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Bank income smoothing, ownership concentration and the regulatory environment

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ABSTRACT

We empirically examine whether the way a bank might use loan loss provisions to smooth its income is influenced by its ownership concentration and the regulatory environment. Using a panel of European commercial banks, we find evidence that banks with more concentrated ownership use discretionary loan loss provisions to smooth their income. This behavior is less pronounced in countries with stronger supervisory regimes or higher external audit quality. Banks with low levels of ownership concentration do not display such discretionary income smoothing behavior. This suggests the need to improve existing or implement new corporate governance mechanisms.

1. Introduction

The question whether banks use loan loss provisions (LLP) to manipulate their reported earnings is examined by a fairly large empirical literature, with rather mixed results.[1] A certain degree of latitude in managing earnings can arise through the element of judgement banks 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. Analyzing the earnings management of banks is of importance as income smoothing compromises the faithful representation of their underlying economic condition; accounting numbers no longer reflect the economic reality of underlying risk conditions in this case, reducing the ability of stakeholders, such as regulators and debtholders, to properly monitor banks. The last financial crisis has shown that when bank insiders exploit banks for their own purposes, the likelihood of bank failures increases curtailing economic development and welfare more generally.

In this paper, we investigate whether ownership structure and national institutional factors play an important role in determining these financial reporting characteristics of banks. More specifically, we examine if differences in ownership concentration can explain differences in the level of earnings management, and if the regulatory environment plays a role in potentially disciplining such corporate behavior. Banks with a high level of ownership concentration (one or two controlling owners) could use discretionary LLP to smooth their income, e.g. in an effort to conceal behavior such as extraction of private benefits of control. Arguably, such income smoothing behavior should, however, be less prominent for banks with a dispersed ownership structure, or banks located in countries with stronger regulatory controls.

The existing literature analyzing the relationship between corporate governance and earnings management mainly focusses on US firms with their widely dispersed ownership structure, and mostly on non-financial firms. It sees income smoothing mainly as an act of managerial self-dealing and as such as an agency problem arising from the separation of ownership and control (e.g. Lambert (1984) and Rozycki (1997) for non-financial firms). This

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[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 (2012).

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agency problem can be addressed through internal corporate governance mechanisms such as board effectiveness and managerial compensation (e.g. Klein (2002), Park and Shin (2004) and Zhao and Chen, 2008, and specifically for banking firms Cornett et al. (2009) and Leventis and Dimitropoulos (2012)). However, when large shareholders are also involved in firm decision making, as prevalent in continental Europe and Asia (La Porta et al., 1998), the conflict of interest shifts away from manager vs. shareholders to controlling owner vs. minority shareholders, as large shareholders have incentives to maximize their own benefits at the cost of other shareholders. Internal corporate governance mechanisms are less likely to limit such agency problems as large investors elect representatives to the board of directors that will act in their interest. Where controlling shareholders have incentives to manipulate earnings, it therefore becomes important to determine if governance by external stakeholders, in particular regulators, can curb such behavior. To date, the empirical literature analyzing the relationship between the level of ownership concentration and management of earnings is very scarce. Using country level measures of ownership concentration for panels of listed firms, several authors find mixed results showing that ownership concentration can be associated with either lower or higher levels of earnings management (Leuz et al. (2003), Fan and Wong (2002) for non-financial firms, Gebhardt and Novotny-Farkas (2011) for banking firms).

To investigate the effect of ownership concentration on earnings management, we use a firm-level data set on the ownership structure of banking firms. We focus on banks as they play a particularly important role in the financial intermediation process of modern economies, and because they have additional characteristics that require a separate analysis from non-financial firms. The financial structure of banks' assets combined with high leverage makes them inherently more opaque than other firms (Morgan, 2002), while they are also heavily regulated in response to significant negative externalities associated with bank failures. Banks have consequently a unique form of corporate governance (Adams and Mehran, 2003), with more stakeholders than non-financial firms, including depositors, non-insured debtholders, deposit insurers and regulators. Maintaining a well-functioning and stable financial system requires a better understanding of how these different stakeholders behave and interact together. The global financial crisis triggered in 2007 has shed light on the severe malfunctioning of several mechanisms of the internal and external governance of financial institutions, prompting the need to investigate better ways to strengthen accounting quality and ensure sound corporate governance mechanisms in the banking industry.

Using a sample of European commercial banks over the period 2004–2009, we find that whether or not a bank practices income smoothing through LLP does indeed depend on its degree of ownership concentration and the regulatory environment. For banks with a high level of ownership concentration, we find evidence of income smoothing through the use of LLP. This is significantly less pronounced in countries with stronger supervisory regimes or higher external audit quality, but independent of the level of shareholder protection, the type of audit firm (Big Four or non-Big Four) and the level of non-insured debt. Banks with low levels of ownership concentration are found not to display such income smoothing behavior throughout.

Our contribution to the literature is then threefold. Firstly, we contribute to the literature exploring the relationship between corporate governance and earnings management by analyzing if ownership concentration is an important determinant of earnings management, focussing on the banking sector. Secondly, as a number of institutional factors, such as banking supervision, audit quality and investor protection, can have an impact on accounting quality and earnings management, we further examine whether national regulatory factors can play an important role in the relationship between ownership concentration and the earnings management behavior of banks. Thirdly, by analyzing the relationship between ownership concentration and earnings management using detailed bank level data especially on their ownership structure, and examining a wider dataset containing both listed and unlisted banks, we aim to obtain a better understanding of the underlying mechanisms at work. For this we focus on a European dataset which provides a substantial amount of variability between individual levels of ownership concentration given the lack of regulatory limitations on the percentage of bank capital owned by a single entity in Europe.

Section 2 discusses the relevant literature and develops the research questions we address; Section 3 describes our data, the ownership characterization used and our baseline model specification; Section 4 presents and discusses our results regarding the impact of ownership structure and regulatory environment on income smoothing; Section 5 discusses further issues and contains several robustness checks; and Section 6 concludes the paper.

2. Literature review and research questions

The relationship between corporate governance and earnings management has given rise to a large literature mainly focusing on the conflict of interest between managers and shareholders when firms' ownership structure is widely dispersed. Several theoretical papers show why managers might engage in earnings management. Managers can manipulate earnings in order to influence the information set used by external investors and to maximize their own interest in relation to 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). Consistent with this literature, the existing empirical literature, focussing predominantly on US non-financial firms, shows that managers engage in earnings management to increase their compensation, to minimize their chance of being fired, to positively affect the risk perception of the firm or to reduce future expected income tax liabilities of investors (see e.g. Lambert, 1984; Greenawalt and Sinkey, 1988; Rozycki, 1997).

Boards of directors can play a significant role in controlling agency problems between managers and shareholders as their role is to appoint/dismiss and compensate management with the objective to maximize shareholder value (Fama and Jensen, 1983). Empirical studies provide mixed results on board effectiveness in monitoring management in the financial reporting process (see e.g. Klein (2002), Park and Shin (2004) and Zhao and Chen (2008) for non-financial firms, and Cornett et al. (2009), Leventis and Dimitropoulos (2012) and Leventis et al. (2013) for banking firms). Another mechanism to control management is the market for corporate control: the threat of a hostile takeover can make managers behave in accordance with the interests of current shareholders (Jensen, 1988). In banking, hostile takeovers are extremely rare (Prowse, 1997), mainly due to the opacity of banks and the regulatory approval process for M&As in the banking industry.

These different corporate mechanisms aiming to rein in managers' behavior are much less relevant, however, when the ownership structure is concentrated (Davies, 2000). Large investors can elect their representative(s) to the board of directors who will appoint a manager that will act in the interest of these controlling shareholders. The conflict of interest then shifts away from managers vs. shareholders to one of controlling owner vs. minority shareholders.[2] The effect of controlling ownership on firm value and on

[2] Even if the minority shareholders may collectively hold more voting shares than the controlling shareholders, the control of the firm will lie in the hand of the blockholder if the shares held by the minority shareholders are widely dispersed.

the decision to manipulate earnings depends upon the trade-off between shared benefits of control and any private extraction of firm value by controlling shareholders. The theoretical literature demonstrates that controlling shareholders can impose greater monitoring on management and use their influence to push managers to make decisions that increase overall shareholder value and thereby benefit all shareholders (Jensen and Meckling, 1976; Shleifer and Vishny, 1986). In other words, concentrated ownership can align the interests of controlling shareholders with those of non-controlling ones.

However, there can also be private benefits of control in the sense that they profit only controlling shareholders (Grossman and Hart, 1988; Bebchuk, 1999; Shleifer and Wolfenzon, 2002). Some shareholders might enjoy the "psychic" value attached to being in control; these benefits do not necessarily affect other shareholders (Harris and Raviv, 1988; Aghion and Bolton, 1992). However, when controlling shareholders can engage in actual extraction of corporate resources, such as through perks or transfer of assets on non-market terms to related parties, then other shareholders would be affected through the resulting reduction in firm value (Jensen and Meckling, 1976).[3] When controlling shareholders pursue such objectives that are not profit-maximizing but increase their personal utility, having such controlling shareholders can lead to an entrenchment problem.

The consequences for earnings management of having a concentrated ownership structure are not a clear cut issue conceptually, which furthermore has not been examined on a theoretical level to date. One could argue that under the alignment hypothesis controlling owners have less incentive to engage in earnings management that can potentially harm firm value. Under the entrenchment hypothesis, on the other hand, controlling owners can be thought to be able to control the production of the firm's accounting information and therefore to manage the reporting of earnings to conceal their private control benefits from outsiders. Controlling shareholders could similarly use their financial reporting discretion to overstate earnings and to conceal unfavorable earnings realizations (such as losses) that could lead to interference by other stakeholders (minority shareholders, debtholders and regulators).

