRR (i.e. "unlikely to pay").

The change in NPE definition was verified through the data integrity validation process, and then checked on a file-by-file basis during the credit file review (CFR) for residential real estate and all non-retail asset classes. Any changes to NPE status were then projected to the unsampled portion of the portfolio. As such, after the AQR, NPE definitions across the euro area countries for the participating entities were much more harmonised. Due to the fact that on average banks' internal definitions were less conservative than the simplified EBA approach, the application of the simplified approach led to an increase in NPE stock of 54.6 billion from 743.1 billion to 797.7 billion. The CFR and the projection of findings led to an additional increase in NPE of 81.3 billion, resulting in a total increase of 135.9 billion to 879.1 billion of post-CFR NPEs across the participating banks as a result of the AQR (+18%). The impact of the application of the EBA simplified approach and the credit file review on the stock of NPEs varied amongst debtor geographies, with overall increases among SSM debtor geographies ranging from 7% to 116%.

Figure 4 presents a timeline of events and shows the definition of PostAQR period that we use in the econometric analysis.

Table 6 presents descriptive statistics for banks from the AQR and Non-AQR sample. Difference is the average difference between the second column (balance sheet items by AQR banks) and the first column (balance sheet items by Non-AQR banks). We test the statistical significance of the difference using the t-statistic (T-stat). Not surprisingly, given the significance criteria applied under the AQR exercise, AQR banks are bigger than Non-AQR banks (although our sample is already composed of banks that are larger than the median). In terms of prevalent business model, Non-AQR tend to focus more on commercial banking, being loans the main type of assets and customer deposits the main source of funding, relative to AQR banks. Nevertheless, the share of NPLs over total assets is on average smaller for the former rather than for the latter. Similarly, AQR banks show a higher level of NPL ratios as well as larger coverage ratios. In terms of Texas ratio, Non-AQR banks stand in a more comfortable position, being the level of troubled loans

(net of coverage represented by bank capital and loan loss reserves) lower than that in AQR banks. AQR banks seem to be more profitable. Finally, by looking at the evolution of the business over 2006-2010, AQR banks appear to have shrunk their balance sheet by more, although the amount of resources allocated to loans (as a percentage of total assets) is on average lower than for Non-AQR banks (with statistically significant differences, while the opposite emerges for the securities to total asset ratio).

To estimate the causal impact of the AQR on asset quality we first implement a difference-in-difference (DID) strategy, by considering as outcome variables the NPLs to total asset ratio, and the NPLs to gross loans ratio. The treatment is defined as the bank being subject to the first AQR review. Table 7 reports basic differences in NPLs, total assets, gross loans, NPLs/TA, and NPLs/GL between AQR and Non-AQR bank (before and after the AQR exercise). The DID coefficient suggests that, regardless of whether banks- and country-time- fixed effects are included, the AQR increased the NPLs to total asset ratio by roughly 24% of the average NPLs/TA ratio in the treated banks, more than in the control group.

We use this change in the NPLs to total asset ratio, induced by the AQR exercise as an exogenous shock that involve only part of our sample of banks. For bank-level outcome (growth of loans, growth of assets, growth of securities, change in the gross loans to total asset ratio, and change in the securities to total asset ratio) the treatment is defined as the bank being subject to the first AQR review. For each bank-level outcome, we estimate the following econometric model:

$$y_{ij,t} = \alpha_0 + \beta_1 AQRbank_{ij} X PostAQR_t + \beta_0 PostAQR_t + \theta_1 X_{ij,t-1} + \mu_{j,t} + \lambda_{ij} + \epsilon_{ij,t} \quad (2)$$

where β_1 is our main coeffcient of interest, the indicator variable AQR is absorbe by the bank fixed effects, $PostAQR_t$ indicates the years after 2012. We include bank fixed effects and country-year fixed effect. Standard errors are clustered at bank level.

The estimates rely on a pre-AQR exercise parallel-trend assumption. This assumption is supported graphically (see figure 5) and it is formally tested by checking the statistical significance of the interaction term AQR*Year in a model where our preferred indicator of asset quality (NPLs/TA) is regressed on: a linear trend, the AQR dummy, bank level controls, and the interaction term; in the sample before the AQR exercise (2006-2012). Column 1 of Table 8 shows that the estimated coeffcient of the interaction term is small

and not statistically different from zero. This suggests that the parallel trend assumption is not rejected.

We also test for anticipated effects of the policy: we estimate a model in which the AQR dummy is interacted with all year dummies. Column 2 of Table 8 reports the estimated coeffcients on the leads (statistically, zero) and lags (negative and large right after the AQR exercise). These estimates rule out any anticipated effects of the supervision, consistent with the parallel-trend assumption. Further, the lack of anticipation effects suggests that any other changes in regulation that differently affected AQR and Non-AQR banks were not crucial in affecting NPLs/TA patterns.

4.3 Extensions: High NPL banks and High NPL countries

Because asset quality differs greatly across banks and countries in the euro area (ESRB 2017), we take advantage of this variability and run several additional tests. We provide additional evidence within a difference-in-differences regression framework on the role of asset quality in determining bank lending behavior. Specifically, we explore two additional sources of heterogeneity across banks: first we identify High vs. Non-High NPL banks by using several indicators for High NPL banks; second we split our sample in banks from High NPL countries (those with average NPL/GL above the 10% in 2010-2015) and Non-High NPL countries. We estimate the following regression models:

$$\begin{aligned} y_{ij,t} = \alpha_0 + \beta_4 AQRbank_{ij} X PostAQR_t X NPL/TA_{t-1} + \beta_3 AQRbank_{ij} X NPL/TA_{t-1} + \\ \beta_2 PostAQR_t X NPL/TA_{t-1} + \beta_1 AQRbank_{ij} X PostAQR_t + \beta_0 PostAQR_t + \\ \theta_1 X_{ij,t-1} + \mu_{j,t} + \lambda_{ij} + \epsilon_{ij,t} \end{aligned} \tag{3}$$

$$\begin{aligned} y_{ij,t} = \alpha_0 + \beta_5 AQRbank_{ij} X PostAQR_t X HighNPLbank + \\ \beta_1 AQRbank_{ij} X PostAQR_t + \beta_0 PostAQR_t + \\ \theta_1 X_{ij,t-1} + \mu_{j,t} + \lambda_{ij} + \epsilon_{ij,t} \end{aligned} \tag{4}$$

In Tables 11 we split the sample according to whether banks are located in countries plagued by a high level of NPLs, rather than in countries featured by a physiological level of troubled loans. We contend that the banks' reaction to AQR shock and increased

volume of troubled loans (as measured by the interacted variable AQR banks x Post AQR x NPL/TA) can be different according to how relevant is the NPL issue in a given country/banking system. We do not find evidence of any such a difference. We then want to exploit discrepancies across banks' in terms of asset quality by focusing on High NPL banks. We consider High NPL a bank in which the average NPL to total asset ratio over 2010-2015 is greater than the sample average NPL/TA over the same period. We find that the AQR exercise in High NPL banks over 2013-2015 determines a greater reduction in lending and (Table 12). We run similar tests by splitting the sample according to the average level of the NPL ratio in the bank's domicile (Tables 13). We find that the negative results on bank lending and banks' assets are explained by the AQR shock in High NPL banks located in High NPL countries.

4.4 Extensions: Bank capital shortfall

As a result of the AQR and the consequent stress-test, the second step of the comprehensive assessment, some banks were found undercapitalized and, hence, were asked to replenish their capital buffer. Precisely, the comprehensive assessment found a capital shortfall of 25 billion at 25 banks (see the list in Appendix XY) after comparing the projected solvency ratios against the thresholds defined for the exercise, namely, 8% of CET1 in the baseline scenario and AQR, 5.5% of CET1 in the adverse scenario) Twelve of the 25 banks covered their capital shortfall by increasing their capital by 15 billion in 2014; the other ones were required to prepare capital plans within two weeks of the announcement of the results (October 2014) and to cover the capital shortfall over the following nine months (ECB 2014). All these adjustments occurred over the post AQR period, as defined in our analysis (2014-2015). Banks have two main strategies to improve regulatory capital ratios. They can either increase the numerator (regulatory capital) or reduce the denominator (risk-weighted assets); a combination of the two is of course also possible. Strengthening the capital position may entail higher retained earnings (for example through reduced bonus payments and dividends) as well as new issuance of common equity. Banks can reduce risk-weighted assets by changing the composition of the asset side (i.e., by shifting from riskier to safer exposure) and by shrinking their assets (Gropp et al. 2018). However, adjusting the numerator, rather than the denominator, seems a more costly strategy for

banks, especially for those in a difficult position (such as banks that received a fail grade in the CA). To rule out the possibility that our results in the diff-in-diff analysis are driven by the banks need to adjust balance sheets to restore adequate capital ratios, rather than by consideration on their asset quality we re-run our main regressions and exclude, from the treated group, the 25 banks that were found undercapitalized after the comprehensive assessment. Results, reported in Tables 14 to 17, are qualitatively similar to those emerged in previous analysis. Particularly, as in previous tests, in Table 17, we find that in the post AQR period, asset quality leads treated balance sheet adjustment in the post AQR period if the treated bank holds a large amount of NPLs (i.e, the NPL over total asset ratio is greater than the sample average). If this is the case, the effect of the AQR in high NPLs banks is that of shrinking assets and proportionally reducing loans (with no differential effects in terms of asset composition).

