# The effects of the financial crisis and the role of Stress Tests on banks accounting discretion

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**Abstract**

In order to investigate how a financial system is resilient, our empirical analysis uses a unique panel database of 180 European banks continuously listed, over the period 2005:4 - 2016:4, to analyse the use of accounting discretion and disclosure by the management of banks during economic downturns. Our study tests three different research question: RQ#1) Do the different financial crises periods push banks managers to pursue both income smoothing and regulatory capital management via LLPs increased?; RQ#2) Do the impact of EBA Stress Tests results affect banks management behaviour in set up the level of LLPs?; RQ#3) Do banks under EBA Stress Tests undertake income smoothing and regulatory capital management via LLPs increased more than for non-treated banks? The empirical analyses are based on a balanced panel of 180 European banks continuously listed, over the period 2005:4 - 2016:4. Our empirical results show that bank banks tend to smooth income but not to influence regulatory capital via LLPs. In particular, smoothing income hypothesis is emphasised during the subprime crisis "early crisis": 2007:3 to 2008:3 and during the great financial depression "late crisis": 2008:4 (Lehman & Brothers collapse) to 2010:2. This evidence can be explained by the peculiar features of the recent financial turmoil, originated by a toxic assets contagion in the financial markets and the growing recourse to market-based funding by listed banks. However, regarding the behaviour of banks that underwent the EBA stress tests, we do not observe that the disclosure of the stress tests results together with the release of a detailed set of sensitive information is neither associated with more income smoothing nor regulatory capital management by tested banks via an increased discretionary use of LLPs. Robustness check are provided.

Keywords: bank stress tests; accounting discretion; income smoothing; capital management; financial crisis.

JEL classification: C12; C20 E58; G21; G30

## 1. Introduction

In the past decade, the European banking system has been characterized by two major and deep crises which have emphasised an exceptional wave of turbulence: the Global Financial Crisis (GFC) and the Sovereign Debt Crisis (SDC).[3] The GFC, coming from the United States, hit European banks through their exposure to toxic assets in their portfolios and the freeze of wholesale funding markets. The SDC, instead, coming from within the euro area, relied on a loss of confidence in the sustainability of public debts and to the risk of a fragmentation in the monetary union. Both of them, in the space of a few years, have increased the number of ailing firms, bringing about a sharp rise in the stock of non-performing loans (hereafter, NPLs) and undermining the financial stability in the euro area. Both of them, moreover, have highlighted the importance of financial system stability to macroeconomic performance. NPLs have become an increasing matter of concern for several banks

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[3] See Visco I., (2018), Remarks by Ignazio Visco, Governor of Bank of Italy during the panel discussion entitled: "The Real Effects of Disrupted Credit: Evidence from the Global Financial Crisis".

in the European Union (EU). A higher stock of NPLs reduces banks' ability to supply credit to the economy via a higher cost of funding, lower profitability, and capital. To better monitor and to provide a more comprehensive supervision of this topic, supervisory authorities have tried to face it by harmonizing the definition of NPLs and Non Performing Exposures (NPEs). Financial regulators have responded to this challenging environment by increasing cooperation with other regulators, as well as encouraging financial intermediaries to employ more sophisticated approaches to risk management.

Furthermore, to assess the resilience of financial systems, regulators, since the financial crisis of 2007 - 2009, have introduced macroprudential stress tests: their main aim is to stress the resilience of financial systems as a whole: the regulators want to test how the financial system is resilient under extreme conditions. Until the outbreak of the financial crisis, the use of stress tests was limited and largely conducted by banks for internal risk management aims. Following the financial crisis, stress testing becomes an important key of the bank regulation toolkit.

In order to investigate how a financial system is resilient, our empirical analysis uses a unique panel database of 180 European banks continuously listed, over the period 2005:4 - 2016:4, to analyse the use of accounting discretion and disclosure by the management of banks during economic downturns. Our hypothesis relies on the strong incentive that banks management exploit for accounting discretion to overstate assets, equity and regulatory capital. This behaviour may allow these banks to conceal their financial difficulties from stakeholders, delay intervention by regulators and enable themselves to continue operating. In greater detail, we will focus on the banks' ability to deal with Loan Loss Provision (LLP) as a forward-looking asset quality measure in relation to the backward-looking one NPLs, capital adequacy and earnings as main regulatory indicators to measure soundness. We are curious to investigate this phenomenon in relation to those banks subjected to the European Banking Authority (EBA) stress tests. Moreover, inspired by the financial momentum and by the lack of empirical evidence, we want to study, in a new fashion way, the accounting discretion of troubled banks along three different moments identified by the three financial crises widely recognized by the academic literature. Particularly, our attention will be devoted to: a) the subprime crisis "early crisis": 2007:3 to 2008:3 (Kashyap and Zingales, 2010; Kuppuswamy and Villonga, 2010); b) the great financial depression "late crisis": 2008:4 (Lehman & Brothers collapse) to 2010:2 (Kashyap and Zingales, 2010; Kuppuswamy and Villonga, 2010); c) the sovereign debt crisis: 2010:3 (emerging news about Greece's default) to 2012:4 (Giordano *et al*., 2013; Beirne and Fratzcher, 2013).

Moreover, until the end of the Global Financial Crisis, south European banking system were only marginally affected by the crisis. Things changed dramatically starting from spring 2010, when

Greece disclosed to be on the edge of bankruptcy. Since then, the crisis progressively undermined the outstanding sovereign debt of almost all the Mediterranean countries, seriously jeopardising the stability of their banking system. This new disguise of the financial crisis forced the European Central Bank (ECB) to heavily intervene supplying liquidity to the systems, following the "*whatever it takes*" approach of the ECB's President Mario Draghi, in July 2012, being not only a single bank but the whole system of these countries very weak and unable to have a stable funding on the market. Therefore, this new role of ECB featured the "Post-Crisis period", covering the time period 2013:1 - 2015:4, when the ECB implemented the Quantitative Easing policy, heavily intervened on the market with a monthly amount of 60 billion of purchased assets.

Therefore, our research design exploits this financial momentum to extract manifestations of discretion. Particularly, we find evidence that treatment banks were highly intervened by regulators. We aim to in-depth analyse banks' accounting behaviour by comparing different key regulatory variables of treatment and non-treated banks to assess the long-term effect of stress tests and the impact specific treatments, i.e., stress test, together with particular financial momentum emphasized by the financial crisis. According to the related literature and the stress test reports, we identify asset quality measures in terms of forward-looking measure: the Loan Loss Provision (LLP) and Loan Loss Reserve (LLR), the NPLs ratio and the loan growth rate as main regulatory indicators to measure soundness.

Our study tests three different research question: RQ#1) Do the different financial crises periods push banks managers to pursue both income smoothing and regulatory capital management via LLPs increased?; RQ#2) Do the impact of EBA Stress Tests results affect banks management behaviour in set up the level of LLPs?; RQ#3) Do banks under EBA Stress Tests undertake income smoothing and regulatory capital management via LLPs increased more than for non-treated banks?

The empirical analyses are based on a balanced panel of 180 European banks continuously listed, over the period 2005:4 - 2016:4. Our empirical results show that bank banks tend to smooth income but not to influence regulatory capital via LLPs. In particular, smoothing income hypothesis is emphasised during the subprime crisis "early crisis": 2007:3 to 2008:3 and during the great financial depression "late crisis": 2008:4 (Lehman & Brothers collapse) to 2010:2. This evidence can be explained by the peculiar features of the recent financial turmoil, originated by a toxic assets contagion in the financial markets and the growing recourse to market-based funding by listed banks. However, regarding the behaviour of banks that underwent the EBA stress tests, we do not observe that the disclosure of the stress tests results together with the release of a detailed set of sensitive information is neither associated with more income smoothing nor regulatory capital management by tested banks via an increased discretionary use of LLPs.

Broadly speaking, prior empirical findings show that banks, particularly troubled banks, use accounting discretion, i.e., income smoothing and regulatory capital management hypotheses, to overstate capital, especially during economic downturns (Shrieves and Dahl, 2003; Vyas, 2011; Huizinga and Laeven, 2012). Since banks' opportunistic use of accounting discretion is particularly visible, a lively debate about whether banks' overstatement of capital was lead to circumventing regulators or non-regulators arises. Bushman and Landsman (2010) identify two mechanisms through which banks use accounting discretion translate into a lower risk or a delay of intervention by supervisor authority. These two mechanisms differ in terms of which group of outsiders is unable to "see through" troubled banks' overstatement of capital.

If regulators are not able to see through a bank's overstatement of capital, they cannot identify troubled banks and are unable to assess the full extent of their financial difficulties, which keeps regulators from intervening. The second motivation relies on the fact that banks, in contrast to non-financial firms, have a higher percentage of assets characterized by an important degree of opaqueness: particularly, loans hard to evaluate *versus* liquid assets easily to be sold. Therefore, there exists an alternative mechanism: regulators are able to see through this overstatement of capital, but less sophisticated outsiders, such as depositors and the general public, are misled. When depositors and the general public are unaware of banks' financial difficulties, depositors cannot exercise market discipline (i.e., by withdrawing their funds from troubled banks) and regulators feel less pressured to intervene. Hence, if banks are successful in concealing their financial difficulties from less sophisticated outsiders, then regulators' ability to practice forbearance on these banks increases (Gallemore, 2016). See for example the outcome of the stress tests that in addition to banks' size, regulators seem to consider a wider range of bank risk measures such as asset quality and liquidity, while capitalization and non-traditional assets are not important determinants. This result could be an additional incentive for bank managers to delay loan loss provisions (LLPs) and the related announcement of NPLs, as they might aim to avoid stress test intervention. Moreover, treatment banks were punished twice through stress test disclosures. On the one hand, stress tests revealed poor asset quality of treatment banks overall and specifically for 2010/11 and 2014 treatments. Consequently, treated institutions had to undertake more LLPs and announce more NPLs after the stress test treatment compared to non-treated banks. Gounopoulos *et al*. (2017) report mixed evidence for intervention on capital adequacy.

From a policy perspective, our contribution sheds light on the debate on the consequences of bank accounting discretion between regulators and other bank stakeholders. In fact, for those outside the bank, the general purpose of financial reporting is to provide information and to support a wide range of decision contexts and contractual arrangements (Bushman and Williams, 2012). On the other

hand, instead, regulators aim to limit the frequency and cost of bank failures, but in particular, their purpose it to protect the financial system as a whole by limiting the frequency and cost of systemic crises (Rochet, 2005).

Our paper harmonises the recent literature, Leaven and Huizinga (2009), Beatty and Liao (2011), Vyas (2011) and Bushman and Williams (2012) which examine the relationship between bank accounting discretion and the forward-looking provision measure. In particular, inspired by Bushman and Williams (2012) contribution, we extend the forward-looking orientation measure in discretionary loan provisioning within the European banking context, harmonised with the EBA stress test in a specific period of time characterised by the financial turmoil.

In order to robust the empirical findings and to mitigate the endogeneity issues, we provide two robustness checks.

The paper unfolds as follows: section 2 summarises previous research results on the risk taking, loan loss provision, income smoothing, regulatory capital management, the role of supervisory stress test and the market discipline; section 3 provides a few stylised facts regarding the European banking system; section 4 illustrates the database; section 5 describes the empirical strategy; section 6 reports the robustness analysis and section 7 concludes.

## 2. Literature Review

To investigate the role of accounting discretion, the academic literature outlines three streams (Beatty and Liao, 2014): a) the valuation and risk relevance of bank accounting information; b) the use of accounting discretion to manage earnings and regulatory capital; c) the effect of accounting on bank management economic behaviours before, during and after the financial crisis. Each stream identifies, as common denominator, the role played by the Loan Loss Provision (LLP) in mitigating information asymmetry and to circumvent regulatory capital requirements. Among others, a substantial literature examines the use of discretionary LLP to smooth earnings (Beatty *et al*., 1995; Ahmed *et al*., 1999; Laeven and Majnoni, 2003; Bikker and Metzemakers, 2004; Liu and Ryan, 2006; Fonseca and Gonzàles, 2008; Pérez *et al*., 2008; Gebhardt and Novontny-Farkas, 2011; Bushman and Williams, 2012). In reporting the main scientific contribution, we provide four sections: the loan loss provisioning with risk-taking, the regulatory capital management, the supervisory stress test and the market discipline as regulatory tool.

### *2.1 Loan Loss Provisioning and risk-taking, risk-shifting*

Bank accounting research, by facing the issues related to the accounting discretion, focuses the attention on the role played by Loan Loss Provisions (LLP). Particularly, in relation to a banking context, the study of LLPs is motivated by its predominance for banks, the importance of its estimation in the assessment of the asset quality and regarding the effect of the provision on regulatory capital ratio. Banks use provisions to create reserves against loan losses to cover expected losses, whereas capital should absorb unexpected losses. However, due to discretionary accounting, banks may understate or delay current LLPs in presence of low profitability, and *vice versa*. This behaviour might overshadow future bank performance because it hides the true character of the loan portfolio's risk and available capital buffers, as in case of delayed loan loss recognition, capital needs to partly cover both expected and unexpected losses (Bushman and Williams, 2015; Beatty and Liao, 2011; Laeven and Majnoni, 2003).

Banks have a strong latitude in determining the amount of provisions. A higher leverage makes them extremely vulnerable to financial markets turmoil, by prompting adequate LLP in order to restore stability. However, high leverage rises the well-known moral hazard problem of risk-shifting.

After Galai and Masulis (1976), Jensen and Meckling (1976) and Merton (1974), who introduced the risk-shifting problem as one of the major conflicts of interest between shareholders and bondholders, several studies analyse the relation between the potential costs of risk shifting and a firm's characteristics. Saunders *et al*. (1990) investigate the relationship between bank ownership structure and risk taking.[4] In particular, the authors argue that the powerful effect of ownership structure on the risk characteristics of banks is much more emphasised during period of deregulation (e.g., activity and interest rate deregulation, closure rule forbearance) rather than periods of regulation. Since many theoretical papers have sought to identify factors (e.g., convertible debt, debt maturity, regulation, managerial incentives, growth options) affecting the risk-shifting problems (Smith and Warner, 1979; Green, 1984; Smith, 1986; Barclay and Smith 1995; Rajan and Zingales, 1995), Eisdorfer (2008) empirically examines the risk-shifting behaviour in distressed firms shedding light on the relation between investment and volatility of a project. Particularly, shareholders' risk-shifting incentives produce a positive relation between volatility and investment. Jensen and Meckling's (1976) theory implicitly suggests that both of these moral hazard problems lead, inside the banking sector, to a higher loan growth rate and a larger number of NPLs. Both the risk-shifting motive in Jensen and Meckling (1976) and the underinvestment motive in Myers (1977) inspire Diamond and Rajan (2011) to study the reasons why a bank's management of a highly and impaired

[4] For example, Amihud and Lev (1981) and Agrawal and Mandelker (1987) point out the conflict of interest between managerially controlled banks and stockholder controlled banks show an inverse relationship between non-bank firms risk taking and the degree of managerial control.

bank, knowing that it could fail, has incentive to hold, rather than sell, illiquid assets in the future (i.e., "illiquidity seekers"). Indeed, the bank, by selling the asset today, on one hand, will raise cash and will strength the value of its debt; on the other, instead, the bank will sacrifice the returns that it would obtain whether the currently depressed value of the asset recovers. A substantial number of academic studies have investigated the relationship among loan growth, NPLs, and the risk taking of banks (Demirgüç-Kunt, 1989; Barr *et al*., 1994; Berger and Udell, 1994; Gorton and Rosen, 1995; Shrieves and Dahl, 2003). Bernanke and Gertler (1986) maintain that the impaired loans of banks may induce different bank behaviour according to banks' risk preferences. Prudential banks tend to be more cautious when they face increasing levels of impaired loans. However, it is likely that when the NPLs ratio is too high, both the shareholders and bank managers have clear incentives to shift risks.

