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Cover your Assets: Non-Performing Loans and Coverage Ratios in Europe

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Cover your assets: non-performing loans and coverage ratios in Europe*

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August 31, 2020

Abstract

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Keywords: loan loss coverage ratios, loan loss reserves, problem loans.

JEL Classification: G21, G28, M41

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I have nothing to disclose.

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1. Introduction

One of the most debated issues in Europe since the financial and sovereign debt crises concerns the accumulation of large stocks of non-performing loans (NPLs) and the numerous policy actions put forth to deal with this problem. Unfortunately, despite all the undertaken efforts, because of the COVID-19 pandemic and the associated economic recession – far worse than that triggered by the global financial crisis – the issue of surging NPL stocks is bound to be a policy priority once again (Ari et al., 2020).

European policymakers have faced and studied in detail the consequences of high volumes of NPLs, namely limited bank lending ability, impairment of the monetary policy mechanism, and reduced output growth (Draghi, 2017; ESRB, 2019). In designing measures to limit the consequences of high NPLs, particular attention has been dedicated to banks' provisioning and loss coverage policies. In fact, while high amounts of NPLs are certainly problematic, the level of loss coverage, i.e., the amount of loan loss reserves (LLRs), determines how losses originating from NPLs impact bank capital (Constâncio, 2017). To explain the mechanism, each year banks set aside loan loss provisions (LLPs), to form loan loss reserves. These reserves work as a buffer to absorb the expected loan losses because, when the loss occurs, banks can draw on these reserves without impairing their capital. Hence, it is not the amount of NPLs *per se*, but the "uncovered" portion of NPLs that represents the real threat to bank balance sheets.

Against this background, numerous policy initiatives have been adopted to enhance banks' coverage policies and, specifically, to increase the coverage ratio (i.e., the share of loan loss reserves over NPLs), which has gained relevance as a key prudential tool and supervisory metric of bank soundness (ECB, 2016 and 2017a). *Ceteris paribus*, banks with larger volumes of NPLs and lower coverage ratios are more vulnerable to negative shocks affecting borrowers' credit quality, especially in bad times, when loan losses are more likely.[1] It follows that in a situation where NPLs are bound to increase, banks should react promptly to preserve an adequate loss coverage. This is for example what is happening in the COVID-19 crisis, where some large banks have started accumulating provisions in anticipation of future losses on their stocks of loans.

Nevertheless, loan loss coverage policies still vary largely across banks and countries in Europe, with many of the countries with the highest level of NPLs reporting below-average coverage ratios (EBA,

[1] Estimates report that net present value of NPLs may be as may be as low as 40-50% of the loan gross book value. Balance sheets are protected, and capital buffers remain impaired, as long as coverage ratios reflect this haircut (Fell et al., 2016).

2018). [2] In this paper, we exploit this variation to investigate drivers and dynamics of bank coverage ratios and their components at both the micro (bank) and macro (country) level, using a sample of around 440 large and medium-sized banks in Europe over the period 2010–2017. The focus on Europe provides an interesting case study, given the high level of NPLs and the substantial bank and country heterogeneity in the region (EBA, 2018).

Our results point to the following three main conclusions. First, bank-specific factors are the main drivers of coverage ratios. This finding emphasizes the importance of micro prudential oversight as a way to induce banks to increase their coverage ratios. Still, some of the variation in coverage ratios is explained by unobservable, structural bank characteristics that could be better captured by close and customized scrutiny as it occurs in the supervisory dialogue. Among the bank-specific determinants, credit risk related factors such as reserve policies, (the level and change of) NPLs, credit growth, as well as forward-looking measures of credit risk play an important role. These results suggest that coverage ratios work more as a prudential (forward-looking) buffer than merely (and backward-looking) a booking account, even in a context where the "incurred loss" model (ILM) for calculating bank provisions is prevalent. This provides evidence of prudent behavior in setting coverage ratios even before the new accounting standard IFRS 9 was put into practice (as a forward-looking and ideally countercyclical approach to calculate provisions, IFRS 9 should lead to higher coverage ratios by promoting a timelier and more prudent provisioning).

Capitalization and cost efficiency also explain coverage policy variation, although to a lesser extent. In particular, increases in capitalization help banks enhance coverage ratios, i.e., one buffer reinforces the other. Or, capital contraction gives banks an incentive to under-reserve, possibly to limit the immediate negative implications of higher provisioning on equity. Finally, an increase in the cost-to-income ratio is also associated with lower coverage level, possibly via incentives to under-reserve as in Ristolainen (2018).

The second main conclusion is that variations in NPLs or loan loss reserves affect coverage ratios in a non-trivial manner. In particular, by inspecting the underlying mechanisms, we show that when NPLs increase, banks tend to set aside larger reserves, but in a way that is not sufficient, at least in the short term, to determine higher coverage ratios. The relationship between coverage ratios and asset quality is,

[2] For example, large institutions have commonly reported lower coverage ratios than small and medium-sized banks. At the country level, the average coverage ratio in Europe is nearly 46%, but it ranges from 24% in Finland to nearly 70% in Hungary (EBA, 2018).

however, non-linear, as very high-NPL banks tend to be comparatively better covered as their asset quality worsens.[3] Moreover, by looking at well-reserved banks and risky banks (those with structurally high levels of LLRs and NPLs, respectively), we show that the former tend to have lower coverage ratios than the average bank, while the latter tend to be better covered. These findings altogether emphasize the need to look at reserves or the stock of NPLs only in conjunction with the associated level of coverage, as a comprehensive measure of balance sheet strength.

The third main conclusion concerns the effectiveness of a set of macro policies and policy tools in shaping coverage ratios, although as a less powerful alternative to micro supervision. In particular, we find that more stringent macroprudential policies (especially time-varying/dynamic loan-loss provisioning) are associated with higher coverage ratios. In addition, banks from high-NPL countries exhibit lower NPLs and lower coverage ratios in the presence of a better rule of law. This may suggest that stronger contract enforcement or more efficient courts support NPL resolution and thus decrease the need of large coverage. We also find that tighter capital rules are associated with lower NPLs and coverage ratios, but only in high-NPL countries, which call for a different calibration of such policies in different jurisdictions. This result is in line with the finding in Gropp et al. (2019) that banks tend to de-risk and deleverage in an attempt to comply with more stringent capital regulation.

Finally, we find higher coverage ratios in banks located in countries where secondary markets for distressed debt are larger, and even more so in banks located in high-NPL countries. This result corroborates the statements by European central authorities about the need to report adequate coverage ratios to make loan disposals more likely and limit actual losses for the seller (Fell et al., 2016; Constâncio, 2017).

This paper also contributes to the literature on NPLs and provisioning. Despite the increased policy relevance, the empirical evidence on coverage ratios and its determinants remains scarce. Previous works on related topics have focused on explaining either NPLs or provisions, which, however, are rather uncorrelated with coverage ratios (see Table 1).[4] In fact, we find this ratio does not always move in the

[3] As it is quite standard, also in supervisory reports, we measure asset quality with the level of NPLs. We are, however, aware that low NPLs do not necessarily translate in high quality of the underlying assets. One reason is that economic booms help loans remain performing. Another reason may also be that NPLs are low because of managerial under-reporting.

[4] Previous studies on LLPs discuss the role of discretion (Liu and Ryan, 2006; Bushman and Williams, 2012; Norden and Stoian, 2013; Beatty and Liao, 2014, and literature therein), as well as their timeliness and contribution to procyclical lending (Huizinga and Laeven, 2019; Laeven and Majnoni, 2003; Beatty and Liao, 2011; Nicoletti, 2018).

same direction of each of its component. In particular, unlike previous work on bank provisioning (see Laeven and Majoni, 2003, among others), managerial discretion to e.g., smooth earnings does not explain coverage policy, which instead responds primarily to non-discretionary factors related to expected credit risk. It follows that the coverage ratio is a more comprehensive indicator of balance-sheet strength and that variables that explain NPL or reserve dynamics are not always relevant to explain variation in coverage ratios.

Moreover, as we investigate the dynamics of coverage ratio components too, we are able to explore the mechanisms through which banks protect themselves against credit losses in response to shocks. This allows us, for example, to draw some conclusions on whether coverage policies are driven by accounting rather than prudential considerations and which policy measures may help foster loan loss coverage policies.

The remainder of the paper is structured as follows. Section 2 provides background details on the main measures taken to enhance loss coverage for NPLs and the reasons why it is important for banks to build up adequate coverage ratios. Section 3 illustrates the data and provides descriptive statistics for our sample. Section 4 and 5 empirically investigate the main sources of variation in coverage ratios and their components. We first focus on micro-level factors (Section 4) and then extend the analysis by using macro-level data (Section 5). Section 6 concludes.

2. NPLs and coverage ratios: Economic importance and institutional background

This section describes the supervisory initiatives introduced in recent years to enhance coverage ratios and briefly explains the role of coverage ratios as prudential tools.

2.1. Recent measures to enhance loss coverage for NPLs

NPLs have recently become a key priority for prudential authorities in Europe because of their negative effects on the stability and growth of both individual banks and the banking system as a whole. From a micro perspective, a high stock of NPLs may cast doubts on the quality of a bank's assets, thus making bank funding more expensive. This may in turn impede lending as banks with poor asset quality may seek to regain adequate capital ratios by deleveraging and cutting back on lending rather than by raising new equity. Finally, high NPL ratios can also distort bank managers' incentives in that troubled

Berger and De Young (1997), Nkusu (2011), Klein (2013), and Beck et al. (2015) among others, study the determinants of NPLs.

loans may increase moral hazard and favor excessive risk taking because of eroding bank capital (Bruno and Marino, 2019). From a more macro perspective, a high level of NPLs may also generate negative externalities at the system level, so that banks operating in a high NPL country may be seen in general as weaker relative to banks operating in a country with lower stocks of troubled assets (ESRB, 2019).

