Did the financial crisis affect income smoothing and capital management policies? Evidence from European banks

Abstract

Based on a broad sample of European banks over the period 2006-2010, we test for the main hypotheses of discretionary use of loan loss provisions: capital management and income smoothing. The objective of this paper is twofold: to add new evidence to previous literature results and to investigate banks' behavior during stressed financial market conditions.

Overall, our results support the hypothesis of income smoothing but not that of capital management. Particularly, we observe that, if compared to unlisted institutions, publicly traded banks are more engaged in income smoothing practices via loan loss provisions during the post-crisis years, whereas the opposite occurs for the capital management. This could entail that during stressed market conditions, their provisioning policies are mainly driven by the incentives to stabilize earnings over time, in order to increase capital endowment at minor costs. Furthermore, assuming a disciplining effect of EU-wide stress tests, we find some evidence confirming that tested banks are less involved in income smoothing practices via loan loss provisions, whereas they are more willing to manage their regulatory capital.

Jel classification: C23, G21, M41

Parole chiave ADEIMF: Capital Management in Financial Institutions; Financial Institutions Performance; Regulation and Supervision of Financial Institutions

1. Introduction

Loan loss provisions (LLPs) are one of the banks' main accrual. From the perspective of banking system soundness and stability, they are to be set aside in order to cover future deterioration of the credit portfolio quality. Nevertheless, since bank managers can take advantage of a certain level of discretion in deciding their final amount, empirical evidence shows that provisions do not reflect only expected credit losses but are prone to be used for other objectives. Particularly, prior literature points out four main reasons underlying the manipulation of loan loss provisions: capital management, earnings smoothing, signaling and taxes. It is only on the last one, the tax motivation, that the empirical evidence seems to be unambiguous. Furthermore, past empirical research is mostly focused on the US banking system, and deals with the consequences of the introduction of the 1990 capital adequacy regulation. More recently, a bunch of papers have investigated the discretionary use of LLPs at European and international bank samples, mainly focusing on the income smoothing hypothesis.

In this paper we investigate whether the use of loan loss provisions by bank managers at European banks has been affected by the financial crisis broken out in the second half of 2007. The financial crisis strongly impacted banking systems in Europe, and its consequences on bank managers' provisioning decisions are not straightforward. Since it severely affected banks' loan portfolio quality and earnings, it could have constrained the opportunity to discretionally manage earnings and capital via loan loss provisions. Opposite evidence could be supported by some other factors, such as the contemporaneous reduction in regulatory capital ratios, induced by the above mentioned deterioration of their credit quality, and the higher incentives in risk shifting behavior, linked to the high leverage ratios and the presence of safety nets.

Overall, the final objective of this research is twofold: to add new evidence on European banks to previous literature results; to shed light on banks' behavior during bad financial market conditions. As to the first point, the lack of consistent evidence may be due to the adoption of different methodologies, or may be the consequence of the non-steady nature of managers' incentives over time. So choosing the right methodology and testing these hypotheses under different market conditions can provide further and useful insights. With regard to the second point, to our knowledge there is no paper detecting bank managers' discretionary use of LLPs during stressed financial market conditions. Focusing on that can be useful from both a regulatory and an accounting perspective, in order to make the supervisory authorities' response to the crisis more effective, on the one hand, and to set accounting rules more consistent with the objective of a fair representation of the expected evolution of a bank's loan losses, on the other.

Based on a comprehensive sample of 709 European banks over the period 2006-2010, we find an overall evidence supporting the idea that European bank managers use loan loss provisions to smooth income. By focusing on banks' behavior after the financial crisis broke out, our results show that incentives to smooth income decrease, especially for private banks and for banks subject to the European Banking Authority stress tests. As to the capital management, there is no evidence supporting this practice at our sample banks, even after the crisis broke out. However, managers of privately held credit institutions and banks subject to the authority' assessment are more willing to engage in capital management practice.

The remainder of the paper is organized as follows. In section 2, we briefly summarize the current regulatory setting, which plays an important role in explaining bank managers' behavior. Section 3 provides a literature review, developing the rationale for managers to use their discretion in estimating loan loss provisions. Section 4 describes the data, the sample selection process, and the methodology we adopt in our analysis. In section 5 we present and discuss the empirical evidence. Finally, section 6 reports final remarks and conclusions.

2. Bank provisioning policies: some stylized facts

Loan loss accounting methods are well-founded and basically the same around the world, even if the underlying principles may significantly differ: the main objective of European accounting rules for banks is the conservative valuation of their assets, whereas the accurate measurement of each period's net income is strongly emphasized by the American accounting system (Hasan and Wall, 2004). From the banking supervisors' perspective, loan loss provisions should be used only to cover expected credit losses. Banking practice shows that, though banks' financial reporting system is highly regulated, managers still can take advantage of a certain degree of discretion in determining, for example, whether a loan can be considered impaired or not. Via loan loss provisions, managers retain the power to substantially affect banks' income and capital, send distorted signals to the stakeholders, hide the true economic substance of their firms' activity, and their actual value. An increasing attention has been devoted to the role of bank provisioning rules in modern banking activity since the introduction of capital requirements systems. The debate over the pro-cyclical effect of capital regulation has sometimes overlooked the role that loan loss provisions play in the capital regulatory framework.

Provisioning rules and capital requirements are linked through the coverage of credit risk: as widely known, banks have to set a certain amount of loan loss provisions to face expected losses in their credit portfolio, whereas bank capital has to cover the unexpected component of loan losses. From this point of view, loan loss provisions can be considered a cost of the lending process since the actual risk is the unexpected loss and not the expected one. Before going more in depth in the next paragraph, here we can tell in advance that loan loss provisions have a direct impact on both bank profit and capital: on the one hand, the underestimation of its lending costs – due to an underestimation of the expected loss – determines, ceteris paribus, an increase in bank profit and could lead a bank to grant new loans because of this overconfidence; on the other hand, an increase in loan loss provisions – caused by a deterioration of its credit portfolio quality – can lead to a decrease in bank capital if losses are large enough to cause a capital erosion.

In order to better understand the role that loan loss provisions play in modern banking activity, it must be highlighted that this balance sheet account merges different information and behaviors (Bouvatier and Lepetit, 2008). Typically, accounting practice distinguishes between specific provisions and general provisions. The amount of specific provisions depends on credit losses and it increases specific reserves, which are deducted from the asset value. Specific provisions are also known as non-discretionary provisions and are used to cover expected losses in a bank's loan portfolio. General provisions are set aside against not yet identified losses and are added to general reserves on liabilities. Since they are linked to the expansion of customer loans, general provisions are highly judgmental and prone to be manipulated by bank managers for discretionary purposes.

Bank provisioning systems are backward-looking because credit institutions mainly relate non-discretionary provisions to problem loans. During economic upturns risk perception gets better, few non-performing loans are identified by bank managers and the level of loan loss provisions is low. When economic conditions deteriorate, banks experience an increase in loan defaults and loan loss provisions rise. Expected losses are underestimated during benign economic conditions but it is just during economic upturns that banks grant future non-performing loans. Then, when it is too late, banks will have to set provisions aside to face these losses. At times of crisis, due to the shortage of loan loss reserves, bank capital has to cover both expected and unexpected losses, thus worsening the already negative impact of minimum capital requirements over the economic activity during recessions.

2.1. Loan loss provisions within the current supervisory framework

The 1988 risk-based capital standards required all banks to have a minimum qualifying regulatory capital to risk weighted assets ratio of 8 percent (Basel Committee on Banking Supervision, 1988). At least one half of the regulatory capital must be in the form of the highest quality capital, Tier 1 capital, consisting of common stockholders' equity, some qualifying preferred stocks subject to certain limitations, and the minority of interest in the equity accounts. The rest of the regulatory capital, Tier 2 or supplementary capital, was admitted within the limit of 100% of Tier 1 capital and included asset revaluation reserves, undisclosed reserves, hybrid capital instruments, subordinated debt, and general provisions and loan loss reserves. The amount of general provisions or general loan loss reserves must be limited to a maximum of 1.25%, or exceptionally and temporarily up to 2%, or risk assets. In order to be part of the total qualifying regulatory capital, which must be freely available to meet unidentified losses, the Committee required that general provisions and loan loss reserves were not ascribed to particular assets and did not reflect a reduction in the valuation of particular assets, otherwise provisions would not be freely available to meet losses which may arise elsewhere in the portfolio.