An interesting question at the empirical level is then whether the degree of ownership concentration has an impact on the level of earnings management. Very few empirical papers analyze the relationship between the level of ownership concentration and earnings management of firms, all using country level data on ownership concentration. Leuz et al. (2003) find differences across 31 countries in earnings management of listed non-financial firms. Consistent with the hypothesis that firms use earnings management to conceal firm performance from outsiders, their results show that firms in countries with dispersed ownership structure engage in less earnings management. Fan and Wong (2002), working on a panel of listed East Asian non-financial firms, find that high ownership concentration and large separation of ownership and control are associated with lower levels of earnings informativeness. On the other hand, Gebhardt and Novotny-Farkas (2011), again using a country level measure of ownership concentration, find that income smoothing is higher in European countries where listed banks are widely held.

Our paper contributes to this literature exploring the relationship between corporate governance and earnings management by analyzing if ownership concentration, as measured at the firm level, is an important determinant of earnings management, specifically for the case of both listed and unlisted European banks. We further investigate whether the existing regulatory environment is an effective means to curb the potential discretionary income smoothing behavior of banks with high levels of ownership concentration in this context.

[3] As the key element of private benefits of control is the fact that they are difficult to observe by outsiders, measuring them in applied work is intrinsically difficult; see Dyck and Zingales (2004).

Table 1
Distribution of banks by country over the period 2004–2009.

Country	Our sample of commercial banks	Full sample of commercial banks in BankScope	Percent of total assets[a]
Austria	47	79	54.20
Belgium	21	44	95.65
Denmark	51	60	96.87
Finland	6	9	98.22
France	140	180	97.43
Germany	137	192	96.19
Greece	16	19	97.33
Ireland	7	34	5.22
Italy	132	172	90.87
Luxembourg	65	95	86.58
Netherlands	8	39	1.22
Norway	11	16	73.54
Portugal	17	25	94.67
Spain	57	83	85.32
Sweden	14	22	97.71
Switzerland	94	168	92.64
U.K.	50	152	1.13
Total	873	1389	Median = 92.64

[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.

3. Data, ownership characterization and baseline specification

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[4]: 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 1389 active European commercial banks for at least some of the period considered. Limiting our sample to European commercial banks which provide information on loan loss provisions, and after eliminating extreme bank year observations for all the variables of interest, we are left with a final sample of 873 commercial banks[5]; 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 (see Table 1).[6]

[4] We refer to a geographical definition of Europe. The Swiss banking system plays an important role in Europe and we therefore include it in our analysis.

[5] Bankscope labels as commercial banks institutions that are mainly active in a combination of retail banking, wholesale banking (large corporates) and private banking. This broad definition implies that our sample can contain some commercial banks with a low ratio of loans to total assets; to counter this, we drop the banks with the lowest 5% of the ratio of loans to total assets from our sample.

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

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

	L	EQ	LLP	ER	DEP	MF	ROA	ROE	COM	TA
Our sample of commercial banks										
All banks (873 banks, 3406 observations)										
Mean	55.69	9.49	0.32	1.30	49.69	15.21	0.71	8.51	1.36	24,921
Maximum	99.94	78.94	3.70	16.52	97.69	92.13	15.08	78.08	27.19	2,246,380
Minimum	4.73	0.31	−1.57	−14.50	1.31	0.03	−13.06	−90.69	−5.79	13
Std. Dev.	26.69	7.70	0.52	1.51	26.45	15.59	1.19	12.42	2.35	111,748
Cluster 1 Low ownership concentration (852 observations)										
Mean	60.34	9.89	0.32	1.41	51.72	17.70	0.80	8.70	1.22	47,328
Std. Dev.	23.37	6.32	0.47	1.51	23.84	15.79	1.20	10.42	2.28	166,566
Cluster 2 Medium ownership concentration (528 observations)										
Mean	57.81	9.21	0.37	1.33	47.25	15.49	0.66	7.10	1.23	16,111
Std. Dev.	26.84	6.26	0.53	1.38	27.83	16.94	1.09	10.62	1.87	97,352
Cluster 3 High ownership concentration (2026 observations)										
Mean	53.18	9.39	0.30	1.25	49.47	14.09	0.68	8.80	1.46	17,426
Std. Dev.	27.62	8.55	0.53	1.54	27.08	15.00	1.21	13.56	2.48	82,038
Full sample of commercial banks available in BankScope (1389 banks)										
Mean	48.28	14.67	0.46	1.46	48.88	15.03	0. 87	7.83	2.72	19,258
Std. Dev.	30.36	18.17	1.05	2.58	28.02	16.40	3.86	14.89	8.18	96,708

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

3.2. Ownership measures

We follow several approaches in classifying banks by the degree of concentration in their ownership structure. We firstly use a simple criterion reflecting whether or not a bank has a majority shareholder (with equity holding[7] 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 dimensions of concentration/dispersion in banks' ownership structures (following Husson et al. (2010) and Husson et al. (2011); see Appendix 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 (*Share*1), the percentage held by the second-largest shareholder (*Share*2) 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 Fig. 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 around 97% of the share (with a minimum of nearly 70%). Amongst the 873 banks in our sample, 294 belong to Cluster 1, 182 to Cluster 2 and 594 to Cluster 3 at some point in time, with 183 banks that change between clusters during the sample period.

3.3. Baseline specification

In order to examine how a bank's ownership structure and the regulatory environment 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), Bikker and Metzemakers (2005), Anandarajan et al. (2007) and Leventis et al. (2011), differentiating between discretionary and non-discretionary components of banks' loan loss provisioning behavior as follows

$$LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \alpha_3 EQ_{i,j,t-1} + \alpha_4 L_{i,j,t} + \alpha_5 \Delta L_{i,j,t} + \alpha_6 COM_{j,t} + \alpha_7 \Delta y_{j,t} + \alpha_j + \delta_t + \varepsilon_{i,j,t} \quad (1)$$

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 Eq. (1) it is identified by the loan to total assets ratio ($L_{i,j,t}$), the loan growth rate ($\Delta L_{i,j,t}$), the GDP growth rate ($\Delta y_{j,t}$) and the ratio of commission and fee income to total asset ($COM_{i,j,t}$).[8] The loan to total assets ratio is generally used as an indi-

[7] We consider direct holdings only.

[8] We do not include the non-performing loans to total net loans ratio in our core regressions, as in 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 5.6.

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

	Share1	Share2	HERF
All banks in our sample (3406 observations)			
Mean	74.07	7.89	0.67
Std. Dev.	31.99	12.50	0.37
Minimum	0.01	0.00	0.00
Maximum	100.00	50.00	1.00
Cluster 1 Low ownership concentration (852 observations)			
Mean	29.71	8.28	0.14
Std. Dev.	20.64	5.94	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 (528 observations)			
Mean	56.08	32.25	0.45
Std. Dev.	13.59	9.68	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 (2026 observations)			
Mean	97.42	1.21	0.95
Std. Dev.	6.04	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* = percentage held by largest shareholder; *Share2* = percentage held by second-largest shareholder; *HERF* = Herfindahl index on 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 shareholders; we then compute *HERF* as $\sum_{j=1}^{n} OS_j^2$, with n the total number of shareholders). Mean test examines 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, with $p < 0.1$.

** The *P*-value of the test is reported, with $p < 0.05$.

*** The *P*-value of the test is reported, with $p < 0.01$.

Clusters 1–3 are determined using a hierarchical agglomerative clustering (HAC) approach that uses three ownership measures (*Share1, Share2* and *HERF*) in the construction of clusters of banks with "similar" ownership characteristics.

cator 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. Moreover, banks having a relatively high level of commission and fee income might allocate additional loan loss provisions to signal that they are safe even if they provide multiple services (Anandarajan et al., 2007; Leventis et al., 2011); we thus expect a positive coefficient for the variable $COM_{i,j,t}$. 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).[9] 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, even if scope for such behavior is more limited since Basel 1 (and even more so under Basel 2):[10] banks with low regulatory capital could be more inclined to make loan loss provisions to keep their capital ratio adequate. To control for such capital management behavior, we use the lagged ratio of equity to total assets ($EQ_{i,j,t-1}$), expecting a negative relationship with loan loss provisions if capital management is present.[11]

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 Eq. (1). This estimator combines the original equation and a transformed one; 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 correlation matrix and the variance inflation factors (VIF), which have a mean value of 1.16 with a maximum of 1.27.

The results for our baseline regression of Eq. (1), reported in Table 4, 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 ($ER_{i,j,t}$). 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.[12] 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 ($\Delta L_{i,j,t}$) and the impact of non-traditional activities ($COM_{i,j,t}$) turn 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.

In the next section, we now examine whether ownership structure and the regulatory environment play a role in the way banks use loan loss provisions to smooth their income.

[9] Banks can also use loan loss provisions to signal their financial strength (Ahmed et al., 1999; Kanagaretnam et al., 2004; Kanagaretnam et al., 2005; Leventis et al., 2012); 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 turned out significant (see Section 5.6); however, as it reduces the number of usable years, we dropped it from our core regressions.

[10] 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.

[11] 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; see also footnote 12.

[12] For robustness, we also test (on a smaller sample of banks) the capital management hypothesis using the regulatory capital ratio instead of the equity to total assets ratio. We find again that European banks do not use LLP for capital management objectives; details are available upon request.