NPLs in European banks skyrocketed to unprecedented levels in the wake of the global financial crisis and have decreased only recently thanks in part to the pressure of the European supervisors. According to the EBA, the NPL ratio of European Union (EU) financial institutions has decreased on average from 6% as of mid-2015 to 3% as of mid-2019. Nevertheless, there are still significant discrepancies across banks and countries, with the aggregate level of NPLs in EU banks remaining very high (over 600 billion euros as of June 2019) and the gap versus international peers remaining striking, making EU banks more vulnerable than their international peers to the repercussions of poor asset quality. [5]

As argued by Constancio (2007), one of main concerns in dealing with the surge of NPLs has been the absence of common provisioning practices in Europe. This has contributed to the large variation in NPLs and coverage ratios across banks and countries, and has also impeded benchmarking and peer comparison as supervisory practice. To ensure financial stability the need to implement measures aiming to harmonize provisioning practices and enhance loss coverage have grown (Stamegna, 2019; ECB, 2019).

To strengthen the supervisory approach to NPLs, in March 2017, the ECB released guidelines on how to manage and provision for problem loans, complemented with quantitative indicators on the minimum levels of prudential provisions, based on the vintage and the degree of collateralization of the non-performing exposures (ECB, 2018). One year later, in July 2018, the ECB announced the decision to set bank-specific supervisory expectations for the provisioning of NPLs as part of the supervisory dialogue. The aim was to harmonize the degree of loss coverage over the medium term across comparable banks.

Along the same lines, in March 2018, the European Commission adopted a comprehensive package of measures that included a proposal to introduce common minimum coverage levels for newly originated loans that become non-performing. In April 2019, an amendment to the European capital regulatory framework, the “prudential backstop”, required banks to have minimum loss coverage for non-performing exposures and to deduct from their own funds (common equity tier 1 capital) those not sufficiently covered.

[5] According to World Bank data, the NPL ratio was 1% in the US at the end 2018.

To complete the picture, the accounting standard IFRS 9, introduced in January 2018, changed the impairment recognition by requiring banks, in essence, to make larger and timelier provisions based on the amount of "expected losses". Until the introduction of IFRS 9, banks in most European countries accumulated provisions according to a backward-looking approach, reflecting "incurred" credit losses (Cohen and Edwards, 2017).[6] Ideally, under the new accounting standard, provisions would better anticipate deteriorating economic conditions that may affect a borrower's ability to repay. In such a way, provisions could be used effectively to cover expected losses, instead of bank capital acting as a buffer against unexpected losses (Laeven and Majnoni, 2003). This is for example what is happening in the COVID-19 crisis, where banks have started accumulating a large amount of provisions in anticipation of future losses on their stocks of loans.

The switch to the new standard has been an important step in reconciling the perspective of accounting standard setters and bank regulators. Losses on NPLs are in fact subjected to both accounting standards and prudential regulation with different perspectives, especially before the IFRS 9 introduction. The former emphasizes transparency of financial statements, the latter emphasizes safety and soundness. From the perspective of the accounting rules, loan loss provisions have an overall detrimental effect on earnings and regulatory capital.[7] Because these are at the discretion of bank managers, there is potential for banks to provision more or less than necessary as a way to smooth their income and capital, as we will discuss in Section 4.1. On one hand this would introduce discretionary modifications to earnings and reduce comparability across firms (Walter, 1991). On the other hand, from a prudential perspective, higher provisioning may reflect a more cautious approach to building up large reserves prior to future losses.

2.2. Coverage ratio as a prudential tool

The initiatives illustrated above show that coverage ratios have gained relevance as a key prudential and monitoring tool to shield banks' balance sheets. Why is it desirable for regulatory and

[6] There are some exceptions. Notably, Spanish bank regulators introduced a forward–looking provisioning regime in 2000, meant to address procyclicality issues, which led to more timely and higher general provisions (de Lis et al., 2001; Jiménez et al., 2017).

[7] The actual effect on bank capital of provisioning is hard to determine, because the regulatory implications of provisions varies according to the approach used by banks for calculating capital requirements, and on the nature of bank provisions (namely, general vs. specific provisions). See Bruno and Carletti (2017) for a concise discussion on the effects of provisions on bank capital.

supervisory purposes to promote high loan loss coverage? The answer is that adequate coverage ratios can help banks mitigate most of the concerns associated with high NPLs.

Adequate loan loss reserves, and thus high coverage ratios, for a given level of NPLs, enhance banks' safety and soundness by protecting bank capital when losses materialize (Wheeler, 2019). Specifically, loan loss reserves are a "contra-asset" account, which reduces the loans by the amount the bank expects to lose when some portion of the loans are not repaid. Periodically, the bank managers decide how much to add to the LLR account, and record this amount as an expense item on the profit and loss account through "provisions for loan losses". This allows banks to recognize the estimated loss even before the actual loss can be determined with accuracy and certainty. To the extent that credit risk is not under-estimated and allowances are adequate to cover for the actual loss, by building adequate coverage ratios banks protect their capital and preserve their capacity to provide credit to the economy (Beatty and Liao, 2011).[8]

High coverage ratios also help to make banks' balance sheet more transparent. In the traditional banking literature (e.g., Diamond and Dybvig, 1983), loans are illiquid and untraded contracts generating cash flows that are hard to predict. In the absence of a true market price, the loan fair value is approximated through the process of provisioning. The process of accumulating provisions is, in fact, equivalent to reducing the face value of the loan to its present value, taking into account the allowance built up over time (Song, 2002). If loan loss allowances were underestimated, bank assets and capital ratios would be overvalued and balance sheets would be distorted.

Relatedly, because high loan loss coverage corresponds, *de facto*, to low loan net book value, it follows that reporting high coverage ratios is also a precondition to make the asset disposal more likely and reduce the bid-ask spread between sellers and buyers (Fell et al., 2016). However, anecdotal evidence and market practices show that, on average, coverage ratios in European banks are still inadequate if compared to actual recovery rates or haircuts applied as an effect of NPL resolution.[9] This points to the importance of increasing coverage ratios in order to reduce the negative impact of credit losses on capital.

[8] The NPL Guidance also stresses the importance of timely provisioning related to NPLs, as "these serve to strengthen banks' balance sheets, enabling them to (re)focus on their core business, most notably lending to the economy" (ECB, 2018).

[9] In the context of the NAMA, the asset management company established in Ireland in 2009, assets were priced with a 57% haircut, with an average haircut on loan portfolios ranging from 43% to 61%. In the case of SAREB, the Spanish asset management company established in 2012, total assets were valued with a 53% haircut, with large

In sum, coverage ratios are important tools to ensure the safety and soundness of the banking sector, enhance the transparency of banks' balance sheets and favor the disposal of NPLs. Yet, as we will show below, they show important variation both across banks and countries. Because of this, a number of policy measures have been introduced in recent years aiming at increasing the level of coverage ratios and decreasing their dispersion. In what follow we analyze the determinants of coverage ratios in Europe, as well as of their components, and derive implications as to which policies may be more effective.

3. Data and summary statistics

We collect annual bank-level data from the S&P Global Market Intelligence Platform (S&P Global). The dataset spans the years 2010–2017 and covers all EU countries as of 2017. Following Eber and Minoiu (2016), we collect data at the highest consolidation level. To avoid including small banks that could introduce noise, we only keep banks that are being classified as medium-sized and large according to the ECB definition.[10] Given the purpose of the analysis, we also drop the institutions whose commercial banking business is negligible from the sample.[11] All variables are winsorized at 2.5% and 97.5%. The final sample contains 441 banks, representing around 70% of banking assets in Europe. Table A.1 reports the breakdown of observations and banks in our sample.[12]

Figures 1 to 3 explore trends in NPLs, LLRs, and coverage ratios in on our sample. Figure 1 shows that the evolution of the average coverage ratio over all countries and in high-NPL countries (low-NPL countries), defined as those with NPL/TA above (below) the sample mean.[13] In both groups of countries, coverage ratios have trended up since the sovereign debt crisis in 2010–2012 and, again, after the

discrepancy by loan type (Medina Cas and Peresa, 2016). Looking at Italy, the recovery rate on NPLs is estimated between 41% (Carpinelli et al., 2016) and 47% (Ciavoliello et al., 2016), indicating an average haircut of about 60%.

[10] The ECB labels as large those institutions with assets greater than 0.5% of total consolidated assets of European Union banks and medium–sized as those with assets between 0.5% and 0.005%.

[11] We delete institutions with a loan-to-asset ratio and a deposit-to-asset ratio smaller than 20%, those not classified as 'bank' or 'savings bank/thrift/mutual', as well as those that, although being classified as banks by S&P Global, may operate not in a pure commercial manner because for example of ownership (e.g., government-owned banks) or scope (e.g., asset management companies).

[12] As it emerges from Table A.1, German banks are over-represented in terms of number of institutions in our sample. This is common in the empirical literature on European banks (see Altavilla et al., 2017, among others) and reflects the highly fragmented nature of the German banking system. To check whether this has implications, we have re-run the analysis on a sample excluding German banks. Results, available upon request, remain robust.

[13] Our definition of high-NPL countries is time-varying, with some countries coming in only for part of the sample. All countries in which the NPL ratio exceeds 10% in 2016 (in accordance with the definition of the ESRB, 2017) are consistently covered. These countries are the following, in order of descending NPL ratio: Greece, Cyprus, Portugal, Italy, Slovenia, Ireland, Bulgaria, Hungary, Romania, and Croatia.

introduction of the single supervisory mechanism (SSM) in 2014. Overall, European banks have progressively increased their coverage ratios, partly as a managerial response to asset quality deterioration and partly due to stricter supervisory and market scrutiny.[14]

Throughout our sample period, high-NPL countries tend to report coverage ratios below the sample average, although the gap has progressively narrowed over time. In fact, most of the time variation in coverage ratios seems to be explained by high-NPL countries, as they have increased from nearly 35% to 55% in 2010-2017, as opposed to low-NPL countries whose average coverage ratio moved from 45% to 55%. Figures 2 and 3 show the dynamics of the components of the coverage ratio for high and low-NPL countries, respectively. By comparing Figure 1 with Figures 2 and 3, it emerges that while the dynamics of LLRs and NPLs are similar, they are different from those of coverage ratios.