When a firm is in financial distress, risk-shifting incentives also play a role in the investment-volatility relation. Several authors argue that, after the Lehman Brothers collapse, banks might have saved themselves by holding on to risk assets rather than selling them (Bruche and Lobet, 2011; Diamond and Rajan, 2011). Koudstaal and Wijnbergen (2012), collecting data on US banks between 1993 and 2010, find that higher loan-loss reserves are associated with a more troubled loan portfolio. Zhang *et al*. (2016) examine the impact of NPLs on bank behaviour in the Chinese banking system by estimating a NPLs threshold value. The authors confirm that an increase in the NPLs ratio induces bank management to an inappropriate credit expansion and, potentially, may result in further deterioration of the loan quality and undermine the financial stability. The same empirical result is obtained by Cincinelli and Piatti (2017) in relation to the Italian banking system. However, a common evidence, from above studies, show how the level of impaired loans can be an important determinant of bank management behaviour. We argue that the level of NPLs could help the identification the presence of moral hazard in the banking sector.

### *2.2 Income smoothing hypothesis*

According to Barth *et al*., 1999, the income smoothing hypothesis, recognised also as earnings management, argues that investors prefer earning increases. A substantial number of empirical studies point out that companies' decision makers affect a company' performance by undertaking specific accounting choices to become more interesting for investors (see e.g., Dechow *et al*., 2010).

Focusing on the banking context, the empirical literature distinguishes the income smoothing phenomenon in relation to: a) privately held and; b) publicly held banks. Privately-owned banks have less motivation to smooth earnings than publicly-owned banks as their investors suffer less under

information asymmetry (Beatty *et al*., 2002). According to Anandarajan *et al*. (2007), publicly traded banks use income to signal success and strength to their shareholders, since they raise funds in the stock market. However, on the other hand, Fonseca and Gonzàles (2008) argue that listed banks are less likely to smooth income because they are subject to a stricter supervision due to their larger size and a greater impact in the case of a banking crisis.

In relation to our research question, the peculiar consequences caused by the financial turmoil may have created incentives to shift risk and consequently smoot income, particularly for publicly banks. Therefore, during financial crisis, banks might be more involved in income smoothing, particularly during the sovereign debt crisis period.

According with prior literature, we proxy the income smoothing hypothesis through the ratio between the earnings before taxes and loan loss provisions over total assets. The coefficient of ROA should be positive, moreover, a lower (higher) income leads banks management to decrease (increase) their provisions.

### *2.3 Regulatory capital management hypothesis*

The banks motivation, related to meet regulatory capital requirements and buffers, refers to capital management. Allen *et al*. (2011) and Thakor (2012) argue that the level of capital attenuates banks management motivation to invest in risky and innovative projects and to reduces the moral hazard phenomena. Moreover, the likelihood of bankruptcy before and during a crisis depends on the size of the bank. Focused on financial distress, Berger and Bouwman (2013) conclude that the likelihood of bankruptcy is reduced for small banks that hold more capital and that the positive impact of capital on medium and large banks is more dependent upon the situation and only ensured during crises.

The recent banking regulation amendments on Basel III (Pillar 1) require banks to raise capital standards –supplemented by leverage and liquidity ratios–implying to hold more common equity (TIER 1 capital) and additional capital buffers to cover distinct risks of counterparties, securities and trading books (BCBS, 2014). Further, Basel III argues that LLPs affect regulatory capital by reducing TIER 1 capital through included retained earnings. However, as LLPs and LLRs increase equally, latter, up to a maximum of 1.25% of credit risk-weighted assets (CRWA), may be added back to TIER 2 capital and hence may boost total regulatory capital (Ng and Roychowdhury, 2014). Due to the continuously increasing focus on regulatory capital requirements, banks seem to have a higher need to optimise their capital adequacy ratios, which has been widely explored by the literature. For instance, Beatty and Liao (2014) distinguish between *ex ante* Basel I and *ex post* Basel I period and

summarize different studies that analyse the changes in the former requirements related to capital adequacy. More recently, empirical evidence on financial crises shows that banks managed capital requirements intensively towards their goals. Beatty and Liao (2011) illustrate that delayed recognition of expected loan losses were widely used in the financial crisis to optimise capital which led to more procyclicality and exacerbated the credit crunch. Huizinga and Laeven (2012) argue that banks with relatively high amount of mortgage backed securities contracts had significantly lower LLPs in their accounts in 2008 to manage their capital ratios. Bierey and Schmidt (2017) postulate that, during the sovereign debt crisis, banks delayed write-offs on Greek government bonds to strengthen capital and to receive higher governmental support.

A substantial number of empirical studies document that banks, which are at risk of violating capital adequacy requirements, use accounting discretion to overstate assets, and consequently, equity and regulatory capital (Beatty *et al*., 1995; Collins and Wahlen, 1995; Kim and Kross, 1998; Shrieves and Dahl, 2003). Substantial overstatement of capital by exercising accounting discretion has also been documented during the subprime crisis. In greater detail, banks delayed impairments on structured credit instruments such as mortgage-backed securities (Vyas, 2011; Huizinga and Laeven, 2012); recognized lower LLPs (Huizinga and Laeven, 2012); determined the fair value for a larger share of financial assets (Glaser *et al*., 2014); reclassified financial assets out of the fair value categories into the amortized cost categories (Huizinga and Laeven, 2012; Bischof and Daske, 2016).

Overstatement of capital may not be entirely visible to outsiders, in particular, if asset measurement is to a large extent based on banks' private information. For instance, loan portfolios are heterogeneous across banks, making it difficult to assess whether low loan write-downs reflect banks' opportunistic use of accounting discretion or a higher quality of banks' individual loan portfolios (i.e., a less risky loan portfolio). However, even if banks' overstatement of capital during a financial crisis is visible to regulators, it may lower the risk of foreclosure by regulators, provided that the overstatement is not transparent to specific groups of non-regulator outsiders. Regulators have an incentive to practice forbearance, particularly during a financial crisis, when regulatory foreclosure might trigger spillover effects (e.g., the failure of a single bank leads to a disruption of the entire financial system), market panic and bank runs (Brown and Dinc, 2011; Gallemore, 2016). However, regulatory forbearance is unlikely if depositors are aware of banks' financial difficulties, since depositors will practice market discipline by withdrawing their funds from banks that experience severe financial distress (MartinezPeria and Schmukler, 2001; Spiegel and Yamori, 2007). This will trigger the foreclosure of a troubled bank, even if regulators would be willing to practice forbearance. Hence, regulators are pressured to intervene if banks' financial difficulties are transparent to non-regulator outsiders.

Furthermore, regulatory forbearance might erode regulators' reputation and market participants' trust in effective bank supervision. The third pillar of the Basel II framework is aimed at supporting market discipline to curtail regulators' ability to practice forbearance. Against this backdrop, regulators' ability to practice forbearance increases if troubled banks successfully conceal their financial difficulties from non-regulator outsiders by overstating capital.

According to the Basel II Capital Accord, the TIER1 capital includes retained earnings, implying that banks characterised by a low capital endowment might have more incentives to make lower LLPs. Prior empirical literature, by analysing the regulatory capital management issue, focuses the attention on the ratio of actual regulatory capital divided by the regulatory minimum capital (Beatty *et al*., 1995; Ahmed *et al*., 1999; Leventis *et al*., 2011). We follow Curcio *et al*. (2017) by considering the ratio of TIER1 capital to Risk Weighted Assets (RWA) for two reasons: a) the former ratio does not suffer from the influence of accounting relations on the link between bank capital and LLPs; b) in relation to the TIER2 capital, the definition of TIER1 capital measure is more homogeneous across the national supervisory standards. Therefore, we argue that banks with less capital may have lower incentives to set provisions aside in order to increase their primary regulatory capital endowment via retained earnings. Hence, we expect that the regulatory capital management hypothesis is supported if the coefficient of the explanatory variable TIER1 capital to RWA is positive.

### *2.3 Supervisory stress test*

Bank opaqueness could be reduced by the supervisory stress test results disclosed by the supervisor Authorities. Many authors, who examined U.S. and European stress tests such as FED' 2009 stress test (Candelon and Sy, 2015; Morgan *et al*., 2014; Quijano, 2014), EBA's 2011 stress test (Petrella and Resti, 2013) and ECB's 2014 comprehensive assessment (Carboni *et al*., 2017) on market reaction, reject the "*irrelevance hypothesis*", i.e., markets ignore stress test results and find evidence for the dilution effect that is exacerbated through *ex ante* result share or bond price decrease of stress-tested banks due to uncertainty about the outcome. All the authors postulate that the markets' reaction indicate that stress test results could not be predicted and hence provided new and valuable information and reduced information asymmetry.

However, the positive impact of stress test disclosures seems to be particularly significant during financial turmoil, whereas researchers cast doubt on their benefits during normal times. Bouvard *et al*. (2015) argue that during economic downturns more transparency can reduce uncertainty among banks and contribute to financial stability, while in relatively calm times bank-specific information

might not be convincingly presented by regulators, increase opacity and harm markets' trust. At the same advice, Schuermann (2014) and Borio *et al*. (2014) propose that stress tests serve effectively as crisis management tool rather than early warning device for different reasons: some banks might be more affected by the adverse scenario than others, and even to accommodate banks treated with the correct stress scenarios, it could be difficult in normal times than during distress because of regulators need to rely on past events. Goldstein and Sapra (2013) and Schuermann (2014) propose that during financial crisis detailed information should be published to give markets the opportunity to work with the additional information and to assess whether banks are sound or not. Borio *et al*. (2014) argue that no stress test prior to the financial crisis of 2008 was able to detect the risks that banks hold in their exposures. This signal of soundness encouraged all stakeholders with a wrong perception of safety to continue with their high risk-taking practices. More recently, Candelon and Sy (2015) and Carboni *et al*. (2017) confirm the perception that in the U.S. and in the Europena financial context the impact of regular stress testing decreases the learning curve of the curve of the regulators and supervisors. Sahin and de Haan (2016) illustrate that the markets did not react to EBA's 2014 stress test because the markets expected similar results. However, they also argue that the success for regulators was ensured through their learning development from the in-depth insights in the participating institutions.

### *2.4 Market discipline*

The Basel II Capital Accord, which posits a central role for informational transparency in facilitating market discipline, recognises the fundamental role played by financial accounting information in prudential oversight of banks. While Basel Pillar 3 envisions a range of disclosures that may or may not be part of the formal financial accounting rules (BCBS, 2006), financial accounting systems form the foundation of the firm-specific information set available to interested parties outside the firm and are a logical starting point for investigating properties of information important for addressing moral hazard problems at banks. It is also plausible that the quality of banks' financial accounting information is correlated with the quality of bank disclosures falling outside the financial accounting rules.

According with Stephanou (2010), the banking literature distinguishes two different types of market discipline: a direct and an indirect one. Direct discipline refers to the influence that market participants themselves exert on a bank risk-taking behaviour. For example, transparency may enhance *ex ante* discipline as managers anticipate that informed investors would be more likely to discern increased risk-taking and respond quickly to greater risks by demanding higher yields on their

investments. By contrast, indirect market discipline operates via regulatory intervention triggered by market signals, such as price movements of bank securities (Hovakimian and Kane, 2000; Kane, 2004; Rochet, 2005; Flannery and Thakor, 2006). Barth *et al*. (2004) examine regulations on capital adequacy, deposit insurance systems, bank supervisory power, regulations fostering information disclosure and private sector monitoring of banks, and government ownership of banks. They find that policies relying on regulatory features fostering accurate information disclosure, private-sector oversight of banks, and incentives for private agents to exert corporate control work best to promote bank development, performance, and stability. Further, Beck *et al*. (2006) find that supervisory strategies empowering private monitoring of banks by forcing banks to disclose accurate information lowers the degree to which corruption of bank officials is an obstacle to firms raising external finance. Demirguc-Kunt *et al*. (2008) study whether compliance with the Basel Core Principles for Effective Banking Supervision improves bank soundness. They document that requiring banks to regularly and accurately report financial data to regulators and market participants increases banks' soundness (measured with Moody's financial strength ratings). These findings highlight the importance of transparency in making supervisory processes effective and strengthening market discipline. Tadesse (2006), using a range of survey-based metrics, finds that banking crises are less likely in countries with greater regulated disclosure and transparency.

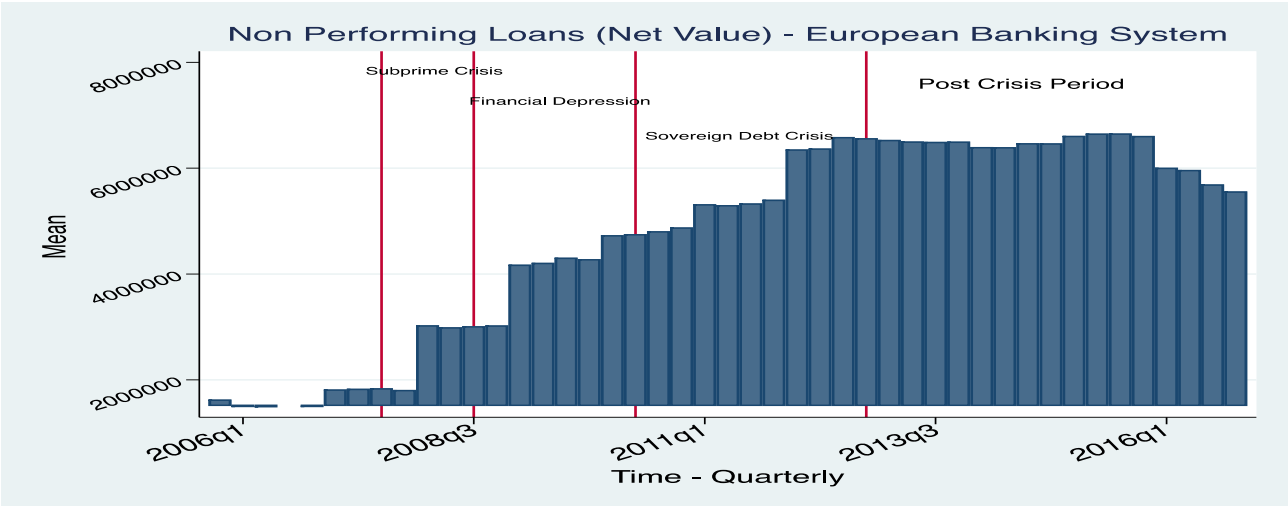
Finally, Nier and Baumann (2006) investigate bank transparency's role in providing incentives for banks to limit risk. Nier and Baumann (2006) examine the extent to which higher levels of transparency enhance market discipline and provide more incentives for banks to limit risk of default by holding larger capital buffers. Finally, Laeven and Levine (2009) focus on conflicts between bank managers and owners over risk, and document that bank risk is generally higher in banks with large owners holding substantial cash flow rights.

## 3. The European banking system: a few stylized facts

The real estate subprime loans crisis, recognized by the academic literature as "*the early crisis*", affected the European banking system between 2007:3 to 2008:4 (see e.g., Kashyap and Zingales, 2010; Kuppuswamy and Villonga, 2010). After that, the European financial context was interested by the great financial depression "*late crisis*", i.e., Lehman Brothers collapse, and by the sovereign debt crisis, i.e., emerging news about Greece's default (Kashyap and Zingales, 2010; Beirne and Fratzcher, 2013; Giordano *et al*., 2013). This particular financial momentum has left "scars" on the

banking context regarding many European Union (EU) countries in the form of elevated levels of NPLs. While the process of repairing bank balance sheets has been going on for the last few years, the ratio of NPLs to total loans remains high by historical standards. However, among countries, important discrepancies remain both across EU and in the Euro Area, with the NPL ratio ranging from above 45% in Cyprus and Greece to a ratio between 1 and 2% in Luxemburg, Estonia and Finland (EBA, 2016).