5 Robustness

Tables 18 and 19 present two robustness exercises using two other indicators of banks' asset quality: the NPL ratio (the share of NPLs to gross loans) and the Texas ratio. The NPLs ratio is the most commonly used and straightforward measure for loan portfolio quality; it is based on the assumption that lending is the prevalent business for banks, and as such measuring the share of NPLs (over total loans) works as a proxy for the bank's overall asset quality. Texas ratio is a measure of credit risk net of the protection (buffer) provided to banks by either capital (Tier 1) or loan loss reserves. Consistently, we want to understand whether the negative impact on lending of NPLs is mitigated when the buffer is high. Results are still confirmed. To rule out that our results are driven by other confounding factors, we insert dummy variables to account for the banking crisis years (2008-2009) and the euro sovereign crisis (2010-2012). This is important because the analysis runs over a period comprising two subsequent crises, which have depressed the economic growth and possibly credit demand. As such, banks might have decided to adjust their balance sheets independently from asset quality consideration. In fact, our results confirm that, over and beyond the impact of the 2008-2009 and the 2010-2012 crises, poorer asset quality is associated to lower asset growth. Deleveraging occurs at the expense of the lending business, since banks decided to cut loans proportionally by more

than assets, while expanding securities portfolio. Finall, in the diff-in-diff analysis we use a further definition of High-NPL banks, depending on whether the banks average NPL to total loan ratio is above the critical threshold of 10% over the sample period. Results, in Tables 21 and 22, are unchanged.

6 Conclusions

In this paper, we attempted to shed light on the relation between asset quality and allocation strategies in euro area banks over 2006-2015. Consistently to previous evidence, we find a negative and statistically significant association between banks' asset quality and asset and loan growth rate. We also uncover that the ultimate effect of deleveraging strategy is a higher share of securities to total assets at the expense of the loan portfolio. These findings are confirmed regardless of the indicator of asset quality used in the analysis, and after taking into account the role played by the two subsequent crises. Measuring the direct impact of NPLs on lending is, however, not straightforward, first of all because NPLs growth in many European countries might have been the side effect of two subsequent crises, which may also have reduced both demand and credit supply. In an attempt to uncover the causal nexus between NPLs and lending, we exploit the first ECB's AQR exercise as a quasi-natural experiment by using a difference-in-difference strategy, to compare AQR banks vs. Non-AQR banks over the pre-post treatment period.

We find that AQR banks have shrunk both loan and securities portfolios by more than Non-AQR banks as an effect of deleveraging strategies induced by stricter supervision. To rule out the possibility that such an effect is driven by banks' structural heterogeneity on asset quality, we run further tests and look at how poorer asset quality in AQR banks during 2013-2015 also impact banks' allocation strategies. We find limited evidence that an exogenous change in the volume of NPLs (as that triggered by the AQR exercise) leads to a negative change in AQR banks' total assets. Despite such a reduction in the volume of assets, we find no evidence of a differential impact, in AQR banks vs. Non-AQR banks, of increased NPLs on the change of loans and securities (in terms of volume and as a share of total assets).

By exploiting the variability across banks' asset quality, our results show a negative impact on banks' balance sheet only in High NPLs banks. Precisely, when we focus on

banks featured by a high level of NPLs (either measured as a percentage of assets or as a share of total gross loans), we find that the AQR shock over 2013-2015 determines negative changes in the volume of assets, loans and (to a lower extent) securities. The reduction of loans and securities is proportional to the decrease of banks' total assets and, thus, there is no evidence of a change in the loan to total asset and securities to total asset ratios. Results are also confirmed if we restrict the analysis to AQR banks that suffered for a capital shortfall after the comprehensive assessment.

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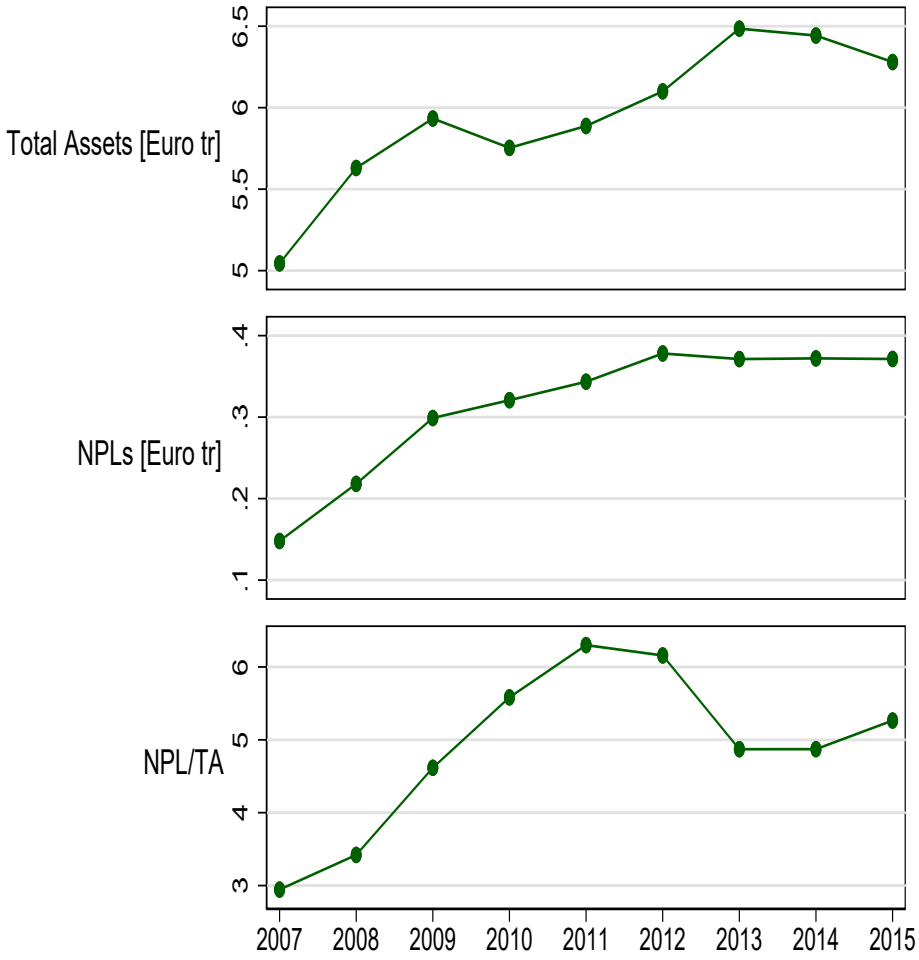
Appendix