Figures 4 and 5 confirm the presence of large cross-sectional variability in asset quality and coverage ratios, respectively, both across countries and within the same country (see also Table A.1 for a sample composition in terms of per–country average coverage ratios and their components). Figure 4 shows that countries with higher median NPLs also have a larger dispersion in NPL/TA across banks. By comparing the two figures, no obvious country-level mapping emerges between the quality of bank loans and the level of coverage. This suggests that although differences in asset quality may contribute to explain heterogeneity in European banks' coverage ratios, other factors may also play a role.[15]

Descriptive statistics and correlations for all the variables are shown in Table 2 and Table A.2, respectively. The average bank in our sample is a traditional commercial bank, whose core business is lending (the average loan to asset ratio is 65%) and whose main source of funds are customer deposits (the deposits to assets ratio averages 66%). As far as bank asset quality is concerned, the NPL to total asset ratio averages at about 4%. The average coverage ratio is 51%, with large variation across banks (the minimum coverage ratio being 10% and the maximum 89%). These numbers are comparable to those reported in aggregate statistics (ECB, 2016; EBA, 2018).

Looking at measures of bank capitalization, the CET 1 regulatory capital ratio is on average 15%, well above the Basel III minimum requirement of 8.5% including the capital conservation buffer. The

[14] This may be due to stricter supervisory and regulatory scrutiny in relation to the ECB's asset quality exercises, increased market pressure, as well as a deterioration of collateral values (Council of the European Commission, 2017).

[15] An EBA report on NPLs also shows that the correlation between these assets and coverage ratios is low over time, with a correlation coefficient close to 0 at least since September 2014 (EBA, 2016).

average ROAA is around zero, confirming that low profitability has been a major source of concerns for European banks and that high NPLs have been an important cause of low profitability in European banks (Altavilla et al., 2018).

Table 2 also shows descriptive statistics for the set of macro variables we consider, namely institutional variables, including the depth of the NPL secondary market, and business/financial cycle indicators. The former include two indices to account for the regulatory and judicial environment, namely the Regulatory Quality index and the Rule of Law index, both published by the World Bank, and the a series of macroprudential variables, grouped in a Macroprudential index as in Cerutti et al. (2017) macroprudential policy dataset. The latter include business cycle indicators such as real GDP growth and unemployment rate, variables related to the financial cycle, such as asset price growth (i.e., house and stock prices), and private credit to GDP ratio, as well as the short term interest rate. A description of these macro variables, together with the relative hypotheses, is given in Section 5.

4. Exploiting the cross section of banks: micro-level analysis

In this section we analyze the role of the micro bank-specific variables in explaining coverage ratios. We start with illustrating the main specification and testable predictions, and then present the results.

4.1 Baseline specification, main variables, and testable predictions

To explore the link between coverage ratios and bank specific characteristics we first exploit our sample heterogeneity at the micro-level. Looking simultaneously at the coverage ratio and its components, loan loss reserves and non-performing loans (both scaled by total assets), enables us to better understand the mechanisms by which banks set coverage ratios, over and above the accounting identification of impaired loans. Our key dependent variable is the coverage ratio, in addition, we also use its components as additional dependent variables in separate models.[16]

We estimate the following regression having LLRs, NPLs and coverage ratios as dependent variables in separate models:

[16] We are aware that across jurisdictions and banks there may be different definition of NPLs (Baudino et al., 2018). A harmonized definition of NPLs was however introduced in 2014 by the EBA, by which non-performing loans are those that satisfy either of the following criteria: (a) exposures that are more than 90 days past due; and (b) the debtor is assessed as unlikely to pay its credit obligations in full without realisation of collateral. Unfortunately, the breakdown of the NPL aggregate is unavailable for most banks in our sample.

$$Y_{i,k,t} = \mu_i + \gamma_{k,t} + \beta X_{i,k,t-1} + \varepsilon_{i,k,t}, \quad (1)$$

where $i = 1, \ldots, N$, $k = 1, \ldots, K$ and $t = 1, \ldots, T$, with i being the bank, k being the country, and t being the year. $Y_{i,k,t}$ is our dependent variable, which can be coverage ratio or its components, that is loan loss reserves or NPLs over total assets. The vector $X_{i,k,t-1}$ includes bank-level variables to account for bank specific factors that can be relevant in determining the coverage ratio and its components. The equation includes bank and country-year fixed effects (μ_i and $\gamma_{k,t}$, respectively).[17] In one specification, we replace bank fixed effects with various time-invariant characteristics, as we explain further below and later in Section 4.2. All explanatory variables (with the exception of the change in NPLs and loan growth) are lagged by one year to mitigate concerns about reverse causality. When $Y_{i,k,t}$ equals the ratio of LLRs to total assets (NPLs to total assets), we remove the lagged LLRs to total assets (NPLs to total assets) as explanatory variable.

In identifying the bank-specific drivers of banks' coverage policy, we draw primarily on the literature which examines the determinants of provisioning and NPLs. We group our independent variables in four main categories: credit risk, funding, bank performance, and forward looking.

We start with a large set of credit-risk related variables. In the literature on bank provisioning these factors are referred to as non-discretionary, as opposed to (discretionary) characteristics accounting for different management objectives (see Beatty and Liao, 2014, among others). Specifically, we include measures of asset quality such as the level of loan loss reserves as well as the level and the change of NPLs (scaled by total assets). *Ceteris paribus*, we expect poorer asset quality to be associated with higher loan loss reserves, as banks with higher NPLs should be more prone to increase loss coverage for the reasons discussed in Section 2. In one specification, in the spirit of Bushman and Williams (2012), we also test whether banks' coverage policy includes forward-looking considerations, which we model by including next year's change in non-performing loans, to account for (potential) future losses. We then include variables measuring the relevance of the lending business (the share of gross loans over total assets) as well as the growth of gross loan as other potential factors affecting credit risk and therefore banks' loss coverage policies (Bouvatier and Lepetit, 2012; Nicoletti, 2018). The idea is that banks that are more willing to invest their funds in loans (rather than, e.g., securities) are more exposed to credit risk (Keeton and Morris, 1987). Also, excessive credit growth may be associated with more risky lending, and hence with higher NPLs in the future (Jiménez and Saurina, 2006; Huizinga and Laeven, 2019). It follows that a

[17] The inclusion of bank and country fixed effects is also important to absorb the variation in coverage ratios due to possibly different definitions of NPLs across banks and jurisdictions.

larger share of loans to total assets and higher credit growth should favor a more prudent coverage policy and therefore higher coverage ratios. Finally, we control for size, measured by the natural logarithm of total assets, as aggregate statistics show that smaller banks tend to report higher coverage ratios (EBA, 2018). More generally, prior research has shown that size is a relevant determinant of lending and risk taking (see Kishan and Opiela, 2000, among others), and, thus, it may also explain banks' coverage ratios and their components.

To investigate the role played by bank funding structure, we include measures of capitalization, by using the common equity tier 1 (CET 1) capital ratio, and reliance on deposits, proxied by the share of customer deposits to total assets. Capital plays contrasting roles in terms of coverage ratios. Previous studies argue that bank managers may exploit discretion in provisioning not only to smooth income, but also to manage capital (see, among others, Liu and Ryan, 2006 and Beatty and Liao, 2014, and literature therein). It follows that capital-constrained banks may have an incentive to use provisions to achieve regulatory capital targets (Andries et al., 2017). This occurs because provisions have a mechanical negative effect on banks' capital, by reducing earnings.

These arguments point to a positive relationship between capitalization and provisioning, as weak banks would have the incentive to hold back on LLPs and under-reserve in order to preserve regulatory capital. In addition, according to the "moral hazard" hypothesis (Keeton and Morris, 1987), undercapitalized banks are more prone to gamble for resurrection and thus increase the riskiness of their loan portfolio compared to stronger banks, also by lending to zombie firms (Schivardi et al., 2018, and literature therein). Taken together, these theories imply a positive correlation between capital and coverage ratios, through both the effects on reserves and NPL levels.

An alternative view would instead justify the existence of a negative nexus between coverage ratios and regulatory capital as the two balance-sheet items are seen as substitutable buffers against potential losses. In this view, low capitalized banks may have the incentive to increase loan loss coverage to partly compensate for their lack of capital (Norden and Stoian, 2013). Or, to change perspective, better capitalized banks would be in a more comfortable position to absorb shocks prompted by the deterioration of the loan portfolio. As such, these banks would have less incentives to set high coverage ratios.

The relevance of deposits may also help explain banks' reserving practices. In line with Calomiris and Kahn (1991), we expect that banks with a larger share of demandable debt, being more exposed to

market discipline, have stronger incentives to report high coverage ratios compared to banks that rely less on deposits.[18]

We then test whether bank performance, as measured in terms of profitability (proxied by the return on average assets, ROAA) and efficiency (proxied by the cost-to-income ratio, i.e., the ratio of operating expenses over operating income) influences coverage ratios. According to the income-smoothing hypothesis (see Liu and Ryan, 2006 and Beatty and Liao, 2014, and literature therein), when earnings are low, provisions are deliberately understated to mitigate the adverse effect of other factors on earnings, in contrast to situations when earnings are high. Conversely, banks can smooth their earnings by drawing from loan loss reserves if actual losses exceed expected losses.[19] This results in a systematic under (over)-reserving in banks with low(high) profits. We therefore expect a positive correlation between ROAA and coverage ratios.

As for cost efficiency, in the literature on NPL determinants a high cost-to-income ratio can be associated with either higher or lower troublesome loans, according to whether the "bad management" prevail over the "skimping" hypothesis (Berger and De Young, 1997). Under the bad management hypothesis, low cost efficiency (i.e., high cost-to-income ratios) is a signal of poor management practices, thus implying lower portfolio quality as a result of poor screening and monitoring. On the contrary, under the skimping hypothesis, high cost-to-income ratios are associated with lower NPLs, as more resources are allocated to the monitoring of credit risk. As a result, when the cost-to-income increases, we then expect higher NPLs and, *ceteris paribus*, lower coverage ratios if the bad management view prevails, as opposed to when the skimping hypothesis dominates.

Another strand of literature (Ristolainen, 2018) links more directly the effect of bank performance on coverage ratios through banks' incentives to under-report NPLs or to under-reserve, which would be stronger in less profitable and less efficient banks. Consistent with this view, we expect lower coverage ratios when bank performance worsens.

Finally, we include a number of time-invariant bank characteristics (in the form of dummies) when removing the bank fixed effects in one specification. These variables include: *Significant*, to account for

[18] A positive association between the deposit to asset ratio and coverage ratio is also in line with Drechsler et al. (2018). They argue that deposits effectively behave as term liabilities because banks are able to exert market power. They thus optimally invest into (risky) long-term assets. Hence, any positive correlation between deposits and coverage ratios could reflect some bank assets' characteristic not directly captured by our variables.