Figure n. 1 - The stock of NPLs in the European banking context




Source: Authors data processing from Eikon Thomson Reuters Data Stream.

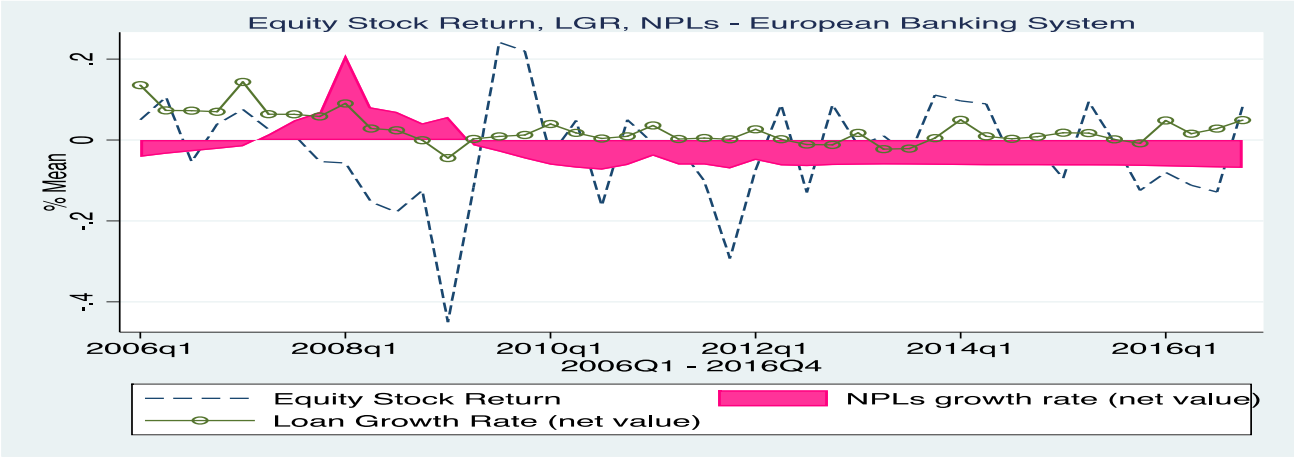
The health status of the financial sector in general, and the share of NPLs in banks' balance sheets in particular, are strongly inter-related with macroeconomic conditions. During economic downturns, both corporates and households are more likely to fall behind with the repayment of their loans, leading to an increase in the share of NPLs. Figure n. 1 shows the impetus of the financial crisis on the bank assets quality. The subprime crisis, the financial depression and the sovereign debt crisis have exacerbated the stock level of NPLs in the entire European banking system. Starting from the 2012:4, the stock of NPLs appear stable until the beginning of the 2016, where they show a decreasing. The quality of loan portfolios, across most countries in the world, remained relatively stable in the decade prior the outbreak of the financial crisis which hit the global economy in 2007 - 2008.

Patterns of NPL developments have varied significantly across member states, reflecting different problems and cycles in national banking systems. In addition, member states have proactively addressed the emerging NPL problems in different ways through policy measures, including legislative reforms, which also partly explains different developments across countries.

The measurement of NPLs in Europe has suffered from lack of harmonization and transparency. Prior to the financial crisis there was no single, harmonized EU-wide definition of NPEs. In addition,

banks could use loopholes in existing national definition to conceal forbearance. As a result, policy-makers and external stakeholders alike faced difficulties in trying to establish a true picture of credit quality in EU banks, both within and across jurisdictions.[5]

Figure n. 2 - The path of the equity stock return, LGR and NPLs in the European Banking System




Source: Authors data processing from Eikon Thomson Reuters Data Stream.

Many euro area Large and Complex Banking Groups (LCBGs) returned to modest profitability in 2009 (see Figure n. 2), and their financial performances strengthened further in the first quarter of 2010. However, the International Monetary Fund, in its Global Financial Stability Report, argues that in a positive outlook, many euro area banks may not be able to increase sufficiently their profitability (IMF, April 2017).

Stress tests performed by regulators indicate that NPL ratios would increase under adverse scenarios, but that local banks could absorb these losses in view of their relatively high capital buffers. Although the rise of NPL ratios in the new EU member states has adversely affected several euro area LCBGs, the profitability of banking systems in many Central and Eastern European (CEE) countries remained relatively strong in the first half of 2009, well above the median ROE of euro area LCBGs over the same period.

In 2011, the outlook for the European economy has taken a turn for the worse. Sharply deteriorating confidence and intensified financial turmoil is affecting investment and consumption, while urgent fiscal consolidation is weighing on domestic demand and weakening global economic conditions are holding back exports.

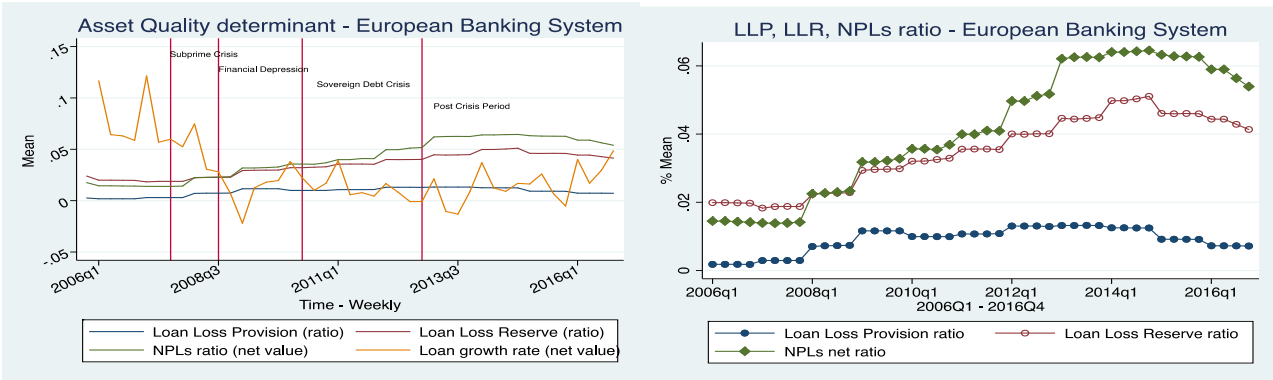
[5] Only in October 2013 the European Banking Authority (EBA) published the common definitions on 'non-performing exposures' and 'debt forbearance'. The standards on Non- Performing Exposures and Forbearance provide common definitions and reporting templates to allow supervisors to assess the level of forbearance activities and non- performing loans on a comparable basis across the EU. The proposed definitions of non- performing and forbearance exposures rely on the existing concepts of default and impairment but provide for specific harmonization features. These definitions apply to all loans and debt securities that are on balance sheets, except for those held for trading, as well as to some off-balance sheet exposures.

The emerging news about Greece's default and the persistence of sovereign strains in the euro area, as part of the broader global financial crisis, has implied pronounced uncertainty surrounding euro area macro-financial developments. Weak economic prospects and uncertainty regarding the duration and severity of the downturn pose several risks to the euro area financial sector. Particularly vulnerable are financial sectors that have low levels of profitability and low non-performing loan coverage ratios, that operate in countries where the debt-servicing capacity of the non-financial sector is impaired as a result of a high degree of leverage or an elevated level of unemployment, or that face the need for adequate provisioning for commercial and/or residential property loan portfolios. At the same time, a lasting divergence of growth prospects across individual euro area countries may also add to a further fragmentation of euro area funding markets.

Along the second and third quarters of 2012, bank assets quality were characterized by, on average, broadly stable NPLs, although the dispersion across banks widened and several banks reported significant increases. Thanks to higher loan loss provisioning, banks' coverage for non-performing loans has improved somewhat. This higher provisioning was a welcome development since several banks have reduced their coverage ratios over the past few years. On average, coverage ratios declined from 60% in 2008 to 55% in the first half of 2012 (EBA, 2016). Developments across banks varied widely, however, with some banks increasing their coverage ratios at the same time as other banks reduced theirs by up to 25 percentage points. Some banks that have been reducing their coverage ratios would have reported lower profits if coverage of NPLs had been kept unchanged. This has also left such banks more vulnerable to increases in NPLs.

Figure n. 3 shows the trend of the Loan Loss Provision (LLP) and the Loan Loss Reserve (LLR) in contrast to the NPLs. Both LLP and LLR, as forward-looking measure of the bank asset quality, on average, increased along the time period 2006:1 to 2016:4. Particularly, from the subprime crisis the level of both of them increased dramatically until the last quarter of 2015, with a slight decrease during the last quarter of 2016.

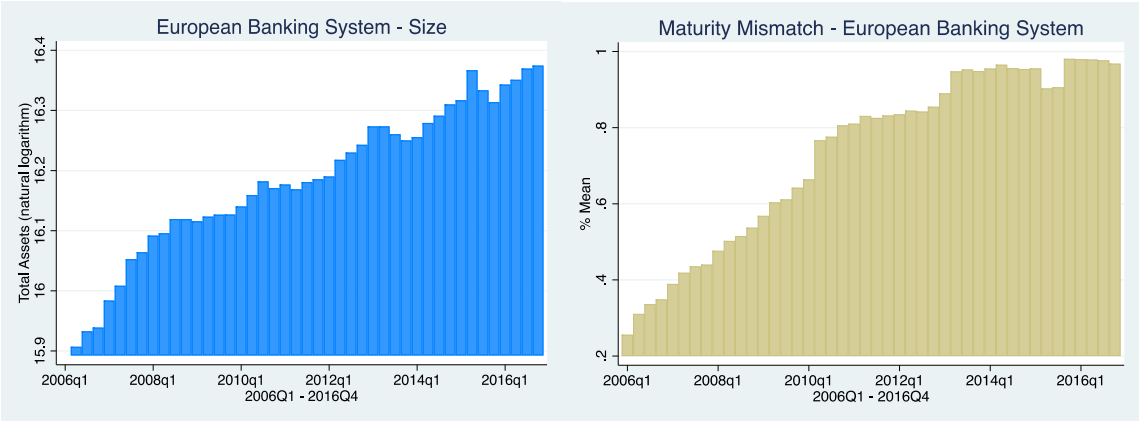
Figure n. 3 - The determinant of the assets quality - European Banking System




Source: Authors data processing from Eikon Thomson Reuters Data Stream.

In 2013, stress in the euro area financial sector has fallen markedly from previous peaks. Several vulnerabilities in the interaction between sovereigns, banks and the macroeconomy persist. Although the size of the European banking system still increases, a crucial aspect should be considered: the interconnected among banks. Figure n. 4, on right hand side, shows the trend of the maturity mismatch measure as a proxy of interconnectivity among banks. This proxy approaches the relative level of short term funding as the total short-term debt minus cash to total liabilities ratio.

Figure n. 4: European Banking System - *Size and Maturity Mismatch*




Source: Authors data processing from Eikon Thomson Reuters Data Stream.

In the first half of 2015, however, both the profitability and the solvency positions of banks have improved somewhat. Euro area banks asset quality has remained in the focus of both supervisors and market participants as banks balance sheets in some countries are still burdened with a high level of non-performing exposures. Large public disclosures, including those associated with the ECB's comprehensive assessment and the EBA 2015 transparency exercise, have helped to clarify the nature and extent of these NPLs. While euro area banks' solvency positions have improved significantly over the past few years, the NPLs overhang remains a drag on banks profitability and weighs on their ability to extend new loans. Euro area banks' NPE ratios remain elevated by international comparison and the high level of NPEs continues to be a key challenge for the financial system.

In line with the overall significant progress on risk reduction in the EU banking sector, the ratio of NPLs continues to decline in the Union. Despite this positive trend, high NPL ratios remain an important challenge for several Member States and for the Union as a whole. There is evidence of encouraging progress in reducing NPL ratios in Member States, due to a combination of policy actions and economic growth. However, NPLs continue to pose risks to economic growth and financial stability. The total volume of NPLs across the EU is still at the level of EUR 950 billion,

clearly above pre-crisis levels. Structural impediments continue to hamper a faster fall in NPL stocks. Among other elements, activity on secondary markets for Non-Performing Loans is not yet sufficient to substantially contribute to NPL reduction efforts, notwithstanding the increased interest from certain investor groups and the increasing volume of NPL-related transactions. Moreover, debt restructuring, insolvency and debt recovery processes are still too slow and unpredictable in some cases.

All in all, it is important to recognize the progresses made in increasing robustness of the European banking system. However, still needs to be done to fully overcome the consequences of the financial crisis and completely restore the condition of all national banking sectors. Both regulators and supervisors ought to steer and support a strong and efficient banking sector that the European economy needs.

## 4. Dataset

We test our hypotheses with a dataset that is *ad hoc* for its sample of stress tested and its comprehensive variable selection as well its extended data period from 2005:4 to 2016:4 and manually completed data quality.

We select the treatment sample of public banks based on the European stress test results published by regulatory authorities European Banking Authority (EBA) and European Central Bank (ECB). These reports disclose all banks that participated in regulatory stress tests between 2010 and 2016 with detailed information about the financial situation and stress test performance of the participating banks. From this information, we collected data and we composed the data sample of continuously listed commercial banks based on the European countries. Due to lack of data caused by inconsistent reporting frequency of variables, by M&A-activities and by bankruptcy, the sample filtered is composed of 180 continuously listed commercial banks belonging to 20 European countries. We start our database base on Orbis bank focus and validate the extracted accounting data with distinct resources such as Eikon Thomson Reuters and SNL database. However, the accounting data quality of European banks from public databases is relatively incomplete and inconsistent depending upon demanded variable and period.

Table 1 reports the all sample of banks treated and not-treated by each country. On average, the sample is composed of 52.54% (i.e., 62 banks treated in contrast to 118 banks not-treated in the European banking system) banks treated.

Following Gebhardt and Novotny-Farkas (2011), Hamadi *et al*. (2016) and Gounopoulos *et*

*al*. (2017), we supplement the initial available data for the treatment and no-treatment banks by hand-collecting missing figures for all variables from banks' financial reports published on their websites or stored on Eikon-Thomson Reuters database. This hand-collection process enables us to uniquely complete the data and include very specific accounting variables such as various regulatory capital figures, LLPs, LLRs and NPLs that are difficult to obtain and usually incomplete even unavailable in common data sources.

**Table 1 – All sample: Banks treated vs. banks not-treated by country: holding period 2005:4 – 2016:4**

| Country | Banks treated | Banks not-treated | % treated vs. not-treated |
|---|---|---|---|
| Austria | 3 | 5 | 60.00% |
| Belgium | 2 | 1 | 200.00% |
| Cyprus | 1 | 1 | 100.00% |
| Denmark | 3 | 19 | 15.79% |
| Finland | 0 | 2 | 0.00% |
| France | 3 | 13 | 23.08% |
| Germany | 4 | 7 | 57.14% |
| Greece | 5 | 1 | 500.00% |
| Hungary | 1 | 1 | 100.00% |
| Ireland | 3 | 0 | - |
| Italy | 10 | 11 | 90.91% |
| Luxembourg | 0 | 1 | 0.00% |
| Malta | 1 | 2 | 50.00% |
| Netherlands | 2 | 2 | 100.00% |
| Norway | 1 | 26 | 3.85% |
| Poland | 3 | 9 | 33.33% |
| Portugal | 3 | 0 | - |
| Spain | 9 | 0 | - |
| Sweden | 4 | 5 | 80.00% |
| United Kingdom | 4 | 12 | 33.33% |
| **Total** | **62** | **118** | **52.54%** |

Notes: this table reports the number of banks treated and not-treated in the sample of empirical analysis.
Source: Authors data processing from Eikon Thomson Reuters Data Stream.

