Loan loss provisioning behavior, income smoothing and the role of banks' ownership structure

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Abstract

We empirically examine whether the way a bank might use loan loss provisions to smooth its income, potentially in order to obscure its risk taking, is influenced by its ownership structure. Using a panel of European commercial banks, we find evidence of such behavior for banks with a high level of ownership concentration. This behavior is less pronounced in countries with stronger supervisory regimes, but independent of the type of the majority shareholder and the level of shareholder protection. Banks with a low level of ownership concentration are found not to display such discretionary income smoothing behavior, except in countries with the weakest supervisory regimes.

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1 Introduction

Banks may be able to conceal their risk taking, at least partly, from both regulators and (outside) investors by engaging in earnings management. A certain degree of latitude in managing their earnings can arise through the element of judgement managers can exercise in the determination of loan loss provisions, which require an assessment of expected loan losses. This assessment of expected loan losses may naturally involve a significant element of subjectivity. Therefore, banks may have the ability to also pursue additional management objectives in the process, such as smoothing their income by exaggerating loan loss provisions when income is high, and understating them when income is low. The ability of banks to smooth their income could be stronger than for other types of firms as "banks are black boxes: money goes in, and money goes out, but the risks taken in the process of intermediation are hard to observe from outside the bank" (Morgan 2002). If the sole aim of such income smoothing through the use of discretionary loan loss provisions is to conceal a bank's risk taking, it would be viewed as undesirable by both bank regulators and accounting standard setters alike.

As stressed in the corporate finance literature more generally, a bank's risk taking decisions may result from the interactions of different stakeholders. Some of these stakeholders can directly participate in managerial decisions (insiders such as managers or large shareholders), while others are not actively involved in such decision making (outsiders such as minority shareholders or employees). From a risk-perspective, shareholders are generally viewed as more risk-loving than managers. In the case of banks, the risk appetite of shareholders compared to managers and debt holders could be even stronger due to the existence of deposit insurance (Merton 1977) and the convex payoffs faced by shareholders more generally (John et al. 1991). Banks with more powerful shareholders could therefore be characterized by higher levels of bank risk, a prediction confirmed empirically by Laeven and Levine (2009) and Haw et al. (2010). When dominant shareholders impose higher risk preference on managers in this way, the incentive to conceal such higher risk taking through income smoothing, from outsiders such as debt holders or regulators, might become even stronger than for banks with a more dispersed ownership structure, where managers' risk preference could prevail. Given the importance of these issues for investors, regulators and accounting standard setters alike, it is surprising that there is to date no detailed study for the banking industry that examines if banks' ownership structure, such as whether or not there are controlling insiders, influences the extent to which banks use discretionary loan loss provisions to smooth their income. This paper aims to fill this research gap.

Whereas there is a fairly large empirical literature that examines, with rather mixed results, whether banks do use loan loss provisions (LLP) to smooth their income,[1] there are few papers that examine the driving factors behind banks' incentives to engage in such income smoothing. Fonseca and Gonzalez (2008) examine a range of variables reflecting institutional, regulatory and financial structure for a sample of 40 countries; they find that income smoothing decreases with the strength of investor protection, the extent of accounting disclosure, bank activity restrictions and official and private supervision, while it increases with the degree of market orientation and development of financial systems. Shen and Chih (2005) similarly find, using a sample of 48 countries, that stronger protection of investors and greater transparency in accounting disclosure can reduce banks' incentives to manage earnings. Cornett et al. (2009), on the other hand, examine the impact of several corporate governance mechanisms on the earnings management of large US bank holding companies, showing that CEO pay-for-perfomance induces it, whereas board independence constrains it.

[1]See e.g. Greenawalt and Sinkey (1988), Wahlen (1994), Beatty et al. (1995), Beaver and Engel (1996), Ahmed et al. (1999), Cavallo and Majnoni (2001), Kanagaretnam et al. (2003), Laeven and Majnoni (2003), Hasan and Wall (2004), Bikker and Metzemakers (2005), Liu and Ryan (2006), Anandarajan et al. (2007), Fonseca and Gonzalez (2008) and Bouvatier and Lepetit (2010).

The focus of our paper is to empirically examine the role that a bank's ownership structure plays in the way it may use LLP to smooth its income, an important aspect that has not been previously studied. For this purpose, we construct a novel database on European commercial banks for the period 2004-2009 with detailed information on banks' individual ownership structure. Using an original clustering approach, we obtain a refined differentiation between banks that have a concentrated ownership structure with a small number of shareholders able to exert control and thus influence risk taking behavior, and banks with a more dispersed ownership structure characterized mostly by less powerful, smaller shareholders. If bank insiders have incentives to conceal any greater risk taking from other investors and regulators, then one could expect banks with more concentrated ownership to more strongly use LLP to smooth their income to reduce the likelihood of detection of such risk taking. We further investigate whether banks with shareholders that hold controlling stakes exhibit a different relationship between LLP and bank earnings depending on the type of shareholder (such as industrial firm, institutional investor, family or bank), as different shareholder types are known to have different propensities to accept risk (Barry et al. 2011). Building on Fonseca and Gonzalez (2008), we lastly examine whether the regulatory environment, i.e. strength of supervisory regime and degree of shareholder protection, has an impact on the way banks potential income smoothing behavior using LLP is affected by the bank's ownership structure.

We find for our sample of European commercial banks that whether or not a bank practices income smoothing through LLP, potentially in order to obscure its risk taking, does indeed depend on its degree of ownership concentration. For banks with a high level of ownership concentration, we find evidence of income smoothing through the use of LLP and higher levels of bank risk. This income smoothing behavior is independent of the type of the majority shareholder and the level of shareholder protection, but significantly less pronounced in countries with stronger supervisory regimes. Banks with low levels of ownership concentration are found not to display such discretionary income smoothing behavior, except in countries with the weakest supervisory regimes. The exploitation of such discretionary loan loss provisioning practices by banks in countries with weaker supervisory regimes would be considered undesirable by outside investors, regulators and accounting standard setters alike, as it increases banks' opacity.

Section 2 now presents our research hypotheses; Section 3 describes our data and the ownership characterization used; Section 4 examines the relationship between ownership concentration and bank risk; Section 5 presents and discusses our results regarding the impact of ownership structure on income smoothing; Section 6 contains several robustness checks; and Section 7 concludes the paper.

2 Research hypotheses

Several seminal theoretical papers argue that income smoothing might be optimal from a manager's perspective. Lambert (1984) and Dye (1988) show that risk-averse managers without access to capital markets have an incentive to smooth the firm's reported income, as a by-product to the optimal solution to an agency problem and/or in order to influence investor perception of the firm's risk and thus value. Trueman and Titman (1988) generalize the latter result, in a market setting that relaxes the assumptions of risk aversion and restricted capital market access, showing that income smoothing might allow the manager to "reduce the estimate of various claimants of the firm about the volatility of its underlying earnings process, which [...] lowers their assessment of the probability of bankruptcy", leading to a possible positive impact on the firm's market value.

Such incentives to smooth income to conceal risk taking behavior can apply to firm insiders more generally, i.e. not just managers but also shareholders. From a risk-perspective, managers are generally viewed as more risk-averse than shareholders.[2] The existence of deposit insurance further reinforces the risk preference of shareholders compared to managers and debt holders in the case of banks (Merton 1977). Banks that have more powerful shareholders could therefore display higher levels of bank risk, as confirmed empirically by Laeven and Levine (2009) and Haw et al. (2010). Such banks might then have increased incentives to conceal such higher risk taking by smoothing their income, as compared to banks with a more dispersed ownership structure, where managers' risk preference could prevail. For banks, such concealing of risk taking could be facilitated by the fact that the financial structure of their assets combined with high leverage makes them inherently more opaque than other firms (Morgan 2002). This makes such potential income smoothing more difficult to detect by outsiders, in particular as banks can smooth their income through subjective judgements in the determination of loan loss provisions, which require an assessment of expected loan losses. This leads us to empirically examine the following two connected hypotheses:

Hypothesis 1 *Banks with a more concentrated ownership structure display higher bank risk.*

Hypothesis 2 *Banks with a more concentrated ownership structure display a higher degree of income smoothing through loan loss provisions.*

The risk appetite of controlling shareholders may not be the same for different types of shareholder. This could be driven by the varying degrees of diversification they can achieve (Shleifer and Vishny 1997), such as for institutional investors vs individuals/families, or by reputational effects, such as for banks. Barry et al. (2011) find that banks with higher proportions of

[2] Managers' risk appetite may be damped by career concerns (Amihud and Lev 1981), their non-diversifiable human capital (Jensen and Meckling 1976) and private benefits of control (Demsetz and Lehn 1985, Kane 1985).

shares held by institutional investors or industrial firms display higher levels of risk, whereas the opposite applies for shareholdings by individuals/families and banks. These differing risk preferences could then affect bank's incentives to conceal such risk taking through the discretionary use of income smoothing, leading us to investigate

Hypothesis 3 *The type of a bank's controlling shareholder has an impact on its degree of income smoothing through loan loss provisions.*

The degree to which dominant shareholders can impose their risk preferences on managers may depend on the regulatory environment (John et al. 2000, Laeven and Levine 2009). Dominant shareholders of banks in countries with stronger supervisory regimes may have less scope to push the bank to take on additional risk, leading to a reduced incentive to conceal such risk taking through income smoothing. Fonseca and Gonzalez (2008) indeed find that banks display less income smoothing in countries with higher degrees of supervision. Their results are thus not supportive of a plausible alternative argument one could make: as stronger supervisory regimes may increase the probability of on-site inspections for a given level of earnings volatility, banks might actually have an increased incentive to engage in more income smoothing behavior to counteract this.

Another aspect of the regulatory environment that could have an impact on banks' potential income smoothing behavior is the level of shareholder protection. Leuz et al. (2003) argue that earnings management should be more prominent in countries with lower levels of shareholder protection, as insiders can then more easily derive private control benefits and thus have stronger incentives to obfuscate firm performance; they confirm this for a large sample of non-financial firms. In line with this prediction, Fonseca and Gonzalez (2008) analogously find that banks perform less income smoothing through loan loss provisions in countries where shareholder protection is stronger. Shen and Chih (2005), on the other hand, find that banks engage in more earnings management, albeit measured as accruals at an aggregate level, in countries with a stronger level of shareholder protection. Our analysis goes further by considering the role of ownership concentration in this context, as driven by the different risk preferences implied. When the level of shareholder protection is high, even minority shareholders can influence managers to take on higher risk. This effect could be even larger as minority shareholders might be better diversified than shareholders with larger holdings, making them willing to accept even more risk (Shleifer and Vishny 1997). This could then lead to banks with lower degrees of ownership concentration also resorting to income smoothing through loan loss provisions in order to obfuscate such risk taking. The income smoothing behavior of banks with dominant shareholders, by the same risk-based argument, should however not be affected by the degree of shareholder protection as they are already in a strong position to impose their risk preferences. This leads us to consider

Hypothesis 4 *A bank's income smoothing behavior using loan loss provisions depends on its degree of ownership concentration and is affected by the strength of the supervisory regime and/or the level of shareholder protection.*

We then proceed to examine these hypotheses using a panel of European commercial banks, with a substantial degree of heterogeneity in ownership structures, as described in the following section.

3 Data and ownership characterization

3.1 Data description

Our study focusses on European commercial banks, for which we extracted both (unconsolidated) bank financial statement data and banks' individual ownership information from BvD BankScope, which provides detailed information on the latter only starting 2004. Our data set therefore covers the period 2004-2009, and includes the following European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and United Kingdom. We construct our panel data set using annual releases of BankScope to capture the time-varying dimension of banks' ownership structure. BankScope provides unconsolidated financial statement data for 1674 European commercial banks for at least some of the period considered. Limiting our sample to banks that provide information on loan loss provisions, and after some data cleaning, we are left with a final sample of 925 commercial banks; Table 1 gives a breakdown of these by country. Table 2 presents some general descriptive statistics for both our data set and the corresponding full sample of banks available under BankScope. The median data coverage of our sample, as measured in percent of total assets in the wider BankScope one, lies at almost 93%, with very similar bank activity characteristics between the two.[3]

[Insert Tables 1 and 2]

3.2 Ownership measures

We follow several approaches in classifying banks by the degree of concentration in their ownership structure and the type of their dominant shareholders. We firstly use a simple criterion reflecting whether or not a bank has a majority shareholder (with equity holding[4] larger than 50%): the dummy variable $NoMAJ$ takes the value of one if there is no such majority shareholder, representing banks with a more dispersed ownership structure.