[19] As bank profitability and GDP growth tend to be positively related, income smoothing would be implicitly forward-looking in nature and can mitigate pro-cyclicality (Laeven and Majnoni, 2003; Bushman and Williams, 2012).

the institutions included in the 2014 Comprehensive Assessment exercise; *Listed* and *Saving, Mutual or Thrift,* to account for differences across bank owners/business type; *International Financial Reporting Standards (IFRS)*, to control for possible heterogeneity in reporting practices. In addition, we include a set of dummies that capture structural aspects related to banks' loan loss reserve policy, asset quality and lending strategy, size, funding, and performance identifying banks that rank in the top decile of the distribution of the following variables: LLR/TA, NPL/TA, Gross Loans/TA, Log(TA), Deposits/TA, CET1 ratio, ROAA and cost-to-income ratio.[20] Based on these reference variables, we classify banks as *Well reserved*, *Risky*, *Loan-based*, *Large*, *Deposit-based*, *Sound*, *Profitable* and *Inefficient*.

4.2 Results

From a policy maker's view point it is important to understand which factors explain most of the variation in loan loss coverage policy. To gauge these factors, we proceed in steps.

4.2.1 Micro time-varying and invariant variables

As a preliminary analysis, we run our main regression on the coverage ratio by including only fixed effects at the bank and the country-year level. As shown in Table 3, the regression including only bank fixed effects has an adjusted r-squared of 0.8, while the one with bank and country-year fixed effects has an adjusted r-squared of 0.82. These results show that most of the variation of the coverage ratio is explained by time-invariant bank characteristics and that the additional fixed effects only mildly improve the statistical fit. In terms of policy implications, it follows that bank characteristics matter more than country specificities in explaining bank loan loss coverage policies, and that therefore policy makers concerned about coverage ratios should first and foremost strengthen microprudential oversight.

We then analyze which of the (time-varying and time-invariant) bank characteristics help explain variations in the coverage ratio and its components. Columns 1 to 3 of Table 4 present the results for the baseline investigation on the main micro drivers of NPLs, LLRs and coverage ratios, respectively, where bank fixed effects are replaced by the time-invariant characteristics described in Section 4.1.

We find that among the structural components, significant banks tend to report lower coverage ratios, as also found in Ristolainen (2018), possibly because of too-big-too fail motives. At the same time,

[20] The dummies are time invariant since they are constructed based on average values for the entire length of the sample.

listed banks show significantly higher coverage ratios, perhaps as an effect of closer investor scrutiny for these banks than for unlisted banks.

Turning to the dummy variables used to identify the time-invariant component of our main baseline variables, we find that well reserved and risky banks report lower and higher coverage ratios than the average bank, respectively. This evidence suggests that considering loan loss reserves and NPLs separately can be misleading, supporting the argument that the NPL stock should be looked at only in conjunction with the associated degree of coverage (Constâncio, 2017). We also find that loan-based and sound (well capitalized) banks tend to have lower coverage ratios. The latter result points to a substitution effect between capitalization and loan loss coverage for banks with high capital levels, as suggested in Norden and Stoian (2013).

Interestingly, Table 4 also shows that the large set of bank characteristics included in the analysis explains the variation of NPLs and LLRs well (the adjusted r-squared in Columns 1 and 2 is above 0.9), but it seems to be less powerful in explaining the variation in the coverage ratio (the adjusted r-squared in Column 3 is 0.56). This finding indicates again that looking at only the dynamics of loan loss reserving and NPLs is not sufficient to fully understand the dynamics of coverage ratios. It also suggests that there may be omitted variables which explain the way banks set their coverage ratio. These variables plausibly pertain to the individual bank's managerial sphere and are, therefore, unobservable (from a modeler's point of view) or are hard to identify.

As a next step we include bank fixed effects to account for bank-specific time invariant characteristics, including unobservable ones. In Table 4 Columns 4 to 6 present the results for our baseline specification, results are broadly consistent with those without bank fixed effects. Among the time-varying variables, credit risk variables are important to explain coverage policy. We find in particular that the relationship between the level and the change of NPLs and coverage ratio is negative (Column 6), while, as in Huizinga and Laeven (2019), there is a strong positive relationship between asset quality and LLRs (Column 5). This means that although banks tend to react to higher NPLs by increasing loan loss reserves, such an increase does not seem adequate to compensate for the larger amount of NPLs. As a result, when the loan portfolio quality deteriorates, coverage ratios reduce.

We find that higher credit growth is associated with larger loan loss reserves and higher coverage ratios, despite the negative relationship between credit expansion and NPLs. This last result suggests that, in line with Jiménez and Saurina (2006) and Huizinga and Laeven (2019), when the loan portfolio expands,

banks prudently enhance their loan loss coverage by anticipating higher (potential) future losses, independent of the impact higher credit growth has on the NPL/TA ratio in the short run.

Among the variables capturing bank funding structure, capital is positively related to coverage ratios, although only at the 10% level, but not with the individual components. This suggest that capital and coverage ratios are not substitute approaches to deal with loan losses, except perhaps for banks with very high capital as shown in Column 3 of the table. Concerning bank performance, profitability explains only the dynamics of the individual components but not coverage ratios directly, while the degree of efficiency, as captured by the level of the cost-to-income ratio, is negatively correlated with both NPLs and coverage ratios. Overall, these results provide some support to the view that lower performance increases banks' incentives to under-report NPLs and to under-reserve, as found in Ristolainen (2018).

As robustness check (see Table A.3), we replace our asset quality indicator with the NPLs to total loans ratio, the ROAA with the return on average equity (ROAE), the CET1 ratio with the Tier 1 ratio. Results remain consistent with the baseline specification.

4.2.2 Forward-looking variables and high-NPL banks

Next, we extend our baseline specification to account for the forward-looking behavior of banks and investigate the behavior of high-NPL banks. Results are shown in Table 5. Columns 1 and 2 report results from a specification where we add the change in NPLs at t + 1, to account for (potential) future losses, to the baseline. We find a strong positive association between this forward-looking measure of asset quality and coverage ratios.[21] This finding reinforces the interpretation of our results on credit growth, suggesting that coverage ratios work more as a prudential (forward-looking) buffer than merely (and backward-looking) a booking account.

Columns 3 and 4 in Table 5 explore the differential behavior of banks with the highest levels of NPLs. On one hand we expect that banks with high NPLs should face higher expected losses and should therefore be more in need of setting up higher coverage ratios to protect their balance sheets. On the other hand, because provisions to loan-loss reserves would further reduce earnings and capital, high-NPL banks may have more incentives to under-provision for potential losses when asset quality further deteriorates, or when profits and capital decrease relative to banks with lower NPL ratios (Ristolainen, 2018). To exploit the large discrepancies among NPLs ratios we focus on banks in the top decile of the

[21] In untabulated results, available upon request, we replace the change in NPLs at t+1 with the lead of the NPL to total asset ratio. The positive effect on coverage ratios is confirmed.

NPL/TA ratio distribution by including *High NPL* dummy and its interaction with the share of NPLs to total assets, CET1 ratio, and ROAA. Note that this *High NPL* dummy variable is now time-varying, in contrast with the dummy variable *Risky* used before representing banks with structurally high NPLs levels during the whole sample.

Results in Columns 3 and 4 show that while higher NPLs are in general associated with reduced coverage ratios, in high-NPL banks this correlation is significantly less negative, pointing to a non-linear relationship between asset quality and coverage ratios. While banks are generally unable (or unwilling) to adjust their loan-losses at the same pace as asset quality deteriorates, banks facing a very high level of credit risk try to restore an adequate level of coverage. This finding may be driven by particularly strong supervisory pressure or peer effects. The result confirms the one found for banks with structurally high levels of NPLs in Table 4.

Turning to capitalization we uncover a positive association between the level of capital and loan loss reserves in high-NPL banks, but with no differential effect on coverage ratios. As for the nexus between profitability and coverage ratio, we find a significant and negative correlation, suggesting that high-NPL banks tend relatively more to use their profits in other ways than to increase reserves and coverage ratios, consistent with a pro-cyclical behavior of bank provisioning (Huizinga and Laeven, 2019).

5. Exploring macro-level data

In this section we exploit the richness of country characteristics to better explain the variation in coverage ratios across countries. We replace the country-year fixed effects with a large set of time varying macro variables related to institutional/governance rules and macroprudential policy to analyze their role as potential drivers of banks' coverage choices. In doing this, we also consider separately the specificities of high-NPL countries and the role of a secondary market where NPLs can be sold.

5.1. Specification and variables

We estimate the following regression having LLRs, NPLs and coverage ratios as dependent variables in separate models:

$$Y_{i,k,t} = \mu_i + \lambda_t + \beta_1 X_{i,k,t-1} + \beta_2 Z_{k,t-1} + \varepsilon_{i,k,t}, \qquad (2)$$

where $X_{i,k,t-1}$ includes lagged bank-level variables as illustrated in Section 4 and $Z_{k,t-1}$ comprises the lagged time-varying macro-level factors capturing three dimensions: regulatory quality, rule of law, and macroprudential stringency. Table 2 reports aggregate statistics for all the macrovariables included in the analysis. We saturate the specification with bank and year fixed effects (μ_i and λ_t, respectively).

In the spirit of Andries et al. (2017), we include *Regulatory Quality* as a measure of the government's ability to formulate and implement policies and regulations. To capture the quality of the judicial system, we include an index of *Rule of Law* capturing agents' confidence in rules, quality of contract enforcement, property rights and courts. Both variables are published by the World Bank, based on an annual survey. We expect better regulatory quality as represented by higher values of *Regulatory Quality* to be associated with more prudent coverage policy and thus higher coverage ratios. We also expect more stringent (higher) *Rule of Law* to be associated with lower coverage needs, as for example banks may recover NPLs more quickly and efficiently when the legal and judicial framework is strengthened.