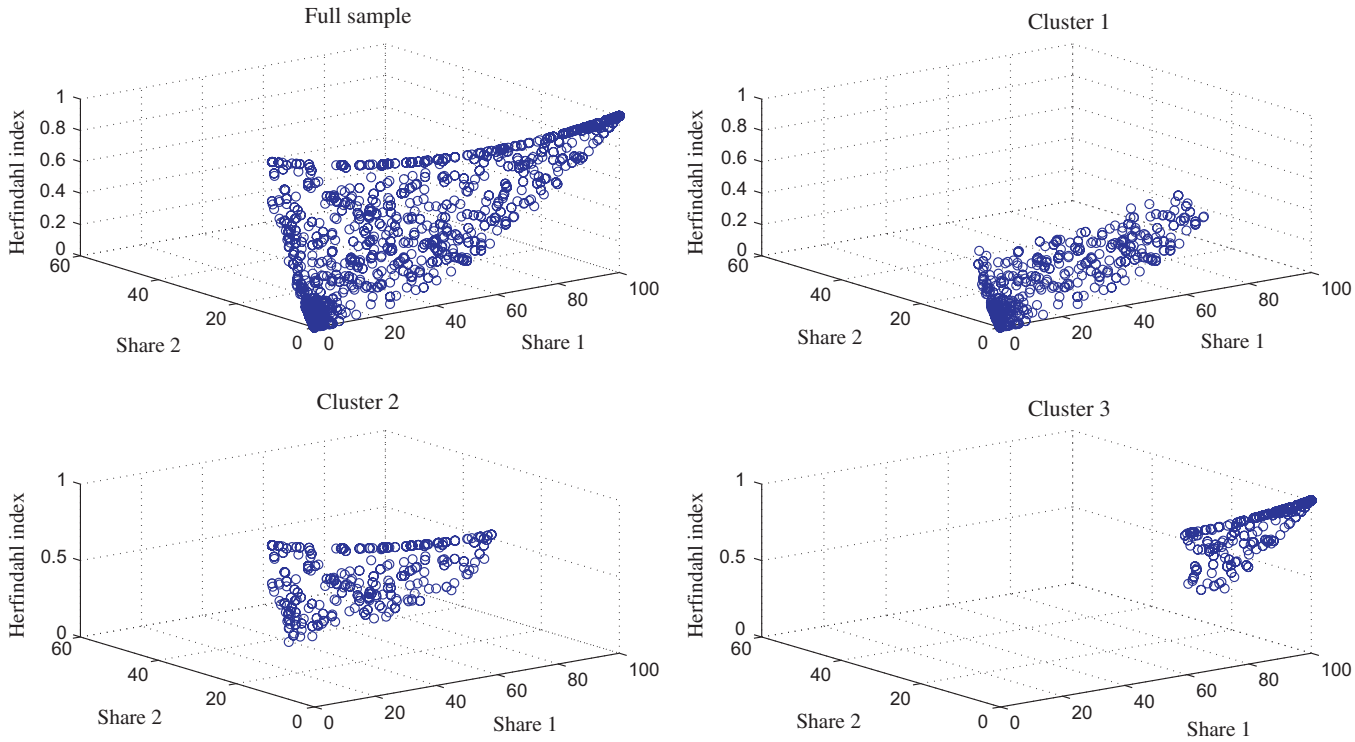

Fig. 1. Position of banks inside their respective cluster.

4. Ownership structure and income smoothing

4.1. Role of ownership concentration

We now examine whether banks with more concentrated ownership structures display either higher degrees of income smoothing through loan loss provisions, which would be consistent with the hiding of private benefit extraction (in line with the entrenchment hypothesis), or rather lower degrees of income smoothing which could arise from increased monitoring of management (in line with the alignment hypothesis). For this we augment the baseline specification of Eq. (1) 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 that consists mostly of less powerful shareholders. We consider the following two specifications

$$LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \alpha_3 ER_{i,j,t} \cdot NoMAJ_{i,j,t} + \sum_{k=1}^{5} \alpha_{3+k} CNTRLk_{i,j,t} + \alpha_9 NoMAJ_{i,j,t} + \alpha_j + \delta_t + \varepsilon_{i,j,t} \quad (2)$$

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

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. If insiders in banks with more concentrated ownership use LLP more to smooth the bank's income, in order to potentially hide the extraction of private benefits, we would expect the coefficient on the interaction term $ER_{i,j,t} \cdot NoMAJ_{i,j,t}$ in Eq. (2) to be significant and negative/positive to be in support of the entrenchment/alignment hypothesis, respectively. Eq. (3) 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/positive to be consistent with the entrenchment/alignment hypothesis, respectively.[13] We also add the same set of control variables ($CNTRLk_{i,j,t}$) as in Eq. (1), i.e. the variables $EQ_{i,j,t-1}, L_{i,j,t}, \Delta L_{i,j,t}, COM_{i,j,t}$ and $\Delta y_{j,t}$.

The estimation results for Eqs. (2) and (3), using the same estimation methodology as for our baseline specification in Section 3.3, are given in Table 4. We find (at the 10% level) that banks without a majority shareholder behave differently overall from those with such a majority shareholder in the way they use loan loss provisions to smooth their income. These banks display a lower level of income smoothing behavior than banks with a majority shareholder, as shown by the Wald test on $(\alpha_2 + \alpha_3)$. Turning to the more refined characterization of ownership concentration using a clustering approach, 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 0.0691 that is significant at the 1% level, whereas banks in Cluster 1 are seen not to display this kind of income smoothing behavior (the Wald test on $\alpha_2 + \alpha_3$ is not significant). These results illustrate the strength of our clustering methodology compared with the simple threshold approach implicit in the

[13] We cannot, however, directly test if higher ownership concentration is associated with extraction of private benefits as these are difficult to measure or even observe; see footnote 3.

Table 4
Degree of ownership concentration and income smoothing for European commercial banks for the period 2004–2009 (two-step system GMM estimator).

	Eq. (1) (Baseline)	Eq. (2)	Eq. (3)
$LLP_{i,j,t-1}$	0.3292***	0.3288***	0.3241***
	(0.0455)	(0.0439)	(0.0429)
$ER_{i,j,t}$	0.0627***	0.0692***	0.0691***
	(0.0117)	(0.0127)	(0.0128)
$ER_{i,j,t} \cdot NoMAJ_{i,j,t}$		−0.0324*	
		(0.0188)	
$ER_{i,j,t} \cdot C1_{i,j,t}$			−0.0497***
			(0.0158)
$ER_{i,j,t} \cdot C2_{i,j,t}$			0.0316
			(0.0276)
$L_{i,j,t}$	0.0043***	0.0042***	0.0043***
	(0.0005)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	−0.0561***	−0.0548***	−0.0545***
	(0.0216)	(0.0212)	(0.0210)
$\Delta y_{j,t}$	−0.0192***	−0.0194***	−0.0212***
	(0.0049)	(0.0048)	(0.0050)
$EQ_{i,j,t-1}$	−0.0009	−0.0009	−0.0009
	(0.0014)	(0.0014)	(0.0013)
$COM_{i,j,t}$	0.0069	0.0060	0.0057
	(0.0055)	(0.0052)	(0.0053)
Interaction dummies	No	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Wald Tests			
$\alpha_{ER} + \alpha_{ER \cdot NoMAJ} = 0$ [*P*-value]		0.0368**	
		[0.0234]	
$\alpha_{ER} + \alpha_{ER \cdot C1} = 0$ [*P*-value]			0.0194
			[0.1713]
P-value AR(2) test	0.1854	0.2005	0.2277
P-value Hansen test	0.3481	0.3614	0.3932
No. banks	873	873	873
No. obs.	3406	3406	3406

Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; Dummy variable: *NoMAJ* = equals 1 if bank has no majority owner; *C1* = equals 1 if bank is in Cluster 1 (low ownership concentration); *C2* = equals 1 if 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; *COM* = commissions & fees income/total assets.
* Standard deviation of coefficient estimates in parentheses, with $p < 0.1$.
** Standard deviation of coefficient estimates in parentheses, with $p < 0.05$.
*** Standard deviation of coefficient estimates in parentheses, with $p < 0.01$.

majority shareholder dummy.[14] In particular, we can observe from Fig. 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 the entrenchment hypothesis; this would be consistent with banks that have more concentrated ownership structures extracting higher levels of private benefits, and then trying to conceal this behavior from outsiders, such as minority shareholders, debtholders and regulators, by smoothing their income through the use of loan loss provisions.

We can also emphasize the economic significance of the observed income smoothing behavior of banks with more concentrated ownership structure. For this, we consider a 0.6273 increase in earnings, corresponding to a 50% increase from the mean level of the variable $ER_{i,j,t}$, and then evaluate the effect on loan loss provisions according to the estimated coefficient from Eq. (3) reported in Table 4. We furthermore make the distinction between short term effect and long term effect, in line with our dynamic specification. Our calculations indicate that loan loss provisions increase by 14.15% in the short run and by 20.94% in the long run (from their mean level) for banks which belong to Clusters 2 and 3. The income smoothing behavior of banks with a concentrated ownership structure is therefore not only statistically significant but also represents economically meaningful adjustments reported in income statements.

[14] Robustness checks with thresholds lower than 50% are reported in Section 5.6.