**Table 2 – All sample: descriptive statistics of bank-specific variables reduced at the 1th and 99th percentiles. Holding period 2005:4 – 2016:4**

| Variables | Observations | Mean | Minimum | Median | Maximum | Std. Dev. |
|---|---|---|---|---|---|---|
| LLPs ratio | 6,756 | 0.009 | -0.004 | 0.004 | 0.087 | 0.014 |
| LLRs ratio | 5,899 | 0.036 | 0.00 | 0.022 | 0.261 | 0.044 |
| NPLs ratio | 5,717 | 0.043 | 0.00 | 0.016 | 0.426 | 0.072 |
| NPLs growth | 7,920 | -0.031 | -5.3 | 0.014 | 1.441 | 0.825 |
| Loan Growth rate | 7,920 | 0.025 | -0.708 | 0.011 | 0.698 | 0.155 |
| ROA | 7,920 | 0.002 | -0.034 | 0.001 | 0.025 | 0.006 |
| CAR | 3,491 | 0.124 | 0.00 | 0.114 | 0.631 | 0.083 |
| SIZE | 7,920 | 16.18 | 7.28 | 16.081 | 21.68 | 2.46 |

Notes: this table reports summary statistics of the variables we use in our analysis in relation to all sample. The table presents the observation, mean, standard deviation, minimum, quartiles and maximum for the following bank-specific variables: Loan Loss Provision (LLP), Loan Loss Reserve (LLR), Loans growth (net value) is the loans growth for each bank; NPLs growth is the Non-Performing Loans growth for each bank; NPLs is the ratio between Non Performing Loans and total outstanding loans; Loan Loss Provision is the forward-looking asset quality; Loan Loss Reserve is the forward-looking

credit risk; ROA is the return on assets measured by the net income over total asset for each bank; CAR is the Capital Adequacy Ratio measured by the common equity tier 1 over the risk weighted assets.
Source: Authors data processing from Eikon Thomson Reuters Data Stream.

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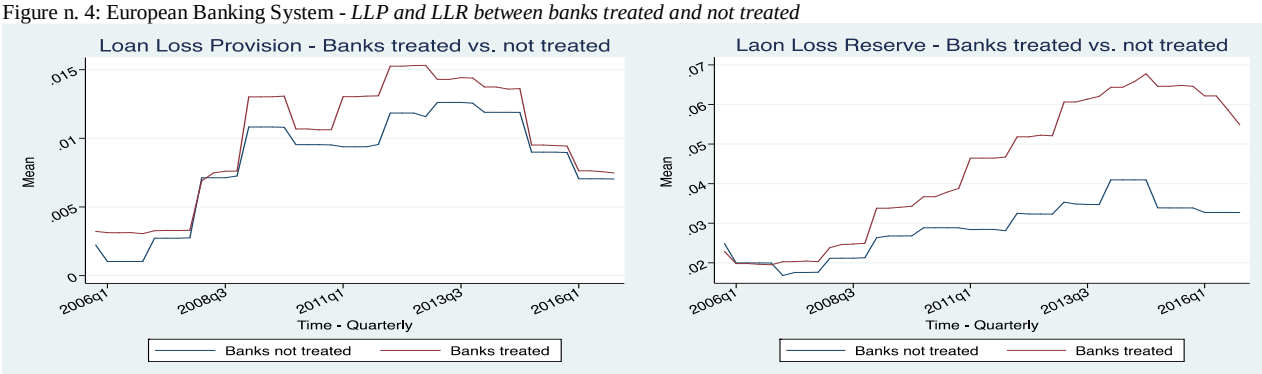
Table 2 reports descriptive statistics of the main regression variables, whereas table 3 and table 4 illustrates the structure between banks under and not under EBA stress test.[6] Our main dataset comprises distinct stress test, 2010, 2011, 2014, 2016, relevant risk and performance measures. Particularly, we collect individual accounting variables and ratios that cover forward and backward-looking asset quality and credit risk and capital adequacy to measure each bank's solvency and soundness. The data covers a period from 2005:4 to 2016:4 on a quarterly basis which enables us to analyse a comprehensive *pre* and *post* treatment period. To mitigate later estimation problems, the data is reduced to the 1st and 99th percentile and the variables are normalized conform to the recent literature standards.

Both the Figure n. 4 and the table n. 2 show, on average, how banks under stress tests are characterised by a greater level of the two forward-looking measures LLPs and LLRs.

Figure n. 4: European Banking System - *LLP and LLR between banks treated and not treated*




Source: Authors data processing from Eikon Thomson Reuters Data Stream.

**Table 3 – Banks under Stress Tests: descriptive statistics of bank-specific variables. Holding period 2005:4 – 2016:4**

| Variables | Observations | Mean | Minimum | Median | Maximum | Std. Dev. |
|---|---|---|---|---|---|---|
| LLPs ratio | 2,406 | 0.01 | -0.004 | 0.005 | 0.087 | 0.013 |
| LLRs ratio | 2,365 | 0.045 | 0.001 | 0.026 | 0.261 | 0.051 |
| NPLs ratio | 2,300 | 0.069 | 0.00 | 0.039 | 0.426 | 0.089 |
| NPLs growth | 2,728 | 0.191 | -0.855 | 0.104 | 1.44 | 0.33 |
| Loan Growth rate | 2,728 | 0.008 | -0.708 | 0.002 | 0.698 | 0.155 |
| ROA | 2,728 | 0.001 | -0.034 | 0.00 | 0.025 | 0.004 |
| CAR | 1,732 | 0.108 | 0.00 | 0.107 | 0.338 | 0.046 |
| SIZE | 2,728 | 18.608 | 11.829 | 18.609 | 21.68 | 1.763 |

Notes: this table reports summary statistics of the variables we use in our analysis in relation to only banks under stress tests. The table presents the observation, mean, standard deviation, minimum, quartiles and maximum for the following bank-specific variables: Loan Loss Provision (LLP), Loan Loss Reserve (LLR), Loans growth (net value) is the loans growth for each bank; NPLs growth is the Non-Performing Loans growth for each bank; NPLs is the ratio between Non Performing Loans and total outstanding loans; Loan Loss Provision is the forward-looking asset quality; Loan Loss Reserve is the forward-looking credit risk; ROA is the return on assets measured by the net income over total asset for each bank; CAR is the Capital Adequacy Ratio measured by the TIER1 over the risk weighted assets.
Source: Authors data processing from Eikon Thomson Reuters Data Stream.

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[6] For a greater comprehension, we report in appendix section the geographic structure of the main banks specific variables.

**Table 4 – Banks not under Stress Tests: descriptive statistics of bank-specific variables. Holding period 2005:4 – 2016:4**

| Variables | Observations | Mean | Minimum | Median | Maximum | Std. Dev. |
|---|---|---|---|---|---|---|
| LLPs ratio | 4,350 | 0.008 | -0.004 | 0.003 | 0.087 | 0.014 |
| LLRs ratio | 3,534 | 0.029 | 0.000 | 0.02 | 0.261 | 0.037 |
| NPLs ratio | 3,417 | 0.026 | 0.00 | 0.007 | 0.426 | 0.050 |
| NPLs growth | 5,192 | -0.148 | -5.3 | 0.002 | 1.441 | 0.970 |
| Loan Growth rate | 5,192 | 0.035 | -0.708 | 0.015 | 0.698 | 0.155 |
| ROA | 5,192 | 0.002 | -0.034 | 0.002 | 0.025 | 0.006 |
| CAR | 1,759 | 0.140 | 0.00 | 0.121 | 0.631 | 0.105 |
| SIZE | 5,192 | 14.904 | 7.289 | 14.961 | 20.28 | 1.694 |

Notes: this table reports summary statistics of the variables we use in our analysis in relation to banks not under stress tests. The table presents the observation, mean, standard deviation, minimum, quartiles and maximum for the following bank-specific variables: Loan Loss Provision (LLP), Loan Loss Reserve (LLR), Loans growth (net value) is the loans growth for each bank; NPLs growth is the Non-Performing Loans growth for each bank; NPLs is the ratio between Non Performing Loans and total outstanding loans; Loan Loss Provision is the forward-looking asset quality; Loan Loss Reserve is the forward-looking credit risk; ROA is the return on assets measured by the net income over total asset for each bank; CAR is the Capital Adequacy Ratio measured by the common equity tier 1 over the risk weighted assets.
Source: Authors data processing from Eikon Thomson Reuters Data Stream.

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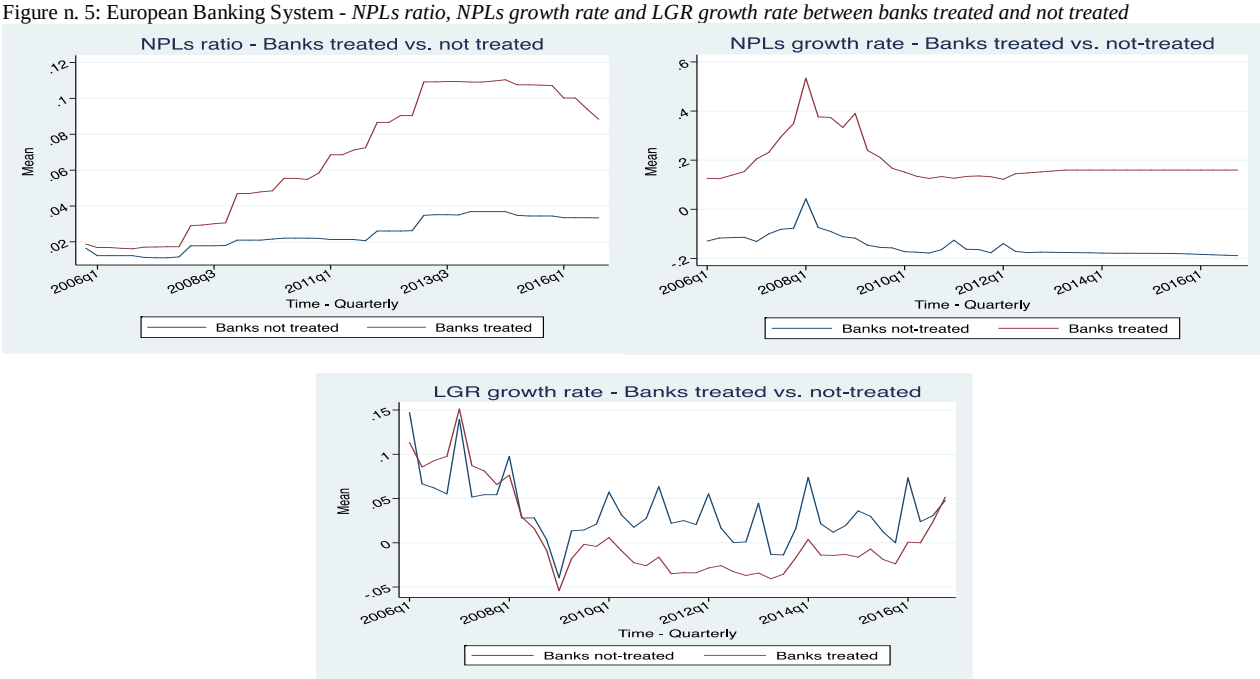
Figure n. 5: European Banking System - *NPLs ratio, NPLs growth rate and LGR growth rate between banks treated and not treated*




Source: Authors data processing from Eikon Thomson Reuters Data Stream.

Figure n. 5 depicts an interesting path among the main component of banks assets quality and the lending activity. In particular, banks under stress tests show a higher value of both NPLs and the growth rate of NPLs rather than banks not treated. The stock of NPLs for banks treated reaches the highest value in correspondece of the outbreak of the Global Financial Crisis (GFC): the real shock, due to the collapse of world trade, and the financial shock, via exposure to toxic assets and the freeze of wholesale bank funding markets. Both shocks affected bank lending in the european banking context (Figure 5 - Loan growth rate). In fact, credit supply reacts negatively to these adverse shocks by amplifying the decrease in real activity, the contraction in credit demand and the deterioration in

credit quality.

## 5. Empirical strategy

The outcome of stress test results, that consider a bank to be sound, is mainly driven by various bank-specific variables such as asset quality, capital and earnings. In our research, we use a static and balanced panel data technique to estimate the impact of stress tests on banks' accounting information and discretionary behaviour. Particularly, we are interested in estimating if treatment banks are more motivated to apply accounting discretion strategies. For the latter approach, our dependent variables of interest are Loan Loss Provision (LLP) and Loan Loss Reserve (LLR), which have been observed by regulators to be the main drivers to reduce capital adequacy ratios. Our main explanatory variables are the NPLs ratio, the NPLs growth ratio and the Loan Growth Rate (LGR). We also consider as control variables the Capital Adequacy Ratio (CAR) measured as the ratio between TIER 1 and the Risk Weighted Assets (RWA), which measure capital management, the Return on Assets (ROA), as a proxy of the earnings management, and the SIZE measured by the natural logarithm of total assets. As previously described, we collect accounting data for a pool of 180 European treatment and non-treated European banks.

To conduct our analyses, we estimate the following modification of our baseline model:

$$Y_{i,j,t}=\alpha_0+\beta_1 NPLs_{i,j,t-1}+\beta_2 \Delta NPLs_{i,j,t-1}+\beta_3 LGR_{i,j,t-1}+\beta_4 ROA_{i,j,t-1}+\beta_5 CAR_{i,j,t-1}+\beta_6 Size_{i,j,t-1}+\beta_7 \Delta GDP_{j,t-1}+\gamma_t+\varepsilon_{i,t,j} \quad (1)$$

where:

$Y_{i,t,j}$: is the loan loss provision (LLP) and Loan Loss Reserve (LLR), respectively, for bank *i* at quarter *t* in a country *j*;

$NPLs_{i,j,t-1}$: is the Non-Performing Loans ratio between Non-Performing Loans over the outstanding loans, for bank *i* at quarter *t-1* in a country *j*;

$\Delta NPLs_{i,j,t-1}$ : is the Non-Performing Loans ratio growth, for bank *i* at quarter *t-1* in a country *j*;

$LGR_{i,j,t-1}$ : is the loans growth rate in terms of net values, for bank *i* at quarter *t-1* in a country *j*;

$ROA_{i,j,t-1}$ is the Return on Assets measured by the earnings before taxes and loan loss provisions over total assets, for bank *i* at quarter *t-1* in a country *j*. According with prior literature, this variable aims to capture and to detect income smoothing. The coefficient of ROA should be positive, moreover, a lower (higher) income leads banks management to decrease (increase) their provisions.

$CAR_{i,j,t-1}$ : is the Capital Adequacy Requirement measured by TIER1 over risk weighted assets, for

bank *i* at quarter *t-1* in a country *j*. This measure is used for capital management purpose. Following prior literature, we argue that lower capitalised banks have lower incentives to set provisions in order to increase their primary regulatory capital endowment via retained earnings. Therefore, we assume that capital management hypothesis is supported if the coefficient of CAR is positive.

$Size_{i,j,t-1}$ : is the natural logarithm of total assets, for bank *i* at quarter *t-1* in a country *j*. The bank size has often been considered an important factor for the quality of a bank portfolio. Large banks have more diversification opportunities, and as such they can reduce the level of troubled loans (Salas and Saurina, 2002; Rajan and Dhal, 2003). In addition, large banks are better able to evaluate loan quality because of their richer resources (Hu *et al*., 2004). Therefore, bank size is negatively associated with the quality of loans portfolio. However, due to the "*too big to fail*" argument, we expect a positive relationship between the bank size and the level of LLPs.

$\Delta GDP_{j,t-1}$ : is the percentage change in Gross Domestic Product. This variable aims to capture the pro-cyclicality in LLPs due to macroeconomic conditions. Since banks are expected to reduce provisions to increase their income and/or capital during worsening macroeconomic conditions, we hypothesise a negative coefficient of the variable.