The second version of the capital accord, known as Basel II, which is still in force and will be replaced by Basel III starting from January 2013, confirms the two tier-structure of regulatory capital, and still requires general loan loss provisions to be freely available to cover unidentified losses to be eligible for the total qualifying regulatory capital (Basel Committee on Banking Supervision, 2006). Furthermore, loan loss provisions are treated differently within Basel II, depending on the approach that banks adopt to manage credit risk. Within its so called Pillar 1, Basel II allows banks to choose between two approaches for determining their capital requirements: the Standardized approach, which introduces the use of external rating, leaving unchanged the capital charges for loans granted to unrated firms; the Internal Ratings-Based (IRB) approach, which allows banks to use their own internal estimates of the credit risk components (i.e. probability of default, loss given default, exposure at default and maturity). Under the Standardized approach, general provisions/loan loss reserves can be included in Tier 2 capital up to the limit of 1.25% of Risk Weighted Assets (RWAs). Banks adopting the Internal Rating Based (IRB) approach should use loan loss provisions to cover expected losses, but must face unexpected losses raising adequate capital. The possibility to include general provisions in Tier 2, similar to the Standardized method, is no longer admitted. To be more precise, banks must compare the expected credit loss, calculated according to the IRB approach, with the total eligible provisions. If the expected credit loss is higher than the amount of total eligible provisions, banks must deduct the difference (50% of it must be deducted from Tier 1 capital, and 50% from Tier 2 capital). If total provisions exceed the expected loss, the difference can be recognized in Tier 2 capital up to a maximum of 0.6% of credit-risk weighted assets.

2.2. Bank provisioning policies: between capital requirements and international accounting standards

Loan loss accounting received enormous attention not only from banking supervisors but also from international accounting authorities. Scant coordination and different objectives of the two kind of set of rules occasionally generated issues to be addressed: the Basel Committee generally favors a use of accounting principles by banks based on prudent and conservative valuations, being the soundness and safety of the international banking system its statutory objective; in contrast, from the accounting regulators' perspective, provisioning policies must be based on loan losses which actually affect banks and that can be objectively proven, since pursuing higher levels of accounting information transparency and quality, and developing a common set of accounting rules are their main goals.

IFRS/IAS 39 involves banks' evaluation of their credit portfolio and requires that loan assessment be based on the amortized cost, that is to say the current value of expected cash flows. What's more interesting to this research, IFRS/IAS 39 states that loans must be recorded in the bank balance sheet at their nominal value – i.e., the result of their amortization plan – unless objective proofs of deterioration occur. In this case, the difference between the loan nominal value and the loan value calculated as the value of its expected cash flows must be charged on the bank profit and loss account. As to the net charge-offs, IFRS/IAS 39 refers to the concept of incurred loss, which is very different from that of expected loss: according to IFRS/IAS 39, adjustments are allowed only to face losses already occurred, or that are presumed, but on the basis of an event already occurred, though after the loan was granted. Consequently, banks' provisions cannot be set aside based on expected loan losses, even if those provisions are estimated by means of the statistical methods which bank internal rating systems are founded on.

2.3. Loan loss provisions and the pro-cyclicality of bank capital requirements

Pro-cyclicality is one of the main issues related to those regulatory frameworks where capital requirements are calculated as a percentage of bank risky loans: it means that capital requirements are higher when economic conditions get worse, and borrowers' defaults increase, and lower in case of economic upturn. The story is not new: bankers are famous for selling umbrellas in fair weather and asking them back when it rains. In benign economic conditions, banks would be seeking for capital to fund lending opportunities but as defaults rise, loan loss provisions and write-offs increase, hitting bank equity. In general, capital requirement systems exacerbate the effect via rating downgrades/upgrades. Compared to the Standardized one, the Internal Ratings-Based approach is characterized by a higher risk sensitivity, which means that as risks to the bank increase in an economic downturn, probability of default, loss given default and exposure at default may all rise compared with internal modeling assumptions. To be more precise, there are two key factors that could make movements in capital requirements more dynamic during the economic cycle: i) migration between internal ratings impacting the probability of default;[1] ii) lower collateral values hitting the loss given default, where the former is usually considered to have a larger impact in determining lower capital ratios during economic downturn.[2] Due to the difficulty in raising new capital during economic recession, in order to keep the ratio between capital and risky loans above the minimum, banks should reduce the size of their lending activity, thus stressing firms' financial issues, that is to say the negative impact of the cycle too. The mechanism works in the reverse during a period of upward economic trend.

Nevertheless, bank capital requirements are not the only pro-cyclical problem. Though the international accounting standards are a step forward in pursuing higher levels of accounting transparency, according to some critics, these standards can make bank returns more volatile, and lending policies even more cyclical than the past. As highlighted above, international accounting standards only allow banks to book provisions for loan losses when they become due. Banks cannot set provisions aside for losses that they expect to have in the future. Consequently, expected losses will grow faster than loan loss reserves and banks will experience a deduction from capital.

Depending on what kind of losses capital requirements are designed to cover, bank provisioning policies can make a system of capital requirements more or less cyclical. If capital

[1] Banks using the standard approach are not immune to rating downgrades, but are considerably more insulated due to the fixed weighting of each bucket, whose width also allows for considerable increase in the probability of default before capital ratios are impacted (for example, corporate downgrades from AAA to AA has no effect on risk weighting).

[2] Some rules have been built in to dampen these effects: with regard to the former, banks must use a longer-term horizon for probability of default estimations, whereas, as to the latter, the loss given default must reflect downturn conditions where necessary.

requirements have to face the only unexpected loss, provisioning policies can reduce capital requirements' pro-cyclicality since banks would increase loan loss reserves by making more provisions during an economic expansion, taking advantage of good profit margins, while they would draw from these reserves, reducing provisions, when the credit loss amount gets higher. The mechanism that we have just described lies at the basis of the so called "dynamic" provisioning policies currently adopted in the Spanish banking system. When the loan is granted, the amount of loan loss provisions to be set aside is proportionate to the long-run expected loss of the different counterparties, thus producing flat ratios of provisions to customer loans through the economic cycle (Perez et al., 2006, Fernandez de Lis et al., 2000). This mechanism, which leaves very little room to managerial discretion, aims at determining a counter-cyclical behavior that automatically smoothes income over time. On the contrary, if capital requirements are designed to cover also the expected loss, pro-cyclicality stretches to the provisions as well.

Within the wider reform project of the Basel II Accord, a countercyclical buffer of common equity or other fully loss absorbing capital will be implemented, according to national circumstances, in order to grant a higher protection of the banking sector from periods of excess aggregate credit growth. For any given country, this buffer, which should vary within a range of 0% - 2.5%, will only be in effect when there is excess credit growth that is resulting in a system wide increase of risk.

3. Literature review and hypotheses development

3.1 Loan loss provisions and earnings management

The earnings management hypothesis assumes that banks' managers have incentive to smooth earnings[3], aimed at reducing the variability of the net profit over time. In particular, the hypothesis suggests that LLPs are deliberately understated to mitigate the adverse effects of other factors on earnings in case of poor performance. This implies that the manipulation of reported earnings aims to hide a bank's real economic results and to improve the perception of its riskiness for investors, regulators and supervisors.

Several studies examine the relationship between LLPs and earnings before taxes and provisions in the period before Basle I implementation, when LLPs were included in the Tier 1 capital. In that period income smoothing by poorly performing banks had a cost in terms of a reduction in primary regulatory capital. Ma (1998) and Collins et al. (1995), both find evidence that LLPs are used by banks for income smoothing. Greenwalt and Sinkey (1988) find that regional banks engaged in more aggressive income smoothing than money-centered banks. Bhat (1996) finds that banks that engaged in aggressive income smoothing were in poorer financial health relative to others. However, other studies find conflicting evidence for the same period: among others, Scheiner (1981), Wetmore and Brick (1994), and Beatty et al. (1995).