4.2. Role of regulatory environment

We now examine whether the regulatory environment can constrain the income smoothing behavior of insiders in banks with high ownership concentration. Shen and Chih (2005), Fonseca and Gonzalez (2008) and Leuz et al. (2003) find that higher investor protection results in lower earnings management. This is consistent with the hypothesis that the ability of insiders to acquire private benefits from control is limited by legal systems that protect the rights of outside investors. Shen and Chih (2005) and Fonseca and Gonzalez (2008) further find that there is less earnings management in countries with greater transparency in accounting disclosure. More generally, a high quality audit is expected to constrain opportunistic earnings management (Becker et al., 1998; Francis et al., 1999). Fonseca and Gonzalez (2008) also show that banks in countries where supervisors have greater powers to discipline banks and to reduce their incentives to undertake risk display lower levels of income smoothing. As we find that European banks with a more concentrated ownership structure use LLP to smooth their income, we want to check if the regulatory environment can limit such opportunistic behavior. For this we augment Eqs. (2) and (3) with interaction terms between $ER_{i,j,t}$ and a regulatory index REG_j as follows

$$LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \alpha_3 ER_{i,j,t} \cdot REG_j + \alpha_4 ER_{i,j,t} \cdot NoMAJ_{i,j,t} + \sum_{k=1}^{5} \alpha_{4+k} CNTRLk_{i,j,t} + \alpha_{10} NoMAJ_{i,j,t} + \alpha_{11} REG_j + \delta_t + \varepsilon_{i,j,t} \quad (4)$$

$$LLP_{i,j,t} = \alpha_0 + \alpha_1 LLP_{i,j,t-1} + \alpha_2 ER_{i,j,t} + \alpha_3 ER_{i,j,t} \cdot REG_j + \sum_{k=1}^{2} \alpha_{3+k} ER_{i,j,t} \cdot Ck_{i,j,t} + \sum_{k=1}^{5} \alpha_{5+k} CNTRLk_{i,j,t} + \sum_{k=1}^{2} \alpha_{10+k} Ck_{i,j,t} + \alpha_{13} REG_j + \delta_t + \varepsilon_{i,j,t} \quad (5)$$

For the regulatory index REG_j we first consider an index for strength of supervisory regime ($SupReg_j$), 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 powers to intervene in and resolve troubled banks. For our sample, the index has a median of 6 and ranges from 4 (Belgium, Italy and Sweden) to 9 (Portugal, Switzerland and UK). While there is harmonization of European rules on capital requirements for banks, there is heterogeneity across European countries regarding their supervision. This heterogeneity comes from different propensities of regulatory authorities to do on-site examinations in order to make an overall assessment of banks to determine their economic condition. It also stems from regulators' differing abilities to remove and replace managers and directors or to force a bank to change its internal organizational structure when problems are detected. If stronger supervisory regimes can restrain the entrenchment behavior of insiders, we expect the interaction term $ER_{i,j,t} \cdot SupReg_j$ to be significant and negative.

We alternatively use an index measuring the quality of external audits ($QualAudit_j$). We use the World Bank's 2008 Bank Regulation and Supervision database to compute an index that indicates (i) whether or not there is independent assessment of the accuracy of financial statements disclosed to the public, and (ii) whether or not supervisors are empowered to take specific actions to

prevent and correct problems.[15] The external audit quality index ranges in principle from 0 to 11; it has a median of 9, with a minimum of 6 (Italy) and a maximum of 11 (Denmark, Switzerland) in our sample. Again there is heterogeneity in Europe regarding the role of supervisors in ensuring the reliability and integrity of the financial process, depending on whether they have influence over the independence of auditors and can take legal action against them if problems are detected. We expect that the level of monitoring and control imposed by external audits and supervisory actions can constrain opportunistic earnings management, leading to a significant and negative coefficient of the interaction term $ER_{i,j,t} \cdot QualAudit_j$.

We finally consider an index measuring the level of minority shareholder protection ($ShareProct_j$). 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 insiders.[16] For our sample, the index has a median of 3.5 and ranges from 2 (Greece, Italy and Luxembourg) to 5 (UK). The ability of minority shareholders to ask questions to managers or to engage in action against them varies widely across European countries. Part of this heterogeneity can be explained by differences in the legal system: French-civil-law countries have the weakest legal protection of investors whereas common-law countries have generally the strongest legal system; German- and Scandinavian-civil-law countries are located in between. If minority shareholders have higher ability to control insiders, we expect the interaction term $ER_{i,j,t} \cdot ShareProct_j$ to be significant and negative.

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 Eq. (4) 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 Eq. (5), with REG_j evaluated at minimum, median and maximum levels. To facilitate interpretation of regression coefficients in this context, we scale the three regulatory indices to have a minimum of zero.

We observe from the baseline Eq. (1) in Table 5 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. We also find that banks in countries with higher quality of external audits (i.e. higher $QualAudit_j$) are less engaged in income smoothing (see Table 6). We further do not observe any income smoothing behavior in countries with the highest external audit quality. These results hold whether or not banks have a majority shareholder (Eq. (4) in Tables 5 and 6). These results are similarly confirmed in the more refined analysis of Eq. (5), 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 either stronger supervisory regimes or higher external audit quality, with no such income smoothing in the countries with either the strongest supervisory regimes or the highest external audit quality. 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 or the lowest external audit quality, 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 regimes or higher external audit quality. These results thus are consistent with the entrenchment effect being more moderate in countries with stronger supervisory regimes or stronger external audit quality systems.

The degree of minority shareholder protection ($ShareProct_j$), on the other hand, based on the results from estimating Eqs. (4) and (5) given in Table 7, is seen not to have a significant impact on the income smoothing behavior of European commercial banks. In particular, we observe from the more refined analysis of Eq. (5) that banks with medium and high levels of ownership concentration use LLP to smooth their income irrespective of the level of shareholder protection. This result is not surprising for Cluster 3 (high level of ownership concentration), given that here the controlling shareholder holds on average around 97%. For Cluster 2, on the other hand, the corresponding average lies at 56%, which could have left room for higher degrees of minority shareholder protection to have an impact through reducing the scope for entrenchment. Again, banks with low levels of ownership concentration(and therefore a predominance of minority shareholders) are seen not to engage in income smoothing behavior.

5. Further issues and robustness checks

We now examine several additional factors that could also have an impact on the income smoothing behavior of banks, and perform a range of further robustness checks.

5.1. Risk preferences

The income smoothing observed for banks with high ownership concentration could also be driven by the potential impact of the risk preferences of controlling shareholders. Shareholders are generally viewed as more risk-loving than managers. In the case of banks, the risk appetite of shareholders compared to managers and debtholders 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 that have more powerful shareholders could 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.

In order to differentiate the impact of risk preferences from the presumed entrenchment behavior of controlling shareholders, we augment the specification of Eq. (3) by introducing an additional interaction term between the variable $ER_{i,j,t}$ and bank risk

[15] The yes/no responses to the following questions are coded as 1/0: (1) Is an external audit a compulsory obligation for banks?; (2) Are auditing practices for banks in accordance with international auditing standards?; (3) Is it required by the regulators that bank audits be publicly disclosed?; (4) Are specific requirements for the extent or nature of the audit spelled out?; (5) Are auditors licensed or certified?; (6) Do supervisors get a copy of the auditor's report?; (7) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank?; (8) Are auditors required by law to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse?; (9) Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank?; (10) Can supervisors take legal action against external auditors for negligence?; and (11) Has legal action been taken against an auditor in the last 5 years?

[16] This index considers laws and regulations applicable to publicly listed firms. Similar disclosure requirements, approval procedures and facilitation of private litigation are relied on by owners of non-listed firms to deter managerial misconduct. We thus consider this index for our sample of both listed and non-listed firms.

Table 5
Supervisory strength, degree of ownership concentration and income smoothing for European commercial banks for the period 2004–2009 (two-step system GMM estimator).

	Eq. (1) augmented (Baseline)	Eq. (4)	Eq. (5)
$LLP_{i,j,t-1}$	0.3179***	0.3201***	0.3140***
	(0.0477)	(0.0442)	(0.0430)
$ER_{i,j,t-1}$	0.1020***	0.1132***	0.1190***
	(0.0197)	(0.0210)	(0.0215)
$ER_{i,j,t} \cdot SupReg_j$	−0.0164***	−0.0173***	−0.0194***
	(0.0051)	(0.0052)	(0.0052)
$ER_{i,j,t} \cdot NoMAJ_{i,j,t}$		−0.0418**	
		(0.0182)	
$ER_{i,j,t} \cdot C1_{i,j,t}$			−0.0614***
			(0.0165)
$ER_{i,j,t} \cdot C2_{i,j,t}$			0.0307
			(0.0259)
$L_{i,j,t}$	0.0040***	0.0039***	0.0040***
	(0.0004)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	−0.0523**	−0.0499**	−0.0486**
	(0.0211)	(0.0204)	(0.0201)
$\Delta y_{j,t}$	−0.0195***	−0.0196***	−0.0217***
	(0.0043)	(0.0042)	(0.0044)
$EQ_{i,j,t}$	−0.0005	−0.0005	−0.0004
	(0.0013)	(0.0013)	(0.0013)
$COM_{i,j,t}$	0.0083*	0.0073	0.0070
	(0.0050)	(0.0046)	(0.0048)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	No	No	No
Period fixed effects	Yes	Yes	Yes
Marginal effects:	*All banks*	*If* $NoMAJ_{i,j,t} = 0$	*In Cluster 2 & 3*
ER at Min(SupReg)	0.1020***	0.1132***	0.1190***
	[0.0000]	[0.0000]	[0.0000]
ER at Med(SupReg)	0.0693***	0.0785***	0.0802***
	[0.0000]	[0.0000]	[0.0000]
ER at Max(SupReg)	0.0202	0.0265*	0.0221
	[0.1400]	[0.0531]	[0.1065]
		If $NoMAJ_{i,j,t} = 1$	*In Cluster 1*
ER at Min(SupReg)		0.0714***	0.0576***
		[0.0002]	[0.0014]
ER at Med(SupReg)		0.0367**	0.0189
		[0.0146]	[0.1636]
ER at Max(SupReg)		−0.0153	−0.0393**
		[0.4451]	[0.0460]
P-value AR(2) test	0.1803	0.1960	0.2287
P-value Hansen test	0.4036	0.4113	0.4528
No. banks	873	873	873
No. obs.	3406	3406	3406