We then use a more sophisticated clustering approach based on hierarchical agglomerative clustering (HAC) to account more accurately for several

[3] Note that only few banks in Ireland, the Netherlands and the United Kingdom provide information on loan loss provisions.

[4] We consider direct holdings only.

dimensions of concentration/dispersion in banks' ownership structures (Husson et al. 2010, Husson et al. 2011; see Appendix A for details). We consider three ownership measures in the construction of clusters of banks with "similar" ownership characteristics: the percentage held by the largest shareholder (*Share1*), the percentage held by the second-largest shareholder (*Share2*) and a Herfindahl index computed for a bank's ownership distribution (*HERF*). The first two measures give meaningful information on the shape of the ownership concentration, whereas the Herfindahl index captures the distribution of ownership for all shareholders. The HAC used relies on the Euclidean distance to compute similarity between two banks, and uses Ward's method as the linkage rule to determine the distance between clusters made up of several banks. We end up with three distinct bank clusters; banks can change cluster over time if their ownership structure changes accordingly. Table 2 gives some general descriptive statistics for banks in these clusters, Table 3 reports statistics for the ownership measures for each of the three clusters, and Figure 1 shows the position of each bank inside their respective cluster.

Banks in Cluster 1 (low ownership concentration) are characterized by a relatively dispersed ownership structure. These banks have mostly a large number of shareholders that do not hold controlling shares (i.e. less than 50% of the total shares), or, very rarely, one controlling shareholder with a substantial number of shareholders that hold a small share each. Banks in Cluster 2 (medium ownership concentration) have a more concentrated ownership structure with mainly two shareholders that together hold a controlling stake, and some smaller shareholders. Banks in Cluster 3 (high ownership concentration) present a very strong degree of ownership concentration with one controlling shareholder that holds on average 97.49% of the share (with a minimum of 69.80%). Amongst the 925 banks in our sample, 153 belong consistently to Cluster 1, 83 to Cluster 2 and 498 to Cluster 3, whereas 191 change between clusters during the sample period.[5]

[5] Of the 925 banks in our sample, only 98 are listed: of these, 50 belong consistently to

Following the BankScope classification, we differentiate between the following shareholder types: banks, institutional investors, industrial firms, individuals and families, managers, state, public, foundations, and unnamed shareholders. From Table 4 we observe that European commercial banks' dominant shareholders fall predominantly into the categories of banks, institutional investors, industrial firms, and to a lesser degree, individuals and families. Dominant shareholdings by managers and the government, on the other hand, are much less common in our sample.

[Insert Tables 3 and 4, and Figure 1]

4 Ownership concentration and bank risk

In order to test our Hypothesis 1, that banks with more concentrated ownership structures display higher bank risk, we consider the following empirical cross-section specifications

$$\begin{aligned} Log(RISK_{i,j}) = \alpha_0 + \alpha_1 NoMAJ_{i,j} + \alpha_2 Change1_{i,j} + \alpha_3 L_{i,j} \\ + \alpha_4 NONINT_{i,j} + \alpha_5 Log(TA_{i,j}) + \alpha_6 \Delta Log(TA_{i,j}) \\ + \alpha_7 X_{i,j} + \alpha_j + \epsilon_{i,j} \end{aligned} \quad (1)$$

$$\begin{aligned} Log(RISK_{i,j}) = \alpha_0 + \alpha_1 C1_{i,j} + \alpha_2 C2_{i,j} + \alpha_3 Change2_{i,j} + \alpha_4 L_{i,j} \\ + \alpha_5 NONINT_{i,j} + \alpha_6 Log(TA_{i,j}) + \alpha_7 \Delta Log(TA_{i,j}) \\ + \alpha_8 X_{i,j} + \alpha_j + \epsilon_{i,j} \end{aligned} \quad (2)$$

where the subscripts refer to bank i in country j. We consider several measures of bank risk computed from accounting data for the dependent vari-

Cluster 1, 12 to Cluster 2 and 5 to Cluster 3, with 31 moving between clusters during the sample period.

ables $RISK_{i,j}$.[6] To reflect bank activity risk, we use the standard deviations of adjusted return on equity ($SDAdjROE_{i,j}$) and adjusted return on assets ($SDAdjROA_{i,j}$), with adjusted return on equity $AdjROE_{i,j} = ER_{i,j}/E_{i,j}$ and adjusted return on assets $AdjROA_{i,j} = ER_{i,j}/TA_{i,j}$, where $ER_{i,j}$ is earnings before taxes and loan loss provisions, $E_{i,j}$ is total equity and $TA_{i,j}$ is total assets. We adjust our activity risk measures in this fashion to avoid a potential risk measurement bias introduced for banks that use loan loss provisions to smooth their income; this bias could occur when standard return on equity/assets measures are used that rely on net income (i.e. earnings after taxes and loan loss provisions) instead. To proxy bank insolvency risk, we analogously use two adjusted Z-score measures,[7] defined as $AdjZ1_{i,j} = \left(AdjROA_{i,j} + EQ_{i,j}\right)/SDAdjROA_{i,j}$ and $AdjZ2_{i,j} = \left(100 + AdjROE_{i,j}\right)/SDAdjROE_{i,j}$, where $AdjROA_{i,j}$ and $AdjROE_{i,j}$ are average adjusted return on assets and return on equity, and $EQ_{i,j}$ is the average equity to total assets ratio (all in percentages). As all four of our bank risk measures are highly skewed, we use their natural logarithms in our specifications.

In Equation (1) the degree of ownership concentration is represented by the variable $NoMAJ_{i,j}$, a dummy variable which equals 1 if the bank does not have a majority owner, consistently over the sample period, and 0 otherwise. In Equation (2), we alternatively use the more refined cluster classification of ownership concentration by introducing the variables $Ck_{i,j}$, dummy variables which equal 1 if the bank is in cluster k, again consistently over the sample period, and 0 otherwise. Banks whose ownership concentration changes along these dimensions over the sample period are represented by the dummy variables $Change1_{i,j}$ and $Change2_{i,j}$ in Equations (1) and (2), respectively. As banks with higher ownership concentration (in Cluster 3) are the reference

[6] As only 98 of the 925 commercial banks in our sample are listed on the stock market, relying on market based risk measures would severely reduce our sample.

[7] Both Z-score measures are based on the Bienaymé-Chebyshev inequality, as in Hannan and Hanweck (1988) and Boyd et al. (1993).

category in Equations (1)-(2), the coefficients on the ownership concentration variables $NoMAJ_{i,j}$ and $C1_{i,j}$, $C2_{i,j}$ should then be significantly negative for the standard deviation of adjusted return measures and significantly positive for the adjusted Z-score measures in order to be consistent with our Hypothesis 1, reflecting lower risk associated with banks with lower ownership concentration.

In both specifications, we also introduce a set of commonly used control variables (as in Lepetit et al. 2008), accounting for business differences with the average net loans to total assets ratio $L_{i,j}$ and the average ratio of net non-interest income to total operating income $NONINT_{i,j}$, for size with the logarithm of average total assets $Log(TA_{i,j})$, and for acquisition effects with the average growth rate of total assets $\Delta Log(TA_{i,j})$. We further introduce country effects α_j, and add the adjusted profitability measures $AdjROA_{i,j}$ when the dependent variable is $SDAdjROA_{i,j}$, and $AdjROE_{i,j}$ when the dependent variable is $SDAdjROA_{i,j}$.

The nature of our risk measures combined with our relatively short sample period leads us to restrict our specifications to be cross-sectional; we use standard OLS estimators and correct for heteroskedasticity following White's methodology. We have 872 banks instead of the 925 in our panel dataset, restricted by data availability for the ratio of net non-interest income to total operating income ($NONINT_{i,j}$). Our empirical results, displayed in Table 5, are generally consistent with our Hypothesis 1 that banks with more concentrated ownership structures have higher levels of bank risk.[8] Banks without a majority shareholder have both lower insolvency risk (based on both adjusted Z-score measures) and lower activity risk (based on the standard deviation of adjusted returns on equity) compared to banks with a majority shareholder. Banks in Cluster 1, which is characterized by a

[8] As reported in Table B1 in Appendix B, we obtain similar results using rolling bank risk measures in our panel dataset; however, as the explanatory power of most key control variables is low using these time-varying risk measures, we consider the cross-sectional analysis more robust in this context.

relatively dispersed ownership structure, similarly have both lower insolvency and activity risk than those in Cluster 3, the reference category with high degrees of ownership concentration (results for Cluster 2 are mixed). As our results thus confirm our first hypothesis of higher levels of bank risk arising in banks with more concentrated ownership, we now move on to examine whether these banks might use loan loss provisions to smooth their income in order to conceal such differential risk taking behavior.

[Insert Table 5]

5 Ownership structure and income smoothing

5.1 Baseline specification

In order to examine how a bank's ownership structure might affect the way it can use discretionary LLP to smooth its income, we build on an empirical baseline panel specification that is close to those in Greenawalt and Sinkey (1988), Cavallo and Majnoni (2001) and Bikker and Metzemakers (2005), differentiating between discretionary and non-discretionary components of banks' loan loss provisioning behavior as follows

$$\begin{aligned} LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \alpha_3 EQ_{i,j,t-1} + \alpha_4 L_{i,j,t} \\ + \alpha_5 \Delta L_{i,j,t} + \alpha_6 \Delta y_{j,t} + \alpha_j + \delta_t + \varepsilon_{i,j,t} \end{aligned} \quad (3)$$

where $LLP_{i,j,t}$ is the ratio of loan loss provisions to total assets, and the subscripts refer to bank i in country j for year t.

The non-discretionary component represents loan loss provisions made to cover expected credit losses (Wahlen 1994, Beaver and Engel 1996, Hasan and Wall 2004) and exhibits a cyclical pattern (Laeven and Majnoni 2003, Bikker and Metzemakers 2005). In our specification Equation (3) it is identified by the loan to total assets ratio ($L_{i,j,t}$), the loan growth rate ($\Delta L_{i,j,t}$) and the GDP growth rate ($\Delta y_{j,t}$).[9] The loan to total assets ratio is generally used as an indicator of risk of default for the overall credit portfolio and should therefore positively affect loan loss provisions. Similarly, the loan growth rate should be positively related to loan loss provisions if loan expansions lead banks to make general loan loss provisions. At the macroeconomic level, the GDP growth rate captures the creditworthiness of banks' customers and should therefore negatively affect loan loss provisions.

The second, discretionary component of loan loss provisions captures those made for managerial objectives such as income smoothing and capital management (Ahmed et al. 1999, Hasan and Wall 2004, Anandarajan et al. 2007).[10] Banks can use loan loss provisions to smooth their income, i.e. they can understate (overstate) loan loss provisions when earnings are expected to be low (high). We use the ratio of earnings before taxes and loan loss provisions to total assets ($ER_{i,j,t}$) to test if banks use loan loss provisions to smooth their income; a positive relationship between this ratio and LLP would be consistent with the income smoothing hypothesis. Banks can also use loan loss provisions for capital management: banks with low regulatory capital could be more inclined to make loan loss provisions to keep their capital ratio adequate.[11] To capture this behavior we use the lagged ratio of

[9] We do not include the non performing loans to total net loans ratio in our core regressions, similarly to Greenawalt and Sinkey (1988), Cavallo and Majnoni (2001) and Bikker and Metzemakers (2005), as it drastically reduces our available sample (by two thirds); we do however consider it as a robustness check in Section 6.

[10] Banks can also use loan loss provisions to signal their financial strength (Ahmed et al. 1999, Kanagaretnam et al. 2004, Kanagaretnam et al. 2005); this is generally captured by the one-year-ahead change of earnings before taxes and loan loss provisions ($ER_{i,t+1} - ER_{i,t}$) in the literature. Including this variable in our regressions never turned out significant (see Section 6); as it reduces the number of usable years, we dropped it from our core regressions.