In the post-Basle I implementation, LLPs are not included in Tier 1 capital and can only make a limited contribution to Tier 2. This implies that the new capital adequacy regulation of Basle I removed the costs associated with earnings management, if compared to the previous regulatory set of rules. However, the evidence of a more aggressive earnings management in the post-Basle I period are confirmed for OECD countries (Ford and Weston, 2003), but not in the USA (Ahmed et al., 1999). In contrast with the traditional hypothesis, Bouvatier and Lepetit (2008) find evidence that banks reduce LLPs when earnings before taxes and provisions increase, and this

[3] Goel and Thakor (2003) distinguish between "real" and "artificial" earnings smoothing. The first one can change firm future cash flows, and affects the firm value. Examples can be changes in the timing of investments, promotional discounts, etc. The latter is achieved by taking advantage of the flexibility of the financial reporting system, which, to some extent, leaves the managers the discretion to decide the amount of some items of the financial statement.

strengthens the cyclicality in LLPs. Particularly, the authors emphasize the pro-cyclicality effects of LLPs, finding evidence that during periods of economic expansion credit risk is underestimated, banks tend to decrease non-discretionary LLPs and, as a consequence, are more willing to grant new loans. On the contrary, in case of economic slowdown, the non-discretionary component of LLPs tends to increase because of the deterioration of credit quality, so that banks have lower incentives to increase their credit supply.

Other studies emphasize that income smoothing incentive can derive from bank managers' will to adjust a bank's current performance to a firm-specific mean (Collins at al., 1995), or to the average performance of other benchmark-banks, as highlighted by Kanagaretnam et al. (2005). Bhat (1996) shows that income smoothing helps managers to reduce the bank stock price volatility, to stabilize over time managers' compensation and to improve the risk perception of a bank to regulators. From the perspective of using income smoothing to convey a signal of stability to investors, Beatty et al. (2002) find that publicly traded firms engage more in income smoothing because of the higher number of stakeholders. From the agency theory perspective (Jensen and Meckling, 1976; Fama, 1980), managers acting as agents for the bank owners are under more pressure to post higher returns. Hasan and Lozano-Vivas (2002) suggest that managers of unlisted institutions might have different goals and strategies relative to the managers of traded institutions because they face less direct monitoring and pressure. Nichols et al. (2009) finds that the demand for "conservatism" is greater among public banks than at private banks. Such a result suggests that publicly traded banks have higher incentives to put in place income smoothing practices in order to reduce earning variability and the firm risk perception by financial markets.

From the perspective of using income smoothing to improve the risk perception of a bank to regulators, Fonseca and Gonzales (2008) underline that the high leverage and the safety nets intended to avoid industry contagion in the event of a bank run give rise to the well known moral hazard problem of risk-shifting (among others, Greenbaum and Thakor, 1995; Berger et al. 1995). The greater the incentives for banks' managers to shift risk, the higher the opportunity to engage in earnings management to hide their risk-shifting. Therefore, the more efficient bank regulation and supervision proves to be in limiting bank risk, the fewer the incentives for bank managers to smooth bank earnings. Nevertheless, stricter limitations on bank activities may reduce the opportunity for smoothing earnings using other discretionary components of bank income as security gains and losses (Beatty et al., 1995; Shrieves and Dahl, 2003) and may create more incentives to use loan loss provisions.

To our knowledge none of the paper presented above investigated banks' income smoothing practice during adverse financial conditions, such as those experienced after the second half of 2007. Two of the main implications of the financial crisis are, on the one hand, the deterioration of the credit portfolio quality, which forces managers to increase non-discretionary loan loss provisions, and, on the other hand, a general reduction in banks' profitability. Both of them are expected to reduce the opportunity for a discretionary use of LLPs. On the contrary, some other factors could support the opposite evidence. The peculiar nature of the financial turmoil, originated in banks' balance sheets by a toxic assets contagion, did exacerbate the moral hazard problem mentioned above, and created further incentives for risk shifting and consequent income smoothing via LLPs. Furthermore, with regard to publicly traded banks, we expect them to be engaged even more aggressively in income smoothing because of their stronger interests in reporting more stable income numbers during bad market conditions.

Hence, relative to prior literature, which assumes a positive relationship between LLPs and earnings before taxes and provisions, and an even more positive relationship for listed banks, we propose two additional hypotheses to test:

H_1: The relation between LLPs and earnings before provisions and taxes will be significantly more positive in the period 2008-2010, relative to the period 2006-2007.

H_2: The relation between LLPs and earnings before provisions and taxes will be significantly more positive for listed banks in the period 2008-2010 relative to unlisted banks.

3.2 Loan loss provisions and capital management

As mentioned before, according to the Basle II set of rules, retained earnings are part of Tier 1 capital, implying that an increase in LLPs, via a reduction of retained earnings, has a negative effect. Therefore, low-capital banks could be less willing to make loan loss provisions. On the other hand, if banks have loan loss reserve below the threshold of the 1.25% of the risk-weighted asset, an increase in LLPs has a positive effect on the capital ratio because it raises Tier 2. If the increase in Tier 2 via LLPs is larger than the decrease in Tier 1, the relationship between capital and LLPs becomes positive. Hence, the direction of the relationship between LLPs and capital depends on which of the mentioned effects prevails.

In preceding literature, the discretionary use of LLPs for capital management is based on the idea that bank managers use LLPs to reduce expected regulatory costs associated with violating capital requirements. Studies that examine how banks used LLPs to improve capital ratio in the period before 1989 (prior to Basle I) show the evidence of an incentive to manipulate LLPs by inflating loan loss reserves when capital levels were close to violating minimum capital regulations (among others Moyer, 1990, Scholes et al., 1990 and Beatty et al., 1995). For the same period, in contrast with the evidence of a negative relationship between LLPs and capital ratio, Collins et al. (1995) find a positive influence of capital on LLPs, meaning that when bank capital is low, managers tend to decrease rather than increase loan loss provisions, showing that banks use write-offs more than LLPs to manage capital ratios.

Studies that examine the relationship between LLPs and capital after the implementation of Basle I show results that are consistent with the capital management hypothesis. With regard to the evidence referred to the US banking system, Kim and Kross (1998) find that low-capital banks tend to decrease LLPs in order to increase capital ratios, while banks with high capital ratios do not experience any relevant change in their provisioning policy. Ahmed at al. (1999) point out that LLPs are influenced not only by the expected quality of the loan portfolio, but also by manager's incentives to manage capital adequacy ratio. As to non-US markets, analysing a sample of Australian commercial banks, Anandarajan et al. (2007) find some evidence supporting the capital management hypothesis, like Bouvatier and Lepetit (2008) for their sample of European credit institutions.

Based on the above arguments, we expect that low-capital banks will have more incentives to engage aggressively in capital management, by discretionally reducing the LLPs, in the post-2007 period because the financial crisis significantly increases the risk of insolvency and thus the cost of violating capital requirements. As to the potential difference between publicly quoted and private banks, we expect the former group to be more sensitive to violation of capital requirements and then to engage in more capital management.

Hence, relative to preceding capital management literature, we propose the following additional hypotheses:

H_3: The relation between LLPs and total capital ratio will be significantly more positive for banks in the period 2008-2010, relative to the period 2006-2007.

H_4: The relation between LLPs and total capital ratio will be significantly more positive for listed banks in the period 2008-2010 relative to unlisted banks.

3.3 Loan loss provisions and supervisory stress testing

As mentioned before for the earnings management hypothesis, the relationship between LLPs and earnings before taxes and loan loss provisions could also be influenced by the efficiency and effectiveness of bank regulation and supervision in limiting bank risk. If supervisors have greater power to intervene to discipline managers and reduce their incentives to undertake risk, they will also reduce managers' incentives to use LLPs discretionally (Fonseca and Gonzales, 2008). In this regard, the supervision played a crucial role in the post-crisis period for both monitoring the effects of the crisis and reassure investors.