For marginal effects, *P*-value is given in brackets. Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; *SupReg* = index for strength of supervisory regime; Dummy variables: *NoMAJ* = equals 1 if bank has no majority owner; *C*1 = equals 1 if bank is in Cluster 1 (low ownership concentration); *C*2 = equals 1 if 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; *COM* = commissions & fees income/total assets.
* Standard deviation of coefficient estimates in parentheses, with $p < 0.1$.
** Standard deviation of coefficient estimates in parentheses, with $p < 0.05$.
*** Standard deviation of coefficient estimates in parentheses, with $p < 0.01$.

measures ($RISK_{i,j,t}$). We consider two such measures of bank risk computed from accounting data, using 3-year rolling windows. To reflect bank activity risk, we use the standard deviation of adjusted return on equity ($SDAdjROE_{i,j,t}$), with adjusted return on equity $AdjROE_{i,j} = ER_{i,j}/E_{i,j}$, where $ER_{i,j}$ is earnings before taxes and loan loss provisions and $E_{i,j}$ is total equity. 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 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 an adjusted Z-score measure,[17] defined as $AdjZ_{i,j,t} = (100 + AdjROE_{i,j,t})/SDAdjROE_{i,j,t}$, where $AdjROE_{i,j}$ is the average adjusted return on equity (in percentages). As our bank risk measures are highly skewed, we use their natural logarithms in our specifications; we further use centered versions of these for ease of interpretation. We expect the interaction term $ER_{i,j,t} \cdot RISK_{i,j,t}$ to be significant if the risk preferences of insiders impact the way banks smooth their income. We also introduce the variable $RISK_{i,j,t}$ as a control variable,[18] and we apply the GMM instruments to deal with potential endogeneity issues.

The estimation results, using the same estimation methodology as for our baseline specification in Section 3.3, are given in Table 8. We observe throughout that bank risk has no significant impact on banks' income smoothing behavior using LLP, which even allowing for bank risk taking remains driven by banks' ownership concentration, in line with the entrenchment hypothesis.[19]

[17] This Z-score measure is based on the Bienaymé-Chebyshev inequality, analogous to Hannan and Hanweck (1988) and Boyd et al. (1993).

[18] The correlations between the variables $RISK_{i,j,t}$ and $LLP_{i,j,t-1}$ are relatively low (respectively −0.0663 and 0.0991 for $AdjZ_{i,j,t}$ and $SDAdjROE_{i,j,t}$).

[19] In Table 8, we do not include the estimation results using the variable $NoMAJ_{i,j,t}$ instead of the cluster dummy variables $Ck_{i,j,t}$. For this case we also find that bank risk has no impact on banks' income smoothing behavior (results are available on request).

Table 6
External audit quality, degree of ownership concentration and income smoothing for European commercial banks for the period 2004–2009 (two-step system GMM estimator).

	Eq. (1) augmented (Baseline)	Eq. (4)	Eq. (5)
$LLP_{i,j,t-1}$	0.3130***	0.3161***	0.3114***
	(0.0492)	(0.0453)	(0.0437)
$ER_{i,j,t-1}$	0.1577***	0.1641***	0.1726***
	(0.0290)	(0.0297)	(0.0308)
$ER_{i,j,t} \cdot QualAudit_j$	−0.0296***	−0.0294***	−0.0316***
	(0.0070)	(0.0071)	(0.0072)
$ER_{i,j,t} \cdot NoMAJ_{i,j,t}$		−0.0331*	
		(0.0184)	
$ER_{i,j,t} \cdot C1_{i,j,t}$			−0.0577***
			(0.0161)
$ER_{i,j,t} \cdot C2_{i,j,t}$			0.0336
			(0.0255)
$L_{i,j,t}$	0.0039***	0.0038***	0.0039***
	(0.0004)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	−0.0479**	−0.0459**	−0.0439**
	(0.0206)	(0.0198)	(0.0194)
$\Delta y_{j,t}$	−0.0182***	−0.0185***	−0.0204***
	(0.0043)	(0.0043)	(0.0045)
$EQ_{i,j,t}$	−0.0003	−0.0004	−0.0003
	(0.0013)	(0.0013)	(0.0013)
$COM_{i,j,t}$	0.0090*	0.0080*	0.0073
	(0.0049)	(0.0045)	(0.0046)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	No	No	No
Period fixed effects	Yes	Yes	Yes
Marginal effects:	*All banks*	*If* $NoMAJ_{i,j,t} = 0$	*In Cluster 2 & 3*
ER at Min(QualAudit)	0.1577***	0.1641***	0.1726***
	[0.0000]	[0.0000]	[0.0000]
ER at Med(QualAudit)	0.0394***	0.0465***	0.0463***
	[0.0000]	[0.0000]	[0.0000]
ER at Max(QualAudit)	0.0098	0.0171	0.0148
	[0.4434]	[0.1968]	[0.2488]
		If $NoMAJ_{i,j,t} = 1$	*In Cluster 1*
ER at Min(QualAudit)		0.1310***	0.1149***
		[0.0000]	[0.0016]
ER at Med(QualAudit)		0.0134	−0.0113
		[0.4069]	[0.4310]
ER at Max(QualAudit)		−0.0160	−0.0429**
		[0.3983]	[0.0185]
P-value AR(2) test	0.1931	0.2041	0.2403
P-value Hansen test	0.4373	0.4411	0.4865
No. banks	873	873	873
No. obs.	3406	3406	3406

For marginal effects, *P*-value is given in brackets. Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; *QualAudit* = index for quality of external audits; Dummy variables: *NoMAJ* = equals 1 if bank has no majority owner; *C*1 = equals 1 if bank is in Cluster 1 (low ownership concentration); *C*2 = equals 1 if 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; *COM* = commissions & fees income/total assets.
* Standard deviation of coefficient estimates in parentheses, with $p < 0.1$.
** Standard deviation of coefficient estimates in parentheses, with $p < 0.05$.
*** Standard deviation of coefficient estimates in parentheses, with $p < 0.01$.

5.2. Listed vs. non-listed banks

Whether banks are listed or non-listed could have a significant impact on both the incentives and the ability of bank insiders to use LLP to smooth bank income. Some parts of the existing literature argue that earnings management should be higher in public than private firms if managers of public companies have higher incentives to report earnings that capital market participants will perceive favorably, leading them to engage in more earnings management (Beatty and Harris, 1999; Beatty et al., 2002; Nichols et al., 2009; Fonseca and Gonzalez, 2008). However, outside investors who do not have access to private information and only rely on public information might be reluctant to supply capital to firms that display poor quality information. Listed firms have therefore incentives to provide financial statements that help these outsiders assess their economic performance, resulting in less earnings management (Burgstahler et al., 2006). Moreover, since 2005 listed banks in the European Union are required to comply with International Financial Reporting Standards (IFRS). Those accounting rules might reduce the ability of firms to engage in earnings management as they improve transparency of reporting practices (Barth et al., 2008; Leventis et al., 2011).[20] Furthermore, supervisors apply more scrutiny to "too big to fail banks" and might therefore be better able to limit their income smoothing behavior through LLP (Fonseca and Gonzalez, 2008).

Out of the 98 listed banks we have in our full sample of 873 banks, 78 belong to Cluster 1 at some point in time (which has 294 banks in total), 32 to Cluster 2 and 19 to Cluster 3, with 31

[20] Firms had the choice to adopt IFRS accounting standards prior to the mandatory adoption date of 2005; this can be seen as a commitment to greater transparency resulting in less earnings management (Leventis et al., 2011). This argument does not apply for our unconsolidated bank sample as listed firms in the European Union are only required to comply with IFRS for consolidated statements. Banks can choose to adopt IFRS for their unconsolidated statement in 2004 for at least two reasons: (i) early adoption, or (ii) to comply with the choice of accounting standard of the parent company; this implies that we are not able to clearly identify early adopters in 2004.

Table 7
Shareholder protection, degree of ownership concentration and income smoothing for European commercial banks for the period 2004–2009 (two-step system GMM estimator).

	Eq. (1) augmented (Baseline)	Eq. (4)	Eq. (5)
$LLP_{i,j,t-1}$	0.3263***	0.3273***	0.3225***
	(0.0467)	(0.0444)	(0.0435)
$ER_{i,j,t-1}$	0.0434**	0.0510***	0.0514***
	(0.0171)	(0.0174)	(0.0181)
$ER_{i,j,t} \cdot ShareProct_j$	0.0160	0.0152	0.0149
	(0.0119)	(0.0115)	(0.0118)
$ER_{i,j,t} \cdot NoMAJ_{i,j,t}$		−0.0318*	
		(0.0176)	
$ER_{i,j,t} \cdot C1_{i,j,t}$			−0.0458***
			(0.0160)
$ER_{i,j,t} \cdot C2_{i,j,t}$			0.0290
			(0.0281)
$L_{i,j,t}$	0.0041***	0.0040***	0.0041***
	(0.0004)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	−0.0543**	−0.0527**	−0.0518**
	(0.0215)	(0.0210)	(0.0209)
$\Delta y_{j,t}$	−0.0217***	−0.0218***	−0.0237***
	(0.0041)	(0.0042)	(0.0043)
$EQ_{i,j,t-1}$	−0.0009	−0.0009	−0.0009
	(0.0013)	(0.0013)	(0.0013)
$COM_{i,j,t}$	0.0034	0.0024	0.0018
	(0.0052)	(0.0051)	(0.0052)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	No	No	No
Period fixed effects	Yes	Yes	Yes
Wald Tests			
$\alpha_{ER} + \alpha_{ER \cdot NoMAJ} = 0$ [*P*-value]		0.0192	
		[0.3013]	
$\alpha_{ER} + \alpha_{ER \cdot C1} = 0$ [*P*-value]			0.0056
			[0.7010]
P-value AR(2) test	0.1903	0.2035	0.2289
P-value Hansen test	0.4030	0.4096	0.4379
No. banks	873	873	873
No. obs.	3406	3406	3406

Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; *ShareProct* = index for degree of shareholder protection; Dummy variables: *NoMAJ* = equals 1 if bank has no majority owner; *C*1 = equals 1 if bank is in Cluster 1 (low ownership concentration); *C*2 = equals 1 if 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; *COM* = commissions & fees income/total assets.