[11] The Basel I accord allows general loan loss reserves (which include general loan loss provisions) to count toward Tier 2 capital up to a maximum of 1.25% of risk-weighted assets. For banks using the IRB approach, Basel II changes this limit to 0.6% of credit-risk-weighted assets.

equity to total assets ($EQ_{i,j,t-1}$), expecting a negative relationship with loan loss provisions if capital management is present.[12]

We consider a dynamic adjustment of loan loss provisions, as progressive provisioning practices of potential losses against loans or a concentration in time of default events could lead to a time dependency. Country fixed effects (α_j) and time fixed effects (δ_t) are also included in the specification. We use the Blundell and Bond (1998) system GMM estimator, which is appropriate for dynamic panel specifications (Baltagi 2005), to estimate Equation (3). This estimator combines the original equation and a transformed one, which can be the first difference of the original equation. We apply the forward orthogonal deviations transformation of the original equation as suggested by Arellano and Bover (1995) and use the two-step estimator including the Windmeijer (2005) finite-sample correction. In order to limit the number of instruments, we restrict the lag range used in generating them at four and the instrument matrix is collapsed as suggested by Roodman (2009). The GMM instruments are only applied to the lagged dependent variable ($LLP_{i,t-1}$), whereas the other variables are considered as strictly exogenous.

We check the validity of our estimates with the AR(2) test and the Hansen test. The AR(2) test corresponds to the Arellano-Bond test which tests for absence of second-order serial correlation in the first-differenced residuals. The Hansen test allows for checking the validity, i.e. the exogeneity, of the entire set of instruments as a group. We also ensure the absence of multicollinearity problems by computing the variance inflation factors (VIF), which have a mean value of 1.10 with a maximum of 1.16.

The results for our baseline regression of Equation (3), reported in Table 6, show that European commercial banks use discretionary loan loss provisions to smooth their income, reflected in a positive and significant coefficient on the ratio of earnings before taxes and loan loss provisions to total assets

[12] We use the equity to total assets ratio instead of the regulatory capital ratio, as data availability would reduce our available sample by two thirds otherwise.

$(ER_{i,j,t})$. Capital management, however, is not a significant determinant of loan loss provisioning practices for European banks as the coefficient on the lagged ratio of equity to total assets $(EQ_{i,j,t-1})$ is not significant.[13] As regards the non-discretionary component of loan loss provisions, the coefficient of the variable loans to total assets $(L_{i,j,t})$ is also significant and positive, capturing the risk of default for the overall credit portfolio, whereas the loan growth rate $(\Delta L_{i,j,t})$ turns out to be not significant. The significant and negative coefficient for the GDP growth rate $(\Delta y_{j,t})$ indicates that macroeconomic conditions are relevant, representing the cyclical behavior of LLP. Lastly, the coefficient of the lagged dependent variable is significantly positive, indicating that banks do adjust loan loss provisions gradually to recognize potential losses against loans.

We now examine further whether ownership structure, majority shareholder type and/or the regulatory environment play a role in the way banks use loan loss provisions to smooth their income.

[Insert Table 6]

5.2 Role of ownership concentration

Our results in Section 4 confirmed our Hypothesis 1 that higher levels of bank risk arise in banks with more concentrated ownership. We now proceed to test our Hypothesis 2, which postulates that banks with more concentrated ownership structures display higher degrees of income smoothing through loan loss provisions. For this we augment the baseline specification of Equation (3) with variables reflecting the degree of ownership concentration as characterized in Section 3.2. This is to differentiate between banks that have a concentrated ownership structure where a small number of shareholders are able to exert control, and banks with a more dispersed ownership structure

[13] We test in robustness (on a smaller sample of banks) the capital management hypothesis using the regulatory capital ratio instead of the equity to total assets ratio. We do find again that European banks do not use LLP for capital management objectives.

that consists mostly of less powerful shareholders. We consider the following two specifications

$$\begin{aligned} LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \alpha_3 ER_{i,j,t} \cdot NoMAJ_{i,j,t} \\ + \sum_{k=1}^{4} \alpha_{3+k} CNTRLk_{i,j,t} + \alpha_8 NoMAJ_{i,j,t} + \alpha_j + \delta_t + \varepsilon_{i,j,t} \end{aligned} \quad (4)$$

$$\begin{aligned} LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \sum_{k=1}^{2} \alpha_{2+k} ER_{i,j,t} \cdot Ck_{i,j,t} \\ + \sum_{k=1}^{4} \alpha_{4+k} CNTRLk_{i,j,t} + \sum_{k=1}^{2} \alpha_{8+k} Ck_{i,j,t} + \alpha_j + \delta_t + \varepsilon_{i,j,t} \end{aligned} \quad (5)$$

where $NoMAJ_{i,j,t}$ is a dummy variable which equals 1 if the bank does not have a majority owner and 0 otherwise, and $Ck_{i,j,t}$ is a dummy variable which equals 1 if the bank is in cluster k and 0 otherwise.[14] If insiders in banks with more concentrated ownership use LLP more to smooth the bank's income, in order to potentially hide their risk taking, we would expect the coefficient on the interaction term $ER_{i,j,t} \cdot NoMAJ_{i,j,t}$ in Equation (4) to be significant and negative for our Hypothesis 2 to hold. Equation (5) introduces the more refined cluster dummy variables to represent ownership concentration, where Cluster 3 (with high ownership concentration) is used as the reference category. If banks with less concentrated ownership (i.e. classified in Clusters 1 or 2) engage in less income smoothing through LLP, the coefficients on the interaction terms $ER_{i,j,t} \cdot C1_{i,j,t}$ and $ER_{i,j,t} \cdot C2_{i,j,t}$ would be expected to be significant and negative to be consistent with our Hypothesis 2. We also add the same set of control variables ($CNTRLk_{i,j,t}$) as in Equation (3), i.e. the variables $EQ_{i,j,t-1}$, $L_{i,j,t}$, $\Delta L_{i,j,t}$ and $\Delta y_{j,t}$.

The estimation results for Equations (4) and (5), using the same estimation methodology as for our baseline specification in Section 5.1, are given

[14] These dummy variables, contrary to the ones in Section 4, are time-varying in our panel setting, capturing the fact that banks can change between categories.

in Table 6. We find that banks without a majority shareholder do not behave differently overall from those with such a majority shareholder in the way they use loan loss provisions to smooth their income. Turning to the more refined characterization of ownership concentration using a clustering approach, however, we find that banks with a low level of ownership concentration (Cluster 1) behave differently from those with medium and high levels of ownership concentration (Clusters 2 and 3). In particular, banks in Clusters 2 and 3 display the income smoothing behavior previously observed for the overall sample, with a coefficient of 0.0707 that is significant at the 1% level, whereas banks in Cluster 1 are seen to not strongly significantly display this kind of income smoothing behavior, with a smaller coefficient of 0.0237 that is only significant at the 10% level. These results illustrate the strength of our clustering methodology compared with the simple threshold approach implicit in the majority shareholder dummy.[15] In particular, we can observe from Figure 1 that a large proportion of banks in Cluster 2 do not have a majority shareholder, explaining the difference in results between the two approaches. Using the refined clustering approach, our results are thus supporting our Hypothesis 2; taken together with our results regarding Hypothesis 1, this would be consistent with banks that have more concentrated ownership structures taking on higher levels of risk, and then trying to conceal this risk taking from outsiders, such as debt holders or regulators, by smoothing their income through the use of loan loss provisions.

5.3 Role of type of majority shareholder

As different shareholder types can have different propensities to accept risk, we then investigate, in line with our Hypothesis 3, whether for banks with a majority shareholder (holding more than 50%) the relationship between LLP and bank earnings depends on the type of that shareholder. For this we build on the specification of Equation (4) by adding interaction terms

[15] Robustness checks with thresholds lower than 50% are reported in Section 6.

between $ER_{i,j,t}$ and majority shareholder type dummies as follows[16]

$$\begin{aligned} LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + ER_{i,j,t}(&\alpha_2 + \alpha_3 Mbank_{i,j,t} + \alpha_4 Mindust_{i,j,t} \\ &+ \alpha_5 Mfamily_{i,j,t} + \alpha_6 Mother_{i,j,t} + \alpha_7 NoMAJ_{i,j,t}) \\ &+ \sum_{k=1}^{4} \alpha_{7+k} CNTRLk_{i,j,t} + \sum_{l=1}^{5} \alpha_{11+l} Duml_{i,j,t} + \alpha_j + \delta_t + \varepsilon_{i,j,t} \end{aligned} \tag{6}$$

where the dummy variable $Mbank_{i,j,t}$ takes the value of 1 if the majority shareholder is a bank and 0 otherwise; we similarly construct $Mindust_{i,j,t}$ for industrial firms, $Mfamily_{i,j,t}$ for individuals and families, and $Mother_{i,j,t}$ for all remaining shareholder types excluding institutional investors.[17] The reference category for the resulting interaction terms between $ER_{i,j,t}$ and the different shareholder type dummies is banks where the majority shareholder is an institutional investor.

Institutional investors will generally hold well diversified investment portfolios, and therefore be less sensitive to the risk stemming from investments in a specific bank than less well diversified investors such as individuals and families.[18] Barry et al. (2011) show that shareholdings by institutional investors and also industrial firms lead to higher bank risk the larger the equity stakes held, whereas for shareholdings by banks and individuals and families the opposite holds true. Using a bank risk specification that augments Equation (1) with the majority shareholder type dummies defined above, we analogously find that banks whose majority shareholder is either individuals/families or another bank have lower bank insolvency and activity risk

[16] Investigating this analogously for the cluster specification of Equation (5) is more problematic as the relevance of the type of the largest shareholder becomes less clear-cut for the clusters with low ownership concentration.

[17] These are managers, state, public, foundations, and unnamed shareholders; we do not have enough observations for these to consider them as separate groups. We also add the sets of dummy variables $Duml_{i,j,t}$ on their own, i.e. $\{NoMAJ_{i,j,t}$, $Mbank_{i,j,t}$, $Mindust_{i,j,t}$, $Mfamily_{i,j,t}$, $Mother_{i,j,t}\}$.

[18] We do not have data on the structure of shareholders' portfolios and their degree of diversification.

than those where the majority shareholder is an institutional investor or an industrial firm (see Table B2 in Appendix B). This could imply that banks with individuals and families or other banks as the majority shareholder might have fewer incentives to use LLP to smooth their income, which in Equation (6) would be reflected in the coefficients on the interaction terms with $Mbank_{i,j,t}$ and $Mfamily_{i,j,t}$ being significant and negative, while the coefficient on the interaction terms with $Mindust_{i,j,t}$ would be insignificant.

The results in Table 7 show that banks with either institutional investors or industrial firms as majority shareholder do not display income smoothing behavior that is different from those controlled by banks or individuals and family. Thus, the fact that banks controlled by either institutional investors or industrial firms have higher bank insolvency and activity risk than those controlled by other banks or individuals and families does not imply that their income smoothing through loan loss provisions is carried out differently. In other words, for banks with a relatively concentrated ownership structure the degree of income smoothing through LLP appears to be independent of the amount of risk taken.

[Insert Table 7]

5.4 Role of regulatory environment

Finally, we examine whether the regulatory environment has an impact on how banks use their loan loss provisions to smooth their income, in line with our Hypothesis 4. For this we augment Equations (4)-(5) with interaction terms between $ER_{i,j,t}$ and a regulatory index REG_j as follows

$$\begin{aligned} LLP_{i,j,t} = {} & \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \alpha_3 ER_{i,j,t} \cdot REG_j \\ & + \alpha_4 ER_{i,j,t} \cdot NoMAJ_{i,j,t} + \sum_{k=1}^{4} \alpha_{4+k} CNTRLk_{i,j,t} + \alpha_9 NoMAJ_{i,j,t} \\ & + \alpha_{10} REG_j + \alpha_j + \delta_t + \varepsilon_{i,j,t} \end{aligned} \quad (7)$$

$$
\begin{aligned}
LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \alpha_3 ER_{i,j,t} \cdot REG_j \\
+ \sum_{k=1}^{2} \alpha_{3+k} ER_{i,j,t} \cdot Ck_{i,j,t} + \sum_{k=1}^{4} \alpha_{5+k} CNTRLk_{i,j,t} + \sum_{k=1}^{2} \alpha_{9+k} Ck_{i,j,t} \\
+ \alpha_{12} REG_j + \alpha_j + \delta_t + \varepsilon_{i,j,t} \quad (8)
\end{aligned}
$$

For the regulatory index REG_j we consider an index for strength of supervisory regime ($SupReg_j$), and alternatively an index representing the degree of shareholder protection ($ShareProct_j$). The strength of supervisory regime index is drawn from the World Bank's 2008 Bank Regulation and Supervision database, in line with Laeven and Levine (2009) and Shehzad et al. (2010); it ranges in principle from 0 to 11, and covers capital stringency and audit requirements, and powers to intervene in and resolve troubled banks. For our sample, the index has a median of 6 and ranges from 4 to 9. To represent the level of shareholder protection we use the revised anti-director rights index in Djankov et al. (2008), which ranges in principle from 0 to 6 and considers shareholders' voting powers, their ease of participation in corporate voting, and their legal protection against expropriation by managers. For our sample, the index has a median of 3.5 and ranges from 2 to 5.