The EU-wide stress tests carried out by EBA in 2010 and 2011 can represent an example of supervisory intervention by banking authority to discipline managers. A supervisory "stress test" program requires a large number of banks (accounting for a significant share of the overall loans and deposits of a country's banking system) to assess the impact of an adverse macroeconomic scenario on their profitability and capitalisation levels (see Quagliariello, 2009, for a complete picture of macro- and micro- stress testing approaches in many European countries). Both 2010 and 2011 EU-wide stress tests involved 91 European banks and used as starting point for the scenario generation the financial data as of December 2009 and 2010, respectively. The main difference between the two exercises is that in 2010 they reported only aggregate results (CEBS, 2010), so that the outcome of the test has been kept confidential by the supervisors, while in 2011 the test (EBA, 2011), which was considerably more conservative than that used one year before, has led to the release of some 3,400 data points for each of the participating banks. In both cases banks subject to the stress tests are required to disclose more sensitive information. In this regard, Fonseca and Gonzales (2008) show that greater disclosure increases the reliability of bank financial statements by reducing income smoothing, though they mainly focus on accounting disclosure.

Some recent research papers have discussed stress tests and their impact on bank's stock price to investigate whether they succeed in their goal of evaluate banking resilience and reassure investors. Beltratti (2011) looks at the 2011 EU-wide stress tests and concludes that they provide relevant information to markets, (i.e., the capital shortfall associated with individual banks) because their results could have not be predicted by the investors on the based of previous available information. Cardinali and Nordmark (2011) analyse the 2010 and 2011 European stress tests by looking at cumulative abnormal returns for tested and un-tested banks. While the 2010 exercise appears to have been relatively uninformative to investors, the release of the 2011 methodology gave rise to negative CARs for stress-tested banks, while non-tested institutions remained roughly unaffected.

For the purpose of this study, we use the EBA stress tests as an ideal empirical experiment to test if stricter supervision and higher disclosure leads to a disciplining effect on bank managers' LLPs-related decisions, by reducing income smoothing. We expect that managers of stress-tested banks have more constraints in manipulating LLPs due to the higher disclosure that stress tests require. However, since the supervisory assessment has the main objective to test for banks' capital adequacy in adverse scenarios, we expect that the incentives in capital management for tested banks increase.

H_5: Within the post-crisis period, the relation between LLPs and earnings before taxes and loan loss provisions will be less positive for banks tested by the European Banking Authority relative to un-tested banks.

H_6: Within the post-crisis period, the relation between LLPs and total capital ratio will be more positive for banks tested by the European Banking Authority relative to un-tested banks.

4. Data and methodology

4.1 Sample selection

We collect bank balance-sheet and income statement data of European banks from Thomson's (Bureau van Dijk) Bankscope database, over the period 2006–2010. We follow a selection strategy based on three criteria: i) to grant business model homogeneity, we include commercial banks, cooperative and savings banks; ii) to avoid duplications, we consider financial information from consolidated balance sheets, if available, and from unconsolidated otherwise; iii) from a geographical perspective, we started considering banks from the same 21 European countries of origin of the credit institutions subject to the 2010 and 2011 stress tests[4] (which refer to 2009-2010 financial data). The list of tested banks is publicly available on the EBA website.

We exclude from our sample outlier banks whose data present extreme values. Since most of these institutions are located in Belgium and Ireland, the number of countries included in the final sample drop to 19. The bank data we use for the estimates are constrained by the availability of information on some variables, such as non-performing loans and regulatory capital ratios. Moreover, we excluded outliers by eliminating the extreme bank/year observations when a variable presents extreme values. Based on our selection strategy, the number of banks included in our sample ranges from a minimum of 274 in 2006 to a maximum of 709 in 2008, for a total of 2,930 observations.

4.2 Descriptive statistics

Table 1 summarizes the main descriptive statistics of the variables that we use into our empirical analysis: loan loss provisions to total assets (LLPTA), impaired loans to total assets (ILTA), operating income to total assets (OITA), total capital ratio (TCR), and the per-capita real gross domestic product growth rate[5] (GDPGR). Particularly, data are referred to the whole sample from 2006 to 2010, and are expressed in percentage points.

[Here table 1]

As expected, the trend of the variables over the 5-year horizon is hugely affected by the financial crisis broke out in the second half of 2007. The average value of the ratio of loan loss provisions to total assets has considerably increased, passing from circa 0.20% in 2006 to 0.51% in 2010, and peaking at 0.57% in 2009. With regard to the credit quality of our sample banks, as the financial crisis approaches, impaired loans increases: they were, on average, 1.72% of total assets in 2006, and rise to 4.90% at the end of 2010. As to banks' profitability, the average ratio of earnings before taxes and loan loss provisions (i.e. the operating income) to total assets stood at 3.29% in 2006, whereas it peaks at circa 3.6% in 2007 year-end, and drops to 2.95% in 2010. As to our banks' capital requirements, the average total capital ratio has noticeably changed over the sample period, by monotonically increasing from 12.95% in 2006 to 15.68% in 2010.

It is also worth noting that the average level of loan loss provisions to total assets differs across countries: for each year of the time horizon we take into account, Table 2 reports the mean value of LLPTA for the 19 countries of origin of our banks. In the last column, we show the overall average level of the ratio. Finland, Norway and Sweden in 2006, and Denmark in 2007, show a

[4] The first EU-stress tests were carried out in 2009 on 22 cross-border European banks. The EBA website do not report information on these banks. Therefore, we exclude these tests from the analysis. Furthermore, the disciplining effect we assume become more effective when banks expect to be included in the tests.

[5] Data about the gross domestic product of the countries are provided by International Monetary Fund website.

negative average level of loan loss provisions to total assets. This happens when banks are too prudential and overestimate the losses they would face in the future. From an accounting point of view, to explain the negative sign, we have to point out that loan loss provisions are made up of two components: the write-downs, which measure the actual write-offs a bank records, and the write-backs, which are used to restore the value of a loan after a previous write-down. So, when their credit portfolio performs better than it is supposed, write-backs exceed write-downs and the final amount of loan loss provisions is negative.

[Here table 2]

From a geographical perspective, our banks mainly belong to Italy, Norway, Spain, United Kingdom, France and Germany. Among these countries, the average LLPTA reaches its maximum for the United Kingdom, being equal to 0.56%, whereas Norway is characterized by the lowest level of the ratio, standing at 0.16%. Figure 1 shows the average ratio of loan loss provisions to total assets in the main countries for each year over the sample period.

[Here Figure 1]

Overall, the six countries show an upward trend till 2009, when the average LLPTA reaches its maximum value for UK, Germany and Spain. Particularly, UK banks recorded the worst performance since the average loan loss provisions peaked at 1.02% of the total assets. On the contrary, looking at the bottom of the figure, the average LLPTA of Norwegian banks in both in 2009 and 2010 was lower than in 2008 but yet higher than 2007.

Finally, it is interesting to notice that different types of banks are associated to different levels of loan loss provisioning. Table 3 reports the average level of the main variables (as percentage of total assets) for each year of the sample period.

[Here Table 3]

It is widely recognized that larger banks are less capitalized if compared to smaller credit institutions. With regard to our banks' capital requirements, data confirm this general evidence: commercial banks, whose size is on average larger than that of cooperative and savings banks, show a lower average total capital ratio. Particularly, the average ratio of total regulatory capital to risk-weighted assets is 12.94% for commercial banks, versus 16.38% and 14.44% for cooperative and savings banks, respectively. Bank capital endowment is expected to be correlated with bank risky assets. In fact, as to the portfolio credit quality, impaired loans are on average 5.2% of total assets at cooperative banks, whereas the credit quality of commercial and savings banks is much better: impaired loans equal to almost 2.90% and 2.07% of total assets, for commercial and savings banks, respectively. Though not very significant, this determines differences in terms of profitability between our banks: the average ratio of operating income to total assets for cooperative banks is 3.53%, higher than the values recorded by commercial and savings banks, that stand at 3.09% and 2.96%, respectively. From this broad picture, it seems that cooperative banks are more capitalized but also characterized by a riskier credit portfolio, which is also associated with a higher profitability. This preliminary evidence is the result of the business model that characterizes cooperative banks, relative to the rest of the sample. Particularly, in explaining it, we point out that cooperative banks are much more involved than other banks in traditional lending activity, which has been, during the time horizon we examine, riskier and more profitable than other businesses.

Figure 2 shows the average level of LLPTA (in percentage), for each year over the sample period, associated to each type of bank specialization.