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

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

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

banks moving between clusters during the sample period. To make sure that the smaller level of income smoothing observed in Cluster 1 is not simply due to a predominance of listed banks, we augment the specification of Eqs. (1)–(3) by introducing an additional interaction term between the variable $ER_{i,j,t}$ and the variable $LISTED_{i,j,t}$; the latter takes the value of 1 if bank *i* is listed on the stock market and 0 otherwise. We also introduce the variable $LISTED_{i,j,t}$ as a control variable, and use the same estimation methodology as for previous specifications.

Our results are consistent with the argument that listed banks have less scope for managing earnings using loan loss provisions (see Table 9), possibly explained by outsiders' demand for useful information in evaluating the firms and the scrutiny of supervisors.[21] Importantly though, our previous results that banks with high levels of ownership concentration are engaged in income smoothing behavior whereas banks with low levels of ownership concentration display significantly lower levels of such discretionary behavior remain unchanged, independent of whether they are listed or non-listed.

5.3. Big Four auditors

In addition to the country level index we use to measure external audit quality, we also consider whether or not banks are audited by one of the Big Four firms as a bank level measure of audit quality. In countries where poor audit quality can lead auditors to face high litigation risk (such as US and UK), one can expect that firms audited by a Big Four auditor display lower levels of earnings management. Indeed, empirical evidence has been provided that Big Four auditors constrain the earnings management of firms (e.g. DeFond and Jiambalvo, 1991; Becker et al., 1998; Kanagaretnam et al., 2010). However, auditors may have incentives to "go easy" on management in order to keep them as clients; such behavior can be more particularly observed in countries with lower legal enforcement and lower investor protection (Francis and Wang, 2008; Maijoor and Vanstraelen, 2006).

In order to test if the presence of a Big Four auditor can override the observed differences in the level of earnings management as a result of ownership concentration and differences in regulatory environments, we augment the specification of Eqs. (4) and (5) with an additional interaction term between the variable $ER_{i,j,t}$ and the variable $BIG4_{i,j,t}$; the latter takes the value of 1 if bank *i*

[21] We check if our results might be driven by banks that are cross-listed in the US. US securities law affords stronger rights to outside investors than those in most other countries; these constrain insiders from expropriating minority shareholders, potentially leading to less earnings management (Stulz, 1999). Controling for that, we find that the interaction term $ER_{i,j,t} \cdot CROSS\_LISTED\_US_{i,j,t}$ is not significant (with *CROSS_LISTED_US* taking the value of 1 for banks cross-listed on the US stock market). However, only 12 European banks in our sample are cross-listed in the US, so this result must be taken with care; details are available upon request.

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

	Eq. (1) augmented (Baseline)	Eq. (3) augmented	Eq. (1) augmented (Baseline)	Eq. (3) augmented
$LLP_{i,j,t-1}$	0.3586***	0.3603***	0.3468***	0.3449***
	(0.0436)	(0.0420)	(0.0438)	(0.0423)
$ER_{i,j,t-1}$	0.0630***	0.0746***	0.0727***	0.0831***
	(0.0197)	(0.0212)	(0.0183)	(0.0200)
$ER_{i,j,t}$· $SDAdjROE_{i,j,t}$	−0.0027	−0.0046		
	(0.0144)	(0.0152)		
$ER_{i,j,t}$· $AdjZ_{i,j,t}$			0.0106	0.0099
			(0.0119)	(0.0121)
$ER_{i,j,t} \cdot C1_{i,j,t}$		−0.0575***		−0.0585***
		(0.0157)		(0.0165)
$ER_{i,j,t} \cdot C2_{i,j,t}$		0.0161		0.0156
		(0.0309)		(0.0332)
$L_{i,j,t}$	0.0039***	0.0039***	0.0039***	0.0040***
	(0.0004)	(0.0004)	(0.0005)	(0.0005)
$\Delta L_{i,j,t}$	−0.0505**	−0.0464**	−0.0462*	−0.0436*
	(0.0231)	(0.0225)	(0.0240)	(0.0233)
$\Delta y_{j,t}$	−0.0174***	−0.0195***	−0.0186***	−0.0206***
	(0.0050)	(0.0051)	(0.0050)	(0.0052)
$EQ_{i,j,t-1}$	−0.0005	−0.0007	−0.0011	−0.0012
	(0.0016)	(0.0016)	(0.0016)	(0.0016)
$COM_{i,j,t}$	0.0057	0.0045	0.0056	0.0043
	(0.0062)	(0.0060)	(0.0063)	(0.0061)
$SDAdjROE_{i,j,t}$	0.0338	0.0338		
	(0.0217)	(0.0226)		
$AdjZ_{i,j,t}$			−0.0370**	−0.0345**
			(0.0167)	(0.0170)
Interaction dummies	No	Yes	No	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes	Yes
Wald Tests: $\alpha_{ER} + \alpha_{ER \cdot C1} = 0$ [*P*-value]		0.0171		0.0246
		[0.3880]		[0.1729]
P-value AR(2) test	0.3022	0.3183	0.3111	0.3327
P-value Hansen test	0.3221	0.2620	0.4378	0.3072
No. banks	815	815	815	815
No. obs.	3197	3197	3197	3197

Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; *SDAdjROE* = StDev(ER/E), where E is total equity; *AdjZ* = (100 + AdjROE)/SDAdjROE, where *AdjROE* = Mean(ER/E) is average adjusted return on equity (in percentages); *SDAdjROE* & *AdjROE* are calculated over 3-year rolling windows; Dummy variables: *C*1 = equals 1 if bank is in Cluster 1 (low ownership concentration); *C*2 = equals 1 if 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; *COM* = commissions & fees income/total assets.
* Standard deviation of coefficient estimates in parentheses, with $p < 0.1$.
** Standard deviation of coefficient estimates in parentheses, with $p < 0.05$.
*** Standard deviation of coefficient estimates in parentheses, with $p < 0.01$.

is audited by a Big Four firm (Deloitte, Ernst & Young, KPMG or PwC) and 0 otherwise. We also introduce the variable $BIG4_{i,j,t}$ as a control variable, and use the same estimation methodology as previously.

Results in Table 10 show that banks audited by a Big Four firm do not display a lower level of income smoothing using LLP than banks audited by a non-Big Four one, suggesting that Big Four auditors do not contribute to improving the quality of published financial statements of European banks compared to non-Big Four ones. However, a stricter national supervisory and audit quality regime limits the degree to which banks use LLP to smooth their income irrespective of the type of auditor involved (Big Four or non-Big Four). Our results are thus in line with the recommendations of the International Organization of Securities Commissions (International Organization of Securities Commissions, 2002) and the Financial Stability Board for having an "external auditor oversight body" that should have the authority to perform reviews of audit procedures and to take disciplinary action against auditors as appropriate.

5.4. Market discipline of debtholders

The decision to smooth income using LLP increases bank opacity, and should therefore be considered undesirable by stakeholders such as regulators and debtholders. We have already found that strong regulatory control can reduce the scope for banks to engage in discretionary income smoothing behavior using their LLP. We further want to analyze if the market discipline potentially applied by debtholders can also limit earnings management by bank insiders. As pointed out by Shleifer and Vishny (1997), debtholders are in a position of power as their loans typically have a short maturity, which means borrowers have to refinance at regular, short intervals. However, financial firms are much more leveraged than non-financial firms and have dispersed debt in the form of many small depositors, making debt renegotiations more difficult and thereby weakening the market discipline of debtholders (Acharya et al., 2009). In addition, deposit insurance leads banks to rely less on uninsured creditors, who have incentives to monitor, and more on insured depositors, who have little incentive to exert corporate governance (Levine, 2004). Moreover, any existing bail out policy may also limit the incentives of uninsured creditors to monitor banks. More importantly, earnings management might not be easy to detect by debtholders, especially in the case of banks that are inherently more opaque than other firms and that can use subjective LLP to smooth their income.

We examine if uninsured debtholders are likely to have the incentives and ability to monitor insiders' actions by augmenting Eqs. (4) and (5) with an interaction term between $ER_{i,j,t}$ and the variable $MF_{i,j,t}$, the latter measuring the proportion of market funding (i.e. money-market funding, bonds, subordinated debt and hybrid capital) to total liabilities. The variable $MF_{i,j,t}$ is a proxy to measure

Table 9
Listed vs. non-listed banks, degree of ownership concentration and income smoothing for European commercial banks for the period 2004–2009 (two-step system GMM estimator).