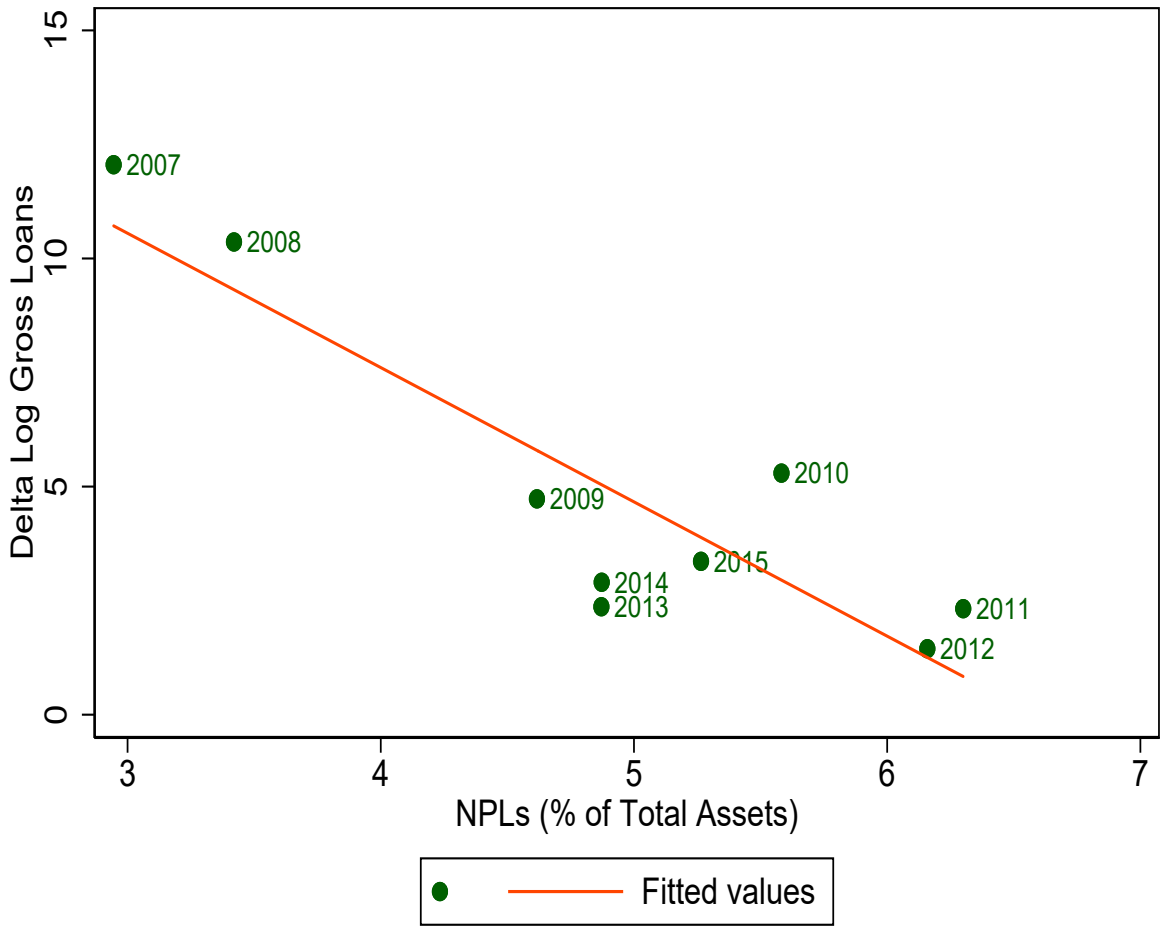
Figures

Figure 1: Non performing loans and total assets



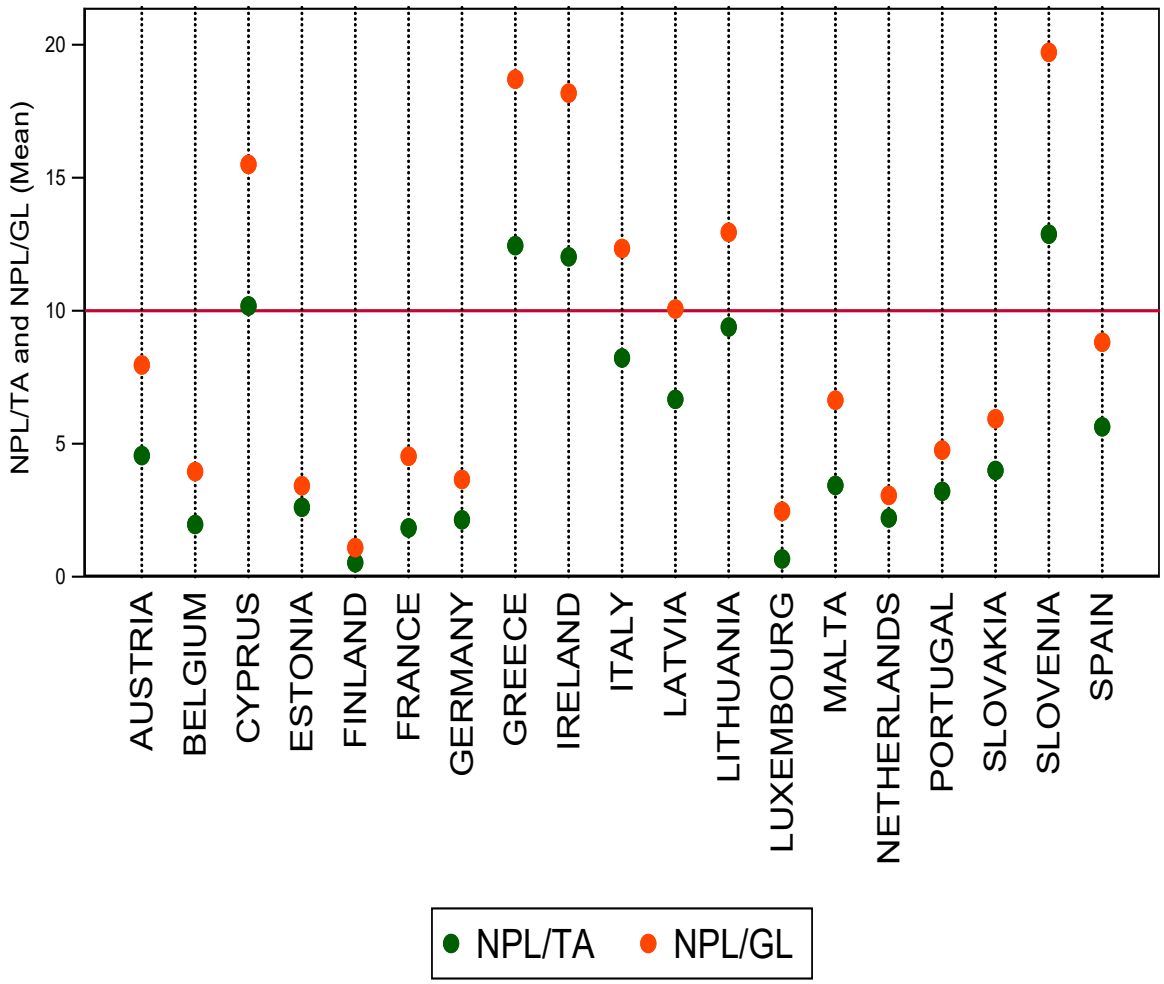
Notes: Figure 1 tracks the evolution of total assets, NPLs and the NPLs to total asset ratio in our sample over the entire period 2006-2015.

Figure 2: Growth of loans and non performing loans (as % of total assets)



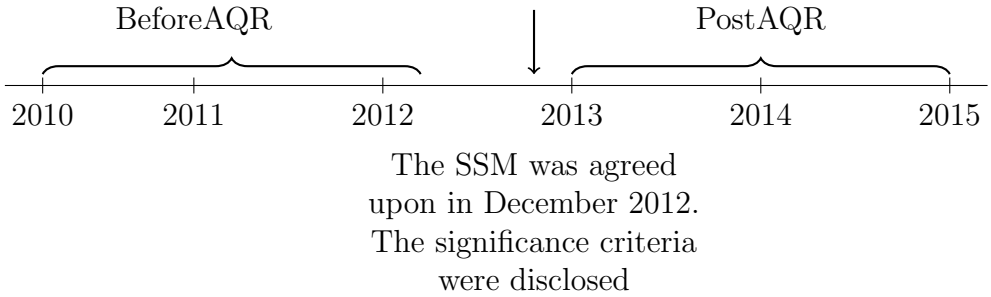
Notes: Figure 2 shows the correlation between growth of gross loans and the banks' incidence of non-performing loans (NPLs) relative to total assets. Each dot represents the average NPLs/TA ratio across countries in a year.

Figure 3: Heterogeneity of bank-level NPL ratios across all European countries (2010-2015)



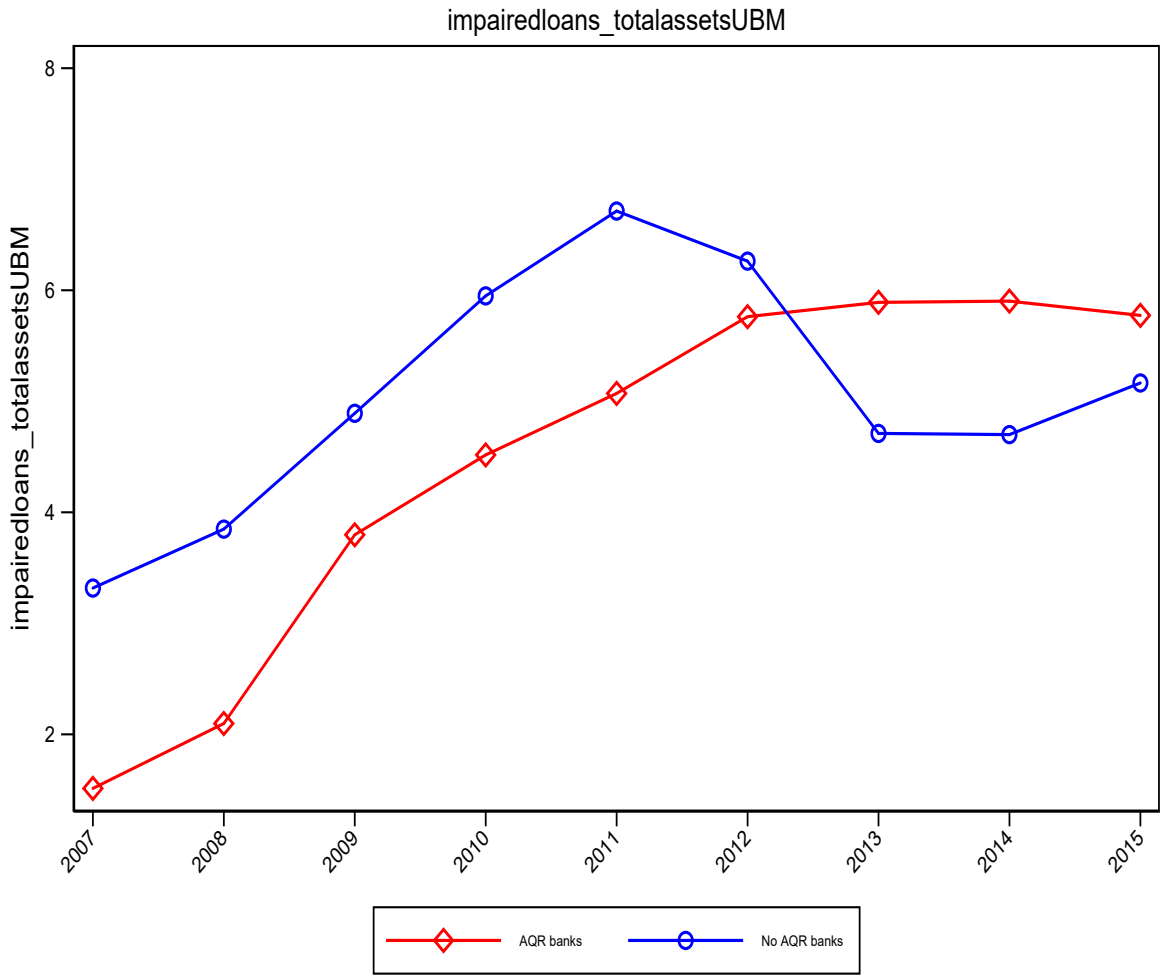
Notes: Figure 3 shows the average (2010-2015) NPL ratios (NPLs/TA and NPLs/GL) of Euro area banks by country. The figure illustrates the construction of the indicator for high NPL country that we use in the paper. The level of 10% for the NPL ratio is the threshold to identify high vs. low NPL countries.