In order to examine the impact of different regulatory regimes on how banks use LLP to smooth their income, dependent on the degree of ownership concentration, we calculate the relevant marginal effects as $\partial LLP_{i,j,t}/\partial ER_{i,j,t} = \alpha_2 + \alpha_3 \cdot REG_j + \alpha_4 \cdot NoMAJ_{i,j,t}$ for Equation (7) and $\partial LLP_{i,j,t}/\partial ER_{i,j,t} = \alpha_2 + \alpha_3 \cdot REG_j + \sum_{k=1}^{2} \alpha_{3+k} \cdot Ck_{i,j,t}$ for Equation (8), with REG_j, $NoMAJ_{i,j,t}$ and $Ck_{i,j,t}$ evaluated at both median and maximum levels. To facilitate interpretation of regression coefficients in this context, we scale both indices to have a minimum of zero.

We observe from Equation (7) in Table 8 that banks in countries with stronger supervisory regimes (i.e. higher $SupReg_j$) perform less income smoothing through LLP, in line with Fonseca and Gonzalez (2008), with those in the countries with the strongest supervisory regimes showing no income smoothing through LLP at all. These results are confirmed in the more refined analysis of Equation (8), which differentiates between clusters of ownership concentration. Banks in Clusters 2 and 3, i.e. with medium and high levels of ownership concentration, use LLP less to smooth their income in countries with stronger supervisory regimes, with no such income smoothing in the countries with the strongest supervisory regimes. Banks in Cluster 1, i.e. with low levels of ownership concentration, are seen to use LLP to smooth their income in countries with the weakest supervisory regimes, albeit to a much lesser degree than those in Clusters 2 and 3; they do not show any significant evidence of this kind of discretionary income smoothing behavior in countries with stronger supervisory regime. These results are thus consistent with our Hypothesis 4: the income smoothing behavior through LLP of banks is affected by both the degree of ownership concentration and the strength of the supervisory regime. As Table B3 in Appendix B (which augments our risk Equations (1)-(2) with $SupReg_j$) shows that banks in countries with stronger supervisory regimes display less risk, this is consistent with the argument that banks in these countries have less scope to take on risk, and therefore have a reduced incentive to conceal such risk taking by smoothing income using LLP.

The degree of shareholder protection ($ShareProct_j$), on the other hand, based on the results from estimating Equations (7)-(8) given in Table 9, is seen not to have a significant impact on the income smoothing behavior of European commercial banks using LLP. In particular, we observe from the more refined analysis of Equation (8) that banks with medium and high levels of ownership concentration use LLP to smooth their income irrespective of the level of shareholder protection, as expected given they are already in a strong position to impose their risk preferences. However, banks with low levels of ownership concentration are seen to not engage in income smoothing behavior either, even in countries with high shareholder protection that therefore have in principle more powerful minority shareholders.

[Insert Tables 8 and 9]

6 Robustness checks

We carry out several robustness checks on our empirical results.

Firstly, in Equation (4), we replace the *NoMAJ* dummy variable, which reflects whether or not a bank has a majority shareholder, with the dummy variable *NoDOM* which alternatively uses thresholds of 40%, 25% and 10% to define whether or not a bank has a dominant shareholder. Table B4 (in Appendix B) shows that our previous results, that banks do not display different income smoothing behavior when they do not have a dominant shareholder, remain unchanged when applying the 40% threshold level. However, in line with the results found using our more refined cluster methodology, we observe that banks without a dominant shareholder do not use loan loss provisions to smooth their income when that threshold is put at the 25% or 10% level.

Secondly, we did not include the non performing loans to total net loans ratio in our main regressions, as this drastically reduces our available sample from 925 to 399 banks; introducing this variable, analogously to Ahmed et al. (1999), in Equations (3)-(5) does not change our main results (Table B5).[19]

We further rerun our main income smoothing regressions excluding the "crisis" years 2008 and 2009 from our sample; this again leaves our main results unchanged (Table B6).

We then allow for the fact that banks can also use loan loss provisions to signal their financial strength. In the literature this is generally captured by the one-year-ahead change of earnings before taxes and loan loss provisions ($ER_{i,t+1} - ER_{i,t}$) (Ahmed et al. 1999; Kanagaretnam et al. 2004). As this reduces the number of usable years, we dropped it from our core regressions; including this variable does not provide any evidence for such signalling behavior, however, nor does it change our main results (Table B7).

[19] The sample size becomes too small to meaningfully examine Equations (6)-(8).

Spain implemented a dynamic loan loss provisioning system in 2000; a dynamic provisioning system entails statistical provisions, which are defined by accounting rules to cover expected loan losses, evaluated over a whole business cycle. As a result, loan loss provisions are smoothed over time.[20] To make sure this does not influence our results, we rerun our main income smoothing regressions excluding Spain from our sample; our main results remain unchanged (Table B8).

Lastly, our bank risk regressions were carried out for a reduced sample of 872 banks; we also run our main income smoothing regressions on this smaller sample, with unchanged results (Table B9).

7 Conclusion

We empirically examined whether the way a bank might use LLP to smooth its income, potentially in order to obscure its risk taking, is influenced by its ownership structure. For this we used a novel database on European commercial banks for the period 2004-2009 with detailed information on banks' individual ownership structure. We also used an innovative clustering approach to distinguish between banks with different degrees of ownership concentration.

We find that banks with a more concentrated ownership structure have higher levels of bank risk compared to those with less concentrated ownership; this is in line with more powerful shareholders being able to impose their objectives and thus risk preferences on management. We further find evidence that banks with a more concentrated ownership structure use discretionary LLP to smooth their income, potentially to obscure their risk taking. This behavior is less pronounced in countries with stronger supervisory regimes, but independent of the type of the majority shareholder and the level of shareholder protection. In countries with the weakest supervisory regimes,

[20] See Saurina (2009) for more details.

banks with a low level of ownership concentration, i.e. characterized mostly by less powerful, smaller shareholders, are found to display much smaller degrees of such discretionary income smoothing behavior than banks with more concentrated ownership; however, they do not display this kind of behavior at all in countries with stronger supervisory regimes.

The fact that banks with high levels of ownership concentration in particular use discretionary loan loss provisions to smooth their income in countries characterized by weaker supervision would be considered undesirable by (outside) investors, regulators and accounting standard setters alike, particularly if it is undertaken to hide substantial bank risk taking. This is in line with the concern expressed by the Basel Committee on Banking Supervision (2010) that "there are unique corporate governance challenges posed where [...] insiders or controlling shareholders exercise inappropriate influences on the bank's activities". A drastic way to limit the influence of controlling shareholders on the use of income smoothing to conceal bank risk taking could be to limit the size of the stake any given shareholder, or coalitions of shareholders, can hold in a bank. Alternatively, our results indicate that countries with high levels of ownership concentration in banking could instead aim for tight levels of supervision, thereby reducing the potential for increased bank opacity arising from banks' smoothing their income with the aim to conceal their risk taking.

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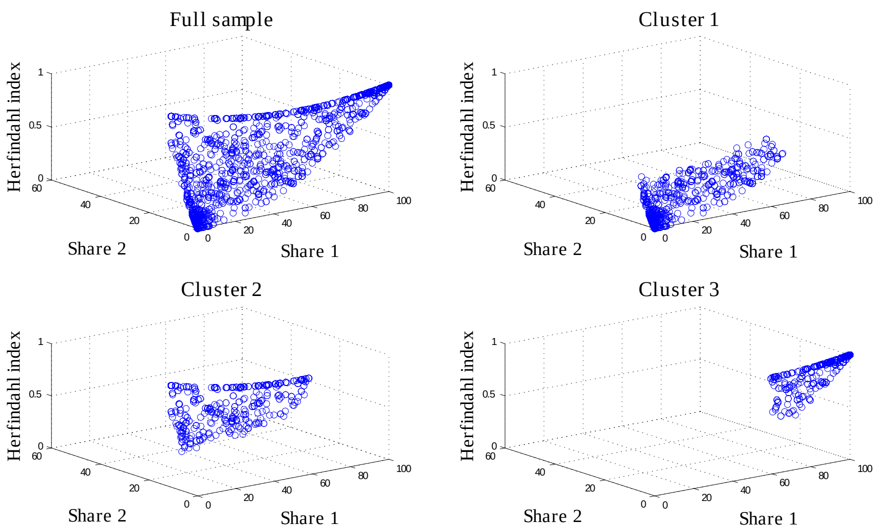

Figure 1: Position of banks inside their respective cluster

Table 1. Distribution of banks by country

Country	Our sample of commercial banks	Full sample of commercial banks in BankScope	Percent of total assets[a]
Austria	53	85	72.84
Belgium	25	58	96.63
Denmark	51	68	96.88
Finland	6	12	98.22
France	146	224	97.81
Germany	150	229	97.93
Greece	16	19	97.33
Ireland	10	39	5.69
Italy	134	214	91.12
Luxembourg	70	123	87.58
Netherlands	8	48	1.22
Norway	11	20	73.54
Portugal	18	30	94.69
Spain	58	97	85.53
Sweden	14	25	97.71
Switzerland	101	204	92.94
U.K.	54	179	1.35
Total	925	1674	Median = 92.94

[a] Percent of total assets represents total assets of commercial banks in our sample divided by total assets of commercial banks of the full sample of banks provided by BvD BankScope for the year 2009.

Table 2. General descriptive statistics, on average over the period 2004-2009

	DEP	MF	L	EQ	LLP	ER	ROA	ROE	TA
Full sample of commercial banks available in BankScope (1674 banks)									
Mean	48.29	14.76	47.49	14.72	0.46	1.43	0.79	7.44	17975.99
Maximum	98.46	96.47	99.97	100	9.87	40.83	69.25	100	2246380
Minimum	0.01	0.78	0.02	0.02	-7.74	-49.54	-67.18	-98.82	0.5
Std. Dev.	27.91	16.21	29.81	18.14	1.03	3.07	3.81	14.77	92252.36
Our sample of commercial banks *All banks (925 banks, 3622 observations)*									
Mean	49.02	15.27	52.88	10.18	.31	1.31	0.72	8.42	24094.69
Maximum	97.69	96.47	99.94	98.50	4.22	17.95	17.61	99.41	2246380
Minimum	0.02	0.78	0.02	0.31	-2.57	-14.50	-13.06	-98.63	6.7
Std. Dev.	27.14	15.92	28.56	10.18	.55	1.68	1.35	12.97	110664.5
Cluster 1 Low ownership concentration (891 observations)									
Mean	51.35	17.86	57.9	10.37	0.35	1.45	0.82	8.66	45210.12
Std. Dev.	24.53	16.17	25.59	7.55	0.54	1.61	1.31	10.61	162806.5
Cluster 2 Medium ownership concentration (569 observations)									
Mean	47.12	15.60	53.82	9.58	0.36	1.38	0.71	7.13	18673.42
Std. Dev.	28.70	16.87	29.58	8.54	0.54	1.77	1.40	12.47	108563
Cluster 3 High ownership concentration (2162 observations)									
Mean	48.57	14.13	50.55	10.26	0.29	1.23	0.68	8.66	16970.57
Std. Dev.	27.69	15.42	29.17	11.44	0.55	1.68	1.36	13.93	79715.46

Variable definitions (all variables are expressed in percentages, except *TA* which is in millions of Euros): *DEP* = deposits/total assets; *MF* = (money-market funding + bonds + subordinated debt + hybrid capital)/total assets; *L* = net loans/total assets; *EQ*= equity/total assets; *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes and loan loss provisions/total assets; *ROA* = return on assets; *ROE*= return on equity; *TA*= total assets (millions of Euros).