To analyze the role played by macroprudential policy, we include the 2018 update of the country-specific prudential measures as derived from the Cerutti et al. (2017) macroprudential policy dataset. We start with the broadest index available in the dataset, the so-called *Macroprudential Index*. This covers three borrower-targeted and nine financial-institution-targeted instruments, therefore taking on values between 0 and 12, where 0 means that none of the instruments are in place and 12 means that all of them are in place. Hence, the higher the index, the more stringent the implementation of macroprudential measures in the respective country. We then replace the index by some of its subcomponents. Based on anecdotal evidence in Walter (1991) and prior research on the effects of macro factors on banks provisioning (Jiménez et al., 2017 and Andries et al., 2017, among others), we focus on those ones that are more likely to affect banks' coverage ratios, namely: *Dynamic loan-loss provisioning* as a measure of provisioning policies, *Capital Surcharges on Systemically Important Financial Institutions (SIFI)* as a measure of capital buffers, *Levy/Tax on Financial Institutions (FI)*, and *Loan-to-Value (LTV) Ratio Caps* capturing the limits to borrowing.

We also include a *High-NPL Country* dummy, to account for banks from countries with an above sample average level of NPLs. [22] All things being equal, banks from countries affected by high levels of NPLs may behave differently from the average sample bank. Most of these countries have in fact weaker

[22] The definition of high-NPL country is the one introduced in Section 3, i.e. a time-varying definition (see footnote 13 for details).

institutional frameworks and as such banks may face more impediments in resolving NPLs (Aiyar et al., 2015; ECB, 2016). This may delay NPLs disposals and induce distortions in banks' provision policies.

Over the last years, high-NPL countries have been under particularly close scrutiny from national and supranational authorities, and banks from these countries have been required to undertake specific efforts to strengthen their balance sheets. It follows that we expect any regulatory intervention in these countries to lead to a relatively stronger reaction by banks located in these countries. [23] To investigate whether this is the case, we interact the high-NPL country dummy with all our proxies for country governance and policy.

Finally, we also control for the business and financial cycle by including a broad range of macroeconomic and financial variables derived from the literature on NPL determinants (Nkusu, 2011; Klein, 2013; Beck et al., 2015) and provisioning procyclicality (Laeven and Majnoni, 2003; Beatty and Liao, 2014). In particular, *Real GDP growth* and the *Unemployment rate* are used as indicators of general macroeconomic performance. *House Price change* and *Stock Price change* help explain differences in asset quality, e.g. via wealth effects among borrowers or via a decreased value of collateral. *Private Sector Credit-to-GDP* captures the aggregate debt burden of households and businesses. Finally we control for *Short term interest rates* as monetary policy may also influence asset quality and loan loss coverage policy.

5.2. Results

Table 6 shows the results of our investigation on the role that quality and stringency of the institutional and regulatory framework play on banks' coverage policy. For sake of space, all the bank-specific variables and the set of macro variables which capture the economic and financial cycle are included in the analysis, but not explicitly reported in the table.

Among all the macro variables considered, only the macroprudential index is positively associated with both reserves and coverage ratios (Columns 2 and 3). Among the components of this index, dynamic loan-loss provisioning is associated with lower NPLs and higher coverage ratios (see Columns 4 and 6). This indicates that when measures to address pro-cyclical provisioning are in place, banks are better able to increase coverage ratios. We also find evidence that taxation on financial institutions is associated with

[23] In fact, the policies and practices in jurisdictions not afflicted by high NPLs "are not expected to be as prescriptive or coordinated as those in jurisdictions currently reacting to high levels of NPLs" ECB (2016).

higher coverage ratios (Column 6), plausibly because of the possibility of higher deductions associated with larger provisions (Andries et al., 2017).[24]

Interestingly, in countries most affected by NPL issues, stricter rule of law is associated with lower NPLs, indicating that better quality enforcement or more efficient courts are relatively more beneficial for NPL accumulation presumably as they entail a quicker recovery phase (Columns 1 and 4). In line with this, stricter rule of law is also related to lower coverage ratio (Columns 3 and 6), perhaps because of lower reserve needs when recoveries are higher.

Among the various macroprudential measures, capital surcharges for systemically important institutions have the strongest impact in high-NPL countries and are associated with lower NPLs and coverage ratios (Columns 4 and 6). This finding is in line with previous research on stricter capital regulation which finds that when banks comply with stricter capital rules deleveraging and de-risking strategies are more likely (Gropp et al., 2019). This mechanism is likely to hold in high-NPL countries where banks presumably have a higher incentive to retain earnings to comply with the new rules rather than to increase provisioning.

As a final comment, it is important to note that although the bank-specific variables are not included in Table 7 for sake of space, they remain the most important determinants of coverage ratios. This is evident in Table A.4 where we carry out a Shapley decomposition to analyze variance explained by the micro and macro determinants we use in our regressions.

5.3 Extension: NPL secondary market and coverage policy

One of the responses most often cited by banks as an impediment to the NPL resolution is the lack of a market to sell NPLs (EBA, 2019). Although relatively underdeveloped in relation to the high NPL stock in some jurisdictions in Europe, NPLs transactions have progressively increased over the last years, varying from 11 billion euros in 2010 to nearly 100 billion euros as of end 2017, according to PwC reports. Transactions are concentrated in a few countries, i.e., Ireland, Germany, Spain, and UK, and more recently, Italy (the largest market place since 2016). [25] Figure 6 shows the value of NPL transactions by country in 2010–2017.

[24] Although at different rates, the majority of EA countries "acknowledge tax deductions for LLPs, write-offs and collateral sales". (ECB, 2016 and 2017b).

[25] The dataset also includes transactions for Portugal (2011), France (2012), Belgium (2013), and Netherlands (2013, 2014, 2015 and 2016) but for more limited amounts.

The market for distressed assets is clearly a market for lemons à la Akerlof, being characterized by high information asymmetries and large bid-ask spreads between sellers and buyers (Fell et al., 2016). High coverage ratios can help make the disposal of loans more likely by reducing the bid-ask spread and the loss a bank takes as a consequence of the NPL sale (see also the discussion in Section 2). We therefore expect deeper markets to be associated with higher coverage ratios as a pre-condition to access the market (see also the discussion in Section 2).

To test this hypothesis, in Table 7, we expand our micro-macro baseline regression to account for the relevance of the NPL secondary market in a given country. We first include the variable *NPL Secondary Market Transactions / TA* to measure the share of NPL transactions over the total banking assets at the country level to proxy the degree of development of the market (Columns 1 to 3). Because the volume of trades is concentrated only in some countries, we also include two categorical variables to account for *Medium* and *Large NPL Secondary Market*, by splitting the sample into terciles (based on the share of NPL transactions over the total banking assets at country level). We use the lowest tercile as the reference category and test whether the other categories are associated with higher coverage ratios. We find that while LLRs are higher when transactions increase and, more generally, in medium sized and large marketplace (Columns 2 and 5), coverage ratios are significantly higher only in countries where the NPL secondary market is large (Column 6).

As a next step, we interact our measures of medium and large NPL secondary markets with the high-NPL country dummy. In line with official statistics, we find that banks from high-NPL countries report lower coverage ratios on average. We find, however, relatively larger reserves and higher coverage ratios in banks from high-NPL countries that are featured by very active marketplaces (Columns 8 and 9). This is not surprising, as banks from high-NPL countries, are more affected by information asymmetries (see Fell et al. 2016) and therefore may need to set higher coverage ratios to access the market.

6. Conclusions

This paper explores micro and macro determinants of coverage ratio, an indicator of bank balance sheet strength that has gained increasing importance in Europe in the last few years.

Our analysis reveals some interesting findings. Bank-specific factors, and among them credit risk (including forward-looking) variables, explain most of the variation in coverage ratios. A deterioration in

asset quality is associated with higher coverage ratios, but the relation is not linear, becoming less negative when banks hold very large stock of troubled assets. Overall, capitalization and coverage ratio appear to be complementary (rather than substitute) tools, where one reinforces the other.

More stringent macroprudential policy is also associated with higher coverage ratios, and interventions on time-varying/dynamic loan-loss provisioning are generally the most effective tools to increase coverage ratios. Structural factors such as the degree of development of NPL secondary markets also explain coverage ratio variation, where larger markets are associated with higher coverage ratios.

High-NPL banks as well as banks from high-NPL countries behave differently from banks less affected by credit risk issues. Coverage policies in banks from more risky countries are especially sensitive to changes in the rule of law, capital rules, and development of the NPL secondary market.

Our results are relevant for the current debate on NPLs and coverage policies. We uncover that variables that are traditionally important in explaining NPLs dynamics are not equally useful to explain variation in loan loss coverage. Bank-specific factors explain most of the variation in banks' coverage ratios, implying that microprudential supervision would be more effective in steering banks' loan loss coverage than macro policies. In terms of macro policies, some specific macroprudential levers, as well as developing loan secondary markets, seem to be effective in shaping banks' coverage. Because of the large discrepancies in asset quality across banks and countries, specific actions for high-NPL banks and high-NPL countries are recommended.

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Tables and Figures

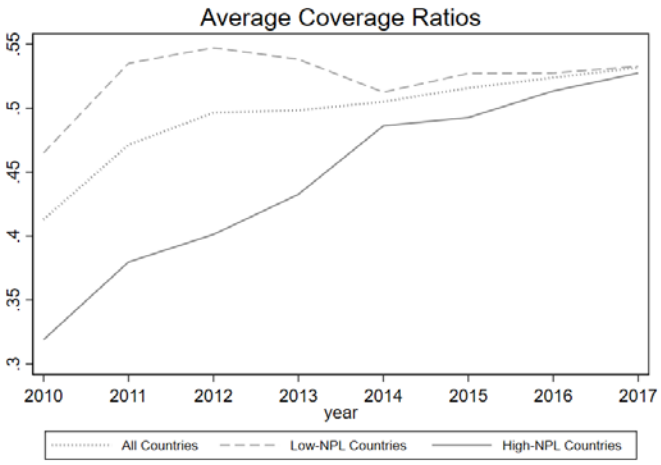

Figure 1: Average coverage ratio for all banks, banks from high-NPL countries, and banks from low NPL-countries. High-NPL countries (low-NPL countries) are defined as those with NPL/TA above (below) the sample mean. Data is winsorized at 2.5% and 97.5% (sample period: 2010–2017, source: authors' calculations).