Figure 4: Asset Quality Review Exercise Timeline



Notes: Figure 4 shows the timeline of the 2014 AQR exercise including our definition of the before and after period used in the paper.

Figure 5: NPLs to total asset ratio: AQR vs. Non AQR banks



Notes: Figure 5 shows the outstanding NPLs to total asset ratio of AQR banks and Non AQR banks over the period 2006-2015.

Tables

Table 1: Descriptive Statistics [2006-2015]

	(1) Mean	(2) St.Dev	(3) p10	(4) p50	(5) p90	(6) Observations
Total Assets [Euro MM]	12,990	25,945	403.5	997.1	75,745	4,123
Gross Loans [Euro MM]	7,913	15,502	260.3	650.3	47,644	4,123
Total Securities [Euro MM]	2,696	5,602	65.30	239.8	14,846	4,123
GL/TA	64.99	13.93	44.27	66.59	82.44	4,123
SEC/TA	24.17	11.84	8.804	23.37	41.67	4,123
DeltaLogTA	4.496	6.519	-4.033	3.904	13.76	4,123
DeltaLogGL	4.305	6.619	-3.994	3.606	13.91	4,123
DeltaLogSec	7.620	21.34	-18.57	5.077	39.84	4,123
DeltaGL/TA	0.0306	5.471	-7.816	0.189	7.213	4,123
Delta Sec/TA	4.720	20.11	-18.11	1.208	34.58	4,123
NPLs/TA	4.954	3.953	0.820	3.709	11.70	4,123
NPLs/GL	8.048	6.254	1.470	6.070	19.06	4,123
CoverageRatio	46.99	19.60	24.75	43.53	71.86	4,123
TexasRatio	44.44	29.81	10.58	37.48	92.86	4,123
DeltaLogNPL	11.62	26.91	-23.32	10.27	48.88	4,123
DeltaLogReserves	3.539	2.174	1.163	2.923	7.324	4,123
DeltaLogProvisions	2.234	2.087	-0.356	1.808	5.981	4,123
Tier1RegulatoryCapitalRatio	13.29	3.749	8.650	12.77	18.81	4,123
ROE %	4.145	3.813	-0.390	3.450	9.690	4,123
ROA%	0.357	0.330	-0.0300	0.290	0.880	4,123
Cash and due from banks/TA	1.409	1.111	0.351	1.121	2.993	4,123
Total customer deposits/TA	55.84	17.61	34.35	53.11	80.23	4,123

Notes: Table 1 presents the descriptive statistics for the entire sample of banks over the period of our empirical analysis (2006-2015). *DeltaLogGL*, *DeltaLogTA*, *DeltaLogSec*, *DeltaGL/TA*, and *DeltaSec/TA* are the outcome variables. *NPLs/TA* and *NPLs/GL* are our main indicators for asset quality; *CoverageRatio* is the loan loss reserve to NPLs ratio. *TexasRatio* is computed as the ratio between loan loss reserves plus regulatory tier 1 capital and NPLs. *Tier1RegulatoryCapitalRatio* is our measure of capitalization; *ROE* our measure of profitability; *Cash and due from banks/TA* our measure of liquidity; and *Total customer deposits/TA* our proxy for the business model.

Table 2: Basic regression [2006-2015]

	(1) Delta LogGL	(2) Delta LogTA	(3) Delta LogTS	(4) Delta GL/TA	(5) Delta SEC/TA
NPLs/TA	-0.552***	-0.436***	0.258	-0.117	0.903***
(t-1)	(0.077)	(0.086)	(0.302)	(0.081)	(0.274)
Bank controls					
(t-1)					
CoverageRatio	0.010	0.016	0.078*	-0.014	0.060
	(0.010)	(0.012)	(0.042)	(0.011)	(0.037)
GL/TA	-0.166***	0.154***	-0.678***	-0.391***	-0.961***
	(0.045)	(0.046)	(0.142)	(0.045)	(0.128)
TS/TA	0.089**	0.034	-2.326***	0.028	-2.633***
	(0.040)	(0.045)	(0.145)	(0.041)	(0.140)
Size	-9.895***	-9.883***	-4.342	-0.766	9.209**
	(1.463)	(1.384)	(4.812)	(1.174)	(4.088)
Tier1Ratio	0.192**	0.191**	0.020	0.016	-0.105
	(0.075)	(0.082)	(0.303)	(0.077)	(0.274)
ROE	0.237***	0.276***	0.240	-0.044	-0.041
	(0.044)	(0.048)	(0.153)	(0.044)	(0.134)
Liquidity	-0.073	-0.234	0.383	0.137	0.379
	(0.186)	(0.204)	(0.679)	(0.185)	(0.608)
CustomerDeposits	0.048*	0.028	0.008	0.032	0.012
	(0.025)	(0.031)	(0.117)	(0.028)	(0.110)
Observations	4,123	4,123	4,123	4,123	4,123
Banks	905	905	905	905	905
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
Bank FE	Yes	Yes	Yes	Yes	Yes
Mean	4.305	4.496	7.620	0.0306	4.720
St. Dev.	6.619	6.519	21.34	5.471	20.11

Notes: Table 2 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of total securities, the change in the gross loans to total assets ratio, and the change in the total securities to total assets ratio. The asset quality indicator is the NPLs/TA ratio. Bank fixed effects and country-year fixed effects are included. Mean and St. Dev. refer to each outcome variable. Standard errors clustered at bank level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 3: Basic regression: Low Prof, Low Cap, Low Dep

	(1) Delta LogGL	(2) Delta LogTA	(3) Delta LogTS	(4) Delta GL/TA	(5) Delta SEC/TA
Bottom 50%					
NPLs/TA	-0.513***	-0.178	0.722	-0.379***	1.052**
	(0.118)	(0.146)	(0.477)	(0.137)	(0.426)
NPLs/TAxLowCap	-0.010	-0.244**	-0.119	0.231**	0.103
	(0.078)	(0.108)	(0.359)	(0.098)	(0.325)
NPLs/TAxLowProf	-0.060	-0.180*	-0.402	0.157*	-0.099
	(0.078)	(0.107)	(0.357)	(0.090)	(0.328)
NPLs/TAxLowDep	0.005	-0.005	-0.190	0.039	-0.191
	(0.102)	(0.122)	(0.392)	(0.102)	(0.370)
Bottom 25%					
NPLs/TA	-0.408***	-0.243**	0.203	-0.165*	0.608*
	(0.089)	(0.099)	(0.345)	(0.089)	(0.316)
NPLs/TAxLowCap	-0.135	-0.301**	-0.125	0.164	0.298
	(0.089)	(0.120)	(0.476)	(0.111)	(0.428)
NPLs/TAxLowProf	0.039	-0.240*	-0.482	0.293**	-0.178
	(0.109)	(0.132)	(0.407)	(0.119)	(0.380)
NPLs/TAxLowDep	-0.320***	-0.140	0.583	-0.190*	0.714*
	(0.082)	(0.114)	(0.421)	(0.109)	(0.368)
Observations	4,123	4,123	4,123	4,123	4,123
Banks	905	905	905	905	905
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Mean	4.291	4.484	7.585	0.0254	4.715
St. Dev.	6.607	6.510	21.34	5.472	20.13