Clusters 1-3 are determined using a hierarchical agglomerative clustering (HAC) approach that uses three ownership measures in the construction of clusters of banks with "similar" ownership characteristics: the percentage held by the largest shareholder, the percentage held by the second-largest shareholder, and a Herfindahl index computed for a bank's ownership distribution.

Table 3. Descriptive statistics on ownership concentration by cluster, on average over the period 2004-2009

	Share1	Share2	HERF
All banks in our sample (3622 observations)			
Mean	74.36	7.96	0.67
Std. Dev.	31.82	12.54	0.36
Minimum	0.01	0.00	0.00
Maximum	100.00	50.00	1.00
Cluster 1 Low ownership concentration (891 observations)			
Mean	29.75	8.57	0.14
Std. Dev.	20.41	6.08	0.13
Minimum	0.01	0.01	0.00
Maximum	70.29	25.13	0.53
Mean test	0.00	0.00	0.00
Cluster 2 Medium ownership concentration (569 observations)			
Mean	56.35	32.15	0.45
Std. Dev.	13.65	9.70	0.13
Minimum	25.00	14.99	0.09
Maximum	81.67	50.00	0.70
Mean test	0.00	0.00	0.00
Cluster 3 High ownership concentration (2162 observations)			
Mean	97.49	1.20	0.95
Std. Dev.	5.94	3.05	0.10
Minimum	69.80	0.00	0.48
Maximum	100	17.50	1.00
Mean test	0.00	0.00	0.00

Variable definitions: *Share1* = the percentage held by the largest shareholder; *Share2* = percentage held by the second-largest shareholder; *HERF*= Herfindahl index on a bank's ownership distribution (we compute for each bank i the variable OS_j, defined by the ratio of the percentage of equity held by each shareholder j to the total percentage of equity held by all the shareholders; we then compute HERF as $\sum_{j=1}^{n} OS_j^2$, where n is the total number of shareholders).

Mean test indicates if the variable has the same mean in the cluster and in the rest of the sample (bilateral test); the *P*-value of the test is reported.

Clusters 1-3 are determined using a hierarchical agglomerative clustering (HAC) approach that uses three ownership measures in the construction of clusters of banks with "similar" ownership characteristics: the percentage held by the largest shareholder, the percentage held by the second-largest shareholder, and a Herfindahl index computed for a bank's ownership distribution.

Table 4. Type of and average shareholding by the dominant shareholder

Type of the dominant shareholder	*Cluster 1* *"Low ownership concentration"*	*Cluster 2* *"Medium ownership concentration"*	*Cluster 3* *"High ownership concentration"*
Bank			
% observations	41.38	54.6	72.38
Average % of shares	34.34	57.93	97.42
Institutional investor			
% observations	23.01	12.01	9.94
Average % of shares	25.39	59.77	98.21
Industrial firm			
% observations	18.88	17.07	13.05
Average % of shares	22.11	59.31	97.86
Individual or family			
% observations	7.5	7.13	1.89
Average % of shares	34.17	39.72	98.66
Manager			
% observations	0.75	0.19	0
Average % of shares	20.35	51.51	0
State			
% observations	1.63	2.63	1.07
Average % of shares	2.57	51.10	94.34
Public			
% observations	0.88	1.31	0.56
Average % of shares	22.65	47.69	91.30
Foundation			
% observations	2.88	0.19	0.25
Average % of shares	32.89	37.53	100
Unnamed shareholder			
% observations	3.09	4.87	0.86
Average % of shares	33.40	51.78	96.2

Note: This table provides:
- the percentage of observations for which we have a bank, an institutional investor, an industrial firm, an individual or a family, a manager, a state, the public, a foundation or an unnamed shareholder as dominant shareholder (i.e. the shareholder that holds the biggest share); for example, 23.01% of the banks have an institutional investor as dominant shareholder in Cluster 1;
- the percentage of shares held by each type of shareholder; for example, institutional investors hold on average 25.39% of the shares when they are the dominant shareholder in Cluster 1.

Clusters 1-3 are determined using a hierarchical agglomerative clustering (HAC) approach that uses three ownership measures in the construction of clusters of banks with "similar" ownership characteristics: the percentage held by the largest shareholder, the percentage held by the second-largest shareholder, and a Herfindahl index computed for a bank's ownership distribution.

Table 5. Degree of ownership concentration and bank risk for European commercial banks for the period 2004-2009 (cross-sectional analysis, OLS estimator)

	$AdjZ1_{i,j}$		$AdjZ2_{i,j}$		$SDAdjROE_{i,j}$		$SDAdjROA_{i,j}$	
	Equation (1)	Equation (2)	Equation (1)	Equation (2)	Equation (1)	Equation (2)	Equation (1)	Equation (2)
$NoMAJ_{i,j}$	0.3099***	-	0.2809***	-	-0.3106***	-	-0.1395	-
	(0.0973)		(0.0980)		(0.0967)		(0.1057)	
$C1_{i,j}$	-	0.3343***	-	0.3455***	-	-0.3496***	-	-0.1956*
		(0.1116)		(0.1049)		(0.1038)		(0.1138)
$C2_{i,j}$	-	0.1742	-	0.2904**	-	-0.2779**	-	-0.2060
		(0.1227)		(0.1285)		(0.1257)		(0.1350)
$Change1_{i,j}$	-0.0123	-	0.0476	-	-0.0037	-	0.0267	-
	(0.1060)		(0.0966)		(0.1051)		(0.0966)	
$Change2_{i,j}$	-	0.0333	-	0.0334	-	-0.0271	-	-0.0266
		(0.0786)		(0.0824)		(0.0817)		(0.0788)
$L_{i,j}$	0.0079***	0.0068***	0.0069***	0.0078***	-0.0071***	-0.0070***	-0.0091***	-0.0091***
	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0013)	(0.0014)	(0.0014)
$NONINT_{i,j}$	-0.0066**	-0.0062**	-0.0059**	-0.0070**	0.0065**	0.0069**	0.0075**	0.0077**
	(0.0029)	(0.0029)	(0.0028)	(0.0029)	(0.0028)	(0.0029)	(0.0033)	(0.0033)
$Log(TA_{i,j})$	-0.0341*	-0.0417**	-0.0462**	-0.0291	0.0400*	0.0349*	-0.1441***	-0.1474***
	(0.0209)	(-0.0194)	(0.0198)	(0.0207)	(0.0207)	(0.0203)	(0.0210)	(0.0205)
$\Delta Log(TA_{i,j})$	-0.0865	0.4068***	0.4304**	-0.1113	0.0892	0.1145	-0.1912	-0.1785
	(0.1416)	(0.1534)	(0.1541)	(0.1387)	(0.1369)	(0.1338)	(0.1824)	(0.1792)
$AdjROA_{i,j}$	-	-	-	-	-	-	0.1154***	0.1154***
							(0.0322)	(0.0323)
$AdjROE_{i,j}$	-	-	-	-	0.0031	0.0030	-	-
					(0.0037)	(0.0036)		
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.1037	0.113	0.1088	0.109	0.1011	0.107	0.2084	0.211
N. Obs.	872	872	872	872	872	872	872	872

All dependent variables are used in the log form. Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *SDAdjROE*=StDev(ER/E) and *SDAdjROA*=StDev(ER/TA), where ER is earnings before taxes and loan loss provisions, E is total equity and TA is total assets; *AdjZ1*=(AdjROA+EQ)/SDAdjROA and *AdjZ2*=(100+AdjROE)/SDAdjROE, where *AdjROA*=Mean(ER/TA) and *AdjROE*=Mean(ER/E) are average adjusted return on assets and return on equity, and EQ is the average equity to total assets ratio (all in percentages); Dummy variables: *NoMAJ* = equals 1 if the bank does not have a majority owner; *C1* = equals 1 if the bank is in Cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in Cluster 2 (medium ownership concentration); *Change1(2)* = equal 1 if a bank's ownership concentration changes over the period; *L* = net loans/total assets; *NONINT* = net non interest income/net operating income; *Log(TA)* = log of total assets; Δ*Log(TA)* = annual growth rate of total assets.

Table 6. Degree of ownership concentration and income smoothing for European commercial banks for the period 2004-2009 (two-step system GMM estimator)

	Equation (3) (Baseline)	Equation (4)	Equation (5)
$LLP_{i,j,t-1}$	0.3407***	0.3439***	0.3399***
	(0.0441)	(0.0432)	(0.0417)
$ER_{i,j,t}$	0.0634	0.0668***	0.0707***
	(0.0115)***	(0.0129)	(0.0141)
$ER_{i,j,t} \bullet NoMAJ_{i,j,t}$	-	-0.0183	-
		(0.0217)	
$ER_{i,j,t} \bullet C1_{i,j,t}$	-	-	-0.0470***
			(0.0168)
$ER_{i,j,t} \bullet C2_{i,j,t}$	-	-	0.0125
			(0.0185)
$L_{i,j,t}$	0.0036***	0.0036***	0.0036***
	(0.0004)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	-0.0341	-0.0329	-0.0287
	(0.0219)	(0.0218)	(0.0216)
$\Delta y_{j,t}$	-0.0207***	-0.0208***	-0.0222***
	(0.0050)	(0.0050)	(0.0051)
$EQ_{i,j,t-1}$	0.0010	0.0009	0.0008
	(0.0012)	(0.0012)	(0.0012)
Interaction dummies	No	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Wald Tests			
$\alpha_{ER} + \alpha_{ER \bullet C1} = 0$			0.0237
[P-value]			[0.0734]
AR(2) test	0.705	0.704	0.790
Hansen test	0.801	0.789	0.808
N. Banks	925	925	925
N. Obs.	3622	3622	3622

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.

Variable definitions: *LLP* = loan loss provisions/total assets ; *ER* = earnings before taxes and loan loss provisions/total assets; Dummy variable: *NoMAJ* = equals 1 if the bank does not have a majority owner; *C1* = equals 1 if the bank is in Cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in Cluster 2 (medium ownership concentration); *L* = net loans/total assets; ΔL =loan growth rate; Δy = GDP growth rate; *EQ*= equity/total assets.

Table 7. Degree of ownership concentration, majority shareholder type and income smoothing for European commercial banks for the period 2004-2009 (two-step system GMM estimator)

	Equation (6)
$LLP_{i,j,t-1}$	0.2690*** (0.0457)
$L_{i,j,t}$	0.0034*** (0.0004)
$ER_{i,j,t}$	0.0657*** (0.0207)
$ER_{i,j,t} \bullet NoMAJ_{i,j,t}$	-0.0121 (0.0245)
$ER_{i,j,t} \bullet Mbank_{i,j,t}$	0.0122 (0.0227)
$ER_{i,j,t} \bullet Mindust_{i,j,t}$	0.0120 (0.0260)
$ER_{i,j,t} \bullet Mfamily_{i,j,t}$	-0.0094 (0.0566)
$ER_{i,j,t} \bullet Mother_{i,j,t}$	-0.0182 (0.0374)
$\Delta L_{i,j,t}$	-0.01355 (0.0218)
$\Delta y_{j,t}$	-0.0049 (0.0071)
$EQ_{i,j,t-1}$	0.0010 (0.0014)
Interaction dummies	Yes
Country fixed effects	Yes
Period fixed effects	Yes
AR(2) test	0.213
Hansen test	0.199
N. Banks	925
N. Obs.	3622

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.

Variable definitions: *LLP* = loan loss provisions/total assets ; *ER* = earnings before taxes and loan loss provisions/total assets; Dummy variables: *NoMAJ* = equals 1 if the bank does not have a majority owner; *Mbank* = equals 1 if the majority shareholder is a bank ; *Mindust* = equals 1 if the majority shareholder (holding more than 50%) is an industrial firm; *Mfamily* = equals 1 if the majority shareholder (holding more than 50%) is an individual or a family; *Mother* = equals 1 if the majority shareholder is all remaining shareholder types excluding institutional investors; *L* = net loans/total assets; ΔL =loan growth rate; Δy = GDP growth rate; *EQ*= equity/total assets.