[Here Figure 2]

Consistently with the evidence reported before of a higher-quality credit portfolio, the average LLPTA at savings banks is systematically lower than that of the rest of the sample. The average level of LLPTA at cooperative banks seems to follow a smoother trend if compared to other banks: it monotonically increases from 0.29% in 2006 to 0.52% in 2010. On the contrary, commercial banks' average LLPTA is much more volatile over time, moving from 0.22% in 2006 to 0.61% in 2010, and peaking at 0.73% in 2009. This evidence means that the financial crisis hit commercial banks harder than the rest of our sample credit institutions.

Table 4 shows the average of the main variables for the publicly listed and unlisted banks, respectively, each year from 2006 to 2010.

[Here Table 4]

Consistently with the findings of Nichols et al. (2009), the level of LLPTA associated to listed banks is higher than that associated to unlisted banks during the years 2008, 2009 and 2010, but the same cannot be said if we look at the preceding years. Moreover, the LLPTA associated to listed banks show a steep increase over time, passing from almost 0.19% in 2006 to 0.62% in 2010 and peaking at circa 0.79% in 2009. On the contrary, if we look at the unlisted banks, we notice that the LLPTA follows a smoother pattern over time, passing from 0.21% in 2006 to 0.49% in 2010 and peaking at almost 0.53% in 2009. If we contemporaneously consider that the average ILTA unlisted banks has increased, over the sample period, at a faster pace than that of unlisted banks, we can infer that the steep increase in LLPs is probably due to the discretionary component.

Moreover, publicly traded banks systematically show a lower total capital ratio if compared to the unlisted credit institutions: on average, the total capital ratio is 12.07% for listed banks and 15.34% for the unlisted ones.

As the financial crisis becomes more severe, major European banks have been subject to stress tests analyses to verify their capital adequacy in the case of economic shocks, and the resilience of the banking system to further deterioration of the economic background. If stress tests have had some impact on the income smoothing and capital management practices, we should find some differences between the banks subject to the supervisors' assessments (henceforth "stressed banks") and the other banks ("non-stressed banks"). Table 5 reports the average values of our main variables for both stressed and non-stressed banks, respectively, for each of the years included in our time horizon, while Figure 3 shows the average level of LLPTA over time for both groups of credit institutions.

[Here Table 5]
[Here figure 3]

In particular, we can notice that in the first three years of the sample period, the average value of LLPTA for stressed banks is lower than that associated to non-stressed banks, while the opposite occurs from 2009. This is probably due to the fact that most of stressed banks belong to the category of commercial credit institutions.

4.3 Methodology

The relevance of the methodology used to test for income smoothing and capital management hypotheses is proved by the contradictory evidence provided by prior studies. Since we consider the dynamic adjustment of loan loss provisions over time, following Bouvatier and Lepetit (2008), Fonseca and Gonzales (2008), Laeven and Majnoni (2003) and Pérez et al. (2006), we test for our hypotheses by applying the generalized method of moments (GMM) first differences estimators developed for dynamic models of panel data by Arellano and Bond (1991). By using this approach

we can address some relevant econometric issues, such as the presence of unobserved bank-specific effects, the autoregressive behavior of loan loss provision, and the potential endogeneity of some explanatory variables. Furthermore, the adoption of the GMM estimating procedure, is particularly suitable for unbalanced panel data.

The explanatory variables we use for testing income smoothing and capital management, are the ratio of operating income to total asset (OITA) and the total capital ratio (TCR), respectively. The former is supported if OITA coefficient has a positive sign, meaning that banks with earnings lower (higher) than their target value, tend to reduce (increase) loan loss provisions to stabilize them. As to the latter, since poorly capitalized banks are less willing to make loan loss provisions in order to increase their regulatory capital endowment, we expect a positive correlation between LLPTA and TCR.

Moreover, we add the impaired loans to total assets (ILTA) to control for the non-discretionary component of LLPs, and the per capita real gross domestic product growth rate (GDPGR) of the country where the bank is located to control for their potential cyclicality. The coefficients of ILTA and GDGPR are expected to be positive and negative, respectively. We do not need to introduce country dummy variables to control for potential "location effects" for two main reasons: first, the real gross domestic product growth rate is suitable to account for such effects, since this variable assumes the same value for all the banks located in the same country; second, due to the high number of dummy variables that we need because of the high number of countries included in the sample, we would fall into a "dummy trap". Furthermore, since loan loss provisioning increases as the financial crisis approaches, we include a dummy variable (CRISIS), taking the value of 1 for years 2008-2010, and 0 otherwise, and expected to be positively correlated with LLPTA. The interaction of such dummy variable with OITA and TCR detects whether banks have modified their income smoothing and capital management practices during the years after the financial crisis broke out. Based on the arguments developed in the previous section, we expect both CRISIS*OITA and CRISIS*TCR to be positively correlated with LLPTA.

In our model we test for differences in income smoothing and capital management between public and private banks by means of a dummy variable (LISTED), assuming the value of 1 if the bank is publicly traded, and 0 otherwise. We consider the interaction between such a dummy variable, OITA and TCR, respectively. Particularly, both LISTED*OITA and LISTED*TCR are expected to have a positive sign, entailing that listed banks are more willing to smooth earnings and manage capital relative to unlisted ones.

To investigate if stress tests have influenced banks' provisioning policies, we analyze the interaction between OITA and TCR and a dummy variable (STRESS) assuming the value of 1 if the bank is included in the list of banks subject to EBA stress tests, which is available at the EBA website, and zero otherwise. We expect STRESS*OITA and STRESS*TCR to be not statistically significant since the supervisory assessment accounts for the last two years. For the same reason, focusing on the post-crisis period, we suppose that STRESS*OITA*CRISIS and STRESS*TCR*CRISIS are significant and with negative and positive coefficients, respectively.

The model thus estimated is therefore:

$$
\begin{aligned}
LLPTA_{it} &= \beta_0 + \beta_1 LLPTA_{it-1} + \beta_2 OITA_{it} + \beta_3 TCR_{it} + \beta_4 ILTA_{it} + \beta_5 CRISIS_t + \beta_6 GDPGR_{it} + \\
&+ \beta_7 CRISIS_t * OITA_{it} + \beta_8 CRISIS_t * TCR_{it} + \beta_9 LISTED_i * OITA_{it} + \beta_{10} LISTED_i * TCR_{it} + \\
&+ \beta_{11} LISTED_i * OITA_{it} * CRISIS_t + \beta_{12} LISTED_i * TCR_{it} * CRISIS_t + \beta_{13} STRESS_i * OITA_{it} + \\
&+ \beta_{14} STRESS_i * TCR_{it} + \beta_{15} STRESS_i * OITA_{it} * CRISIS_t + \\
&+ \beta_{16} STRESS_i * TCR_{it} * CRISIS_t + v_i + \varepsilon_{it} \qquad (1)
\end{aligned}
$$

Where v_i are unobservable bank specific effects that are constant over time but vary across banks, while ε_{it} is the white noise error term. In estimating equation 1 by means of the Arellano and

Bond (1991) approach, only OITA, TCR and ILTA are considered endogenous. Therefore, to correct for the endogeneity of these variables, we add in the GMM estimations their corresponding one-lag values. On the contrary, GDPGR and the dummy variables are considered exogenous, as well as the interaction between variables. To test the overall validity of the instruments, we consider the Sargan test of over-identifying restrictions. It confirms the absence of correlation between the instruments and the error term in our model. Our estimation is robust to heteroskedasticity and autocorrelation.

Table 6 reports the Pearson correlation matrix amongst the main variables adopted in the regression analysis.

[Here table 6]

Overall, the correlation coefficients are all statistically significant at 1% level, except that between GDPGR and OITA, that is significant at 5% level. Secondly, we notice that LLPTA is positively correlated with ILTA, which is an expected result since banks set provisions aside to face losses from non-performing loans. LLPTA is also positively correlated with OITA, entailing that loan loss provisions change with income, thus confirming potential income smoothing practice. The correlation coefficient between LLPTA and and GDPGR is negative and significant, thus confirming the cyclical nature of provisioning policies. Finally, LLPTA is negatively correlated with TCR, thus seeming not to support the capital management hypothesis. We emphasize that, though statistically significant, the correlation between the regressors is generally low enough to exclude cases of multicollinearity.

5. Results

In Table 7 we report results using GMM first differences estimator. We refer to the first regression as the basic model since it does not include any interaction variable. In regressions 2-5 we sequentially include the interaction variables we have defined to test our hypotheses. Finally, all the explanatory variables and the interaction terms are included together in regression n. 6.