$\gamma_t$ : is the coefficient which captures time dummies years. In this equation, we will consider only the time dummy variables.

Table 5 shows the degree of correlation among dependent and explanatory variables at 5% level of statistical significance. In particular, by reporting the Pearson pair-wise correlation coefficients for whole sample banks we can argue how the low correlation among explanatory variables reduces the multicollinearity issues in the baseline equation.

**Table 5 – Correlation Matrix**

| **Correlation Matrix** | **$LLPs_{i,j,t}$** | **$NPLs_{i,j,t-1}$** | **$\Delta NPLs_{i,j,t-1}$** | **$LGR_{i,j,t-1}$** | **$CAR_{i,j,t-1}$** | **$ROA_{i,j,t-1}$** | **$SIZE_{i,j,t-1}$** | **$\Delta GDP_{j,t-1}$** |
|---|---|---|---|---|---|---|---|---|
| **$LLPs_{i,j,t}$** | 1 | | | | | | | |
| **$NPLs_{i,j,t-1}$** | 0.3473* | 1 | | | | | | |
| **$\Delta NPLs_{i,j,t-1}$** | 0.0737* | 0.1505* | 1 | | | | | |
| **$LGR_{i,j,t-1}$** | -0.1208* | -0.1146* | 0.0201 | 1 | | | | |
| **$CAR_{i,j,t-1}$** | -0.1557* | -0.1236* | -0.2458* | 0.0216 | 1 | | | |
| **$ROA_{i,j,t-1}$** | -0.0364* | -0.1655* | -0.0365* | 0.0704* | 0.0532* | 1 | | |
| **$SIZE_{i,j,t-1}$** | -0.0521* | 0.2028* | 0.1094* | -0.0659* | -0.1876* | -0.0546* | 1 | |
| **$\Delta GDP_{j,t-1}$** | -0.0243* | -0.0123 | -0.0162 | -0.0395* | 0.0099 | 0.007 | -0.0052 | 1 |

Notes: this table reports the Pearson pair-wise correlation coefficients for whole sample banks. The dependent variables are: Loan Loss Provision (LLP) is the forward-looking asset quality; the independent variables are: $NPLs_{i,j,t-1}$: is the Non-Performing Loans ratio between Non Performing Loans over the outstanding loans, for bank *i* at quarter *t-1* in a country *j*; $\Delta NPLs_{i,j,t-1}$ : is the Non-Performing Loans ratio growth, for bank *i* at quarter *t-1* in a country *j*; $LGR_{i,j,t-1}$ : is the loans growth rate in terms of net values, for bank *i* at quarter *t-1* in a country *j*; $ROA_{i,j,t-1}$ is the Return on Assets measured by net income over total assets, for bank *i* at quarter *t-1* in a country *j*; $CAR_{i,j,t-1}$ : is the Capital Adequacy Requirement measured by TIER1 over risk weighted assets, for bank *i* at quarter *t-1* in a country *j*; $Size_{i,j,t-1}$ : is the natural logarithm of total assets, for bank *i* at quarter *t-1* in a country *j*; $\Delta GDP_{j,t-1}$ : is the percentage change in Gross Domestic Product. * denotes the significance level of correlation coefficients at 5%.

## *5.1 Discussion of the empirical results*

The results provide empirical evidence on the influence of stress tests on treated banks. Starting from the first analysis, Table 6 reports the empirical results on the entire treatment and control sample of 180 European banks. The examination is divided into two parts: model 1 and 2 have as dependent variable the *LLP*, while model 3 and 4 have as dependent variable the *LLR*. To overcome endogeneity issues, we lagged each explanatory variable by a quarter. Moreover, in order to run a fixed or random effects model, we performed the *Hausman* test: the statistic in this instance is 102.17 with *p*-value = 0.000, which favours the fixed effects model. On the aggregate level, an increase in the *NPLs* and in *ΔNPLs* lead to a greater accrual for a bank. In particular, these measures capture the extent to which current provisions explicitly anticipate future deterioration in the performance of the loan portfolio (Bushman and Williams, 2012). Banks managers would increase provisions systematically when credit quality deteriorates (Balboa *et al*., 2013). In fact, the positive coefficients, both in the *NPLs* and in *ΔNPLs*, are indicative of banks on average anticipating future deteriorations in the performance of the loan portfolio in their current loss provision (Nichols *et al*., 2009; Beatty and Liao, 2011). Moreover, the positive coefficient confirms the direct relation between *LLPs* and *LLRs* and credit quality. *Vice versa* the lending activity, measured by the Loan Growth Rate, reduces both the provision on future credit losses. The variable *Size* shows a positive and statistical significance with *LLPs* ratio; since we do not have a homogeneous expectation in prior empirical literature, we accommodate the motivation that larger banks may require larger provisions (positive relation) as they engage in more operations. However, on the other hand, banks may also be able to diversify credit risk better (negative relation). The relationships referred to the main independent variables are kept constant in all models, both considering as dependent variable the *LLPs* and the *LLRs*. The coefficient of *ΔGDP* is negatively and significantly associated with *LLPs* at 5% confidence level. This suggests that banks make provisions during and not before economic recessions and, moreover, that the pro-cyclical nature of banks' management behaviour is consistent with previous empirical research (Leaven and Majnoni, 2003; Bikker and Metzemakers, 2005; Anandarajan *et al*., 2007; Fonseca and Gonzàles, 2008). Overall, in this panel, our results do not support the income smoothing and the regulatory capital management hypotheses. As further information, since we are considering only listed and treated versus non-treated EBA stress test banks, as table 6, Panel A shows that, both for *LLP* and for *LLR* more *NPLs* are positive and significant determinants of stress test participation. Moreover, empirical results suggest that also the NPLs growth rate could be a crucial determinant of stress test participation (Bierey and Schmidt, 2017).

We also report, as a preliminary robustness check, the empirical results (Model 3 and 4) obtained by using *LLRs* as dependent variable. In relation to the credit quality measures, the coefficients are kept the same and with statistical significance. In addition, we observe a negative and

statistical significance with the explanatory variable *ROA*. It seems to be that *LLRs* are discretionarily set as a linear function of earnings manipulation. However, this empirical evidence is quite hard to corroborate since prior empirical literature focused on the relationship between the provision of future loan losses and the level of earnings.

**Table 6 – Baseline regressions**

| **PANEL A** | **Model (1)** | **Model (2)** | **Model (3)** | **Model (4)** |
|---|---|---|---|---|
| | **Loan Loss Provision** | | **Loan Loss Reserve** | |
| $NPLs_{i,j,t-1}$ | 0.0533*** | 0.0512*** | 0.3588*** | 0.3459*** |
| | (0.016) | (0.016) | (0.036) | (0.036) |
| $\Delta NPLs_{i,j,t-1}$ | 0.0016** | 0.0015** | 0.0029* | 0.0031* |
| | (0.001) | (0.001) | (0.002) | (0.002) |
| $LGR_{i,j,t-1}$ | -0.0093* | -0.0099* | -0.0116** | -0.0117** |
| | (0.005) | (0.005) | (0.005) | (0.005) |
| $CAR_{i,j,t-1}$ | | -0.0063 | | 0.0075 |
| | | (0.005) | | (0.011) |
| $ROA_{i,j,t-1}$ | | -0.157 | | -0.6903*** |
| | | (0.107) | | (0.213) |
| $SIZE_{i,j,t-1}$ | | 0.0018*** | | -0.0012 |
| | | (0.001) | | (0.002) |
| $\Delta GDP_{j,t-1}$ | | -0.0053** | | 0.0047 |
| | | (0.003) | | (0.004) |
| Constant | 0.0036*** | -0.0230** | 0.0229*** | 0.0438* |
| | (0.001) | (0.009) | (0.002) | (0.025) |
| Time Dummy | YES | YES | YES | YES |
| Fixed Effects | YES | YES | YES | YES |
| N. Observations | 7,740 | 7,740 | 7,740 | 7,740 |
| $R^2$ | 0.1635 | 0.1788 | 0.3844 | 0.4003 |
| $R^2$ Adjusted | 0.1621 | 0.177 | 0.3834 | 0.399 |

Notes: this table reports the effect of stress test participation on banks' capital and income management behaviour. The dependent variables are: Loan Loss Provision (LLP) is the forward-looking asset quality; Loan Loss Reserve (LLR) is the forward-looking credit risk; the independent variables are: $NPLs_{i,j,t-1}$: is the Non-Performing Loans ratio between Non Performing Loans over the outstanding loans, for bank *i* at quarter *t-1* in a country *j*; $\Delta NPLs_{i,j,t-1}$ : is the Non-Performing Loans ratio growth, for bank *i* at quarter *t-1* in a country *j*; $LGR_{i,j,t-1}$ : is the loans growth rate in terms of net values, for bank *i* at quarter *t-1* in a country *j*; $ROA_{i,j,t-1}$ is the Return on Assets measured by net income over total assets, for bank *i* at quarter *t-1* in a country *j*; $CAR_{i,j,t-1}$ : is the Capital Adequacy Requirement measured by TIER1 over risk weighted assets, for bank *i* at quarter *t-1* in a country *j*; $Size_{i,j,t-1}$ : is the natural logarithm of total assets, for bank *i* at quarter *t-1* in a country *j*; $\Delta GDP_{j,t-1}$ : is the percentage change in Gross Domestic Product.

***

As further step, we want to study the effects created by the financial crisis on banks management behaviour. In particular, our aim is to analyse the incentives for bank managers to shift risk and to signal bank resilience by reducing earnings volatility and the risk perception of different stakeholders such as depositors, investors and supervisors. We focused on the consequences of both stress tests and financial crisis on the accounting discretion, and we identify three different moments of the financial crises widely recognized by the academic literature. Particularly, our attention is devoted to: a) *Crisis1*: the subprime crisis "early crisis": 2007:3 to 2008:3 (Kashyap and Zingales, 2010; Kuppuswamy and Villonga, 2010); b) *Crisis2*: the great financial depression "late crisis": 2008:4 (Lehman & Brothers collapse) to 2010:2 (Kashyap and Zingales, 2010; Kuppuswamy and Villonga, 2010); c) *Crisis3*: the sovereign debt crisis: 2010:3 (emerging news about Greece's default) to 2012:4 (Giordano *et al*., 2013; Beirne and Fratzcher, 2013).

To capture these effects, we add three dummy variables for each financial crisis and we estimated the marginal effects for banks treated by taking the value 1 for those banks under EBA stress test. Interestingly, is the positive and statistically significant coefficient of each dummy crisis: i.e., the financial crisis requires a greater accrual of *LLPs*.

We also created three interaction variables related to the credit quality, $NPLs_{i,j,t-1}$*Stress*, $\Delta NPLs_{i,j,t-1}$*Stress* and $LGR_{i,j,t-1}$*Stress*, only for banks under EBA stress tests (where "Stress" is a dichotomous variable which takes value 1 for banks included in the EBA stress tests and 0 otherwise). The marginal effects for banks treated show an interesting result, i.e., a negative and statically significant relationship between *NPLs* ratio. This negative coefficient confirms and is indicative of bank accounting discretion by treated banks. However, to our knowledge, since now, previous literature is scant about the empirical evidence.

**Table 7 – The marginal effects for banks treated**

| **PANEL B** | **Baseline Model (1)** | **Baseline Model with marginal effects (2)** | **Marginal effects for banks treated** |
|---|---|---|---|
| | | **Loan Loss Provision** | |
| $NPLs_{i,j,t-1}$ | 0.0954*** | 0.0956*** | -0.0693** |
| | (0.024) | (0.024) | (0.028) |
| $\Delta NPLs_{i,j,t-1}$ | 0.0010* | 0.0010* | 0.0025 |
| | (0.001) | (0.001) | (0.002) |
| $LGR_{i,j,t-1}$ | -0.0096 | -0.01 | -0.0025 |
| | (0.007) | (0.007) | (0.008) |
| $CAR_{i,j,t-1}$ | -0.0048 | -0.0049 | |
| | (0.005) | (0.005) | |
| $ROA_{i,j,t-1}$ | -0.1755* | -0.1857* | |
| | (0.098) | (0.101) | |
| $SIZE_{i,j,t-1}$ | 0.0018*** | 0.0018*** | |
| | (0.001) | (0.001) | |
| $\Delta GDP_{j,t-1}$ | -0.0047** | -0.0062*** | |
| | (0.002) | (0.002) | |
| Crisis1 | | 0.0012*** | |
| | | (0.000) | |
| Crisis2 | | 0.0038*** | |
| | | (0.001) | |
| Crisis3 | | 0.0045*** | |
| | | (0.001) | |
| Constant | -0.0246*** | -0.0234*** | |
| | (0.008) | (0.0083) | |
| Time Dummy | YES | NO | |
| Fixed Effects | YES | YES | |
| Dummy Crisis | NO | YES | |
| N. Observations | 7,740 | 7,740 | |
| $R^2$ | 0.2006 | 0.1764 | |
| $R^2$ Adjusted | 0.1985 | 0.1749 | |

Notes: this table reports the effect of stress test participation on banks' capital and income management behaviour. The dependent variables are: Loan Loss Provision (LLP) is the forward-looking asset quality; Loan Loss Reserve (LLR) is the forward-looking credit risk; the independent variables are: $NPLs_{i,j,t-1}$: is the Non-Performing Loans ratio between Non Performing Loans over the outstanding loans, for bank *i* at quarter *t-1* in a country *j*; $\Delta NPLs_{i,j,t-1}$ : is the Non-Performing Loans ratio growth, for bank *i* at quarter *t-1* in a country *j*; $LGR_{i,j,t-1}$ : is the loans growth rate in terms of net values, for bank *i* at quarter *t-1* in a country *j*; $ROA_{i,j,t-1}$ is the Return on Assets measured by net income over total assets, for bank *i* at quarter *t-1* in a country *j*; $CAR_{i,j,t-1}$ : is the Capital Adequacy Requirement measured by TIER1 over risk weighted assets, for bank *i* at quarter *t-1* in a country *j*; $Size_{i,j,t-1}$ : is the natural logarithm of total assets, for bank *i* at quarter *t-1* in a country *j*; $\Delta GDP_{j,t-1}$ : is the percentage change in Gross Domestic Product.

***

Moreover, inspired by the financial momentum and, to our knowledge, by the lack of empirical evidence, we want to study, in a new fashion way, the accounting discretion, i.e., both the income smoothing and the regulatory capital management hypotheses, not only along three different moments, previously identified, in addition to a new time period emphasised by the monetary policy conducted by the ECB. Until the end of the Global Financial Crisis, south European banking system were only marginally affected by the crisis. Things changed dramatically starting from spring 2010, when Greece disclosed to be on the edge of bankruptcy. Since then, the crisis progressively undermined the outstanding sovereign debt of almost all the Mediterranean countries, seriously jeopardising the stability of their banking system. This new disguise of the financial crisis forced the ECB to heavily intervene supplying liquidity to the systems, following the "*whatever it takes*" approach of the ECB's President Mario Draghi, in July 2012, being not only a single bank but the whole system of these countries very weak and unable to have a stable funding on the market. Therefore, this new role of ECB featured the "Post-Crisis period", covering the time period 2013:1 - 2015:4, when the ECB implemented the Quantitative Easing policy, heavily intervened on the market with a monthly amount of 60 billion of purchased assets, identifies the fourth financial momentum proxied as the "Post-Crisis period".

We also extended the empirical analysis by considering each financial crisis period with the EBA stress tests. For these motivations, we generate four interaction variables, i.e., the four financial crises, harmonised with both income smoothing and regulatory capital management hypotheses in relation to those banks who underwent EBA stress tests. The interaction variables, as reported in the second equation, are the following: for income smoothing hypothesis, we create $ROA_{i,j,t-1}$*Crisis1*Stress Test, $ROA_{i,j,t-1}$*Crisis2*Stress Test, $ROA_{i,j,t-1}$*Crisis3*Stress Test $ROA_{i,j,t-1}$*Crisis4*Stress Test. In relation to the regulatory capital management hypothesis we create other four interaction variables: $CAR_{i,j,t-1}$*Crisis1*StressTest, $CAR_{i,j,t-1}$*Crisis2*StressTest, $CAR_{i,j,t-1}$*Crisis3*StressTest,$CAR_{i,j,t-1}$* Crisis4*StressTest.