Table 8. Supervisory strength, degree of ownership concentration and income smoothing for European commercial banks for the period 2004-2009 (two-step system GMM estimator)

	Baseline	Equation (7)	Equation (8)
$LLP_{i,j,t-1}$	0. 3300*** (0. 0462)	0. 3322*** (0. 0450)	0. 3261*** (0. 0431)
$ER_{i,j,t-1}$	0. 1028*** (0. 0199)	0. 1085*** (0. 0219)	0. 1171*** (0. 0234)
$ER_{i,j,t} \bullet SupReg_j$	-0. 0174*** (0.0052)	-0. 0178*** (0. 0052)	-0. 0195*** (0. 0054)
$ER_{i,j,t} \bullet NoMAJ_{i,j,t}$	-	-0. 0245 (0. 0213)	-
$ER_{i,j,t} \bullet C1_{i,j,t}$	-	-	-0. 0538*** (0.0175)
$ER_{i,j,t} \bullet C2_{i,j,t}$	-	-	0. 0101 (0. 0177)
$L_{i,j,t}$	0. 0035*** (0. 0004)	0. 0034*** (0. 0003)	0. 0035*** (0. 0004)
$\Delta L_{i,j,t}$	-0. 0307 (0. 0210)	-0. 0289 (0. 0208)	-0. 0243 (0. 0206)
$\Delta y_{j,t}$	-0. 0215*** (0. 0044)	-0. 0217*** (0. 0044)	-0. 0233*** (0. 0046)
$EQ_{i,j,t}$	0. 0016 (0. 0012)	0. 0016 (0. 0012)	0. 0015 (0. 0013)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	No	No	No
Period fixed effects	Yes	Yes	Yes
Marginal effects:			
ER at Med(SupReg)	0.0680 [0.0000]	0.0729 [0.0000]	
ER at Max(SupReg)	0.0158 [0.2225]	0.0195 [0.1304]	
ER Cluster 2 and 3 at Min(SupReg)			0. 1171 [0.0000]
ER Cluster 2 and 3 at Med(SupReg)			0.0781 [0.0000]
ER Cluster 2 and 3 at Max(SupReg)			0.0196 [0.1426]
ER Cluster 1 at Min(SupReg)			0.0633 [0.0005]
ER Cluster 1 at Med(SupReg)			0.0243 [0.0663]
ER Cluster 1 at Max(SupReg)			-0.0342 [0.0815]
AR(2) test	0.643	0.639	0.733
Hansen test	0.770	0.751	0.783
N. Banks	925	925	925
N. Obs.	3622	3622	3622

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***. For marginal effects, P-value is given in brackets.

Variable definitions: *LLP* = loan loss provisions/total assets *;* *ER* = earnings before taxes and loan loss provisions/total assets*;* *SupReg* = index for strength of supervisory regime; Dummy variables: *NoMAJ* = equals 1 if the bank does not have a majority owner; *C1* = equals 1 if the bank is in Cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in Cluster 2 (medium ownership concentration); *L* = net loans/total assets; ΔL =loan growth rate*;* Δy = GDP growth rate; *EQ*= equity/total assets.

Table 9. Shareholder protection, degree of ownership concentration and income smoothing for European commercial banks for the period 2004-2009 (two-step system GMM estimator)

	Baseline	Equation (7)	Equation (8)
$LLP_{i,j,t-1}$	0.3378***	0.3397***	0.3354***
	(0.0452)	(0.0444)	(0.0429)
$L_{i,j,t}$	0.0036***	0.0035***	0.0036***
	(0.0004)	(0.0004)	(0.0004)
$ER_{i,j,t-1}$	0.0413**	0.0448***	0.0489***
	(0.0155)	(0.0167)	(0.0175)
$ER_{i,j,t} \bullet ShareProct_j$	0.0169	0.0169	0.0168
	(0.0105)	(0.0105)	(0.0105)
$ER_{i,j,t} \bullet NoMAJ_{i,j,t}$	-	-0.0188	-
		(0.0202)	
$ER_{i,j,t} \bullet C1_{i,j,t}$	-	-	-0.0439***
			(0.0158)
$ER_{i,j,t} \bullet C2_{i,j,t}$	-	-	0.0099
			(0.0186)
$\Delta L_{i,j,t}$	-0.0348*	-0.0336*	-0.0294
	(0.0211)	(0.0210)	(0.0209)
$\Delta y_{j,t}$	-0.0238***	-0.0239***	-0.0256***
	(0.0043)	(0.0043)	(0.0044)
$EQ_{i,j,t}$	0.0010	0.0010	0.0009
	(0.0012)	(0.0012)	(0.0013)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	No	No	No
Period fixed effects	Yes	Yes	Yes
Wald Tests			
$\alpha_{ER} + \alpha_{ER \bullet C1} = 0$			0.0050
[P-value]			[0.7319]
AR(2) test	0.751	0.750	0.835
Hansen test	0.814	0.655	0.689
N. Banks	925	925	925
N. Obs.	3622	3622	3622

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.

Variable definitions: *LLP* = loan loss provisions/total assets *;* *ER* = earnings before taxes and loan loss provisions/total assets*;* *ShareProct* = index for degree of shareholder protection; Dummy variables: *NoMAJ* = equals 1 if the bank does not have a majority owner; *C1* = equals 1 if the bank is in Cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in Cluster 2 (medium ownership concentration); *L* = net loans/total assets; ΔL =loan growth rate*;* Δy = GDP growth rate; *EQ*= equity/total assets.

Appendix A: Clustering methodology

We use hierarchical agglomerative clustering (HAC) combined with partitional clustering (Husson et al. 2010, Husson et al. 2011) to account more accurately for similarities/dissimilarities in banks' ownership structures.

The HAC, based on an agglomerative algorithm, allows building a hierarchy from individuals. In our case, individuals are banks observed yearly and characterized by their ownership structure. Initially, each individual is considered as a separate cluster. The agglomerative algorithm progressively merges clusters according to their similarities which are based on multiple dimensions, i.e. evaluated on a set of variables. We need to specify the distance measure and the linkage rule to implement the HAC; the former determines how the similarity of two individuals is computed and the latter how the hierarchy is built. We use the Euclidean distance as the most commonly chosen type of distance.[1] At the first step of the agglomerative algorithm, similarities can be computed directly with the distance measure, as each individual is considered as a singleton cluster. However, from the second step onwards, a linkage rule is also needed to determine the distance between clusters made up of several individuals. For this we use Ward's method which is based on an analysis of variance approach, and generally viewed as very efficient. In particular, it minimizes at each step the increase in variance for the pair of clusters being merged.

The hierarchy obtained from the HAC can be illustrated by a tree structure called a dendrogram. Cutting the tree before the root allows therefore to partition the sample into k clusters. The classical rule used to choose the number of clusters is based on the growth of the between-clusters inertia according to the number of clusters. We retain k clusters so that the increase of between-clusters inertia from $k-1$ to k clusters is high relative to the one from k to $k+1$ clusters. This is analogous to a high decrease of within-clusters inertia from $k-1$ to k clusters

[1] The Euclidean distance (i.e. the geometric distance in a multidimensional space) is not applied to raw data, but to variables that are standardized in order to deal with scale differences between them.

relative to the one from k to $k+1$ clusters.[2] More precisely, we choose k clusters so that the number k minimizes

$$\min_{k_{\min} \leq k \leq k_{\max}} \frac{W(k) - W(k+1)}{W(k-1) - W(k)}$$

where $W(k)$ is the within-clusters inertia obtained with k clusters. In addition, we consider $k_{\min} = 3$ and $k_{\max} = 10$ as suggested by Husson et al. (2010).[3] The difference $W(k-1) - W(k)$ corresponds to a decrease of within-clusters inertia when moving from $k-1$ to k clusters, that is equal to an increase of between-clusters inertia when moving from $k-1$ to k clusters. The optimal number k^* resulting from the minimization of this criterion indicates that a smaller number of clusters implies a significant increase of within-clusters inertia while a higher number of clusters does not lead to a substantial within-clusters inertia gain. According to the criterion minimization, we conclude for our sample that the optimal number of clusters is 3.

In a second step, partitional clustering, i.e. a k-means algorithm, is applied to the 3 clusters obtained from the HAC in order to improve (or consolidate) the partition obtained from the HAC. The HAC is useful to determine the number of clusters; however, the agglomerative algorithm used in it can never undo what was done previously. In other words, individuals assigned to a cluster in the early stages cannot move to another cluster afterwards. Due to this constraint, the partition obtained from the HAC could be not optimal. The k-means algorithm allows to move individuals between the k clusters in order to minimize the within-clusters inertia.[4] The partition resulting from the k-means algorithm ensures that the k

[2] The total inertia (which does not depend on k) is equal to the within-clusters inertia plus the between-clusters inertia according to the Huygens theorem.

[3] If $k_{\min} = 2$, the optimal number of clusters given by the criterion minimization is very often equal to 2 because the within-clusters inertia decreases sharply when moving from 1 to 2 clusters.

[4] More precisely, the partition obtained from the HAC is used as the initial partition of the k-means algorithm. In a first step, the k cluster centers (centroids) are computed. In a second step, each individual is assigned to the cluster that has the closest centroid. In a third step, when all individuals have been assigned, the positions of the k centroids are recomputed. Steps 2 and 3 are repeated until the centroids no longer move.

clusters are as distinct as possible. To sum up, the HAC allows to determine the optimal number of clusters and the partitional clustering ensures the quality of the partition.

Appendix B

Table B1. Degree of ownership concentration and rolling bank risk measures for European commercial banks for the period 2004-2009 (Random effects estimator)

	$AdjZ1_{i,j}$		$AdjZ2_{i,j}$		$AdjROE_{i,j}$		$AdjROA_{i,j}$	
$NoMAJ_{i,j,t}$	0.2300*** (0.0839)	-	0.2533*** (0.0845)	-	-0.2475*** (0.0837)	-	-0.1292 (0.0934)	-
$C1_{i,j,t}$	-	0.2841*** (0.0885)	-	0.2389*** (0.0900)	-	-0.2746*** (0.0873)	-	-0.1557 (0.0994)
$C2_{i,j,t}$	-	0.1531 (0.1145)	-	0.1085 (0.1092)	-	-0.1429 (0.1117)	-	-0.1408 (0.1162)
$Change1_{i,j,t}$	0.0097 (0.0824)	-	-0.0583 (0.0868)	-	0.0122 (0.0825)	-	0.0656 (0.0884)	-
$Change2_{i,j,t}$	-	-0.0200 (0.0739)	-	0.0228 (0.0729)	-	0.0224 (0.0716)	-	-0.0201 (0.0787)
$L_{i,j,t}$	0.0057*** (0.0010)	0.0055*** (0.0011)	0.0056*** (0.0011)	0.0057*** (0.0010)	-0.0041*** (0.0010)	-0.0041*** (0.0010)	-0.0062*** (0.0011)	-0.0061*** (0.0011)
$NONINT_{i,j,t}$	-0.0004 (0.0009)	-0.0031 (0.0008)	-0.0002 (0.0008)	-0.004 (0.0009)	0.0005 (0.0008)	0.0005 (0.0008)	0.0004 (0.0008)	0.0004 (0.0008)
$Log(TA_{i,j,t})$	0.0008 (0.0158)	0.0074 (0.0155)	0.0058 (0.0154)	0.0018 (0.0159)	0.0164 (0.0149)	0.0142 (0.0149)	-0.2067*** (0.0162)	-0.2072*** (0.0163)**
Δ $Log(TA_{i,j,t})$	0.0654 (0.0703)	0.0911 (0.0709)	0.0953 (0.0708)	0.0621 (0.0704)	-0.0614 (0.0622)	-0.0575 (0.0664)	0.1655** (0.0702)	0.1683 (0.0703)
$AdjROA_{i,j,t}$	-	-	-	-	-	-	0.0295* (0.0180)	0.0295* (0.0180)
$AdjROE_{i,j,t}$	-	-	-	-	-0.0040** (0.0018)	-0.0039** (0.0018)	-	-
Period fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0883	0.0908	0.0894	0.0875	0.0751	0.0775	0.2161	0.1414
N. Obs.	3246	3246	3245	3246	3250	3250	3250	3250

All dependent variables are used in the log form. Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *SDAdjROE*=MovStDev(ER/E) and *SDAdjROA*=MovStDev(ER/TA), where ER is earnings before taxes and loan loss provisions, E is total equity and TA is total assets; *AdjZ1*=(AdjROA+EQ)/SDAdjROA and *AdjZ2*=(100+AdjROE)/SDAdjROE, where *AdjROA*=MovAv(ER/TA) and *AdjROE*=MovAv(ER/E) are moving average adjusted return on assets and return on equity, and EQ is a moving average of the equity to total assets ratio (all in percentages and calculated over 3-year rolling window); Dummy variables: *NoMAJ* = equals 1 if the bank does not have a majority owner; *C1* = equals 1 if the bank is in cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in cluster 2 (medium ownership concentration); *Change1(2)* = dummy variables which equal 1 if a bank's ownership concentration changes over the period; *L* = net loans/total assets; *NONINT* = net non interest income/net operating income; *Log(TA)* = log of total assets; Δ*Log(TA)* = annual growth rate of total assets.