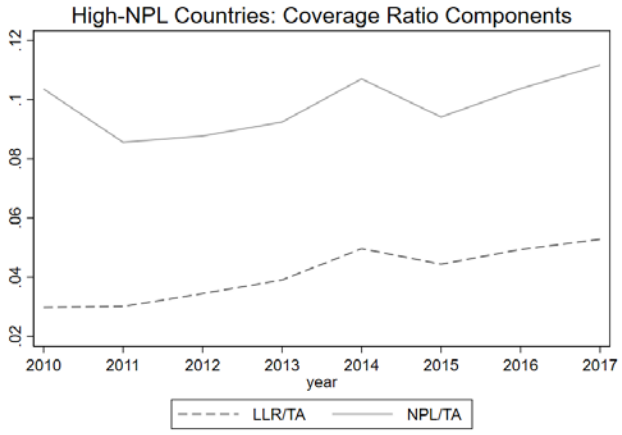

Figure 2: Average coverage ratio components (loan loss reserves and non-performing loans, scaled by total assets) for banks from high-NPL countries. High-NPL countries are defined as those with NPL/TA above the sample mean. Data is winsorized at 2.5% and 97.5% (sample period: 2010–2017, source: authors' calculations).

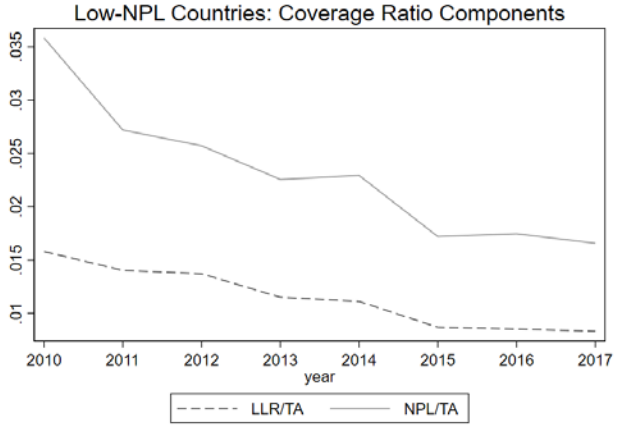

Figure 3: Average coverage ratio components (loan loss reserves and non-performing loans, scaled by total assets) for banks from low-NPL countries. Low-NPL countries are defined as those with NPL/TA below the sample mean. Data is winsorized at 2.5% and 97.5% (sample period: 2010–2017, source: authors' calculations).

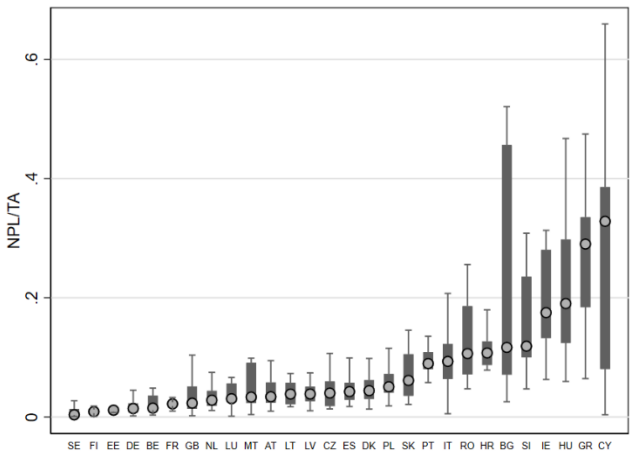

Figure 4: Boxplots of non-performing loans over total assets (NPL/TA) by country. Countries are ordered by median NPL/TA in ascending order. Data is winsorized at 2.5% and 97.5% by country (sample period: 2010–2017, source: authors' calculations).

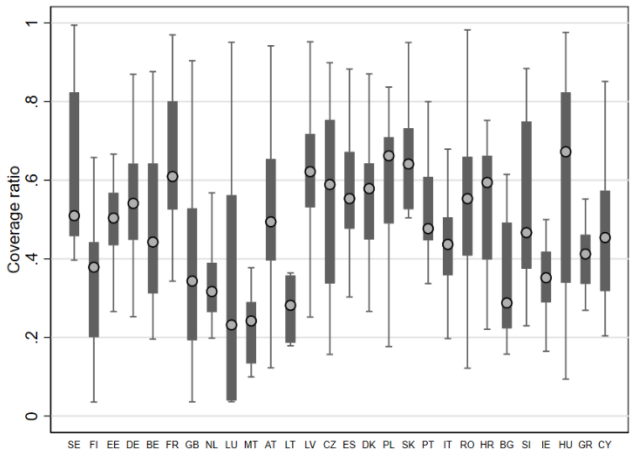

Figure 5: Boxplots of coverage ratios by country. Countries are ordered by median NPL/TA in ascending order. Data is winsorized at 2.5% and 97.5% by country. (sample period: 2010–2017, source: authors' calculations).

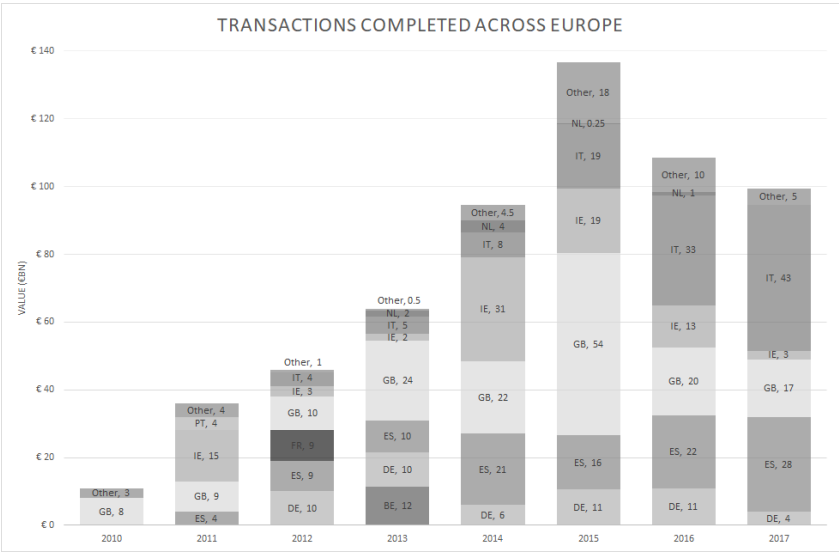

Figure 6: NPL secondary market transaction data (2010–2017, € billions, source: PwC)

Table 1: Correlations between coverage ratio and non-performing loans (NPL/TA), loan loss reserves (LLR/TA), and loan loss provisions (LLP/TA). Correlations with a * are significant at the 10% level.

	NPL/TA	NPL/TA $_{t-1}$	NPL/TA $_{t-2}$	LLR/TA	LLR/TA $_{t-1}$	LLR/TA $_{t-1}$	LLP/TA	LLP/TA $_{t-1}$	LLP/TA $_{t-2}$
Coverage ratio	-0.194*	-0.147*	-0.161*	0.010	0.057	0.080	-0.091	-0.081	-0.052
Coverage ratio$_{t-1}$	-0.195*	-0.165*	-0.165*	-0.010	0.056	0.093	-0.137*	-0.095	-0.059
Coverage ratio$_{t-2}$	-0.266*	-0.240*	-0.225*	-0.081	-0.023	0.045	-0.202*	-0.165*	-0.121

Table 2: Summary statistics for the baseline regression sample. Variables are winsorized at 2.5% and 97.5%.

	Mean	SD	Min	P10	P50	P90	Max	N
Bank Variables								
Coverage ratio	0.507	0.165	0.096	0.291	0.509	0.716	0.894	1845
LLR/TA	0.020	0.023	0.001	0.003	0.011	0.051	0.096	1845
NPL / TA	0.044	0.052	0.001	0.006	0.023	0.113	0.220	1845
Delta (NPL / TA)	-0.001	0.011	-0.028	-0.011	-0.002	0.010	0.041	1845
Gross loans / TA	0.649	0.133	0.294	0.465	0.665	0.809	0.886	1845
Gross loan growth	0.026	0.066	-0.127	-0.048	0.023	0.092	0.271	1845
log (Total Assets)	15.983	1.399	14.335	14.518	15.569	18.579	18.976	1845
Deposits / TA	0.660	0.162	0.280	0.392	0.709	0.827	0.907	1844
CET1	0.145	0.041	0.070	0.102	0.139	0.198	0.368	1843
ROAA	0.003	0.005	-0.016	0.000	0.002	0.007	0.018	1845
Cost-to-income ratio	0.654	0.118	0.364	0.498	0.662	0.794	0.944	1843
Institutional Variables								
Regulatory quality	1.430	0.437	0.148	0.711	1.687	1.817	2.047	1845
Rule of Law	1.398	0.547	-0.112	0.377	1.622	1.857	2.100	1845
Macroprudential Index	3.146	1.103	0.000	2.000	3.000	4.000	6.000	1845
Subcomponents of Macropru. Index								
Dynamic loan-loss provisioning	0.028	0.166	0.000	0.000	0.000	0.000	1.000	1845
Capital Surcharges on SIFI	0.394	0.489	0.000	0.000	0.000	1.000	1.000	1845
Levy/Tax on FI	0.778	0.416	0.000	0.000	1.000	1.000	1.000	1845
Loan-to-Value Ratio Caps	0.267	0.443	0.000	0.000	0.000	1.000	1.000	1845
NPL Secondary Market								
NPL secondary mkt / TA	0.003	0.006	0.000	0.000	0.002	0.006	0.117	1845
Business and Financial Cycle								
Real GDP growth rate	0.017	0.018	-0.091	0.003	0.019	0.029	0.252	1845
Unemployment rate	0.073	0.045	0.029	0.038	0.053	0.122	0.275	1845
House Price change (y-o-y)	0.023	0.041	-0.076	-0.045	0.028	0.073	0.076	1845
Stock Price change (y-o-y)	0.088	0.117	-0.252	-0.072	0.093	0.267	0.293	1845
Private sector credit / GDP	0.905	0.278	0.265	0.775	0.821	1.321	2.450	1845
Short-term interest rate	0.002	0.006	-0.007	-0.003	0.000	0.007	0.049	1845

Table 3: Preliminary analysis. The dependent variable is the coverage ratio. Only the constant and fixed effects at the bank and the country-year level are included.