	Eq. (1) augmented (Baseline)	Eq. (2) augmented	Eq. (3) augmented
$LLP_{i,j,t-1}$	0.3285***	0.3280***	0.3239***
	(0.0460)	(0.0443)	(0.0433)
$ER_{i,j,t}$	0.0668***	0.0715***	0.0709***
	(0.0125)	(0.0130)	(0.0130)
$ER_{i,j,t} \cdot LISTED_{i,j,t}$	−0.0696***	−0.0604**	−0.0538**
	(0.0261)	(0.0250)	(0.0244)
$ER_{i,j,t} \cdot NoMAJ_{i,j,t}$		−0.0259	
		(0.0201)	
$ER_{i,j,t} \cdot C1_{i,j,t}$			−0.0431***
			(0.0165)
$ER_{i,j,t} \cdot C2_{i,j,t}$			0.0331
			(0.0280)
$L_{i,j,t}$	0.0043***	0.0042***	0.0043***
	(0.0005)	(0.0004)	(0.0004)
$\Delta L_{i,j,t}$	−0.0553**	−0.0545**	−0.0539**
	(0.0216)	(0.0212)	(0.0210)
$\Delta y_{j,t}$	−0.0183***	−0.0186***	−0.0206***
	(0.0048)	(0.0048)	(0.0050)
$EQ_{i,j,t-1}$	−0.0008	−0.0008	−0.0008
	(0.0014)	(0.0014)	(0.0014)
$COM_{i,j,t}$	0.0066	0.0059	0.0056
	(0.0056)	(0.0053)	(0.0053)
Interaction dummies	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes
Wald Tests:			
$\alpha_{ER} + \alpha_{ER \cdot LISTED} = 0$ [*P*-value]	−0.0027	0.0111	0.0171
	[0.9088]	[0.6502]	[0.4739]
$\alpha_{ER} + \alpha_{ER \cdot C1} = 0$ [*P*-value]			0.0278*
			[0.0811]
$\alpha_{ER} + \alpha_{ER \cdot C1} + \alpha_{ER \cdot LISTED} = 0$ [*P*-value]			−0.0259
			[0.2649]
AR(2) test	0.1905	0.2022	0.2244
Hansen test	0.3460	0.3588	0.3884
No. banks	873	873	873
No. obs.	3406	3406	3406

Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; Dummy variables: *LISTED* = equals 1 if bank is listed on stock market; *NoMAJ* = equals 1 if bank has no majority owner; *C1* = equals 1 if bank is in Cluster 1 (low ownership concentration); *C2* = equals 1 if 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; *COM* = commissions & fees income/total assets.
* Standard deviation of coefficient estimates in parentheses, with $p < 0.1$.
** Standard deviation of coefficient estimates in parentheses, with $p < 0.05$.
*** Standard deviation of coefficient estimates in parentheses, with $p < 0.01$.

the magnitude of market discipline potentially applied by non-insured debtholders. The higher the proportion of non-insured debt, the stronger should be the resulting market discipline. Results in Table 11 show that the coefficient associated with the interaction term $ER_{i,j,t} \cdot MF_{i,j,t}$ is not significant, meaning that whatever the level of non-insured debt, there is no decrease in the income smoothing behavior of banks having a relatively high level of ownership concentration.

Levine (2004) argues that the effectiveness of market discipline relies on legal systems as violations of contract need to be identified to allow debtholders to exert corporate governance. We therefore further differentiate countries according to their rule of law and the quality of its enforcement to allow for what rights debtholders have and how well these rights are protected. For this, we build the index $Legal_j$ as the average score across two proxies from La Porta et al. (1998): (i) an index of the judicial system's efficiency, and (ii) an index of the rule of law. The resulting index $Legal_j$ ranges from 0 to 10 with higher values corresponding to stricter legal enforcement, with a minimum and maximum of 6.59 and 10, respectively, in our sample.[22] The variable $WMF_{i,j,t}$ is then computed as the product of the variable $MF_{i,j,t}$ and the index $Legal_j$; this weighted measure of market discipline takes into account how the quality of enforcement of laws varies across European countries. Using this weighted measure ($WMF_{i,j,t}$) in our regressions instead of the non-weighted proxy for the impact of market discipline ($MF_{i,j,t}$), our results remain unchanged (see Table 11). Again, banks with high levels of ownership concentration do engage in income smoothing behavior whereas banks with low levels of ownership concentration do not (consistent with the entrenchment hypothesis), independent of the level of their non-insured debt and the quality of law enforcement.

These results are consistent with debtholders either having limited incentives to monitor banks or lacking the ability to detect earnings management due to banks' inherent opaqueness.

5.5. Type of majority shareholder

The existing literature highlights that different shareholder types can have different propensities to engage in opportunistic earnings management. Institutional investors as majority shareholder have both the resources, expertise and incentives to monitor and influence management decisions. However, prior empirical studies fail to reach a consensus on the influence of institutional

[22] Information on legal enforcement is not provided for Luxembourg in La Porta et al. (1998).

Table 10
Big Four auditors, degree of ownership concentration, income smoothing and regulatory regime, 2004–2009, (two-step system GMM estimator).

	Eq. (3) augmented	Eq. (5) augmented	Eq. (5) augmented	Eq. (5) augmented
$LLP_{i,j,t-1}$	0.3526***	0.3406***	0.3490***	0.3629***
	(0.0512)	(0.0505)	(0.0511)	(0.0527)
$ER_{i,j,t}$	0.0920***	0.1389***	0.2139***	0.0677*
	(0.0293)	(0.0315)	(0.0359)	(0.0373)
$ER_{i,j,t} \cdot C1_{i,j,t}$	−0.0592***	−0.0616***	−0.0504***	−0.0488**
	(0.0225)	(0.0207)	(0.0192)	(0.0222)
$ER_{i,j,t} \cdot C2_{i,j,t}$	0.0197	0.0261	0.0276	0.0158
	(0.0281)	(0.0269)	(0.0259)	(0.0281)
$ER_{i,j,t} \cdot SupReg_j$		−0.0228***		
		(0.0064)		
$ER_{i,j,t} \cdot QualAudit_j$			−0.0427***	
			(0.0085)	
$ER_{i,j,t} \cdot ShareProct_j$				0.0177
				(0.0164)
$ER_{i,j,t} \cdot BIG4_{i,j,t}$	−0.0345	−0.0234	−0.0060	−0.0301
	(0.0301)	(0.0283)	(0.0260)	(0.0293)
$L_{i,j,t}$	0.0041***	0.0038***	0.0034***	0.0037***
	(0.0005)	(0.0004)	(0.0004)	(0.0005)
$\Delta L_{i,j,t}$	−0.0691***	−0.0606***	−0.0427**	−0.0486**
	(0.0231)	(0.0223)	(0.0210)	(0.0221)
$\Delta y_{j,t}$	−0.0128***	−0.0150***	−0.0211***	−0.0273***
	(0.0049)	(0.0045)	(0.0052)	(0.0052)
$EQ_{i,j,t-1}$	−0.0010	−0.0002	0.0001	−0.0011
	(0.0014)	(0.0014)	(0.0014)	(0.0014)
$COM_{i,j,t}$	0.0065	0.0099*	0.0075	0.0021
	(0.0058)	(0.0054)	(0.0050)	(0.0058)
Interaction dummies	Yes	Yes	Yes	Yes
Country fixed effects	Yes	No	No	No
Period fixed effects	Yes	Yes	Yes	Yes
Wald tests				
$\alpha_{ER} + \alpha_{ER \cdot C1} = 0$ [*P*-value] *Marginal effects:*	0.0328			0.0189
	[0.1894]			[0.4559]
		In Clusters 2 & 3	*In Clusters 2 & 3*	
ER at Min(REG)		0.1389***	0.2139***	
		[0.0000]	[0.0000]	
ER at Med(REG)		0.0933***	0.0433*	
		[0.0006]	[0.0700]	
ER at Max(REG)		0.0249	0.0006	
		[0.4151]	[0.9826]	
		In Cluster 1	*In Cluster 1*	
ER at Min(REG)		0.0773***	0.1635***	
		[0.0023]	[0.0000]	
ER at Med(REG)		0.0317	−0.0071	
		[0.1334]	[0.7442]	
ER at Max(REG)		−0.0367	−0.0498*	
		[0.1861]	[0.0549]	
P-value AR(2) test	0.3679	0.3705	0.3756	0.3762
P-value Hansen test	0.5050	0.5476	0.5490	0.5992
No. banks	643	643	643	643
No. obs.	2554	2554	2554	2554

Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; Dummy variables: *C*1 = equals 1 if bank is in Cluster 1 (low ownership concentration); *C*2 = equals 1 if bank is in Cluster 2 (medium ownership concentration); *SupReg* = index for strength of supervisory regime; *QualAudit* = index for quality of external audits; *ShareProct* = index for degree of shareholder protection; BIG4 = equals 1 if bank is audited by Big 4; *L* = net loans/total assets; ΔL = loan growth rate; Δy = GDP growth rate; *EQ* = equity/total assets; *COM* = commissions & fees income/total assets.
* Standard deviation of coefficient estimates in parentheses, with $p < 0.1$.
** Standard deviation of coefficient estimates in parentheses, with $p < 0.05$.
*** Standard deviation of coefficient estimates in parentheses, with $p < 0.01$.

ownership on earnings management. Bushee (1998) and Bange and De Bondt (1998) find that institutional ownership reduces incentives of firms to manage earnings (related to R&D), while Chung et al. (2002) find that firms with large institutional shareholders refrain from earnings management, as it reduces the transparency of the firm's underlying financial position. Families as majority shareholders, on the other hand, might have stronger incentives to pursue private benefits (Claessens et al., 2002). Prencipe et al. (2008) show that family-controlled firms display higher levels of earnings management, consistent with the hypothesis that controlling families manipulate earnings to cover self-oriented behavior. Wang (2006) and Ali et al. (2007), on the other hand, find that family-controlled firms have fewer incentives to engage in earnings management. This can be linked to reputational effects and controlling families caring about the long-term viability of the firm, resulting in higher monitoring of managers. Given these mixed results regarding the propensities of controlling institutional investors and families to engage in opportunistic income smoothing behavior, we want to investigate 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 Eq. (2) by adding interaction terms between $ER_{i,j,t}$ and majority shareholder type dummies. We follow the BankScope classification in differentiating between the following shareholder types: banks, institutional

Table 11
Market discipline of debtholders, degree of ownership concentration and income smoothing for European commercial banks for the period 2004–2009 (two-step system GMM estimator).