To test for the discretionary use of LLPs during the four moments of the financial crisis, we use the following model:

$$
\begin{aligned}
LLP_{i,j,t}=&\alpha_0+\beta_1 NPLs_{i,j,t-1}+\beta_2 \Delta NPLs_{i,j,t-1}+\beta_3 LGR_{i,j,t-1}+\beta_4 ROA_{i,j,t-1}+\beta_5 CAR_{i,j,t-1}\\
&+\beta_6 Size_{i,j,t-1}+\beta_7 \Delta GDP_{j,t-1}+\gamma_t+\beta_8 CAR_{i,j,t-1}*Crisis1+\beta_9 CAR_{i,j,t-1}*Crisis2\\
&+\beta_{10} CAR_{i,j,t-1}*Crisis3+\beta_{11} CAR_{i,j,t-1}*Crisis4+\beta_{12} ROA_{i,j,t-1}*Crisis1\\
&+\beta_{13} ROA_{i,j,t-1}*Crisis2+\beta_{14} ROA_{i,j,t-1}*Crisis3+\beta_{15} ROA_{i,j,t-1}*Crisis4\\
&+\beta_{16} CAR_{i,j,t-1}*Crisis1*Stress\ Test+\beta_{17} CAR_{i,j,t-1}*Crisis2*Stress\ Test\\
&+\beta_{18} CAR_{i,j,t-1}*Crisis3*Stress\ Test+\beta_{19} CAR_{i,j,t-1}*Crisis4*Stress\ Test
\end{aligned}
$$

$$+\beta_{20}ROA_{i,j,t-1}*Crisis1*Stress\ Test+\beta_{21}ROA_{i,j,t-1}*Crisis2*Stress\ Test$$
$$+\beta_{22}ROA_{i,j,t-1}*Crisis3*Stress\ Test+\beta_{23}ROA_{i,j,t-1}*Crisis4*Stress\ Test$$
$$+\ \varepsilon_{i,t,j} \qquad (2)$$

where $NPLs_{i,j,t-1}$, $\Delta NPLs_{i,j,t-1}$, $LGR_{i,j,t-1}$, $ROA_{i,j,t-1}$, $CAR_{i,j,t-1}$, $Size_{i,j,t-1}$ and $\Delta GDP_{j,t-1}$ are the same independent variables described for the first equation.

**Table 8 – Regression results for income smoothing and capital management**

| PANEL C | Model (1) | Model (2) | Model (3) |
|---|---|---|---|
| $NPLs_{i,j,t-1}$ | 0.0567*** | 0.0474*** | 0.0553*** |
| | (0.0164) | (0.0163) | (0.0167) |
| $\Delta NPLs_{i,j,t-1}$ | 0.0014** | 0.0019** | 0.0018*** |
| | (0.0006) | (0.0007) | (0.0006) |
| $LGR_{i,j,t-1}$ | -0.0098* | -0.0100** | -0.0094* |
| | (0.0054) | (0.0049) | (0.0050) |
| $CAR_{i,j,t-1}$ | -0.007 | 0.004 | 0.0063 |
| | (0.0058) | (0.0061) | (0.0061) |
| $ROA_{i,j,t-1}$ | -0.1885 | -0.2718* | -0.2674* |
| | (0.1248) | (0.1492) | (0.1465) |
| $SIZE_{i,j,t-1}$ | 0.0016*** | 0.0015*** | 0.0015*** |
| | (0.0005) | (0.0004) | (0.0005) |
| $\Delta GDP_{j,t-1}$ | -0.0077*** | -0.0069*** | -0.0076*** |
| | (0.0029) | (0.0025) | (0.0026) |
| $CAR_{i,j,t-1}$*Crisis1 | | 0.0011 | 0.0021 |
| | | (0.0027) | (0.0029) |
| $CAR_{i,j,t-1}$*Crisis2 | | -0.0055 | -0.0038 |
| | | (0.0040) | (0.0043) |
| $CAR_{i,j,t-1}$*Crisis3 | | -0.0125*** | -0.0114** |
| | | (0.0047) | (0.0047) |
| $CAR_{i,j,t-1}$*Crisis4 | | -0.0207*** | -0.0230*** |
| | | (0.0068) | (0.0071) |
| $ROA_{i,j,t-1}$*Crisis1 | | 0.2270** | 0.1821 |
| | | (0.1083) | (0.1209) |
| $ROA_{i,j,t-1}$*Crisis2 | | 0.2142* | 0.2785* |
| | | (0.1166) | (0.1413) |
| $ROA_{i,j,t-1}$*Crisis3 | | 0.0352 | 0.0378 |
| | | (0.1250) | (0.1311) |
| $ROA_{i,j,t-1}$*Crisis4 | | 0.0824 | 0.0188 |
| | | (0.1853) | (0.2352) |
| $CAR_{i,j,t-1}$*Crisis1*Stress Test | | | -0.0031 |
| | | | (0.0139) |
| $CAR_{i,j,t-1}$*Crisis2*Stress Test | | | 0.0156 |
| | | | (0.0134) |
| $CAR_{i,j,t-1}$*Crisis3*Stress Test | | | -0.0027 |
| | | | (0.0120) |
| $CAR_{i,j,t-1}$*Crisis4*Stress Test | | | -0.0208* |
| | | | (0.0122) |
| $ROA_{i,j,t-1}$*Crisis1*Stress Test | | | 0.3424 |
| | | | (0.4826) |
| $ROA_{i,j,t-1}$*Crisis2*Stress Test | | | -0.2577 |
| | | | (0.5246) |
| $ROA_{i,j,t-1}$*Crisis3*Stress Test | | | -0.0367 |
| | | | (0.3469) |
| $ROA_{i,j,t-1}$*Crisis4*Stress Test | | | -0.0922 |
| | | | (0.3518) |
| Constant | -0.0203** | -0.0188*** | -0.0197** |
| | (0.0082) | (0.0069) | (0.0077) |

| | | | |
|---|---|---|---|
| Time Dummy | NO | NO | NO |
| Dummy Crisis | YES | YES | YES |
| Dummy Stress Test | YES | YES | YES |
| Fixed Effects | YES | YES | YES |
| N. Observations | 7,740 | 7,740 | 7,740 |
| $R^2$ | 0.1711 | 0.1638 | 0.1917 |
| $R^2$ Adjusted | 0.1699 | 0.1618 | 0.1889 |

Notes: this table reports the effect of stress test participation on banks' capital and income management behaviour. The dependent variables are: Loan Loss Provision (LLP) is the forward-looking asset quality; Loan Loss Reserve (LLR) is the forward-looking credit risk; the independent variables are: $NPLs_{i,j,t-1}$: is the Non-Performing Loans ratio between Non Performing Loans over the outstanding loans, for bank *i* at quarter *t-1* in a country *j*; $\Delta NPLs_{i,j,t-1}$ : is the Non-Performing Loans ratio growth, for bank *i* at quarter *t-1* in a country *j*; $LGR_{i,j,t-1}$ : is the loans growth rate in terms of net values, for bank *i* at quarter *t-1* in a country *j*; $ROA_{i,j,t-1}$ is the Return on Assets measured by net income over total assets, for bank *i* at quarter *t-1* in a country *j*; $CAR_{i,j,t-1}$ : is the Capital Adequacy Requirement measured by TIER1 over risk weighted assets, for bank *i* at quarter *t-1* in a country *j*; $Size_{i,j,t-1}$ : is the natural logarithm of total assets, for bank *i* at quarter *t-1* in a country *j*; $\Delta GDP_{j,t-1}$ : is the percentage change in Gross Domestic Product.

***

Table 8 shows the empirical results obtained by adding the four interactive variables related both to the four periods of the financial turmoil and related to the effect of banks under EBA Stress Tests. In relation to the capital management hypothesis, we observe a negative and statistically significant coefficient of *CAR*. Due to this relationship, we cannot back up the regulatory capital management hypothesis neither in the long time period nor in each period of financial turmoil. Moreover, we observe, once more, a negative and statistically significant coefficient of *CAR* for those banks under EBA stress test. However, we reject the null hypothesis related to the regulatory capital management.

Regarding the earnings management hypothesis, we observe a positive and statistically significant coefficient with *ROA* during the first and second financial crisis. As to other explanatory variables, we find that the coefficient of the *ΔGDP* is negatively and significantly associated with *LLPs* at 1% confidence level, for all the three estimated equations. This suggest that banks make provisions during and not before economic recessions (Curcio *et al*., 2017). Moreover, the pro-cyclical nature of our banks' behaviour is consistent with previous empirical research. The coefficient of the ratio of *NPLs* divided by total loans is positive and statistically significant for all the equations shown in Table 8 at the 1% confidence level, confirming the direct relation between *LLPs* and credit quality. The variable *Size* confirms the positive and statistical significance with *LLPs* ratio. We argue that larger banks may require larger provisions (positive relation) as they engage in more operations. However, on the other hand, banks may also be able to diversify credit risk better (negative relation).

Overall, our results support the income smoothing hypothesis; Euro Area banks used LLPs discretionally during the crisis, particularly during the subprime crisis and the great financial depressions in order to reduce the volatility of their income and appear less risky to both investors and supervisors. This evidence is emphasised for those banks that underwent the EBA Stress Tests exercise because of the greater incentive created by the disclosure of more detailed information on their resilience to the market.

## 6. Robustness analysis

The robustness of our results is assessed through the following checks: a) we consider only the sample with European banks belonging to the member states of European Unions (i.e., we cancelled out only the Norway state with only one bank under EBA Stress Tests and 26 non treated banks) Table 9; b) according to Curcio *et al*. (2017), we remove banks from Spain and Greece since the especially distressed situation of these two countries' banking sectors during the investigation period Table 10.

**Table 9 – Regression results for income smoothing and capital management for European member states**

| PANEL D | Model (1) | Model (2) | Model (3) |
|---|---|---|---|
| $NPLs_{i,j,t-1}$ | 0.0559*** | 0.0460*** | 0.0537*** |
| | (0.0168) | (0.0168) | (0.0171) |
| $\Delta NPLs_{i,j,t-1}$ | 0.0015** | 0.0020** | 0.0019*** |
| | (0.0007) | (0.0008) | (0.0007) |
| $LGR_{i,j,t-1}$ | -0.0101* | -0.0102** | -0.0097* |
| | (0.0056) | (0.0050) | (0.0052) |
| $CAR_{i,j,t-1}$ | -0.0079 | 0.006 | 0.0094 |
| | (0.0070) | (0.0075) | (0.0077) |
| $ROA_{i,j,t-1}$ | -0.186 | -0.2661* | -0.2548* |
| | (0.1253) | (0.1543) | (0.1514) |
| $SIZE_{i,j,t-1}$ | 0.0017*** | 0.0016*** | 0.0016*** |
| | (0.0005) | (0.0005) | (0.0005) |
| $GDP_{j,t-1}$ | -0.0077** | -0.0068*** | -0.0076*** |
| | (0.0030) | (0.0025) | (0.0027) |
| $CAR_{i,j,t-1}$*Crisis1 | | 0.0008 | 0.0025 |
| | | (0.0035) | (0.0040) |
| $CAR_{i,j,t-1}$*Crisis2 | | -0.0061 | -0.0044 |
| | | (0.0055) | (0.0059) |
| $CAR_{i,j,t-1}$*Crisis3 | | -0.0155** | -0.0147** |
| | | (0.0062) | (0.0061) |
| $CAR_{i,j,t-1}$*Crisis4 | | -0.0275*** | -0.0297*** |
| | | (0.0096) | (0.0099) |
| $ROA_{i,j,t-1}$*Crisis1 | | 0.2383** | 0.1885 |
| | | (0.1135) | (0.1271) |
| $ROA_{i,j,t-1}$*Crisis2 | | 0.2054* | 0.2683* |
| | | (0.1188) | (0.1416) |
| $ROA_{i,j,t-1}$*Crisis3 | | 0.0243 | 0.0114 |
| | | (0.1304) | (0.1412) |
| $ROA_{i,j,t-1}$*Crisis4 | | 0.0651 | -0.0164 |
| | | (0.1911) | (0.2436) |
| $CAR_{i,j,t-1}$*Crisis1*Stress Test | | | -0.0017 |
| | | | (0.0142) |
| $CAR_{i,j,t-1}$*Crisis2*Stress Test | | | 0.0137 |
| | | | (0.0141) |
| $CAR_{i,j,t-1}$*Crisis3*Stress Test | | | -0.0084 |
| | | | (0.0131) |
| $CAR_{i,j,t-1}$*Crisis4*Stress Test | | | -0.0241* |
| | | | (0.0132) |
| $ROA_{i,j,t-1}$*Crisis1*Stress Test | | | 0.3716 |
| | | | (0.4758) |
| $ROA_{i,j,t-1}$*Crisis2*Stress Test | | | -0.2333 |
| | | | (0.5239) |

| | | | |
|---|---|---|---|
| ROA $_{i,j,t-1}$*Crisis3*Stress Test | | | -0.0179 |
| | | | (0.3488) |
| ROA $_{i,j,t-1}$*Crisis4*Stress Test | | | -0.0746 |
| | | | (0.3511) |
| Constant | -0.0212** | -0.0200*** | -0.0215*** |
| | (0.0085) | (0.0073) | (0.0081) |
| Time Dummy | NO | NO | NO |
| Dummy Crisis | YES | YES | YES |
| Dummy Stress Test | YES | YES | YES |
| Fixed Effects | YES | YES | YES |
| N. Observations | 6,579 | 6,579 | 6,579 |
| $R^2$ | 0.175 | 0.1703 | 0.1983 |
| $R^2$ adjusted | 0.1736 | 0.1679 | 0.195 |

Notes: this table reports the effect of stress test participation on banks' capital and income management behaviour in the European countries. The dependent variables are: Loan Loss Provision (LLP) is the forward-looking asset quality; Loan Loss Reserve (LLR) is the forward-looking credit risk; the independent variables are: $NPLs_{i,j,t-1}$: is the Non-Performing Loans ratio between Non Performing Loans over the outstanding loans, for bank *i* at quarter *t-1* in a country *j*; $\Delta NPLs_{i,j,t-1}$ : is the Non-Performing Loans ratio growth, for bank *i* at quarter *t-1* in a country *j*; $LGR_{i,j,t-1}$ : is the loans growth rate in terms of net values, for bank *i* at quarter *t-1* in a country *j*; $ROA_{i,j,t-1}$ is the Return on Assets measured by net income over total assets, for bank *i* at quarter *t-1* in a country *j*; $CAR_{i,j,t-1}$ : is the Capital Adequacy Requirement measured by TIER1 over risk weighted assets, for bank *i* at quarter *t-1* in a country *j*; $Size_{i,j,t-1}$ : is the natural logarithm of total assets, for bank *i* at quarter *t-1* in a country *j*; $\Delta GDP_{j,t-1}$ : is the percentage change in Gross Domestic Product.

***

Consistently with previous results of Table 8, the interacted variables $ROA_{i,j,t-1}$*Crisis1* and $ROA_{i,j,t-1}$*Crisis2* is positive and statistically significant, supporting the hypothesis of the income smoothing during the crisis period, particularly the subprime crisis and the great financial depression. However, as concerns the potential increase in the capital management practice during the crisis, the coefficient of the variable $CAR_{i,j,t-1}$, interacted with dummy crisis, is neither statistically nor economically significant. As expected, and already shown in Table 8, *LLPs* the coefficient of the *ΔGDP* is negatively and significantly associated with *LLPs*, for all the three estimated equations. The coefficient of the ratio of *NPLs* divided by total loans is positive and statistically significant for all the equations shown, confirming the direct relation between *LLPs* and credit quality. The variable *Size* confirms the positive and statistical significance with *LLPs* ratio.