Notes: Table 3 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of total securities, the change in the gross loans to total assets ratio, and the change in the total securities to total assets ratio. The asset quality indicator is the NPLs/TA ratio. We include the interaction of our asset quality indicator with three indicator variables: LowCap (=1 if bank's Tier1 regulatori capital ratio is below the median or the p25 of the distribution), LowProf (=1 if bank's ROE is below the median or the p25 of the distribution), LowDep (=1 if bank's Customer deposits to total asset ratio is below the median or the p25 of the distribution). Bank fixed effects and country-year fixed effects are included. Mean and St. Dev. refer to each outcome variable. Standard errors clustered at bank level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 4: Basic regression: High Coverage Ratio

	(1) Delta LogGL	(2) Delta LogTA	(3) Delta LogTS	(4) Delta GL/TA	(5) Delta SEC/TA
Top 50%					
NPLs/TA	-0.515***	-0.332***	0.499	-0.190**	1.064***
	(0.076)	(0.084)	(0.321)	(0.087)	(0.293)
NPLs/TAxHighCov	-0.119	-0.352**	-0.816*	0.252**	-0.546
	(0.091)	(0.139)	(0.421)	(0.113)	(0.391)
Top 25%					
NPLs/TA	-0.549***	-0.327***	0.582*	-0.218**	1.128***
	(0.079)	(0.096)	(0.344)	(0.099)	(0.322)
NPLs/TAxHighCov	-0.001	-0.180	-0.540	0.170	-0.376
	(0.083)	(0.111)	(0.376)	(0.107)	(0.346)
Observations	4,123	4,123	4,123	4,123	4,123
Banks	905	905	905	905	905
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Mean	4.297	4.496	7.604	0.0296	4.723
St. Dev.	6.621	6.525	21.37	5.480	20.13

Notes: Table 4 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of total securities, the change in the gross loans to total assets ratio, and the change in the total securities to total assets ratio. The asset quality indicator is the NPLs/TA ratio. We include the interaction of our asset quality indicator with the dummy variable HighCov (=1 if bank's coverage ratio – measured as the loan loss reserves to non performing loans ratio – is above the median or the p25 of the distribution). Bank fixed effects and country-year fixed effects are included. Mean and St. Dev. refer to each outcome variable. Standard errors clustered at bank level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 5: Basic regression: High CET1/NPLs

	(1) Delta LogGL	(2) Delta LogTA	(3) Delta LogTS	(4) Delta GL/TA	(5) Delta SEC/TA
Top 50%					
NPLs/TA	-0.575***	-0.452***	0.342	-0.126	1.043***
	(0.079)	(0.089)	(0.320)	(0.083)	(0.295)
NPLs/TAxHighCET1	0.125	0.086	-0.404	0.049	-0.682**
	(0.092)	(0.118)	(0.367)	(0.102)	(0.336)
Top 25%					
NPLs/TA	-0.604***	-0.471***	0.414	-0.179	1.157**
	(0.119)	(0.145)	(0.484)	(0.120)	(0.462)
NPLs/TAxHighCET1	0.068	0.045	-0.192	0.078	-0.315
	(0.108)	(0.140)	(0.454)	(0.108)	(0.431)
Observations	4,123	4,123	4,123	4,123	4,123
Banks	905	905	905	905	905
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
Bank FE	Yes	Yes	Yes	Yes	Yes
Mean	4.303	4.496	7.612	0.0319	4.729
St. Dev.	6.624	6.527	21.38	5.481	20.14

Notes: Table 5 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of total securities, the change in the gross loans to total assets ratio, and the change in the total securities to total assets ratio. The asset quality indicator is the NPLs/TA ratio. We include the interaction of our asset quality indicator with the dummy variable HighCET (=1 if bank's common equity Tier1 to non performing loans ratio is above the median or the p25 of the distribution). Bank fixed effects and country-year fixed effects are included. Mean and St. Dev. refer to each outcome variable. Standard errors clustered at bank level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 6: AQR vs. Non AQR Banks [2006-2015]

	Non AQR (1)		AQR (2)		AQR-No AQR	
	Mean	St.Dev.	Mean	St.Dev.	Diff	T-stat
Total Assets [EuroMM]	3194.00	10367.39	56830.98	29217.34	53636.98***	(49.68)
Gross Loans [Euro MM]	2040.87	6298.07	34195.83	17127.97	32154.96***	(50.75)
Total Securities [Euro MM]	646.13	2145.90	11871.46	6947.04	11225.33***	(43.87)
DeltaLogTA	4.31	5.51	0.57	7.34	-3.73***	(-10.99)
DeltaLogGL	3.49	5.31	0.60	6.56	-2.89***	(-9.43)
DeltaLogSec	9.21	19.78	3.00	21.64	-6.21***	(-6.02)
DeltaGL/TA	-0.10	5.36	0.63	5.91	0.73**	(3.11)
Delta Sec/TA	4.92	20.26	3.83	19.41	-1.09	(-1.38)
GL/TA	65.89	13.17	60.98	16.36	-4.91***	(-7.70)
TS/TA	23.96	11.64	25.12	12.65	1.17*	(2.32)
NPLs/TA	5.04	3.88	4.62	4.24	-0.42*	(-2.46)
NPLs/GL	7.57	5.81	7.37	6.15	-0.20	(-0.82)
CoverageRatio	43.98	16.71	55.33	18.65	11.35***	(12.64)
Texas Ratio	43.33	29.40	49.08	31.04	5.75***	(4.58)
DeltaLogNPL	10.98	26.42	14.30	28.73	3.32**	(2.88)
DeltaLogReserves	12.16	23.85	10.40	23.44	-1.77	(-1.84)
DeltaLogProvisions	19.68	64.79	10.48	69.81	-9.20**	(-3.10)
Tier1RegCapitalRatio	13.64	3.67	11.72	3.70	-1.92***	(-12.72)
ROE	3.88	3.34	5.34	5.30	1.47***	(7.27)
ROA	0.36	0.31	0.35	0.41	-0.01	(-0.46)
Cash and due from banks/TA	1.24	0.93	2.16	1.49	0.92***	(16.23)
Total customer deposits/TA	58.34	16.73	44.64	17.12	-13.70***	(-19.93)
Observations	3370		753		4123	

Notes: Descriptive statistics for banks from the AQR and Non AQR sample. Difference is the average difference between the second column (balance sheet items by AQR banks) and the first column (balance sheet items by Non AQR banks). We test the statistical significance of the difference using the t-statistic (T-stat). *, **, *** indicate statistically significant at the 1%, 5% and 10% level respectively.

Table 7: The effect of AQR on bank's loans quality [2010-2015]

	logNPLs	logTA	logGL	NPLs/TA	NPLs/GL
AQR[after-before]	-0.104	-0.026	-0.132	0.727**	1.293**
No AQR[after-before]	-0.244***	0.068**	0.050*	-0.455***	0.055
AQR-NoAQR[before]	3.723***	3.580***	3.451***	-0.206	0.348
AQR-NoAQR[after]	3.863***	3.485***	3.316***	0.976***	1.585***
DID	0.140	-0.095	-0.135	1.182***	1.237**

Notes: Log non-performing loans, log total assets, log gross loans, NPLs to total asset and to gross loans ratios from AQR and Non AQR banks, before and after the AQR supervision exercise. DID is the difference in difference coefficient. Difference is the average difference between the second column (interest rates charged by state-owned banks) and the third column (interest rates charged by privately owned banks). We test the statistical significance of the difference using the t-statistic with reference to a mean of zero. indicate statistically significant at the 1% and 5% level, respectively.

Table 8: The effect of AQR on bank's loans quality [2006-2015]

	(1) Common Trend Assumption	(2) Leads&Lags
AQR*2007		0.125
		(0.437)
AQR*2008		-0.193
		(0.387)
AQR*2009		0.341
		(0.352)
AQR*2010		0.017
		(0.294)
AQR*2011		-0.207
		(0.223)
AQR*2013		0.420*
		(0.254)
AQR*2014		0.728**
		(0.314)
AQR*2015		0.368
		(0.355)
AQR*Year	-0.007	
	(0.099)	
Observations	1,616	3,849
Banks	390	870
Sample	All	All
p-val leads		0.0455

Notes: The table reports estimates of the effects of the AQR on the average annual NPLs/TA in all banks in our sample. In each of the rows, AQR is an indicator variable for banks under the AQR supervision. In column 1 the sample is before the AQR exercise (2006-2012) and the regression includes a linear trend as a control. In column 2 p-value Leads is the p-value for the joint statistical significance of the leads effect of the AQR. SEs are clustered at bank level. Significance at the 10% (*), at the 5% (**), and at the 1% (***).