	Eq. (2) augmented	Eq. (3) augmented	Eq. (2) augmented	Eq. (3) augmented
$LLP_{i,j,t-1}$	0.3416***	0.3381***	0.3558***	0.3565***
	(0.0522)	(0.0517)	(0.0683)	(0.0692)
$ER_{i,j,t}$	0.0602***	0.0608***	0.0730***	0.0696***
	(0.0165)	(0.0162)	(0.0158)	(0.0154)
$ER_{i,j,t} \cdot NoMAJ_{i,j,t}$	−0.0362*		−0.0377*	
	(0.0198)		(0.0214)	
$ER_{i,j,t} \cdot C1_{i,j,t}$		−0.0580***		−0.0412*
		(0.0194)		(0.0215)
$ER_{i,j,t} \cdot C2_{i,j,t}$		0.0123		0.0290
		(0.0286)		(0.0321)
$ER_{i,j,t} \cdot MF_{i,j,t}$	0.0005	0.0006		
	(0.0006)	(0.0006)		
$MF_{i,j,t}$	0.0010	0.0009		
	(0.0008)	(0.0008)		
$ER_{i,j,t} \cdot WMF_{i,j,t}$			−0.0000	−0.0000
			(0.0003)	(0.0003)
$WMF_{i,j,t}$			0.0007**	0.0007**
			(0.0003)	(0.0003)
$L_{i,j,t}$	0.0039***	0.0040***	0.0036***	0.0037***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)
$\Delta L_{i,j,t}$	−0.0504**	−0.0511**	−0.0691**	−0.0709**
	(0.0230)	(0.0226)	(0.0284)	(0.0285)
$\Delta y_{j,t}$	−0.0154***	−0.0167***	−0.0186*	−0.0190*
	(0.0059)	(0.0061)	(0.0099)	(0.0099)
$EQ_{i,j,t-1}$	0.0007	0.0006	0.0008	0.0006
	(0.0016)	(0.0016)	(0.0016)	(0.0016)
$COM_{i,j,t}$	0.0034	0.0034	0.0014	0.0017
	(0.0057)	(0.0058)	(0.0057)	(0.0058)
Interaction dummies	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes	Yes
Wald Tests				
$\alpha_{ER} + \alpha_{ER \cdot NoMAJ} = 0$ [*P*-value]	0.0240		0.0353	
	[0.2134]		[0.1046]	
$\alpha_{ER} + \alpha_{ER \cdot C1} = 0$ [*P*-value]		0.0028		0.0283
		[0.8931]		[0.2280]
P-value AR(2) test	0.2126	0.2371	0.0627	0.0629
P-value Hansen test	0.2099	0.2221	0.1542	0.1465
No. banks	813	813	750	750
No. obs.	3019	3019	2789	2789

Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; Dummy variable: *NoMAJ* = equals 1 if bank has no majority owner; *C1* = equals 1 if bank is in Cluster 1 (low ownership concentration); *C2* = equals 1 if bank is in Cluster 2 (medium ownership concentration); *MF* = (money-market funding + bonds + subordinated debt + hybrid capital)/total assets; *WMF* = *MF* · *Legal* with *Legal* an index measuring the level of law enforcement; *L* = net loans/total assets; Δ*L* = loan growth rate; Δ*y* = GDP growth rate; *EQ* = equity/total assets; *COM* = commissions & fees income/total assets.
* Standard deviation of coefficient estimates in parentheses, with $p < 0.1$.
** Standard deviation of coefficient estimates in parentheses, with $p < 0.05$.
*** Standard deviation of coefficient estimates in parentheses, with $p < 0.01$.

investors, industrial firms, individuals and families, managers, state, public, foundations, and unnamed shareholders. The dummy variable $Mbank_{i,j,t}$ then 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.[23] The reference category for the resulting interaction terms between $ER_{i,j,t}$ and the different shareholder type dummies is thus banks where the majority shareholder is an institutional investor. In our sample, 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.

The results in Table 12 show that banks with a controlling shareholder do engage in earnings management through LLP; however, this opportunistic income smoothing behavior is independent of whether the majority shareholder belongs to the categories of either institutional investors, families, industrial firms or banks. Thus, the impact of entrenchment in this context is independent of the majority shareholder type.

5.6. Further robustness checks

We carry out several additional robustness checks on our empirical results.[24]

Firstly, in Eq. (2), 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

[23] 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 on their own, i.e. $\{NoMAJ_{i,j,t}, Mbank_{i,j,t}, Mindust_{i,j,t}, Mfamily_{i,j,t}, Mother_{i,j,t}\}$.

[24] While we do not include the estimation results discussed in this section, they are available on request.

Table 12
Majority shareholder type, degree of ownership concentration and income smoothing for European commercial banks for the period 2004–2009 (two-step system GMM estimator).

	Eq. (2) augmented
$LLP_{i,j,t-1}$	0.3288***
	(0.0437)
$ER_{i,j,t}$	0.0910***
	(0.0304)
$ER_{i,j,t}$· $NoMAJ_{i,j,t}$	−0.0540
	(0.0329)
$ER_{i,j,t}$· $Mbank_{i,j,t}$	−0.0301
	(0.0317)
$ER_{i,j,t}$· $Mindust_{i,j,t}$	−0.0076
	(0.0407)
$ER_{i,j,t}$· $Mfamily_{i,j,t}$	−0.0108
	(0.0458)
$ER_{i,j,t}$· $Mother_{i,j,t}$	−0.0427
	(0.0425)
$L_{i,j,t}$	0.0042***
	(0.0005)
$\Delta L_{i,j,t}$	−0.0554***
	(0.0211)
$\Delta y_{j,t}$	−0.0190***
	(0.0049)
$EQ_{i,j,t-1}$	−0.0010
	(0.0014)
$COM_{i,j,t}$	0.0054
	(0.0050)
Interaction dummies	Yes
Country fixed effects	Yes
Period fixed effects	Yes
Wald Test:	
$\alpha_{ER} + \alpha_{ER \cdot NoMAJ} = 0$ [*P*-value]	0.0370*
	[0.0231]
AR(2) test	0.1909
Hansen test	0.3633
No. banks	873
No. obs.	3406

Variable definitions: *LLP* = loan loss provisions/total assets; *ER* = earnings before taxes & loan loss provisions/total assets; Dummy variables: *NoMAJ* = equals 1 if bank has no majority owner; *Mbank* = equals 1 if majority shareholder (holds more than 50%) is a bank; *Mindust* = equals 1 if majority shareholder is an industrial firm; *Mfamily* = equals 1 if majority shareholder is an individual or a family; *Mother* = - equals 1 if majority shareholder is all remaining shareholder types excluding institutional investors; *L* = net loans/total assets; ΔL = loan growth rate; Δ *y* = GDP growth rate; *EQ* = equity/total assets; *COM* = commissions & fees income/total assets.
**Standard deviation of coefficient estimates in parentheses, with $p < 0.05$.
* Standard deviation of coefficient estimates in parentheses, with $p < 0.1$.
*** Standard deviation of coefficient estimates in parentheses, with $p < 0.01$.

shareholder. The results show that, in line with the results found using our more refined cluster methodology, banks without a dominant shareholder do not use loan loss provisions to smooth their income whether that threshold is put at the 40%, 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 873 to 376 banks; introducing this variable, analogously to Ahmed et al. (1999), in Eqs. (1)–(3) does not change our main results.[25]

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

We also 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 provide evidence for such signalling behavior, but does not change our main results.

A last robustness issue relates to Spain's implementation of 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.[26] 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.

6. Conclusion

We empirically examined whether the way a bank might use LLP to smooth its income is influenced by its ownership structure and the regulatory environment in place. For this we constructed a novel database on European commercial banks for the period 2004–2009 with detailed information on banks' individual ownership structure. We also used a clustering approach to distinguish between banks with different degrees of ownership concentration.

We find evidence that banks with a more concentrated ownership structure use discretionary LLP to smooth their income, which would be consistent with the hiding of private benefit extraction (in line with the entrenchment hypothesis). This behavior is less pronounced in countries with stronger supervisory regimes or higher quality of external audits, but independent of the level of shareholder protection, the type of audit firm (Big Four or non-Big Four), the type of the majority shareholder, the level of bank risk and the level of non-insured debt. Banks with dispersed ownership structure are found not to display this kind of earnings management behavior.

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 or lower quality of external audits highlights a malfunctioning of internal but also external governance mechanisms. This suggests the need to improve existing or implement new corporate governance mechanisms, 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".

Our suggestions for regulatory reform would be to push for more transparency regarding ownership structure, as an opaque ownership structure limits potential market discipline brought by stakeholders such as minority shareholders and debtholders. This requires strict information disclosure regarding banks' ownership structure, such as major share ownership and voting rights, beneficial owners, major shareholder participation on the board or in senior management positions. Where such information is not disclosed, the regulatory system should ensure that it is obtainable as a minimum by regulatory and enforcement agencies. We furthermore advocate that countries with high levels of ownership concentration in banking should aim for high levels of supervision and external audit quality. Alternatively, countries with weaker regulatory regimes could force banks to have a diversified ownership model in order to limit the influence of controlling shareholders on the use of income smoothing. A drastic way to do this would be to limit the size of the stake any given shareholder, or coalitions of shareholders, can hold in a bank. Making such a restriction effective would however necessitate controlling for the possibility that

[25] The sample size becomes too small to meaningfully examine Eqs. (4) and (5) in this case.

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

ownership concentration can also arise through pyramidal ownership structures. The examination of earnings management in relation to such more complex ownership structures could be an interesting direction for future research.

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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.[27] 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 relative to the one from k to $k+1$ clusters.[28] More precisely, we choose k clusters so that the number k minimizes

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

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).[29] 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.[30] The partition resulting from the k-means algorithm ensures that the k 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.

[27] 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.

[28] 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.

[29] 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.

[30] 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.

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