For all the regressions the coefficients on our control variables (ILTA, GDPGR, CRISIS) have the expected sign. Particularly, the coefficient on ILTA has a positive sign and is significant at the 1% level in all the regressions; the coefficient on GDP growth rate is negative, confirming the cyclicality of LLPs and the coefficient on the dummy CRISIS, is positive and significant in most of the regressions we run, meaning that our sample banks make more provisions during the financial crisis.

The results for first regression shows that the relation between loan loss provisions and earnings before taxes and provisions is positive and significant at 1% level, whereas we do not find evidence supporting the capital management hypothesis. The interaction of the dummy CRISIS with OITA reveals an unexpected negative coefficient, which is statistically significant at 10% and 5% in regression 2 and 6, respectively. These findings could be interpreted in the sense that the component of LLPs that managers can manipulate has lowered if compared to the non-discretionary one, this being consistent with the preliminary evidence reported in Table 1 of an increase in the ratio of impaired loans to total assets.

We find strong evidence that listed banks engage in less income smoothing than unlisted over the entire period, since the coefficients associated with LISTED*OITA are negative and significant at 1% in both regressions 3 and 6. However, if we focus on the post-crisis period we find that the sign of the coefficient LISTED*OITA*CRISIS turns positive and significant at 5% in regression 6. As to the capital management hypothesis, our results show that the coefficient of LISTED*TCR in regression 6 is positive and significant at the 5% level, entailing that listed banks in our sample use LLPs to manage their regulatory capital ratio. Interestingly, as seen for the earnings management,

we find an inversion in the sign of the relationship which becomes negative and significant at the 5% during the crisis. Overall, the evidence seems to suggest that, if compared to unlisted institutions, publicly traded banks are more engaged in income smoothing practices via LLPs during the post-crisis years, whereas the opposite occurs for the capital management. In fact, the coefficients of LISTED*OITA*CRISIS and LISTED*TCR*CRISIS are both significant at the 5% level in regression 6. This would support the idea that, during stressed market conditions, provisioning policies are mainly driven by the incentives to stabilize earnings. By doing that, bank managers would pursue the objective to increase capital endowment at minor costs by reducing their firms' risk perception.

Consistently with our hypotheses on the disciplining effect of EU-wide stress tests performed in 2010 and 2011, we find some evidence confirming that tested banks are less involved in income smoothing practices via loan loss provisions, even if the opposite occurs for the capital management: both STRESS*OITA*CRISIS and STRESS*TCR*CRISIS have coefficients with the expected signs and significant at 5% level in regression 6.

6. Conclusions

Based on a comprehensive sample of 709 European banks over the period 2006-2010, we test for capital management and income smoothing in order to add new evidence to previous literature results and to shed light on banks' behavior during stressed financial market conditions. Our overall evidence supports the hypothesis of income smoothing but not that of capital management. What is more interesting to us, by focusing on the years after the financial crisis broke out, we observe that, if compared to unlisted institutions, publicly traded banks are more engaged in income smoothing practices via loan loss provisions, whereas the opposite occurs for the capital management. This could entail that during stressed market conditions, their provisioning policies are mainly driven by the incentives to stabilize earnings over time, in order to increase capital endowment at minor costs. Assuming a disciplining effect of EU-wide stress tests, we find some evidence confirming that tested banks are less involved in income smoothing practices via loan loss provisions, whereas they are more willing to manage their regulatory capital. Further studies on the use of loan loss provisions can provide useful insights from the banking supervisors' perspective. From a prudential point of view, the evidence we report points out the need for a sound accounting framework because manipulation of loan loss provisions can prevent the financial data to reflect the actual economic status of European banks.

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Tables and figures

Table 1 – Descriptive Statistics
The table reports the mean and the standard deviation, in percentage, of loan loss provisions to total assets (LLPTA), impaired loans to total assets (ILTA), operating income to total assets (OITA), total capital ratio (TCR), and the per-capita real gross domestic product growth rate (GDPGR), for each year from 2006 to 2010.

Year		LLPTA	TCR	OITA	ILTA	GDPGR
2006	Mean	0.2054	1.7218	3.2924	12.9487	5.6085
	St. Dev.	0.2445	1.7641	1.2929	4.5401	1.2745
2007	Mean	0.2804	2.9645	3.5960	14.4919	4.4883
	St. Dev.	0.2527	2.6092	1.1585	5.7571	1.3540
2008	Mean	0.4443	3.4887	3.2510	14.5422	0.9268
	St. Dev.	0.3517	2.8767	1.2232	5.5455	1.5070
2009	Mean	0.5708	4.3791	3.1264	15.3401	-4.1099
	St. Dev.	0.5019	3.1922	0.9723	5.4074	1.5676
2010	Mean	0.5097	4.9031	2.9525	15.6808	1.8829
	St. Dev.	0.4886	3.4868	0.8880	5.4174	1.2502
Total	Mean	0.4312	3.7263	3.2348	14.8158	1.1263
	St. Dev.	0.4190	3.1090	1.1152	5.4960	3.5996

Table 2 – Average loan loss provision by country of origin
The table reports the mean value, in percentage, of loan loss provision to total asset (LLPTA) for the 19 countries of origin of the sample banks, for each year from 2006 to 2010. The last row and column report the overall average level of the ratio by year and by country respectively.

Country name	Average LLPTA by year					Total
	2006	2007	2008	2009	2010	
AUSTRIA	0.3436	0.2767	0.6585	1.0208	0.6808	0.6134
CYPRUS	0.4820	0.2146	0.2232	0.3273	0.4498	0.3249
DENMARK	0.0031	-0.0440	0.8073	1.4032	1.0989	0.6196
FINLAND	-0.0096	0.0090	0.0696	0.2554	0.1837	0.1016
FRANCE	0.0820	0.0843	0.2016	0.3061	0.2942	0.2042
GERMANY	0.1258	0.0507	0.2411	0.4676	0.1579	0.2200
GREECE	0.4134	0.4389	0.7926	1.2647	1.1039	0.8465
HUNGARY	0.7505	0.6474	1.0073	2.0517	2.2764	1.2977
ITALY	0.3644	0.3540	0.4707	0.5433	0.5432	0.4749
LUXEMBOURG	0.0759	0.1285	0.2920	0.3041	0.1312	0.1963
MALTA	0.0015	0.0131	0.1424	0.0747	0.1094	0.0682
NETHERLANDS	0.0500	0.0427	0.2804	0.4308	0.3058	0.2405
NORWAY	-0.0058	0.0289	0.2673	0.2576	0.1869	0.1635
POLAND	0.0237	0.0908	0.3395	0.8551	0.6905	0.4315
PORTUGAL	0.2764	0.2978	0.4441	0.6558	0.5039	0.4383
SLOVENIA	0.4801	0.3098	0.3812	0.8588	1.0847	0.6331
SPAIN	0.2775	0.3790	0.5667	0.7642	0.5967	0.5119
SWEDEN	-0.0295	0.0433	0.2502	0.3794	0.0946	0.1678
UNITED KINGDOM	0.2276	0.2452	0.5286	1.0211	0.6323	0.5569
TOT	0.2054	0.2804	0.4443	0.5708	0.5097	0.4312

Table 3 – Descriptive statistics by business model
The table reports the average level, in percentage, of loan loss provisions to total assets (LLPTA), impaired loans to total assets (ILTA), operating income to total assets (OITA), total capital ratio (TCR), and the number of banks, for each year from 2006 to 2010, distinguishing between commercial banks, cooperative banks and saving banks. The last row and column report the overall average level of the ratio by year and by country respectively.