Table 9: The effect of AQR [2010-2015]

	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR	0.470	-3.095***	-14.488***	4.814***	-10.448***
	(0.756)	(0.947)	(3.535)	(0.919)	(2.977)
PostAQR	-3.009	0.036	-5.900	-1.079	-2.876
	(2.624)	(2.783)	(6.716)	(1.780)	(5.180)
NPLs/TA	-0.535***	-0.474***	-0.604	-0.054	0.314
	(0.101)	(0.123)	(0.395)	(0.108)	(0.331)
Observations	3,152	3,152	3,152	3,152	3,152
Banks	872	872	872	872	872
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Mean	2.872	3.462	8.099	-0.360	6.039
St. Dev.	5.760	6.137	20.89	5.479	19.38

Notes: Table 9 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of governent securities, the change in the gross loans to total asset ratio and total securities to total asset ratio. The first and second row contain the DiD coefficients and the coefficients for the change in the outcome variables between the before (2010-2012) and the after (2013 and 2015) period for control group banks respectively. AQRbank is a dummy equal to one for banks subject to the first AQR exercise; PostAQR is an indicator variable for the period 2013-2015. We include in all specifications bank FEs, lagged bank level controls and country-year FEs (this allows us to interpret coefficients as within country-year effects). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 10: The effect of NPLs/TA during AQR

	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X NPL/TA	-0.432*	-0.127	-0.801	-0.140	-0.964
	(0.234)	(0.265)	(0.911)	(0.190)	(0.743)
AQRbank X PostAQR	2.274	-2.155	-11.464***	5.943***	-6.521**
	(1.433)	(1.394)	(4.053)	(1.340)	(3.001)
PostAQR X NPL/TA	-0.062	0.022	0.223	-0.109	0.678*
	(0.087)	(0.119)	(0.435)	(0.109)	(0.364)
AQRbank X DeltaNPL/TA	0.417	-0.063	0.939	-0.118	1.026
	(0.363)	(0.394)	(1.267)	(0.254)	(1.015)
PostAQR	-2.458	0.043	-6.743	-0.346	-6.041
	(2.638)	(2.898)	(6.987)	(1.781)	(5.304)
NPLs/TA	-0.499***	-0.456***	-0.798	0.064	-0.175
	(0.105)	(0.133)	(0.512)	(0.127)	(0.458)
Observations	3,152	3,152	3,152	3,152	3,152
Banks	872	872	872	872	872
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	2.872	3.462	8.099	-0.360	6.039
St. Dev.	5.760	6.137	20.89	5.479	19.38

Notes: Table 10 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of governent securities, the change in the gross loans to total asset ratio and total securities to total asset ratio. We augment the Table 9 with a triple interaction AQRbankXPostAQRXNPL/TA. AQRbank is a dummy equal to one for banks subject to the first AQR exercise; PostAQR is an indicator variable for the period 2013-2015; NPL/TA is the time varying NPL/TA variable. The first row contains the DDD coefficients for the change in the outcomes before (2010-2012) and the after (2013 and 2015) the AQR exercise for treated banks induced by a change in the volume of NPLs. We include in all specifications bank FEs, banks' time-varying characteristics (lagged one period) and country-year FEs (this allows us to interpret coefficients as within country-year effects). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 11: The effect of NPL/TA during AQR – High NPL vs. Non-High NPL countries

High NPL countries	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X NPL/TA	-0.381	0.005	-1.727	-0.386	-1.877
	(0.321)	(0.304)	(1.384)	(0.333)	(1.273)
AQRbank X PostAQR	0.987	-6.679***	-12.224	9.119***	-5.571
	(2.373)	(2.360)	(7.750)	(2.734)	(6.956)
PostAQR X NPL/TA	-0.001	0.027	0.478	-0.020	0.805**
	(0.099)	(0.125)	(0.467)	(0.117)	(0.399)
AQRbank X DeltaNPL/TA	0.362	0.177	2.285	-0.033	2.171
	(0.404)	(0.376)	(1.793)	(0.388)	(1.657)
PostAQR	-7.322***	5.221**	37.691*	-17.596***	29.539
	(2.503)	(2.537)	(21.423)	(2.387)	(22.018)
NPLs/TA	-0.518***	-0.424***	-0.808	0.106	-0.179
	(0.113)	(0.149)	(0.555)	(0.139)	(0.492)
Observations	1,390	1,390	1,390	1,390	1,390
Banks	273	273	273	273	273
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	1.704	4.326	14.18	-2.076	12.26
St. Dev.	5.897	6.913	24.53	6.101	23.09
Non-High NPL countries	**(1) DeltaLogGL**	**(2) DeltaLogTA**	**(3) DeltaLogSec**	**(4) DeltaGL/TA**	**(5) Delta Sec/TA**
AQRbank X PostAQR X NPL/TA	-0.420	-0.108	0.975	-0.024	1.122
	(0.483)	(0.542)	(1.561)	(0.341)	(1.232)
AQRbank X PostAQR	2.410	-0.747	-15.764***	4.274***	-10.743***
	(1.851)	(1.860)	(4.853)	(1.540)	(3.830)
PostAQR X NPL/TA	-0.187	0.331	-0.324	-0.637**	-0.228
	(0.318)	(0.372)	(1.335)	(0.283)	(1.225)
AQRbank X DeltaNPL/TA	0.793	0.030	-0.889	0.159	-1.165
	(0.674)	(0.740)	(1.793)	(0.442)	(1.385)
PostAQR	-3.650	-2.868	-4.923	1.026	-4.704
	(3.385)	(3.189)	(7.466)	(2.061)	(5.606)
NPLs/TA	-0.613*	-0.632*	0.649	-0.210	1.436
	(0.326)	(0.352)	(1.281)	(0.307)	(1.204)
Observations	1,762	1,762	1,762	1,762	1,762
Banks	599	599	599	599	599
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	3.793	2.780	3.298	0.993	1.131
St. Dev.	5.478	5.351	15.94	4.494	14.03

Notes: Table 11 reports estimates as in Table 10 in two subsamples of banks: those in High NPL countries (=1 if the average bank's country NPL/GL is above the critical threshold of 10%) and those in Non High NPL countries (=1 if the average bank's country NPL/GL is below the critical threshold of 10%).

Table 12: The effect of High NPL banks during AQR

	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X HighNPLbank	-2.347*	-1.678	-0.096	-2.221*	-0.004
	(1.262)	(1.413)	(4.258)	(1.209)	(3.334)
AQRbank X PostAQR	2.123*	-1.831*	-13.881***	6.115***	-10.149***
	(1.095)	(1.042)	(3.060)	(1.128)	(2.314)
PostAQR	-2.999	0.010	-6.306	-0.851	-3.140
	(2.470)	(2.747)	(6.775)	(1.741)	(5.248)
NPLs/TA	-0.540***	-0.452***	-0.603	-0.065	0.296
	(0.107)	(0.128)	(0.414)	(0.112)	(0.348)
Observations	3,152	3,152	3,152	3,152	3,152
Banks	872	872	872	872	872
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	2.809	3.375	8.298	-0.328	6.478
St. Dev.	5.766	6.204	21.17	5.569	19.70

Notes: Table 12 HighNPLbank=1 if the average bank's NPL/TA over 2010-2015 is greater than the sample average NPL/TA over the same period.

Table 13: The effect of High NPL during AQR – High NPL vs. Non-High NPL countries

High NPL countries	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X HighNPLbank	-8.521***	-6.133***	-10.162	-4.522	-2.102
	(2.152)	(1.501)	(6.869)	(3.317)	(5.990)
AQRbank X PostAQR	6.567***	-0.453	-10.889**	9.585***	-13.586***
	(2.111)	(1.351)	(4.800)	(3.256)	(3.982)
PostAQR	-8.354***	5.357***	35.664**	-18.644***	31.055*
	(1.951)	(1.924)	(16.020)	(1.567)	(16.914)
NPLs/TA	-0.534***	-0.382***	-0.489	0.043	0.299
	(0.108)	(0.137)	(0.468)	(0.125)	(0.408)
Observations	1,390	1,390	1,390	1,390	1,390
Banks	273	273	273	273	273
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	1.744	4.291	14.10	-2.021	12.23
St. Dev.	5.870	6.892	24.50	6.089	23.08
Non-High NPL countries	**(1) DeltaLogGL**	**(2) DeltaLogTA**	**(3) DeltaLogSec**	**(4) DeltaGL/TA**	**(5) Delta Sec/TA**
AQRbank X PostAQR X HighNPLbank	-0.381	1.340	5.678	-2.764**	3.875
	(1.828)	(1.993)	(4.218)	(1.366)	(2.590)
AQRbank X PostAQR	1.994	-1.241	-14.635***	4.983***	-8.567***
	(1.307)	(1.296)	(2.951)	(1.243)	(2.248)
PostAQR	-5.051*	-1.792	-5.565	-1.071	-5.177
	(2.965)	(2.868)	(6.664)	(1.682)	(4.646)
NPLs/TA	-0.584*	-0.406	0.443	-0.681***	1.209**
	(0.325)	(0.346)	(0.909)	(0.224)	(0.602)
Observations	1,762	1,762	1,762	1,762	1,762
Banks	599	599	599	599	599
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	3.766	2.553	3.084	1.193	1.310
St. Dev.	5.500	5.384	15.96	4.550	14.21

Notes: Table 13 – HighNPLbank=1 if the average bank's NPL/TA over 2010-2015 is greater than the sample average NPL/TA over the same period. High NPL countries=1 if the average bank's country NPL/GL is above the critical threshold of 10%; Non High NPL countries=1 if the average bank's country NPL/GL is below the critical threshold of 10%.