	(1)	(2)	(3)
	Coverage ratio	Coverage ratio	Coverage ratio
Constant	0.507***	0.507***	0.507***
	(0.000)	(0.006)	(0.000)
Observations	1845	1845	1845
No. of banks	441	441	441
Adjusted R-squared	0.803	0.215	0.826
FE Bank	Yes	No	Yes
FE Country-year	No	Yes	Yes

Table 4: Micro-level regressions: without bank FE and baseline. The dependent variables are the coverage ratio, LLRs/TA, and NPLs/TA at the bank level. In columns 1-3 bank fixed effects are removed and replaced with bank-specific time invariant characteristics. In columns 4-5 bank fixed effects are introduced. Country-year dummies are included in each regression. Robust standard errors are clustered at the bank-level and reported in parentheses. Significance at the 1, 5 and 10% level is denoted by ***, **, and * respectively.

	Without Bank Fixed Effects			Baseline		
	(1)	(2)	(3)	(4)	(5)	(6)
	NPLs/TA	LLRs/TA	Coverage ratio	NPLs/TA	LLRs/TA	Coverage ratio
LLR/TA$_{t-1}$	1.231***		13.754***	1.056***		5.717***
	(0.077)		(0.973)	(0.126)		(0.581)
NPL / TA$_{t-1}$		0.337***	-5.806***		0.295***	-2.717***
		(0.023)	(0.494)		(0.035)	(0.347)
DELTA (NPL / TA)		0.309***	-1.100***		0.295***	-1.405***
		(0.042)	(0.415)		(0.039)	(0.267)
Gross loans / TA$_{t-1}$	0.021***	0.001	-0.099**	0.025*	0.010	-0.122
	(0.005)	(0.002)	(0.046)	(0.015)	(0.007)	(0.084)
Gross loan growth	-0.033***	0.001	0.091	-0.021*	0.008**	0.183***
	(0.010)	(0.004)	(0.062)	(0.011)	(0.004)	(0.040)
log (Total Assets)$_{t-1}$	-0.003***	0.000	-0.002	0.001	-0.001	0.052
	(0.001)	(0.000)	(0.008)	(0.008)	(0.002)	(0.033)
Deposits / TA$_{t-1}$	-0.009	0.002	-0.026	-0.026	0.003	0.061
	(0.006)	(0.003)	(0.049)	(0.016)	(0.005)	(0.072)
CET1$_{t-1}$	-0.035*	0.000	0.329*	0.019	0.011	0.306*
	(0.019)	(0.009)	(0.170)	(0.021)	(0.009)	(0.160)
ROAA$_{t-1}$	-0.985***	-0.021	-1.066	-0.635***	-0.273***	-0.885
	(0.201)	(0.097)	(1.206)	(0.205)	(0.088)	(0.666)
Cost-to-income ratio$_{t-1}$	-0.017**	0.000	-0.061	-0.021***	-0.002	-0.068**
	(0.007)	(0.003)	(0.050)	(0.007)	(0.003)	(0.034)
Significant	0.004	-0.001	-0.045*			
	(0.003)	(0.001)	(0.023)			
Listed	-0.002	0.000	0.044***			
	(0.002)	(0.001)	(0.016)			
Savings Mutual or Thrift	-0.003	0.000	0.015			
	(0.002)	(0.001)	(0.015)			
IFRS	0.006	-0.002	-0.034			
	(0.004)	(0.001)	(0.025)			
Well Reserved	0.004	0.018***	-0.086***			
	(0.005)	(0.002)	(0.022)			
Risky	0.046***	-0.009***	0.107***			
	(0.005)	(0.003)	(0.024)			
Loan-based	0.000	-0.001	-0.026*			
	(0.002)	(0.001)	(0.016)			
Large	0.002	0.001	0.019			
	(0.003)	(0.001)	(0.024)			
Deposit-based	0.004**	-0.001	-0.020			
	(0.002)	(0.001)	(0.023)			
Sound	0.004*	-0.002*	-0.050**			
	(0.002)	(0.001)	(0.021)			
Profitable	-0.004	0.004**	0.020			
	(0.004)	(0.002)	(0.027)			
Inefficient	-0.002	-0.002	-0.009			
	(0.003)	(0.001)	(0.020)			
Observations	1845	1845	1845	1845	1845	1845
No. of banks	441	441	441	441	441	441
Adjusted R-squared	0.922	0.93	0.561	0.956	0.968	0.853
Adjusted Within R-squared	0.778	0.802	0.441	0.319	0.520	0.157
FE Bank	No	No	No	Yes	Yes	Yes
FE Country-year	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Micro-level regressions: forward looking variable and high-NPL banks. The dependent variables are the coverage ratio and LLRs/TA at the bank level. In columns 1-2 we include the forward looking variable DELTA (NPL / TA)$_{t+1}$ as an independent variable. In columns 3-4 we include the dummy High NPL$_{t-1}$ to account for banks in the top decile of the NPL/TA ratio distribution, and its interactions with NPL/TA$_{t-1}$, ROAA$_{t-1}$, and CET$_{t-1}$. Country-year and bank dummies are included in each regression. Robust standard errors are clustered at the bank-level and reported in parentheses. Significance at the 1, 5 and 10% level is denoted by ***, **, and * respectively.

	Forward Looking		High NPL Banks	
	(1)	(2)	(3)	(4)
	LLRs/TA	Coverage ratio	LLRs/TA	Coverage ratio
LLR/TA$_{t-1}$		5.033***		5.620***
		(1.034)		(0.566)
NPL / TA$_{t-1}$	0.355***	-1.763***	0.331***	-3.403***
	(0.023)	(0.487)	(0.034)	(0.397)
DELTA (NPL / TA)	0.330***	-1.221***	0.310***	-1.451***
	(0.036)	(0.,313)	(0.037)	(0.263)
Gross loans / TA$_{t-1}$	-0.003	-0.131*	0.011	-0.118
	(0.005)	(0.068)	(0.007)	(0.085)
Gross loan growth	0.006	0.085*	0.007*	0.188***
	(0.005)	(0.052)	(0.004)	(0.039)
log (Total Assets)$_{t-1}$	0.000	-0.021	-0.001	0.051
	(0.002)	(0.030)	(0.002)	(0.034)
Deposits / TA$_{t-1}$	0.009*	0.012	0.004	0.036
	(0.005)	(0.080)	(0.005)	(0.072)
CET1$_{t-1}$	0.015	0.315*	0.003	0.329**
	(0.011)	(0.164)	(0.009)	(0.159)
ROAA$_{t-1}$	-0.101	0.479	-0.279***	0.068
	(0.085)	(0.812)	(0.089)	(0.837)
Cost-to-income ratio$_{t-1}$	-0.005*	-0.072*	-0.001	-0.065**
	(0.003)	(0.040)	(0.003)	(0.033)
DELTA (NPL / TA)$_{t+1}$	0.016	1.237***		
	(0.028)	(0.255)		
High NPL Dummy$_{t-1}$			-0.005	-0.109**
			(0.006)	(0.050)
*High NPL dummy$_{t-1}$ * NPL/TA$_{t-1}$*			-0.080*	0.996***
			(0.044)	(0.372)
*High NPL dummy$_{t-1}$ * CET1$_{t-1}$*			0.132***	0.227
			(0.042)	(0.292)
*High NPL dummy$_{t-1}$ * ROAA$_{t-1}$*			-0.152	-2.150**
			(0.176)	(1.073)
Observations	1251	1251	1845	1845
No. of banks	348	348	441	441
Adjusted R-squared	0.977	0.878	0.969	0.856
Adjusted Within R-squared	0.615	0.112	0.543	0.171
FE Bank	Yes	Yes	Yes	Yes
FE Country-year	Yes	Yes	Yes	Yes

Table 6: Micro-macro regressions: baseline. The dependent variables are the coverage ratio and LLRs/TA at the bank level. High-NPL countries are defined as countries with NPL/TA above the sample mean. Bank, business cycle and financial cycle controls as well as bank and time dummies are included in each regression. Robust standard errors are clustered at the bank-level and reported in parentheses. Significance at the 1, 5 and 10% level is denoted by ***, **, and * respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	NPLs/TA	LLRs/TA	Coverage ratio	NPLs/TA	LLRs/TA	Coverage ratio
Regulatory Quality	0.008	-0.004*	-0.014	0.004	-0.003	-0.017
	(0.006)	(0.003)	(0.036)	(0.007)	(0.003)	(0.038)
Rule of Law	-0.015	0.004	0.014	-0.014	0.006	0.029
	(0.009)	(0.004)	(0.034)	(0.009)	(0.004)	(0.033)
Macroprudential Index	0.001	0.001*	0.012**			
	(0.001)	(0.000)	(0.005)			
Dynamic loan-loss provisioning				-0.019***	0.006	0.069**
				(0.006)	(0.004)	(0.027)
Capital Surcharges on SIFI				0.000	0.001	0.004
				(0.003)	(0.001)	(0.012)
Levy/Tax on Financial Institutions				0.003	0.002	0.020*
				(0.002)	(0.001)	(0.011)
Loan-to-Value Ratio Caps				0.002	0.001	-0.006
				(0.003)	(0.002)	(0.013)
High NPL Country Dummy	0.033***	0.005*	-0.006	0.022***	0.004*	-0.034*
	(0.005)	(0.002)	(0.023)	(0.005)	(0.003)	(0.020)
*High NPL Country * Regulatory Quality*	0.000	-0.003	0.021	0.010	-0.002	0.061*
	(0.006)	(0.002)	(0.031)	(0.007)	(0.003)	(0.033)
*High NPL Country * Rule of Law*	-0.012**	-0.001	-0.040*	-0.018***	-0.001	-0.065***
	(0.005)	(0.002)	(0.024)	(0.007)	(0.003)	(0.025)
*High NPL Country * Macroprudential Index*	-0.002	0.000	-0.005			
	(0.001)	(0.000)	(0.005)			
*High NPL Country * Dynamic LLP*				0.007	0.002	-0.057*
				(0.007)	(0.003)	(0.033)
*High NPL Country * Cap. Sur (SIFI)*				-0.007***	0.001	-0.026***
				(0.002)	(0.001)	(0.009)
*High NPL Country * Levy on FI*				0.000	0.001	-0.007
				(0.004)	(0.001)	(0.012)
*High NPL Country * LTV Caps*				0.009**	0.001	0.020
				(0.004)	(0.002)	(0.013)
Observations	1845	1845	1845	1845	1845	1845
No. of banks	441	441	441	441	441	441
Adjusted R-squared	0.954	0.962	0.86	0.956	0.963	0.861
Adjusted Within R-squared	0.550	0.668	0.228	0.569	0.675	0.233
Bank Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Business and Financial Cycle Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
FE Bank	Yes	Yes	Yes	Yes	Yes	Yes
FE Year	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: NPL Secondary Market Transactions. NPL secondary market transaction/TA measures the share of NPL transactions over the total banking assets at the country level. The dependent variables are the coverage ratio, LLRs/TA, and NPLs/TA at the bank level. Bank, business cycle and financial cycle controls, as well as bank and time dummies are included in each regression. Robust standard errors are clustered at the bank-level and reported in parentheses. Significance at the 1, 5 and 10% level is denoted by ***, **, and * respectively.