Specialization		Year						Total
		2006	2007	2008	2009	2010		
Commercial Banks	LLPTA	0.2235	0.2284	0.4595	0.7285	0.5920		0.4627
	TCR	12.0644	11.6545	12.2820	13.7711	14.3458		12.8642
	OITA	3.3386	3.1766	2.7836	2.9570	2.8722		3.0034
	ILTA	1.8612	1.7615	2.3157	3.5845	3.9917		2.7496
	# of Banks	147	188	215	208	190		948
Cooperative Bank	LLPTA	0.2941	0.3419	0.4545	0.5076	0.5229		0.4551
	TCR	14.1943	16.6605	16.1604	16.4606	16.4345		16.3750
	OITA	3.5305	4.0188	3.7298	3.3126	3.0637		3.5279
	ILTA	2.6492	4.3185	4.8843	5.6018	6.2313		5.2092
	# of Banks	28	306	347	344	315		1,340
Savings Bank	LLPTA	0.1534	0.2103	0.3982	0.4952	0.3458		0.3349
	TCR	13.9093	13.4830	14.0283	14.9353	15.8148		14.4434
	OITA	3.1565	3.2045	2.8043	2.9290	2.7890		2.9645
	ILTA	1.2524	1.5058	1.9098	2.6304	2.8768		2.0734
	# of Banks	99	129	147	146	121		642
Total	LLPTA	0.2054	0.2804	0.4443	0.5708	0.5097		0.4312
	TCR	12.9487	14.4919	14.5422	15.3401	15.6808		14.8158
	OITA	3.2924	3.5960	3.2510	3.1264	2.9525		3.2348
	ILTA	1.7218	2.9645	3.4887	4.3791	4.9031		3.7263
	# of Banks	274	623	709	698	626		2,930

Table 4 - Summary statistics by corporate ownership
The table reports the average level, in percentage, of loan loss provisions to total assets (LLPTA), impaired loans to total assets (ILTA), operating income to total assets (OITA), total capital ratio (TCR), and the number of banks, for each year from 2006 to 2010, distinguishing between publicly traded banks and private banks. The last row and column report the overall average level of the ratio by year and by country respectively.

Corporate ownership		Year						Total
		2006	2007	2008	2009	2010		
Private banks	LLPTA	0.212	0.293	0.439	0.534	0.489		0.424
	TCR	13.487	15.053	15.112	15.751	16.112		15.345
	OITA	3.255	3.652	3.318	3.129	2.949		3.259
	ILTA	1.625	3.167	3.684	4.518	5.079		3.918
	# of Banks	190	529	608	598	531		2456
Publicly traded banks	LLPTA	0.191	0.208	0.476	0.789	0.624		0.468
	TCR	11.732	11.333	11.110	12.883	13.271		12.072
	OITA	3.377	3.284	2.851	3.111	2.974		3.109
	ILTA	1.941	1.825	2.310	3.550	3.923		2.733
	# of Banks	84	94	101	100	95		474
Total	LLPTA	0.205	0.280	0.444	0.571	0.510		0.431
	TCR	12.949	14.492	14.542	15.340	15.681		14.816
	OITA	3.292	3.596	3.251	3.126	2.952		3.235
	ILTA	1.722	2.964	3.489	4.379	4.903		3.726
	# of Banks	274	623	709	698	626		2,930

Table 5 - Descriptive statistics for banks subject to the EBA stress tests
The table reports the average level, in percentage, of loan loss provisions to total assets (LLPTA), impaired loans to total assets (ILTA), operating income to total assets (OITA), total capital ratio (TCR), and the number of banks, for each year from 2006 to 2010, distinguishing between banks that in 2010 were subject to the EBA stress tests ("Tested") and banks that were not ("Untested"). The last row and column report the overall average level of the ratio by year and by country respectively.

Status	Stat.	Year						Total
		2006	2007	2008	2009	2010		
Untested	LLPTA	0.210	0.293	0.450	0.547	0.504		0.431
	TCR	13.239	14.954	14.975	15.665	15.944		15.200
	OITA	3.461	3.743	3.384	3.213	3.031		3.350
	ILTA	1.848	3.216	3.704	4.570	5.114		3.956
	# of Banks	213	546	626	615	547		2547
Tested	LLPTA	0.188	0.190	0.405	0.747	0.549		0.431
	TCR	11.934	11.219	11.276	12.931	13.861		12.261
	OITA	2.703	2.557	2.251	2.482	2.405		2.466
	ILTA	1.282	1.184	1.865	2.965	3.444		2.199
	# of Banks	61	77	83	83	79		383
Total	LLPTA	0.205	0.280	0.444	0.571	0.510		0.431
	TCR	12.949	14.492	14.542	15.340	15.681		14.816
	OITA	3.292	3.596	3.251	3.126	2.952		3.235
	ILTA	1.722	2.964	3.489	4.379	4.903		3.726
	# of Banks	274	623	709	698	626		2,930

Table 6 – Pairwise correlation coefficients
The table reports the pairwise Pearson correlation coefficients of loan loss provisions to total assets (LLPTA), impaired loans to total assets (ILTA), operating income to total assets (OITA), total capital ratio (TCR), and of the per-capita real gross domestic product growth rate (GDPGR).

	LLPTA	ILTA	OITA	TCR	GDPGR
LLPTA	1.0000				
ILTA	0.5124***	1.0000			
OITA	0.2308***	0.3127***	1.0000		
TCR	-0.0924***	0.0816***	0.1219***	1.0000	
GDPGR	-0.2688***	-0.2490***	0.0394**	-0.1138***	1.0000
Note: ***, ** significance level of 1% and 5% respectively					

Table 7 – Regression results

Regressions are estimated using Arellano and Bond (1991) GMM first difference estimator for panel data with lagged dependent variables. The dependent variable is loan loss provisions to total assets (LLPTA). As explanatory variables we include one lag of the dependent variable (LLPTA(-1)), impaired loans to total assets (ILTA), operating income to total assets (OITA), total capital ratio (TCR), the per-capita real gross domestic product growth rate (GDPGR). We include also the three following dummy variables: LISTED, assuming the value of 1 if the bank is publicly traded and 0 otherwise, CRISIS, taking the value of 1 for years 2008-2010 and 0 otherwise, and STRESS, taking the value of 1 for banks subject to the EBA stress tests and 0 otherwise. Regressions are estimated for 2006-2010. Standard deviation coefficients are between parentheses. ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

LLPTA	*Predicted sign*	(1)	(2)	(3)	(4)	(5)	(6)
constant		-0.0047 (0.0061)	-0.0157 (0.0127)	-0.0054 (0.0061)	-0.0047 (0.0063)	-0.0017 (0.0062)	-0.0282 (0.0179)
LLPTA(-1)	+	0.0295 (0.1500)	-0.1863 (0.1641)	-0.0418 (0.1400)	0.0224 (0.1614)	0.0779 (0.1374)	-0.2098 (0.1734)
OITA	+	0.2317*** (0.0775)	0.3906** (0.1567)	0.2475*** (0.0820)	0.2149*** (0.0799)	0.2686*** (0.0895)	0.7048*** (0.2603)
TCR	+	-0.0307 (0.0301)	-0.0075 (0.0678)	-0.0162 (0.0370)	-0.0269 (0.0390)	-0.0104 (0.0366)	0.0623 (0.1055)
ILTA	+	0.0252*** (0.0470)	0.2518*** (0.0512)	0.2143*** (0.0471)	0.2384*** (0.0458)	0.2021*** (0.0436)	0.1994*** (0.0473)
CRISIS	+	0.0013*** (0.0003)	0.0061 (0.0081)	0.0013*** (0.0003)	0.0014*** (0.0003)	0.0012*** (0.0003)	0.0153* (0.0089)
GDPGR	-	-0.0048 (0.0041)	-0.0059 (0.0040)	-0.0066* (0.0036)	-0.0051 (0.0041)	-0.0051 (0.0037)	-0.0088** (0.0035)
CRISIS*OITA	+		-0.1599* (0.0895)				-0.4218** (0.1745)
CRISIS*TCR	+		0.0024 (0.0491)				-0.0010 (0.0421)
LISTED*OITA	+			-0.3614*** (0.1203)			-0.4414*** (0.1530)
LISTED*TCR	+			0.0353 (0.0371)			0.0599** (0.0294)
LISTED*OITA*CRISIS	+			0.0467 (0.0306)			0.1989** (0.0919)
LISTED*TCR*CRISIS	+			-0.0165* (0.0098)			-0.0609** (0.0276)
STRESS*OITA	+/-				-0.0658 (0.1189)		0.1394 (0.1205)
STRESS*TCR	+/-				0.0004 (0.0003)		0.0018 (0.0158)
STRESS*OITA*CRISIS	-				0.0358 (0.0312)		-0.1857** (0.0872)
STRESS*TCR*CRISIS	+				-0.0116 (0.0079)		0.0561** (0.0277)
J-stat (p-value)		10.6856 (0.2202)	7.3916 (0.4950)	10.9466 (0.2047)	11.7529 (0.1626)	11.8464 (0.1582)	6.8541 (0.5821)
# Observations		1513	1513	1513	1513	1513	1513
# Banks		703	703	703	703	703	703