**Table 10 – Regression results for income smoothing and capital management for European member states without Greece and Spain**

| **PANEL F** | **Model (1)** | **Model (2)** | **Model (3)** |
|---|---|---|---|
| NPLs$_{i,j,t-1}$ | 0.0730*** | 0.0623*** | 0.0669*** |
| | (0.0164) | (0.0174) | (0.0186) |
| DNPLs $_{i,j,t-1}$ | 0.0015** | 0.0019*** | 0.0019*** |
| | (0.0006) | (0.0007) | (0.0006) |
| LGR $_{i,j,t-1}$ | -0.0108* | -0.0106** | -0.0100* |
| | (0.0060) | (0.0054) | (0.0055) |
| CAR $_{i,j,t-1}$ | -0.0083 | 0.0025 | 0.0062 |
| | (0.0056) | (0.0062) | (0.0063) |
| ROA $_{i,j,t-1}$ | -0.2749** | -0.3877*** | -0.3635** |
| | (0.1356) | (0.1446) | (0.1420) |
| SIZE $_{i,j,t-1}$ | 0.0017** | 0.0014** | 0.0013* |
| | (0.0007) | (0.0006) | (0.0007) |
| GDP$_{j,t-1}$ | -0.0068** | -0.0061** | -0.0061** |
| | (0.0033) | (0.0028) | (0.0030) |
| CAR $_{i,j,t-1}$*Crisis1 | | 0.0005 | -0.0014 |

| | | | |
|---|---|---|---|
| | | (0.0028) | (0.0027) |
| CAR $_{i,j,t-1}$*Crisis2 | | -0.0066 | -0.0056 |
| | | (0.0040) | (0.0043) |
| CAR $_{i,j,t-1}$*Crisis3 | | -0.0104** | -0.0106** |
| | | (0.0046) | (0.0046) |
| CAR $_{i,j,t-1}$*Crisis4 | | -0.0208*** | -0.0234*** |
| | | (0.0071) | (0.0072) |
| ROA $_{i,j,t-1}$*Crisis1 | | 0.2388** | 0.2480** |
| | | (0.1143) | (0.1204) |
| ROA $_{i,j,t-1}$*Crisis2 | | 0.2756** | 0.3581** |
| | | (0.1197) | (0.1445) |
| ROA $_{i,j,t-1}$*Crisis3 | | 0.0312 | 0.1356 |
| | | (0.130) | (0.1170) |
| ROA $_{i,j,t-1}$*Crisis4 | | 0.1267 | 0.1325 |
| | | (0.2099) | (0.2299) |
| CAR $_{i,j,t-1}$*Crisis1*Stress Test | | | 0.0219 |
| | | | (0.0153) |
| CAR $_{i,j,t-1}$*Crisis2*Stress Test | | | 0.0152 |
| | | | (0.0114) |
| CAR $_{i,j,t-1}$*Crisis3*Stress Test | | | -0.0078 |
| | | | (0.0111) |
| CAR $_{i,j,t-1}$*Crisis4*Stress Test | | | -0.0228* |
| | | | (0.0127) |
| ROA $_{i,j,t-1}$*Crisis1*Stress Test | | | -1.1518* |
| | | | (0.6382) |
| ROA $_{i,j,t-1}$*Crisis2*Stress Test | | | -0.6924 |
| | | | (0.6015) |
| ROA $_{i,j,t-1}$*Crisis3*Stress Test | | | -0.7957** |
| | | | (0.3867) |
| ROA $_{i,j,t-1}$*Crisis4*Stress Test | | | -0.9810** |
| | | | (0.4080) |
| Constant | -0.0207** | -0.0179* | -0.0165 |
| | (0.0105) | (0.0091) | (0.0106) |
| Time Dummy | NO | NO | NO |
| Dummy Crisis | YES | YES | YES |
| Dummy Stress Test | YES | YES | YES |
| Fixed Effects | YES | YES | YES |
| N. Observations | 7,095 | 7,095 | 7,095 |
| $R^2$ | 0.2028 | 0.1928 | 0.2439 |
| $R^2$ adjusted | 0.2015 | 0.1906 | 0.241 |

Notes: this table reports the effect of stress test participation on banks' capital and income management behaviour without considering Spain and Greek countries. The dependent variables are: Loan Loss Provision (LLP) is the forward-looking asset quality; Loan Loss Reserve (LLR) is the forward-looking credit risk; the independent variables are: $NPLs_{i,j,t-1}$: is the Non-Performing Loans ratio between Non Performing Loans over the outstanding loans, for bank *i* at quarter *t-1* in a country *j*; $\Delta NPLs_{i,j,t-1}$ : is the Non-Performing Loans ratio growth, for bank *i* at quarter *t-1* in a country *j*; $LGR_{i,j,t-1}$ : is the loans growth rate in terms of net values, for bank *i* at quarter *t-1* in a country *j*; $ROA_{i,j,t-1}$ is the Return on Assets measured by net income over total assets, for bank *i* at quarter *t-1* in a country *j*; $CAR_{i,j,t-1}$ : is the Capital Adequacy Requirement measured by TIER1 over risk weighted assets, for bank *i* at quarter *t-1* in a country *j*; $Size_{i,j,t-1}$ : is the natural logarithm of total assets, for bank *i* at quarter *t-1* in a country *j*; $\Delta GDP_{j,t-1}$ : is the percentage change in Gross Domestic Product.

***

## 7. Conclusions

In the past decade, the European banking system has been characterized by two major and deep crises which have emphasized an exceptional wave of turbulence: the Global Financial Crisis (GFC) and the Sovereign Debt Crisis (SDC). The GFC, coming from the United States, hit European banks through their exposure to toxic assets in their portfolios and the freeze of wholesale funding

markets. The SDC, instead, coming from within the euro area, relied on a loss of confidence in the sustainability of public debts and to the risk of a fragmentation in the monetary union. to assess the resilience of financial systems, regulators, since the financial crisis of 2007 - 2009, have introduced macroprudential stress tests: their main aim is to stress the resilience of financial systems as a whole: the regulators want to test how the financial system is resilient under extreme conditions. Until the outbreak of the financial crisis, the use of stress tests was limited and largely conducted by banks for internal risk management aims. Following the financial crisis, stress testing becomes an important key of the bank regulation toolkit.

In order to investigate how a financial system is resilient, our empirical analysis uses a unique panel database of 180 European banks continuously listed, over the period 2005:4 - 2016:4, to analyse the use of accounting discretion and disclosure by the management of banks during economic downturns. Our hypothesis relies on the strong incentive that banks management exploit for accounting discretion to overstate assets, equity and regulatory capital.

Our study tests three different research question: RQ#1) Do the different financial crises periods push banks managers to pursue both income smoothing and regulatory capital management via LLPs increased?; RQ#2) Do the impact of EBA Stress Tests results affect banks management behaviour in set up the level of LLPs?; RQ#3) Do banks under EBA Stress Tests undertake income smoothing and regulatory capital management via LLPs increased more than for non-treated banks?

The empirical analyses are based on a balanced panel of 180 European banks continuously listed, over the period 2005:4 - 2016:4. Our empirical results show that bank banks tend to smooth income but not to influence regulatory capital via LLPs. In particular, smoothing income hypothesis is emphasised during the subprime crisis “early crisis”: 2007:3 to 2008:3 and during the great financial depression “late crisis”: 2008:4 (Lehman & Brothers collapse) to 2010:2. This evidence can be explained by the peculiar features of the recent financial turmoil, originated by a toxic assets contagion in the financial markets and the growing recourse to market-based funding by listed banks. However, regarding the behaviour of banks that underwent the EBA stress tests, we do not observe that the disclosure of the stress tests results together with the release of a detailed set of sensitive information is neither associated with more income smoothing nor regulatory capital management by tested banks via an increased discretionary use of LLPs.

From a policy perspective, our contribution sheds light on the debate on the consequences of bank accounting discretion between regulators and other bank stakeholders. In fact, for those outside the bank, the general purpose of financial reporting is to provide information and to support a wide range of decision contexts and contractual arrangements (Bushman and Williams, 2012). On the other hand, instead, regulators aim to limit the frequency and cost of bank failures, but in particular, their

purpose it to protect the financial system as a whole by limiting the frequency and cost of systemic crises (Rochet, 2005).

Our paper harmonises the recent literature, Leaven and Huizinga (2009), Beatty and Liao (2011), Vyas (2011) and Bushman and Williams (2012) which examine the relationship between bank accounting discretion and the forward-looking provision measure. In particular, inspired by Bushman and Williams (2012) contribution, we extend the forward-looking orientation measure in discretionary loan provisioning within the European banking context, harmonised with the EBA stress test in a specific period of time characterised by the financial turmoil.

Our results on this specific issue contribute to the scientific debate on the opportunity to disclose stress tests results and on the role played by the regulators and supervisors.

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# Appendix

**Table 1 Appendix – Descriptive statistics of bank-specific variables reduced at the 1st and 99th percentiles. Holding period 2005Q4 – 2016Q4 for each country**