	(1) NPLs/TA	(2) LLR/TA	(3) Coverage ratio	(4) NPLs/TA	(5) LLR/TA	(6) Coverage ratio	(7) NPLs/TA	(8) LLR/TA	(9) Coverage ratio
NPL Secondary Market Transactions / TA	-0.007	0.160**	-0.295						
	(0.144)	(0.069)	(0.472)						
Medium NPL Secondary Mkt				0.000	0.001**	0.010	0.001	0.002**	0.006
				(0.002)	(0.001)	(0.008)	(0.002)	(0.001)	(0.010)
Large NPL Secondary Mkt				0.005**	0.002***	0.021***	0.004**	0.001*	0.012
				(0.002)	(0.001)	(0.008)	(0.002)	(0.001)	(0.009)
High NPL Country							0.012***	0.001	-0.053***
							(0.002)	(0.001)	(0.009)
*High NPL Country * Medium NPL Secondary Mkt*							0.001	0.000	0.007
							(0.002)	(0.001)	(0.010)
*High NPL Country * Large NPL Secondary Mkt*							0.003	0.002**	0.018**
							(0.002)	(0.001)	(0.009)
Observations	1845	1845	1845	1845	1845	1845	1845	1845	1845
No. of banks	441	441	441	441	441	441	441	441	441
Adjusted R-squared	0.947	0.961	0.854	0.948	0.961	0.854	0.953	0.962	0.860
Adjusted Within R-squared	0.482	0.663	0.193	0.487	0.660	0.196	0.535	0.665	0.227
Bank Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Business and Financial Cycle Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE Bank	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FE Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

APPENDIX A1- Additional tables

Table A.1: Sample composition and average coverage ratio, LLR/TA and NPL/TA ratios by country.

Country Code	No. Observations	No. Banks	Avg. Coverage Ratio	Avg. LLR/TA	Avg. NPL/TA
AT	69	19	53%	2%	4%
BE	20	4	47%	1%	2%
BG	11	3	32%	5%	13%
CY	8	2	41%	9%	20%
CZ	20	4	63%	3%	4%
DE	938	232	54%	1%	2%
DK	48	9	55%	4%	7%
ES	74	17	56%	2%	5%
FI	15	6	34%	0%	1%
FR	67	18	63%	1%	2%
GB	128	30	36%	1%	4%
GR	24	5	42%	9%	21%
HR	8	2	57%	6%	11%
HU	9	3	66%	9%	16%
IE	13	3	36%	6%	16%
IT	252	48	44%	5%	10%
LT	4	2	27%	1%	4%
LU	10	2	32%	1%	4%
LV	8	3	54%	2%	4%
MT	9	3	27%	1%	4%
NL	31	6	31%	1%	4%
PL	32	6	59%	3%	6%
PT	20	5	54%	5%	10%
RO	8	2	56%	4%	8%
SE	4	2	72%	1%	1%
SI	9	3	66%	6%	9%
SK	6	2	65%	3%	4%
Total	1845	441			

Table A.2: Correlation matrix of the independent and dependent variables in our baseline (micro and micro-macro) analyses. Correlations with a * are significant at the 10% level.

	Cov. ratio	*LLR / TA*	*NPL / TA*	*DELTA (NPL / TA)*	*Gross loans / TA*	*Gross loan growth*	*log (TA)*	*Dep / TA*	*CET1*	*ROAA*	*Cost-to-inc. ratio*	*Reg. Quality*	*Rule of Law*	*Macro-pru, Index*	*Dyn. LLP*	*Cap.Sur (SIFI)*	*Levy / Tax on FI*	*LTV Ratio Caps*	*NPL sec. mkt*
Cov. ratio	1																		
LLR/TA	0.019	1																	
NPL / TA	-0.227*	0.938*	1																
DELTA (NPL / TA)	-0.159*	0.259*	0.342*	1															
Gross loans/ TA	-0.116*	0.209*	0.222*	0.067*	1														
Gross loan growth	0.065*	-0.263*	-0.301*	-0.087*	0.011	1													
log (Total Assets)	-0.116*	0.092*	0.107*	-0.006	-0.073*	-0.136*	1												
Dep. / TA	0.118*	-0.192*	-0.236*	-0.163*	0.087*	0.218*	-0.498*	1											
CET1	0.096*	-0.145*	-0.167*	-0.126*	-0.158*	0.050*	-0.177*	0.186*	1										
ROAA	0.128*	-0.198*	-0.270*	-0.358*	-0.038	0.301*	-0.044*	0.073*	0.229*	1									
Cost-to-income ratio	-0.027	-0.103*	-0.096*	-0.008	0.029	-0.106*	-0.082*	0.135*	-0.181*	-0.411*	1								
Regulatory Quality	0.053*	-0.655*	-0.630*	-0.201*	-0.049*	0.088*	-0.156*	0.294*	0.160*	-0.005	0.159*	1							
Rule of Law	0.093*	-0.630*	-0.623*	-0.236*	-0.080*	0.055*	-0.047*	0.184*	0.130*	0.022	0.125*	0.923*	1						
Macropru. Index	0.232*	0.018	-0.059*	-0.170*	-0.014	0.085*	-0.156*	0.133*	0.191*	0.110*	0.031	-0.084*	-0.166*	1					
Dynamic LLP	0.023	0.087*	0.064*	-0.033	0.008	0.015	0.106*	-0.013	-0.060*	0.100*	-0.127*	-0.242*	-0.186*	0.098*	1				
Cap. Sur (SIFI)	0.121*	-0.141*	-0.174*	-0.179*	0.015	0.114*	-0.112*	0.181*	0.233*	0.092*	0.070*	0.170*	0.006	0.684*	-0.136*	1			
Levy/Tax on FI	0.264*	-0.229*	-0.297*	-0.224*	-0.105*	0.003	-0.224*	0.204*	0.119*	-0.073*	0.223*	0.269*	0.281*	0.498*	-0.205*	0.246*	1		
LTV Ratio Caps	-0.006	0.434*	0.398*	-0.014	0.001	-0.033	0.115*	-0.196*	-0.029	0.178*	-0.183*	-0.478*	-0.415*	0.394*	0.212*	0.108*	-0.082*	1	
NPL sec. mkt	-0.085*	0.275*	0.295*	-0.052*	0.070*	-0.043*	0.074*	-0.067*	0.004	0.022	-0.019	-0.165*	-0.223*	0.085*	0.023	0.048*	-0.005	0.260*	1

Table A.3: Micro-level regressions: robustness. The dependent variables are the coverage ratio, LLRs/TA, and NPLs/TA at the bank level. Within the explanatory variables, NPL/TA is replaced with NPLs over gross loans (NPL/GL), the CET1 ratio is replaced by the Tier 1 Capital ratio, and ROAA is replaced with the return-on-equity (ROAE). Robust standard errors are clustered at the bank-level and reported in parentheses. Significance at the 1, 5 and 10% level is denoted by ***, **, and * respectively.

	(1)	(2)	(3)
	NPLs/TA	LLRs/TA	Coverage ratio
LLR/TA$_{t-1}$	1.035***		4.807***
	(0.125)		(0.515)
NPL/Gross Loans$_{t-1}$		0.211***	-1.739***
		(0.027)	(0.199)
DELTA (NPL /GL)		0.173***	-1.078***
		(0.025)	(0.156)
Gross Loans/TA$_{t-1}$	0.025*	0.026***	-0.266***
	(0.015)	(0.006)	(0.090)
Gross loan growth	-0.020*	0.017***	0.136***
	(0.011)	(0.005)	(0.043)
log (Total Assets)$_{t-1}$	0.001	0.003	0.033
	(0.008)	(0.002)	(0.035)
Deposits/TA$_{t-1}$	-0.023	0.005	0.058
	(0.015)	(0.005)	(0.073)
Tier 1 Capital$_{t-1}$	0.023	0.014	0.227
	(0.023)	(0.010)	(0.167)
ROAE$_{t-1}$	-0.055***	-0.021***	-0.115**
	(0.016)	(0.006)	(0.051)
Cost-to-income ratio$_{t-1}$	-0.021***	0.001	-0.085**
	(0.007)	(0.003)	(0.033)
Observations	1842	1842	1842
No. of banks	441	441	441
Adjusted R-squared	0.956	0.966	0.853
Adjusted Within R-squared	0.321	0.491	0.155
FE Bank	Yes	Yes	Yes
FE Country-year	Yes	Yes	Yes

Table A.4: Shapley decomposition

Panel A

Variable	Value	In percentage
LLR/TA$_{t-1}$	0.199	38.71%
NPL / TA$_{t-1}$	0.187	36.48%
DELTA (NPL / TA)	0.006	1.23%
Gross loans / TA $_{t-1}$	0.012	2.40%
Gross loan growth	0.004	0.69%
log (Total Assets)$_{t-1}$	0.009	1.74%
Deposits / TA$_{t-1}$	0.004	0.77%
CET1$_{t-1}$	0.001	0.28%
ROAA$_{t-1}$	0.003	0.55%
Cost-to-income ratio$_{t-1}$	0.001	0.16%
Group: Macro	0.087	16.99%
TOTAL	0.513	100.00%

Panel B

Variable	Value	In percentage
Institutional Variables		
Regulatory Quality	0.003	0.65%
Rule of Law	0.006	1.18%
Macroprudential Index	0.027	5.25%
Business and Financial Cycle		
GDP growth$_{t-1}$	0.003	0.53%
Unemployment$_{t-1}$	0.002	0.41%
House Price change y-o-y$_{t-1}$	0.009	1.73%
Stock Price change y-o-y$_{t-1}$	0.001	0.23%
Private credit to GDP$_{t-1}$	0.025	4.91%
Short term interest rate$_{t-1}$	0.005	1.06%
Group: Micro	0.431	84.05%
TOTAL	0.513	100.00%