Figure 1 – Average LLPTA by country of origin from 2006 to 2010

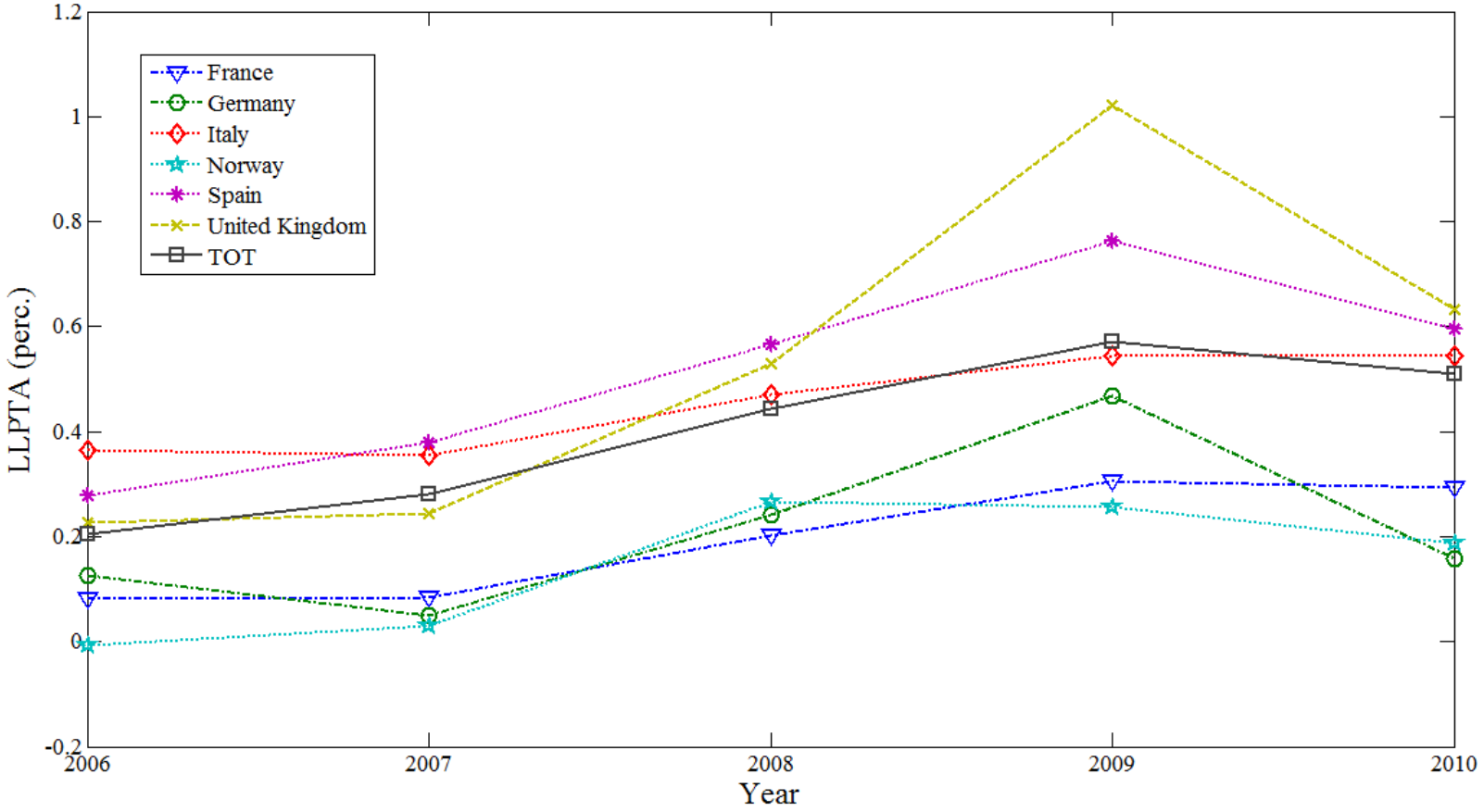

Figure 2 – Average LLPTA by business model from 2006 to 2010

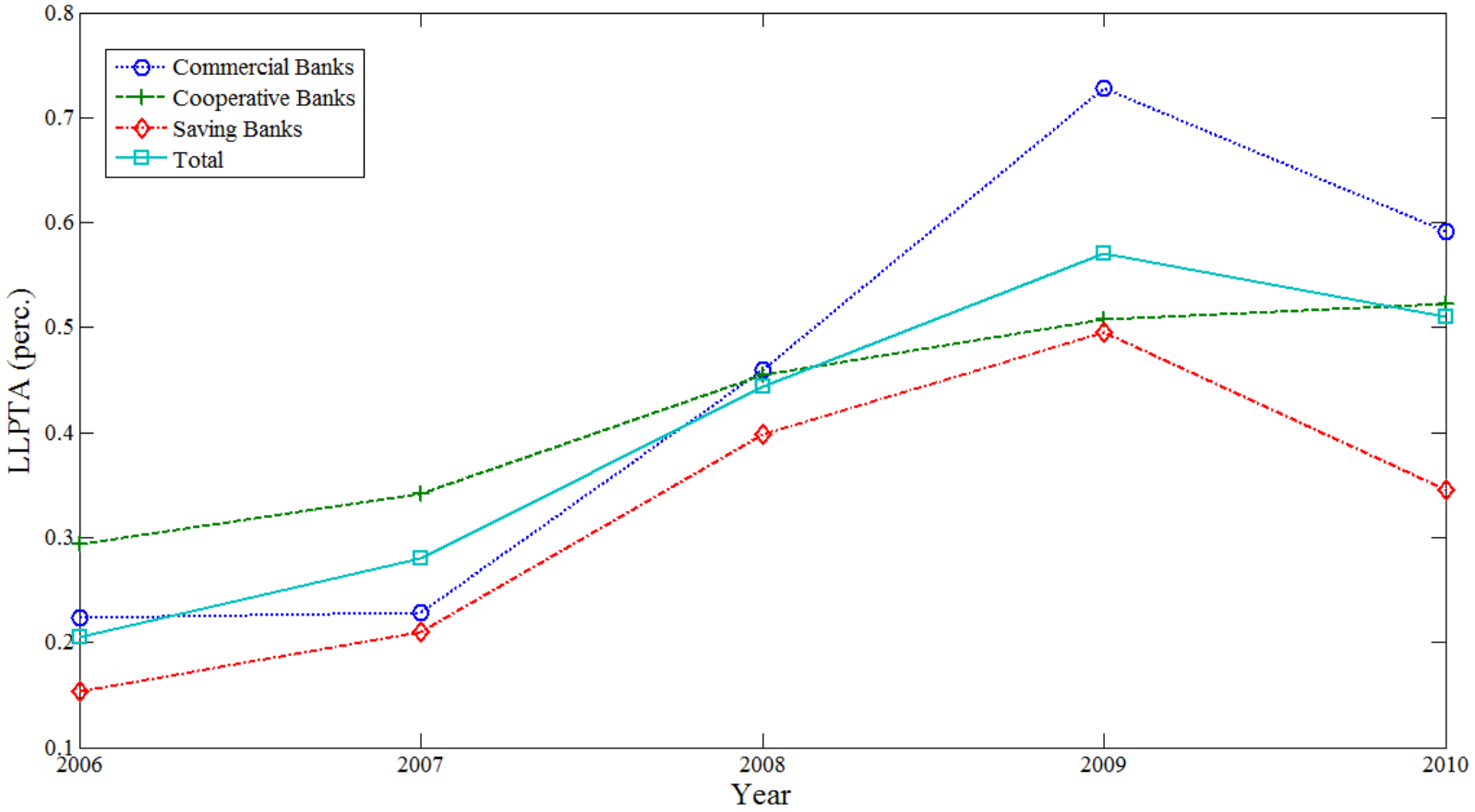

Figure 3 – Average LLPTA of "tested" and "untested" banks from 2006 to 2010