Table B2. Degree of ownership concentration, majority shareholder type and bank risk for European commercial banks for the period 2004-2009 (cross-sectional analysis, OLS estimator)

	$AdjZ1_{i,j}$	$AdjZ2_{i,j}$	$SDAdjROE_{i,j}$	$SDAdjROA_{i,j}$
$NoMAJ_{i,j}$	0.5631*** (0.1449)	0.5099*** (0.1399)	-0. 5573*** (0. 1448)	-0. 2433 * (0. 1421)
$Mbank_{i,j}$	0.2929** (0.1252)	0.2565** (0.1173)	-0. 2833** (0. 1248)	-0. 1414 (0. 1157)
$Mindust_{i,j}$	0.1736 (0.1689)	0.1383 (0.1555)	-0. 1822 (0. 1647)	0. 1124 (0. 1474)
$Mfamily_{i,j}$	0.5206** (0.2300)	0.5374*** (0.2380)	-0. 4929** (0. 2300)	-0. 4519 * (0. 2522)
$Mother_{i,j}$	0.4514** (0.2037)	0.4763 (0.2540)	-0. 4420** (0. 2050)	-0. 2647 (0. 2258)
$Change1_{i,j}$	0.2482 (0.1542)	-	-0. 2567* (0. 1525)	-
$Change2_{i,j}$	-	0.2811** (0.1421)	-	-0. 0800 (0. 1391)
$L_{i,j}$	0.0067*** (0.0013)	0.0066*** (0.0013)	-0. 0069*** (0. 0013)	-0. 0089 *** (0. 0014)
$NONINT_{i,j}$	-0.0067** (0.0029)	-0.0060** (0.0028)	0. 0066** (0. 0028)	0. 0076 ** (0. 0033)
$Log(TA_{i,j})$	-0.0339 (0.0212)	-0.0448** (0.0201)	0. 0395** (0. 0210)	-0. 1443 *** (0. 0214)
Δ $Log(TA_{i,j})$	-0.1029 (0.1429)	0.4155** (0.1531)	0. 1046 (0. 1363)	-0. 1771 (0. 1812)
$AdjROA_{i,j}$	-	-	-	0. 1141 (0. 0321)
$AdjROE_{i,j}$	-	-	0. 0034 (0. 0037)	-
Country fixed effects	Yes	Yes	Yes	Yes
R^2	0.1130	0.1187	0.1099	0.2168
N. Banks	872	872	872	872
N. Obs.	872	872	872	872

All dependent variables are used in the log form. Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.

Variable definitions:

SDAdjROE=StDev(ER/E) and *SDAdjROA*=StDev(ER/TA), where ER is earnings before taxes and loan loss provisions, E is total equity and TA is total assets; *AdjZ1*=(AdjROA+EQ)/SDAdjROA and *AdjZ2*=(100+AdjROE)/SDAdjROE, where *AdjROA*=Mean(ER/TA) and *AdjROE*=Mean(ER/E) are average adjusted return on assets and return on equity, and EQ is the average equity to total assets ratio (all in percentages); Dummy variables: *NoMAJ* = equals 1 if the bank does not have a majority owner; *Mbank* = equals 1 if the majority shareholder is a bank ; *Mindust* = equals 1 if the majority shareholder (holding more than 50%) is an industrial firm; *Mfamily* = equals 1 if the majority shareholder (holding more than 50%) is an individual or a family*;* *Mother* = equals 1 if the majority shareholder is all remaining shareholder types excluding institutional investors; *Change1(2)* = equal 1 if a bank's ownership concentration changes over the period; *L* = net loans/total assets; *NONINT* = net non interest income/net operating income*;* *Log(TA)* = log of total assets; Δ *Log(TA)* = annual growth rate of total assets.

Table B3. Supervisory strength, degree of ownership concentration and bank risk for European commercial banks for the period 2004-2009 (cross-sectional analysis, OLS estimator)

	$AdjZ1_{i,j}$		$AdjZ2_{i,j}$		$AdjROE_{i,j}$		$AdjROA_{i,j}$	
$SupReg_j$	0.0650*** (0.0218)	0.0695*** (0.0219)	0.0626*** (0.0213)	0.0661*** (0.0215)	-0. 0625*** (0. 0213)	-0.0655*** (0.0215)	-0. 0476** (0. 0218)	-0.0501** (0.0220)
$NoMAJ_{i,j}$	0.2453*** (0.0870)	-	0.1874** (0.0880)	-	-0. 2470*** (0. 0865)	-	-0. 0098 (0. 0954)	-
$C1_{i,j}$	-	0.3231*** (0.0935)	-	0.2800*** (0.0994)	-	-0.3340*** (0.0922)	-	-0.0855 (0.1019)
$C2_{i,j}$	-	0.2373* (0.1229)	-	0.1435 (0.1186)	-	-0.222* (0.1199)	-	-0.1707 (0.1328)
$Change1_{i,j}$	-0.0351 (0.1049)	-	0.0195 (0.0977)	-	0.0236 (0. 1037)	-	0. 0332 (0. 0970)	-
$Change2_{i,j}$	-	0.0313 (0.0836)	-	0.0377 (0.0800)	-	-0.0205 (0.0833)	-	-0.0361 (0.0786)
$L_{i,j}$	0.0072*** (0.0122)	0.0070*** (0.0012)	0.0062*** (0.0012)	0.0060*** (0.0012)	-0. 0065*** (0. 0012)	-0.0060*** (0.0011)	-0. 0072*** (0. 0012)	-0.0071*** (0.0012)
$NONINT_{i,j}$	-0.0051* (0.0028)	-0.0054* (0.0028)	-0.0048* (0.0029)	-0.0050* (0.0029)	0. 0051* (0. 0027)	0.0056** (0.0028)	0. 0066** (0. 0031)	0.0067** (0.0031)
$Log(TA_{i,j})$	-0.0282 (0.0189)	-0.0248 (0.0187)	-0.0346** (0.0174)	-0.0317* (0.0171)	0. 0334* (0. 0187)	0.0311* (0.0178)	-0. 1559*** (0. 0193)	-0.1578*** (0.0190)
Δ $Log(TA_{i,j})$	-0.0604 (0.1455)	-0.0855 (0.1410)	0.4454** (0.1593)	0.4233** (0.1575)	0. 0625 (0. 1419)	0.0861 (0.1356)	-0. 1814 (0. 1754)	-0.1746 (0.1734)
$AdjROA_{i,j}$	-	-	-	-	0. 0032 (0. 0036)	-	-	0.1148*** (0.0326)
$AdjROE_{i,j}$	-	-	-	-	-	-0.0071 (0.0222)	0. 1142 (0. 0326)	-
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.0649	0.0717	0.0668	0.0725	0.0612	0.0666	0.1761	0.1782
N. Obs.	872	872	872	872	872	872	872	872

All dependent variables are used in the log form. Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *SDAdjROE*=StDev(ER/E) and *SDAdjROA*=StDev(ER/TA), where ER is earnings before taxes and loan loss provisions, E is total equity and TA is total assets; *AdjZ1*=(AdjROA+EQ)/SDAdjROA and *AdjZ2*=(100+AdjROE)/SDAdjROE, where *AdjROA*=Mean(ER/TA) and *AdjROE*=Mean(ER/E) are average adjusted return on assets and return on equity, and EQ is the average equity to total assets ratio (all in percentages); *SupReg* = index for strength of supervisory regime; Dummy variables: *NoMAJ* = equals 1 if the bank does not have a majority owner; *C1* = equals 1 if the bank is in cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in cluster 2 (medium ownership concentration); *Change1(2)* = equal 1 if a bank's ownership concentration changes over the period; *L* = net loans/total assets; *NONINT* = net non interest income/net operating income*;* *Log(TA)* = log of total assets; Δ *Log(TA)* = annual growth rate of total assets.

Table B4. Robustness check 1, different thresholds to define dominant shareholder in Equations (4) (degree of ownership concentration and income smoothing, 2004-2009, two-step system GMM estimator)

	Equation (4) (Threshold 40% for dominant shareholder)	Equation (4) (Threshold 25% for dominant shareholder)	Equation (4) (Threshold 10% for dominant shareholder)
$LLP_{i,j,t-1}$	0.3454***	0.3495***	0.03406***
	(0.0429)	(0.0422)	(0.0439)
$ER_{i,j,t}$	0.0684***	0.0685***	0.0651***
	(0.0127)	(0.0121)	(0.0116)
$ER_{i,j,t} \bullet NoDOM_{i,j,t}$	-0.0298	-0.0572***	-0.0782**
	(0.0209)	(0.0171)	(0.0393)
$L_{i,j,t}$	0.036***	0.0036***	0.0036***
	(0.0004)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	-0.0318	-0.0319	-0.0343
	(0.0216)	(0.0215)	(0.0218)
$\Delta y_{j,t}$	-0.0208***	-0.0205***	-0.0199***
	(0.0049)	(0.0049)	(0.0050)
$EQ_{i,j,t-1}$	0.0009	0.0008	0.0009
	(0.0012)	(0.0012)	(0.0012)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Wald Tests:			
$\alpha_{ER} + \alpha_{ER \bullet NoDOM} = 0$		0.0113	-0.0131
[P-value]		[0.4149]	[0.7389]
AR(2) test	0.711	0.700	0.717
Hansen test	0.673	0.676	0.663
N. Banks	925	925	925
N. Obs.	3622	3622	3622

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *LLP* = loan loss provisions/total assets *;* *ER* = earnings before taxes and loan loss provisions/total assets*;* *NoDOM* = dummy variable which equals 1 if the bank does not have a dominant shareholder at the different thresholds considered; ; *L* = net loans/total assets; ΔL =loan growth rate*;* Δy = GDP growth rate; *EQ*= equity/total assets.

Table B5. Robustness check 2, addition of non-performing loans to Equations (3-5) (degree of ownership concentration and income smoothing, 2004-2009, two-step system GMM estimator)

	Equation (3) (Baseline)	Equation (4)	Equation (5)
$LLP_{i,j,t-1}$	0. 1017**	0. 1019**	0.0966**
	(0. 0490)	(0. 0490)	(0.0487)
$ER_{i,j,t}$	0. 0484***	0. 0480***	0.0562***
	(0. 0153)	(0. 0153)	(0.0182)
$ER_{i,j,t} \bullet NoMAJ_{i,j,t}$	-	0.0001	-
		(0. 0452)	
$ER_{i,j,t} \bullet C1_{i,j,t}$	-	-	-0.0419*
			(0.0253)
$ER_{i,j,t} \bullet C2_{i,j,t}$	-	-	0.0204
			(0.0369)
$NPL_{i,j,t}$	0. 0100***	0. 0100***	0.0100***
	(0.0030)	(0.0030)	(0.0030)
$L_{i,j,t}$	0. 0036***	0. 0036***	0.0035***
	(0.0004)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	-0. 0073	-0. 0075	-0.0068
	(0. 0454)	(0. 0430)	(0.0454)
$\Delta y_{j,t}$	-0.0425***	-0. 0424***	-0.0425***
	(0.0045)	(0.0044)	(0.0045)
$EQ_{i,j,t-1}$	0. 0021	0. 0021	0.0020
	(0. 0018)	(0. 0019)	(0.0017)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Wald Tests:			
$\alpha_{ER} + \alpha_{ER \bullet C1} = 0$			0.0143
[P-value]			[0.5239]
AR(2) test	0.467	0.471	0.519
Hansen test	0.986	0.985	0.983
N. Banks	399	399	399
N. Obs.	1304	1304	1304

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *LLP* = loan loss provisions/total assets *;* *ER* = earnings before taxes and loan loss provisions/total assets*;* Dummy variables: *NoMAJ* = equals 1 if the bank does not have a majority owner; *C1* = equals 1 if the bank is in cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in cluster 2 (medium ownership concentration); *NPL* = non performing loans/net loans; *L* = net loans/total assets; ΔL =loan growth rate*;* Δy = GDP growth rate; *EQ*= equity/total assets.