Table 14: The effect of AQR net of capital shortfall [2010-2015]

	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR	1.278	-1.682*	-10.231***	4.309***	-7.070***
	(0.849)	(0.896)	(2.708)	(0.947)	(2.092)
PostAQR	-3.323	-1.340	-11.337*	-0.203	-7.116
	(2.747)	(2.748)	(5.937)	(1.727)	(4.546)
NPLs/TA	-0.517***	-0.426***	-0.440	-0.042	0.391
	(0.096)	(0.119)	(0.385)	(0.109)	(0.326)
Observations	3,052	3,052	3,052	3,052	3,052
Banks	853	853	853	853	853
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Mean	2.971	3.561	8.199	-0.363	6.004
St. Dev.	5.712	6.046	20.71	5.454	19.26

Notes: We exclude from the sample 25 banks there experienced a capital shortfall in the AQR period. Table 14 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of governent securities, the change in the gross loans to total asset ratio and total securities to total asset ratio. The first and second row contain the DiD coefficients and the coefficients for the change in the outcome variables between the before (2010-2012) and the after (2013 and 2015) period for control group banks respectively. AQRbank is a dummy equal to one for banks subject to the first AQR exercise; PostAQR is an indicator variable for the period 2013-2015. We include in all specifications bank FEs, lagged bank level controls and country-year FEs (this allows us to interpret coefficients as within country-year effects). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 15: The effect of NPL/TA during AQR net of capital shortfall

	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X NPL/TA	-0.419*	-0.089	-0.965	-0.182	-0.936
	(0.244)	(0.251)	(0.761)	(0.220)	(0.660)
AQRbank X PostAQR	2.470*	-1.545	-8.668**	5.442***	-4.517
	(1.468)	(1.375)	(3.931)	(1.402)	(2.843)
PostAQR X NPL/TA	-0.059	0.020	0.207	-0.108	0.657*
	(0.088)	(0.118)	(0.434)	(0.109)	(0.363)
AQRbank X DeltaNPL/TA	0.572	0.203	2.138*	-0.152	1.559
	(0.353)	(0.361)	(1.145)	(0.267)	(1.067)
PostAQR	-2.934	-1.492	-12.867**	0.711	-10.540**
	(2.817)	(2.933)	(6.301)	(1.742)	(4.681)
NPLs/TA	-0.502***	-0.456***	-0.746	0.074	-0.144
	(0.106)	(0.134)	(0.506)	(0.129)	(0.455)
Observations	3,052	3,052	3,052	3,052	3,052
Banks	853	853	853	853	853
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	2.971	3.561	8.199	-0.363	6.004
St. Dev.	5.712	6.046	20.71	5.454	19.26

Notes: We exclude from the sample 25 banks there experienced a capital shortfall in the AQR period. Table 15 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of governent securities, the change in the gross loans to total asset ratio and total securities to total asset ratio. We augment the Table 9 with a triple interaction AQRbankXPostAQRXNPL/TA. AQRbank is a dummy equal to one for banks subject to the first AQR exercise; PostAQR is an indicator variable for the period 2013-2015; NPL/TA is the time varying NPL/TA variable. The first row contains the DDD coefficients for the change in the outcomes before (2010-2012) and the after (2013 and 2015) the AQR exercise for treated banks induced by a change in the volume of NPLs. We include in all specifications bank FEs, banks' time-varying characteristics (lagged one period) and country-year FEs (this allows us to interpret coefficients as within country-year effects). *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 16: The effect of High NPL banks during AQR net of capital shortfall

	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X HighNPLbank	-1.937	-0.328	3.913	-2.876**	3.557
	(1.297)	(1.476)	(3.770)	(1.234)	(2.715)
AQRbank X PostAQR	2.580**	-1.129	-11.284***	5.672***	-8.296***
	(1.069)	(1.001)	(2.792)	(1.157)	(2.107)
PostAQR	-3.303	-1.508	-12.420**	0.255	-7.907*
	(2.621)	(2.745)	(6.070)	(1.659)	(4.619)
NPLs/TA	-0.530***	-0.415***	-0.458	-0.053	0.349
	(0.103)	(0.124)	(0.408)	(0.114)	(0.347)
Observations	3,052	3,052	3,052	3,052	3,052
Banks	853	853	853	853	853
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	2.916	3.482	8.413	-0.330	6.453
St. Dev.	5.715	6.109	20.99	5.545	19.58

Notes: We exclude from the sample 25 banks there experienced a capital shortfall in the AQR period. HighNPLbank=1 if the average bank's NPL/TA over 2010-2015 is greater than the sample average NPL/TA over the same period.

Table 17: The effect of High NPL during AQR net of capital shortfall – High NPL vs. Non-High NPL countries

High NPL countries	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X HighNPLbank	-7.495***	-4.329***	-3.686	-5.355	3.627
	(2.065)	(1.410)	(6.245)	(3.355)	(5.325)
AQRbank X PostAQR	6.229***	-0.491	-9.118*	9.310***	-11.739***
	(2.005)	(1.458)	(4.848)	(3.312)	(3.953)
PostAQR	-7.923***	3.975**	18.749*	-18.070***	13.160
	(1.717)	(2.006)	(10.173)	(1.215)	(9.306)
NPLs/TA	-0.563***	-0.395***	-0.415	0.038	0.392
	(0.108)	(0.142)	(0.470)	(0.129)	(0.406)
Observations	1,311	1,311	1,311	1,311	1,311
Banks	263	263	263	263	263
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	1.809	4.437	14.33	-2.095	12.29
St. Dev.	5.837	6.819	24.45	6.101	23.12
Non-High NPL countries	**(1) DeltaLogGL**	**(2) DeltaLogTA**	**(3) DeltaLogSec**	**(4) DeltaGL/TA**	**(5) Delta Sec/TA**
AQRbank X PostAQR X HighNPLbank	-0.798	1.498	6.118	-2.957**	4.803**
	(1.853)	(2.071)	(4.165)	(1.461)	(2.368)
AQRbank X PostAQR	2.301*	-0.991	-14.000***	4.983***	-8.480***
	(1.305)	(1.297)	(2.931)	(1.249)	(2.247)
PostAQR	-5.087	-1.657	-6.729	-1.396	-5.199
	(3.147)	(2.918)	(6.373)	(1.702)	(4.539)
NPLs/TA	-0.427	-0.240	0.569	-0.575**	0.892
	(0.311)	(0.336)	(0.928)	(0.231)	(0.625)
Observations	1,485	1,485	1,485	1,485	1,485
Banks	555	555	555	555	555
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	3.893	2.638	3.193	1.229	1.301
St. Dev.	5.422	5.265	15.62	4.457	13.92

Notes: Table 17. We exclude from the sample 25 banks there experienced a capital shortfall in the AQR period. HighNPLbank=1 if the average bank's NPL/TA over 2010-2015 is greater than the sample average NPL/TA over the same period. High NPL countries=1 if the average bank's country NPL/GL is above the critical threshold of 10%; Non High NPL countries=1 if the average bank's country NPL/GL is below the critical threshold of 10%.