| Country | Variables | Observations | Mean | Std. Dev. | Minimum | 0.25 | 0.5 | 0.75 | Maximum |
|---|---|---|---|---|---|---|---|---|---|
| Austria | Loans growth (net value) | 352 | 0.0390 | 0.1900 | -0.7082 | -0.0147 | 0.0252 | 0.0704 | 0.6982 |
| | NPLs growth | 352 | 0.1050 | 0.2375 | -0.5742 | -0.1027 | 0.1510 | 0.2268 | 1.0496 |
| | NPLs | 236 | 0.0376 | 0.0321 | 0.0000 | 0.0123 | 0.0227 | 0.0653 | 0.1132 |
| | Loan Loss Provision | 325 | 0.0065 | 0.0054 | -0.0044 | 0.0039 | 0.0056 | 0.0086 | 0.0301 |
| | Loan Loss Reserve | 298 | 0.0316 | 0.0142 | 0.0045 | 0.0239 | 0.0286 | 0.0358 | 0.0795 |
| | ROA | 314 | 0.0213 | 0.0160 | 0.0005 | 0.0149 | 0.0178 | 0.0230 | 0.1309 |
| | CAR | 219 | 0.1069 | 0.0323 | 0.0002 | 0.0812 | 0.1098 | 0.1305 | 0.2795 |
| Belgium | Loans growth (net value) | 132 | -0.0275 | 0.2882 | -0.7082 | -0.1494 | -0.0271 | 0.0915 | 0.6982 |
| | NPLs growth | 132 | -0.0217 | 0.3235 | -0.8550 | -0.0910 | -0.0177 | -0.0096 | 0.9347 |
| | NPLs | 135 | 0.0162 | 0.0194 | 0.0000 | 0.0000 | 0.0111 | 0.0188 | 0.0606 |
| | Loan Loss Provision | 90 | 0.0038 | 0.0040 | -0.0012 | 0.0009 | 0.0016 | 0.0078 | 0.0131 |
| | Loan Loss Reserve | 62 | 0.0094 | 0.0051 | 0.0041 | 0.0057 | 0.0084 | 0.0113 | 0.0245 |
| | ROA | 135 | 0.0107 | 0.0058 | 0.0005 | 0.0078 | 0.0112 | 0.0160 | 0.0216 |
| | CAR | 79 | 0.0542 | 0.0681 | 0.0000 | 0.0000 | 0.0000 | 0.1065 | 0.2409 |
| Cyprus | Loans growth (net value) | 88 | 0.0189 | 0.1660 | -0.4614 | -0.0477 | -0.0139 | 0.0450 | 0.6982 |
| | NPLs growth | 88 | 0.1955 | 0.4402 | -0.0536 | -0.0064 | -0.0016 | 0.0047 | 1.4412 |
| | NPLs | 57 | 0.0090 | 0.0178 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0499 |
| | Loan Loss Provision | 73 | 0.0504 | 0.0321 | 0.0034 | 0.0153 | 0.0394 | 0.0872 | 0.0872 |
| | Loan Loss Reserve | 73 | 0.1568 | 0.0695 | 0.0672 | 0.0988 | 0.1283 | 0.2329 | 0.2610 |
| | ROA | 69 | 0.1734 | 0.2219 | 0.0187 | 0.0241 | 0.0286 | 0.3243 | 0.6389 |
| | CAR | 25 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Denmark | Loans growth (net value) | 968 | 0.0185 | 0.1022 | -0.7082 | -0.0006 | 0.0001 | 0.0018 | 0.6982 |
| | NPLs growth | 968 | -0.0166 | 0.2513 | -0.8485 | -0.1059 | -0.0006 | 0.0696 | 1.4412 |
| | NPLs | 646 | 0.0146 | 0.0338 | 0.0000 | 0.0000 | 0.0010 | 0.0130 | 0.2089 |
| | Loan Loss Provision | 903 | 0.0158 | 0.0174 | -0.0044 | 0.0039 | 0.0123 | 0.0221 | 0.0872 |
| | Loan Loss Reserve | 572 | 0.0603 | 0.0565 | 0.0023 | 0.0226 | 0.0459 | 0.0719 | 0.2610 |
| | ROA | 897 | 0.0331 | 0.0103 | 0.0090 | 0.0275 | 0.0330 | 0.0412 | 0.0593 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CAR | 472 | 0.1437 | 0.0882 | 0.0243 | 0.1033 | 0.1367 | 0.1646 | 0.6312 |
| Finland | Loans growth (net value) | 88 | 0.0624 | 0.0743 | -0.0909 | 0.0254 | 0.0693 | 0.1062 | 0.2261 |
| | NPLs growth | 88 | -0.0156 | 0.4478 | -1.0142 | -0.3849 | 0.0790 | 0.2944 | 0.7813 |
| | NPLs | 85 | 0.0124 | 0.0097 | 0.0031 | 0.0048 | 0.0072 | 0.0227 | 0.0291 |
| | Loan Loss Provision | 90 | 0.0010 | 0.0012 | -0.0004 | 0.0003 | 0.0008 | 0.0013 | 0.0054 |
| | Loan Loss Reserve | 61 | 0.0056 | 0.0031 | 0.0014 | 0.0025 | 0.0047 | 0.0087 | 0.0126 |
| | ROA | 90 | 0.0130 | 0.0026 | 0.0089 | 0.0112 | 0.0123 | 0.0150 | 0.0187 |
| | CAR | 74 | 0.1149 | 0.0411 | 0.0655 | 0.0933 | 0.1064 | 0.1213 | 0.2532 |
| France | Loans growth (net value) | 704 | 0.0497 | 0.0614 | -0.2815 | 0.0164 | 0.0470 | 0.0822 | 0.4365 |
| | NPLs growth | 704 | -0.2150 | 1.2471 | -5.3049 | -0.1741 | 0.1574 | 0.3114 | 1.4412 |
| | NPLs | 513 | 0.0192 | 0.0211 | 0.0000 | 0.0007 | 0.0156 | 0.0303 | 0.0943 |
| | Loan Loss Provision | 719 | 0.0034 | 0.0027 | -0.0013 | 0.0015 | 0.0028 | 0.0042 | 0.0148 |
| | Loan Loss Reserve | 707 | 0.0254 | 0.0082 | 0.0112 | 0.0193 | 0.0247 | 0.0289 | 0.0514 |
| | ROA | 666 | 0.0182 | 0.0136 | 0.0005 | 0.0091 | 0.0170 | 0.0224 | 0.0740 |
| | CAR | 90 | 0.1867 | 0.1913 | 0.0001 | 0.0869 | 0.1172 | 0.1391 | 0.6312 |
| Germany | Loans growth (net value) | 484 | 0.0328 | 0.2029 | -0.7082 | -0.0382 | 0.0432 | 0.1272 | 0.6982 |
| | NPLs growth | 484 | 0.1174 | 0.4085 | -0.7635 | -0.1366 | 0.0515 | 0.2740 | 1.4412 |
| | NPLs | 340 | 0.0125 | 0.0159 | 0.0000 | 0.0000 | 0.0040 | 0.0205 | 0.0632 |
| | Loan Loss Provision | 452 | 0.0038 | 0.0046 | -0.0044 | 0.0004 | 0.0028 | 0.0060 | 0.0274 |
| | Loan Loss Reserve | 326 | 0.0123 | 0.0113 | 0.0003 | 0.0039 | 0.0091 | 0.0166 | 0.0446 |
| | ROA | 433 | 0.0163 | 0.0153 | 0.0012 | 0.0079 | 0.0112 | 0.0194 | 0.0800 |
| | CAR | 248 | 0.1765 | 0.1664 | 0.0000 | 0.0842 | 0.1184 | 0.1681 | 0.6312 |
| Greece | Loans growth (net value) | 264 | 0.0426 | 0.1423 | -0.3939 | -0.0605 | 0.0107 | 0.1516 | 0.4370 |
| | NPLs growth | 264 | 0.3680 | 0.2484 | -0.3316 | 0.2021 | 0.3766 | 0.5008 | 1.1358 |
| | NPLs | 208 | 0.1713 | 0.1548 | 0.0198 | 0.0510 | 0.0851 | 0.3421 | 0.4267 |
| | Loan Loss Provision | 140 | 0.0243 | 0.0233 | 0.0012 | 0.0057 | 0.0194 | 0.0379 | 0.0872 |
| | Loan Loss Reserve | 220 | 0.0858 | 0.0816 | 0.0074 | 0.0233 | 0.0432 | 0.1360 | 0.2610 |
| | ROA | 222 | 0.0261 | 0.0065 | 0.0102 | 0.0217 | 0.0253 | 0.0306 | 0.0429 |
| | CAR | 94 | 0.0705 | 0.0619 | 0.0000 | 0.0000 | 0.0961 | 0.1147 | 0.1758 |
| Hungary | Loans growth (net value) | 88 | -0.0020 | 0.0992 | -0.4568 | -0.0406 | 0.0041 | 0.0382 | 0.3204 |
| | NPLs growth | 88 | 0.1120 | 0.2718 | -0.6934 | 0.0064 | 0.0480 | 0.1862 | 1.4412 |
| | NPLs | 81 | 0.0929 | 0.0743 | 0.0000 | 0.0001 | 0.0942 | 0.1191 | 0.2940 |
| | Loan Loss Provision | 90 | 0.0221 | 0.0190 | 0.0005 | 0.0072 | 0.0154 | 0.0364 | 0.0734 |
| | Loan Loss Reserve | 90 | 0.0826 | 0.0634 | 0.0012 | 0.0286 | 0.0707 | 0.1420 | 0.1920 |
| | ROA | 90 | 0.0434 | 0.0173 | 0.0169 | 0.0268 | 0.0430 | 0.0629 | 0.0676 |
| | CAR | 53 | 0.1590 | 0.0742 | 0.1016 | 0.1307 | 0.1394 | 0.1698 | 0.6312 |
| Ireland | Loans growth (net value) | 132 | -0.0534 | 0.0878 | -0.2304 | -0.0909 | -0.0646 | -0.0267 | 0.2619 |
| | NPLs growth | 132 | 0.2502 | 0.2775 | -0.0755 | 0.0322 | 0.1250 | 0.4429 | 1.0478 |
| | NPLs | 100 | 0.1583 | 0.1173 | 0.0077 | 0.0481 | 0.1473 | 0.2297 | 0.4267 |
| | Loan Loss Provision | 106 | 0.0163 | 0.0225 | -0.0044 | 0.0008 | 0.0062 | 0.0303 | 0.0872 |
| | Loan Loss Reserve | 106 | 0.0830 | 0.0667 | 0.0032 | 0.0266 | 0.0739 | 0.1260 | 0.2520 |
| | ROA | 106 | 0.0144 | 0.0049 | 0.0050 | 0.0106 | 0.0149 | 0.0189 | 0.0231 |
| | CAR | 51 | 0.1158 | 0.0383 | 0.0429 | 0.0796 | 0.1189 | 0.1446 | 0.1959 |
| Italy | Loans growth (net value) | 924 | 0.0513 | 0.2294 | -0.7082 | -0.0425 | 0.0288 | 0.1195 | 0.6982 |
| | NPLs growth | 924 | 0.2411 | 0.3550 | -0.5225 | 0.0451 | 0.1838 | 0.4055 | 1.4412 |
| | NPLs | 784 | 0.0994 | 0.1028 | 0.0000 | 0.0237 | 0.0636 | 0.1485 | 0.4267 |
| | Loan Loss Provision | 824 | 0.0106 | 0.0144 | -0.0044 | 0.0032 | 0.0065 | 0.0122 | 0.0872 |
| | Loan Loss Reserve | 601 | 0.0516 | 0.0496 | 0.0003 | 0.0172 | 0.0345 | 0.0735 | 0.2610 |
| | ROA | 809 | 0.0271 | 0.0623 | 0.0060 | 0.0145 | 0.0186 | 0.0242 | 0.6389 |
| | CAR | 499 | 0.1024 | 0.0464 | 0.0000 | 0.0775 | 0.0987 | 0.1199 | 0.3147 |
| Luxembourg | Loans growth (net value) | 44 | 0.1674 | 0.2116 | -0.0304 | 0.0401 | 0.1064 | 0.1751 | 0.6982 |
| | NPLs growth | 44 | 0.5684 | 0.0414 | 0.4991 | 0.5330 | 0.5684 | 0.6039 | 0.6378 |
| | NPLs | 16 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| | Loan Loss Provision | 16 | 0.0056 | 0.0016 | 0.0042 | 0.0044 | 0.0050 | 0.0069 | 0.0082 |
| | Loan Loss Reserve | 0 | . | . | . | . | . | . | . |
| | ROA | 16 | 0.0115 | 0.0061 | 0.0077 | 0.0087 | 0.0093 | 0.0109 | 0.0270 |
| | CAR | 3 | 0.1901 | 0.0159 | 0.1802 | 0.1802 | 0.1818 | 0.2084 | 0.2084 |
| Malta | Loans growth (net value) | 132 | 0.1063 | 0.1482 | -0.3630 | 0.0167 | 0.0798 | 0.1414 | 0.6982 |
| | NPLs growth | 132 | 0.2782 | 0.1259 | 0.0637 | 0.1685 | 0.2782 | 0.3878 | 0.4927 |
| | NPLs | 77 | 0.0240 | 0.0302 | 0.0000 | 0.0000 | 0.0000 | 0.0568 | 0.0796 |
| | Loan Loss Provision | 122 | 0.0120 | 0.0181 | -0.0010 | 0.0012 | 0.0039 | 0.0218 | 0.0768 |
| | Loan Loss Reserve | 105 | 0.0154 | 0.0126 | 0.0003 | 0.0070 | 0.0117 | 0.0190 | 0.0474 |
| | ROA | 135 | 0.0180 | 0.0077 | 0.0005 | 0.0154 | 0.0198 | 0.0227 | 0.0293 |
| | CAR | 3 | 0.1062 | 0.0041 | 0.1026 | 0.1026 | 0.1054 | 0.1107 | 0.1107 |
| Netherlands | Loans growth (net value) | 176 | -0.0535 | 0.1358 | -0.7082 | -0.0749 | -0.0447 | -0.0007 | 0.3930 |
| | NPLs growth | 176 | 0.0802 | 0.2528 | -0.2612 | -0.0099 | 0.0484 | 0.1271 | 1.4412 |
| | NPLs | 101 | 0.0351 | 0.0208 | 0.0033 | 0.0174 | 0.0392 | 0.0473 | 0.0847 |
| | Loan Loss Provision | 130 | 0.0022 | 0.0031 | -0.0031 | 0.0000 | 0.0016 | 0.0041 | 0.0086 |
| | Loan Loss Reserve | 112 | 0.0145 | 0.0061 | 0.0046 | 0.0097 | 0.0149 | 0.0172 | 0.0283 |
| | ROA | 126 | 0.0106 | 0.0051 | 0.0019 | 0.0046 | 0.0132 | 0.0148 | 0.0171 |
| | CAR | 53 | 0.1668 | 0.0524 | 0.0940 | 0.1318 | 0.1525 | 0.2052 | 0.3020 |
| Norway | Loans growth (net value) | 1188 | 0.0193 | 0.0732 | -0.2471 | -0.0091 | 0.0143 | 0.0354 | 0.6982 |
| | NPLs growth | 1188 | -0.0189 | 0.1724 | -1.4550 | -0.0394 | 0.0040 | 0.0139 | 1.4412 |
| | NPLs | 764 | 0.0132 | 0.0185 | 0.0000 | 0.0042 | 0.0081 | 0.0135 | 0.0926 |
| | Loan Loss Provision | 1074 | 0.0023 | 0.0029 | -0.0028 | 0.0007 | 0.0014 | 0.0030 | 0.0184 |
| | Loan Loss Reserve | 854 | 0.0108 | 0.0082 | 0.0008 | 0.0057 | 0.0077 | 0.0153 | 0.0438 |
| | ROA | 1022 | 0.0964 | 0.1941 | 0.0113 | 0.0160 | 0.0187 | 0.0219 | 0.6389 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CAR | 659 | 0.1246 | 0.0704 | 0.0076 | 0.0886 | 0.1221 | 0.1473 | 0.6312 |
| Poland | Loans growth (net value) | 528 | 0.0342 | 0.1359 | -0.7082 | -0.0206 | 0.0133 | 0.0503 | 0.6982 |
| | NPLs growth | 528 | 0.0225 | 0.1808 | -0.4308 | -0.0167 | 0.0125 | 0.0278 | 1.4412 |
| | NPLs | 420 | 0.0670 | 0.0470 | 0.0000 | 0.0450 | 0.0621 | 0.0824 | 0.2915 |
| | Loan Loss Provision | 497 | 0.0141 | 0.0183 | -0.0044 | 0.0038 | 0.0069 | 0.0159 | 0.0872 |
| | Loan Loss Reserve | 513 | 0.0364 | 0.0211 | 0.0003 | 0.0231 | 0.0331 | 0.0457 | 0.1565 |
| | ROA | 501 | 0.0310 | 0.0291 | 0.0033 | 0.0223 | 0.0284 | 0.0369 | 0.6389 |
| | CAR | 164 | 0.1424 | 0.0427 | 0.0669 | 0.1131 | 0.1373 | 0.1716 | 0.3389 |
| Portugal | Loans growth (net value) | 132 | 0.0125 | 0.0758 | -0.1085 | -0.0452 | -0.0110 | 0.0723 | 0.1830 |
| | NPLs growth | 132 | 0.2007 | 0.1681 | -0.0629 | 0.0847 | 0.1882 | 0.2840 | 0.9522 |
| | NPLs | 123 | 0.0457 | 0.0611 | 0.0067 | 0.0109 | 0.0235 | 0.0472 | 0.3044 |
| | Loan Loss Provision | 90 | 0.0090 | 0.0071 | 0.0014 | 0.0036 | 0.0070 | 0.0141 | 0.0259 |
| | Loan Loss Reserve | 123 | 0.0342 | 0.0184 | 0.0122 | 0.0196 | 0.0279 | 0.0491 | 0.0764 |
| | ROA | 90 | 0.0158 | 0.0043 | 0.0093 | 0.0119 | 0.0162 | 0.0179 | 0.0262 |
| | CAR | 106 | 0.0929 | 0.0252 | 0.0493 | 0.0748 | 0.0901 | 0.1044 | 0.1679 |
| Spain | Loans growth (net value) | 396 | -0.0374 | 0.2767 | -0.7082 | -0.0773 | 0.0244 | 0.1112 | 0.5591 |
| | NPLs growth | 396 | 0.4274 | 0.4274 | -0.1108 | 0.1266 | 0.2599 | 0.6535 | 1.4412 |
| | NPLs | 264 | 0.0550 | 0.0499 | 0.0000 | 0.0207 | 0.0429 | 0.0749 | 0.2068 |
| | Loan Loss Provision | 297 | 0.0110 | 0.0125 | 0.0000 | 0.0051 | 0.0088 | 0.0135 | 0.0872 |
| | Loan Loss Reserve | 293 | 0.0420 | 0.0252 | 0.0144 | 0.0222 | 0.0321 | 0.0545 | 0.1130 |
| | ROA | 306 | 0.0164 | 0.0074 | 0.0005 | 0.0113 | 0.0152 | 0.0211 | 0.0700 |
| | CAR | 208 | 0.0989 | 0.0235 | 0.0500 | 0.0757 | 0.1010 | 0.1188 | 0.1508 |
| Sweden | Loans growth (net value) | 396 | 0.0449 | 0.1012 | -0.7082 | 0.0007 | 0.0205 | 0.0499 | 0.6982 |
| | NPLs growth | 396 | 0.0029 | 0.1573 | -0.5536 | -0.0242 | -0.0029 | 0.0133 | 1.4412 |
| | NPLs | 261 | 0.0066 | 0.0071 | 0.0000 | 0.0000 | 0.0052 | 0.0088 | 0.0303 |
| | Loan Loss Provision | 217 | 0.0028 | 0.0058 | -0.0015 | 0.0000 | 0.0009 | 0.0020 | 0.0252 |
| | Loan Loss Reserve | 249 | 0.0257 | 0.0619 | 0.0003 | 0.0025 | 0.0062 | 0.0124 | 0.2610 |
| | ROA | 201 | 0.0104 | 0.0045 | 0.0005 | 0.0076 | 0.0097 | 0.0114 | 0.0286 |
| | CAR | 197 | 0.1397 | 0.0638 | 0.0530 | 0.0898 | 0.1246 | 0.1940 | 0.3776 |
| UK | Loans growth (net value) | 704 | 0.0146 | 0.1253 | -0.7004 | -0.0393 | -0.0022 | 0.0264 | 0.6982 |
| | NPLs growth | 704 | -1.1554 | 1.9253 | -5.3049 | -1.9288 | -0.0463 | -0.0026 | 1.4412 |
| | NPLs | 506 | 0.0232 | 0.0304 | 0.0000 | 0.0000 | 0.0149 | 0.0308 | 0.1913 |
| | Loan Loss Provision | 501 | 0.0101 | 0.0103 | -0.0038 | 0.0031 | 0.0079 | 0.0146 | 0.0772 |
| | Loan Loss Reserve | 534 | 0.0250 | 0.0253 | 0.0003 | 0.0093 | 0.0186 | 0.0322 | 0.1745 |
| | ROA | 469 | 0.0427 | 0.0725 | 0.0057 | 0.0130 | 0.0208 | 0.0494 | 0.6389 |
| | CAR | 194 | 0.1320 | 0.0384 | 0.0512 | 0.1104 | 0.1312 | 0.1495 | 0.2798 |

Notes: this table reports summary statistics of the variables we use in our analysis. The table presents the observation, mean, standard deviation, minimum, quartiles and maximum for the following bank-specific variables: Loans growth (net value) is the loans growth for each bank; NPLs growth is the Non Performing Loans growth for each bank; NPLs is the ratio between Non Performing Loans and total outstanding loans; Loan Loss Provision is the forward-looking asset quality; Loan Loss Reserve is the forward-looking credit risk; ROA is the return on assets measured by the net income over total asset for each bank; CAR is the Capital Adequacy Ratio measured by the common equity tier 1 over the risk weighted assets.

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