Table B6. Robustness check 3, non crisis period (degree of ownership concentration, income smoothing and regulatory regime, 2004-2007, two-step system GMM estimator)

	Equation (5)	Equation (8)	Equation (8)
$LLP_{i,j,t-1}$	0.2963***	0.2917***	0.2976***
	(0.0436)	(0.0466)	(0.0453)
$ER_{i,j,t}$	0.0734***	0.1181***	0.0537***
	(0.0163)	(0.0269)	(0.0197)
$ER_{i,j,t} \bullet C1_{i,j,t}$	-0.0539***	-0.0659***	-0.0548***
	(0.01634)	(0.0187)	(0.0161)
$ER_{i,j,t} \bullet C2_{i,j,t}$	0.0110	0.0094	0.0062
	(0.0216)	(0.0201)	(0.0223)
$ER_{i,j,t} \bullet SupReg_{j}$	-	-0.0185***	-
		(0.0058)	
$ER_{i,j,t} \bullet ShareProct_{j}$	-	-	0.0148
			(0.0114)
$L_{i,j,t}$	0.0037***	0.0031***	0.0032***
	(0.0004)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	-0.0059	-0.0054	-0.0121
	(0.0288)	(0.0261)	(0.0276)
$\Delta y_{j,t}$	-0.0453***	-0.0336***	-0.0371***
	(0.0106)	(0.0070)	(0.0068)
$EQ_{i,j,t-1}$	-0.0003	-0.00003	-0.0006
	(0.0014)	(0.0014)	(0.0014)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	Yes	No	No
Period fixed effects	Yes	Yes	Yes
Wald tests			
$\alpha_{ER} + \alpha_{ER \bullet C1} = 0$	0.0195		
	[0.0625]		
Marginal effects:			
ER Cluster 2 and 3 at Min(REG)		0.1181	
		[0.0000]	
ER Cluster 2 and 3 at Med(REG)		0.0811	
		[0.0000]	
ER Cluster 2 and 3 at Max(REG)		0.0256	
		[0.0619]	
ER Cluster 1 at Min(REG)		0.0522	
		[0.0018]	
ER Cluster 1 at Med(REG)		0.0152	
		[0.1671]	
ER Cluster 1 at Max(REG)		-0.0403	
		[0.0403]	
AR(2) test	0.933	0.853	0.961
Hansen test	0.779	0.681	0.789
N. Banks	846	846	846
N. Obs.	2474	2474	2474

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *LLP* = loan loss provisions/total assets *;* *ER* = earnings before taxes and loan loss provisions/total assets*;* Dummy variables: *C1* = equals 1 if the bank is in cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in cluster 2 (medium ownership concentration); *REG* = either index for strength of supervisory regime (SupReg) or index for degree of shareholder protection (ShareProct); *L* = net loans/total assets; ΔL =loan growth rate*;* Δy = GDP growth rate; *EQ*= equity/total assets.

Table B7. Robustness check 4, addition of "signalling" variable to Equations (3-5) (degree of ownership concentration and income smoothing, 2004-2009, two-step system GMM estimator)

	Equation (5)	Equation (8)	Equation (8)
$LLP_{i,j,t-1}$	0.3054***	0. 3077***	0. 3079***
	(0.0517)	(0. 0523)	(0. 0530)
$ER_{i,j,t}$	0.0560***	0. 0898***	0. 0478***
	(0.0154)	(0. 0237)	(0. 0183)
$ER_{i,j,t} \bullet C1_{i,j,t}$	-0.0410***	-0. 0455***	-0. 0384***
	(0.0135)	(0. 0146)	(0. 0138)
$ER_{i,j,t} \bullet C2_{i,j,t}$	0.0049	0. 0006	0. 0022
	(0.0211)	(0. 0203)	(0. 0225)
$ER_{i,j,t} \bullet SupReg_{j}$	-	-0. 0159***	-
		(0. 0051)	
$ER_{i,j,t} \bullet ShareProct_{j}$	-	-	0. 0047
			(0. 0093)
$Signal_{i,j,t}$	0.0095	0. 0082	0. 0088
	(0.0089)	(0. 0084)	(00085)
$L_{i,j,t}$	0.0031***	0. 0027***	0. 0029***
	(0.0003)	(0.0003)	(0.0003)
$\Delta L_{i,j,t}$	-0.0169	-0. 0150	-0. 0166
	(0.0182)	(0. 0172)	(0. 0184)
$\Delta y_{j,t}$	-0.0182**	-0. 0159***	-0. 0213***
	(0.0074)	(0. 0050)	(0. 0047)
$EQ_{i,j,t-1}$	-0.0013	-0. 0011	-0. 0017
	(0.0010)	(0. 0009)	(0.0010)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	Yes	No	No
Period fixed effects	Yes	Yes	Yes
Wald tests:			
$\alpha_{ER} + \alpha_{ER \bullet C1} = 0$	0.0150		
	[0.1016]		
Marginal effects:			
ER Cluster 2 and 3 at Min(REG)		0.0898	
		[0.000]	
ER Cluster 2 and 3 at Med(REG)		0.0580	
		[0. 0003]	
ER Cluster 2 and 3 at Max(REG)		0.0103	
		[0. 4293]	
ER Cluster 1 at Min(REG)		0.0443	
		[0. 0039]	
ER Cluster 1 at Med(REG)		0.0125	
		[0. 2009]	
ER Cluster 1 at Max(REG)		-0.0352	
		[0. 0337]	
AR(2) test	0.607	0.639	0.604
Hansen test	0.440	0.323	0.397
N. Banks	770	770	770
N. Obs.	2586	2586	2586

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes and loan loss provisions/total assets*;* Dummy variables: *C1* = equals 1 if the bank is in cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in cluster 2 (medium ownership concentration). *REG* = either index for strength of supervisory regime (*SupReg*) or index for degree of shareholder protection (*ShareProct*); *Signal* = one-year-ahead change of earnings before taxes and loan loss provisions; *L* = net loans/total assets; ΔL =loan growth rate*;* Δy = GDP growth rate; *EQ*= equity/total assets.

Table B8. Robustness check 5, sample excluding Spain (degree of ownership concentration, income smoothing and regulatory regime, 2004-2007, two-step system GMM estimator)

	Equation (5)	Equation (8)	Equation (8)
$LLP_{i,j,t-1}$	0.3404*** (0.0425)	0. 3255*** (0. 0440)	0.3359*** (0.0438)
$ER_{i,j,t}$	0.0701*** (0.0148)	0. 1194*** (0. 0240)	0.0506*** (0.0181)
$ER_{i,j,t} \bullet C1_{i,j,t}$	-0.0483*** (0.0172)	-0. 0558*** (0. 0179)	-0.0447*** (0.0163)
$ER_{i,j,t} \bullet C2_{i,j,t}$	0.0134 (0.0191)	0. 0113 (0. 0183)	0.0106 (0.0190)
$ER_{i,j,t} \bullet SupReg_j$	-	-0. 0210*** (0. 0055)	-
$ER_{i,j,t} \bullet ShareProct_j$	-	-	0.0154 (0.0117)
$L_{i,j,t}$	0.0037*** (0.004)	0. 0035*** (0. 0004)	0.0036*** (0.0004)
$\Delta L_{i,j,t}$	-0.0414* (0.0242)	-0. 0358 (0. 0231)	-0.0422* (0.0235)
$\Delta y_{j,t}$	-0.0215*** (0.0053)	-0. 0230*** (0. 0047)	-0.0260*** (0.0046)
$EQ_{i,j,t-1}$	0.0006 (0.0013)	0.0014 (0. 0013)	0.0008 (0.0013)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	Yes	No	No
Period fixed effects	Yes	Yes	Yes
Wald tests			
$\alpha_{ER} + \alpha_{ER \bullet C1} = 0$	0.0218 [0.1056]		
Marginal effects:			
ER Cluster 2 and 3 at Min(REG)		0.1194 [0.0000]	
ER Cluster 2 and 3 at Med(REG)		0.0774 [0.0000]	
ER Cluster 2 and 3 at Max(REG)		0.0144 [0.3028]	
ER Cluster 1 at Min(REG)		0.0636 [0.0005]	
ER Cluster 1 at Med(REG)		0.0216 [0.1051]	
ER Cluster 1 at Max(REG)		-0.0414 [0.0387]	
AR(2) test	0.710	0.650	0.749
Hansen test	0.666	0.732	0.781
N. Banks	867	867	867
N. Obs.	3413	3413	3413

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *LLP* = loan loss provisions/total assets ; *ER* = earnings before taxes and loan loss provisions/total assets; Dummy variables: *C1* = equals 1 if the bank is in cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in cluster 2 (medium ownership concentration); *REG* = either index for strength of supervisory regime (SupReg) or index for degree of shareholder protection (ShareProct); *L* = net loans/total assets; ΔL =loan growth rate; Δy = GDP growth rate; *EQ*= equity/total assets.

Table B9. Robustness check 6, smaller sample used for risk equations (degree of ownership concentration, income smoothing and regulatory regime, 2004-2009, two-step system GMM estimator)

	Equation (5)	Equation (8)	Equation (8)
$LLP_{i,j,t-1}$	0.3406***	0.3279***	0.3349***
	(0.0433)	(0.0449)	(0.0448)
$ER_{i,j,t}$	0.0645***	0.1077***	0.0454**
	(0.0144)	(0.0243)	(0.0176)
$ER_{i,j,t} \bullet C1_{i,j,t}$	-0.0422**	-0.0495***	-0.0402**
	(0.0169)	(0.0176)	(0.0159)
$ER_{i,j,t} \bullet C2_{i,j,t}$	0.0168	0.0132	0.0135
	(0.0186)	(0.0178)	(0.0187)
$ER_{i,j,t} \bullet SupReg_j$	-	-0.0176***	-
		(0.0056)	
$ER_{i,j,t} \bullet ShareProct_j$	-	-	0.0156
			(0.0107)
$L_{i,j,t}$	0.0036***	0.0035***	0.0036***
	(0.0004)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	-0.0302	-0.0285	-0.0313
	(0.0241)	(0.0229)	(0.0234)
$\Delta y_{j,t}$	-0.0225***	-0.0233***	-0.0254***
	(0.0052)	(0.0047)	(0.0046)
$EQ_{i,j,t-1}$	0.0006	0.0013	0.0008
	(0.0013)	(0.0013)	(0.0013)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	Yes	No	No
Period fixed effects	Yes	Yes	Yes
Wald tests:			
$\alpha_{ER} + \alpha_{ER \bullet C1} = 0$	0.0223		
	[0.0881]		
Marginal effects:			
ER Cluster 2 and 3 at Min(REG)		0.1077	
		[0.000]	
ER Cluster 2 and 3 at Med(REG)		0.0725	
		[0.000]	
ER Cluster 2 and 3 at Max(REG)		0.0197	
		[0.1472]	
ER Cluster 1 at Min(REG)		0.0582	
		[0.0014]	
ER Cluster 1 at Med(REG)		0.0231	
		[0.0788]	
ER Cluster 1 at Max(REG)		-0.0298	
		[0.1336]	
AR(2) test	0.828	0.776	0.874
Hansen test	0.863	0.845	0.882
N. Banks	872	872	872
N. Obs.	3435	3435	3435

Standard deviation of coefficient estimates in parentheses, with $p < 0.1$ *, $p < 0.05$ **, $p < 0.01$ ***.
Variable definitions: *LLP* = loan loss provisions/total assets *;* *ER* = earnings before taxes and loan loss provisions/total assets*;* Dummy variables: *C1* = equals 1 if the bank is in cluster 1 (low ownership concentration) ; *C2* = equals 1 if the bank is in cluster 2 (medium ownership concentration); *REG* = either index for strength of supervisory regime (*SupReg*) or index for degree of shareholder protection (*ShareProct*); *L* = net loans/total assets; ΔL =loan growth rate*;* Δy = GDP growth rate; *EQ*= equity/total assets.