Robustness

Table 18: Basic regression [2006-2015]

	(1) Delta LogGL	(2) Delta LogTA	(3) Delta LogTS	(4) Delta GL/TA	(5) Delta SEC/TA
NPLs/GL	-0.395***	-0.329***	0.031	-0.073	0.523***
	(0.050)	(0.056)	(0.195)	(0.055)	(0.176)
GL/TA	-0.201***	0.125***	-0.675***	-0.396***	-0.915***
	(0.043)	(0.045)	(0.143)	(0.044)	(0.128)
TS/TA	0.097**	0.042	-2.313***	0.029	-2.633***
	(0.039)	(0.045)	(0.145)	(0.041)	(0.141)
Lly	-10.131***	-10.122***	-4.722	-0.760	9.178**
	(1.411)	(1.358)	(4.833)	(1.175)	(4.116)
Tier1Ratio	0.170**	0.167**	-0.033	0.020	-0.124
	(0.074)	(0.082)	(0.310)	(0.077)	(0.281)
ROE	0.241***	0.277***	0.220	-0.044	-0.061
	(0.044)	(0.047)	(0.151)	(0.043)	(0.133)
Liquidity	-0.065	-0.230	0.354	0.148	0.338
	(0.185)	(0.203)	(0.681)	(0.184)	(0.606)
CustomerDeposits	0.045*	0.026	0.020	0.029	0.027
	(0.025)	(0.031)	(0.116)	(0.029)	(0.109)
Constant	88.656***	69.866***	142.824***	29.408***	55.417
	(13.798)	(12.468)	(43.620)	(11.323)	(36.682)
Observations	4,123	4,123	4,123	4,123	4,123
Banks	905	905	905	905	905
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
Bank FE	Yes	Yes	Yes	Yes	Yes
Mean	4.305	4.496	7.620	0.0306	4.720
St. Dev.	6.619	6.519	21.34	5.471	20.11

Notes: Table 18 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of total securities, the change in the gross loans to total assets ratio, and the change in the total securities to total assets ratio. The asset quality indicator is the NPL/GL ratio. Bank fixed effects and country-year fixed effects are included. Mean and St. Dev. refer to each outcome variable. Standard errors clustered at bank level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 19: Basic regression [2006-2015]

	(1) Delta LogGL	(2) Delta LogTA	(3) Delta LogTS	(4) Delta GL/TA	(5) Delta SEC/TA
Texas	-0.071***	-0.060***	0.025	-0.014	0.107***
	(0.010)	(0.010)	(0.037)	(0.009)	(0.033)
GL/TA	-0.181***	0.142***	-0.681***	-0.393***	-0.945***
	(0.044)	(0.045)	(0.143)	(0.045)	(0.128)
TS/TA	0.088**	0.035	-2.319***	0.027	-2.625***
	(0.039)	(0.045)	(0.145)	(0.041)	(0.140)
Size	-9.029***	-9.201***	-4.896	-0.553	7.661*
	(1.462)	(1.373)	(4.827)	(1.189)	(4.033)
Tier1Ratio	0.124*	0.128	0.006	0.011	-0.040
	(0.075)	(0.083)	(0.314)	(0.078)	(0.287)
ROE	0.234***	0.270***	0.245	-0.046	-0.036
	(0.044)	(0.048)	(0.156)	(0.044)	(0.137)
Liquidity	-0.085	-0.246	0.334	0.145	0.350
	(0.186)	(0.202)	(0.681)	(0.184)	(0.607)
CustomerDeposits	0.046*	0.028	0.020	0.029	0.025
	(0.025)	(0.031)	(0.116)	(0.028)	(0.108)
Observations	4,123	4,123	4,123	4,123	4,123
Banks	905	905	905	905	905
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
Bank FE	Yes	Yes	Yes	Yes	Yes
Mean	4.305	4.496	7.620	0.0306	4.720
St. Dev.	6.619	6.519	21.34	5.471	20.11

Notes: Table 19 presents the estimates of the change in the logarithm of gross loans, the change in the logarithm of total assets, the change in the logarithm of total securities, the change in the gross loans to total assets ratio, and the change in the total securities to total assets ratio. The asset quality indicator is the Texas ratio. Bank fixed effects and country-year fixed effects are included. Mean and St. Dev. refer to each outcome variable. Standard errors clustered at bank level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

Table 20: Basic regression: Crises

	(1) Delta LogGL	(2) Delta LogTA	(3) Delta LogTS	(4) Delta GL/TA	(5) Delta SEC/TA
NPLs/TA	-0.749***	-0.299***	1.720***	-0.467***	2.133***
	(0.072)	(0.073)	(0.232)	(0.070)	(0.220)
Banking Crisis 2008-2009	-1.309**	-1.929***	-0.833	0.530	1.772
	(0.595)	(0.546)	(2.014)	(0.565)	(1.856)
Sovereign Crisis 2010-2012	-0.641	-1.117**	0.618	0.059	1.567
	(0.456)	(0.459)	(1.511)	(0.444)	(1.366)
NPLs/TAxBankingCrisis	0.394***	0.194*	-1.331***	0.185	-1.676***
	(0.114)	(0.112)	(0.441)	(0.120)	(0.431)
NPLs/TAxSovCrisis	0.222***	0.145*	-0.561**	0.183**	-0.667**
	(0.070)	(0.078)	(0.281)	(0.076)	(0.266)
Observations	4,123	4,123	4,123	4,123	4,123
Banks	905	905	905	905	905
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes
Mean	4.305	4.496	7.620	0.0306	4.720
St. Dev.	6.619	6.519	21.34	5.471	20.11

Table 21: The effect of High NPL banks during AQR

	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X HighNPLbank	-2.650**	-3.004**	-2.429	-1.031	-1.514
	(1.280)	(1.489)	(5.016)	(1.330)	(4.069)
AQRbank X PostAQR	2.128**	-1.229	-12.631***	5.325***	-9.336***
	(1.070)	(1.051)	(2.941)	(1.160)	(2.214)
PostAQR	-2.816	0.261	-6.050	-0.836	-2.978
	(2.460)	(2.734)	(6.815)	(1.753)	(5.342)
NPLs/TA	-0.537***	-0.438***	-0.579	-0.077	0.312
	(0.107)	(0.128)	(0.413)	(0.113)	(0.348)
Observations	3,152	3,152	3,152	3,152	3,152
Banks	872	872	872	872	872
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	2.809	3.375	8.298	-0.328	6.478
St. Dev.	5.766	6.204	21.17	5.569	19.70

Notes: Table 21. HighNPLbank=1 if the average NPLs/GL>10%

Table 22: The effect of High NPL during AQR – High NPL vs. Non-High NPL countries

High NPL countries	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X HighNPLbank	-8.269***	-5.654***	-11.029	-5.097	-3.988
	(2.404)	(1.662)	(7.653)	(3.810)	(6.455)
AQRbank X PostAQR	6.349***	-0.866	-10.145**	10.079***	-11.965***
	(2.297)	(1.413)	(5.088)	(3.670)	(3.954)
PostAQR	-8.439***	5.273***	35.652**	-18.635***	31.183*
	(1.926)	(1.905)	(16.083)	(1.541)	(17.005)
NPLs/TA	-0.533***	-0.382***	-0.483	0.047	0.307
	(0.108)	(0.138)	(0.469)	(0.126)	(0.408)
Observations	1,370	1,370	1,370	1,370	1,370
Banks	273	273	273	273	273
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	1.744	4.291	14.10	-2.021	12.23
St. Dev.	5.870	6.892	24.50	6.089	23.08
Non-High NPL countries	**(1) DeltaLogGL**	**(2) DeltaLogTA**	**(3) DeltaLogSec**	**(4) DeltaGL/TA**	**(5) Delta Sec/TA**
AQRbank X PostAQR X HighNPLbank	-0.828	0.180	4.683	-1.647	4.414
	(2.134)	(2.320)	(5.517)	(1.649)	(3.494)
AQRbank X PostAQR	2.018	-0.853	-13.670***	4.403***	-8.119***
	(1.267)	(1.284)	(2.853)	(1.235)	(2.168)
PostAQR	-4.872	-1.669	-6.121	-0.975	-5.892
	(3.020)	(2.846)	(6.507)	(1.792)	(4.565)
NPLs/TA	-0.569*	-0.365	0.481	-0.722***	1.192**
	(0.331)	(0.356)	(0.909)	(0.218)	(0.595)
Observations	1,762	1,762	1,762	1,762	1,762
Banks	599	599	599	599	599
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Bank controls	Yes	Yes	Yes	Yes	Yes
Mean	3.766	2.553	3.084	1.193	1.310
St. Dev.	5.500	5.384	15.96	4.550	14.21

Notes: Table 22. HighNPLbank=1 if the average NPLs/GL>10%

Table 23: The effect of High NPL banks during AQR net of capital shortfall

	(1) DeltaLogGL	(2) DeltaLogTA	(3) DeltaLogSec	(4) DeltaGL/TA	(5) Delta Sec/TA
AQRbank X PostAQR X HighNPLbank	-2.125	-1.465	2.077	-1.860	2.314
	(1.325)	(1.522)	(4.426)	(1.328)	(3.321)
AQRbank X PostAQR	2.514**	-0.676	-10.220***	5.030***	-7.507***
	(1.053)	(1.019)	(2.708)	(1.175)	(2.050)
PostAQR	-3.143	-1.291	-12.362**	0.270	-7.927*
	(2.616)	(2.725)	(6.059)	(1.661)	(4.660)
NPLs/TA	-0.529***	-0.406***	-0.443	-0.061	0.359
	(0.103)	(0.124)	(0.407)	(0.114)	(0.347)
Observations	2,877	2,877	2,877	2,877	2,877
Number of Bankid	717	717	717	717	717
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Mean	2.795	3.523	8.485	-0.479	6.414
St. Dev.	5.728	6.132	20.82	5.521	19.28

Notes: Table 23. We exclude from the sample 25 banks there experienced a capital shortfall in the AQR period. HighNPLbank=1 if the average NPLs/GL>10%