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Effective tax rates for bank entities across European Union. The role of loan loss provisions

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ABSTRACT

The paper investigates the impact of loan loss provisions (LLPs) on bank-specific effective tax rates (ETRs) using data of 2943 banks from European Union during 2007–2014. As control variables we used size, equity, fixed assets and return on assets (ROA), while the specific country-year tax reforms were captured using Devereux-Griffith effective tax rates. The results prove robust to different model estimators and sample selections, which suggests that LLPs act systematically towards the reduction of the bank entities' corporate tax burden. When distinguishing between two banking business models, respectively shareholders-value (commercial banks) and stakeholders-value banks (savings and cooperative banks), empirical findings indicate that provisions negatively affects the former (commercial banks) specific ETRs, whereas for the latter (savings and cooperative banks), no statistical significant effect was detected. From policy perspective, in the context of the switch from the incurred-loss model to the expected-loss model with respect to LLPs (IFRS 9), this may signal additional tax bill reduction for bank entities, if decision makers fail to react promptly. Finally, looking at types of banks investigated, the results show that among all three categories of banks, commercial banks manage to avoid the increase of tax bill driven by some bank-specific determinants (i.e. ROA), while maximizing the tax savings driven by others (i.e. capital intensity), thus suggesting more tax planning oriented behaviour as compared to savings and cooperative banks.

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1. Background

Banks have been intensively criticized for their role in the global financial crisis. Not only that they were seen as being at the origin of the crisis, but also as being the ones that spread the crisis all over the world (Schularick & Taylor, 2012). Moreover, banks that inflicted major losses have been subjects to extensive governments bail-outs. During the crisis, not only did banks not paid their fair share of taxes, but they

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also receive a consistent financial support from governments, which brought up the issue of tax fairness into the public agenda once again. At the European Union (EU) level, policy actions adopted by member states immediately after the Lehman Brothers collapse were coordinated in a massive bailout of financial institutions estimated at 3.65 trillion euro (European Commission, 2009). In that context, looking upon the taxes that banks actually paid becomes a matter of great interests for general public and governments alike, fuelling the debate around the mechanisms that shape the tax bill for bank entities.

Investigating the determinants of firm-specific effective tax rates (ETRs) is not something new. The related literature, which dealt only with nonfinancial companies, started back in the '80s in the US and gradually expanded to cover many countries of the world. However, investigating the determinants of firm-specific ETRs for financial institutions did not receive the proper attention that such a topic deserves, especially when things are looked upon from the perspective of systemic risk involved that justifies specific tax rules and bail-outs which adds up to the complexity of what an equitable taxation should be. In that context, specific determinants, which had not been previously investigated, may play a more important role in the tax figure of financial institutions as compared to nonfinancial companies. We refer here to the loan loss provisions (LLPs), the most important accrual from a bank's balance sheet and on which banks' managers have a significant discretionary power to manipulate and which have substantial tax effects.

While the mechanism of LLPs is straightforward, their effects on banks operations are extremely complex since they depend on the interconnection between the objectives of accounting setters, of supervisory bodies, and of tax authorities, which often are contradictory. Basically, there are two categories of bank provisions: specific and general. Although there are differences between the two, in financial reports they are summed up and disclosed as a single figure. While specific provisions are associated to specific loans, are easily documented and their amount depends mostly on overdue payments and pledged collateral, the general provisions are not linked to specific loans, are highly judgmental, not easily documented and reflects latent/potential losses that are present in the portfolio, but not yet specifically identified. Specific provisions are *ex-post* (backward-looking), while general provisions are *ex-ante* (forward-looking), thus leaving more room for subjective manipulation. For instance, if, by the end of the reporting year, a bank manager observed that there is a higher death rate among credit card holders, then, according to IAS 39, the bank may constitute a general LLP to absorb the corresponding expected losses. Even if the main condition for recognizing provisions under IAS 39 was met, (the loss event should have occurred by the end of the reporting period), the loss, in spite of being reasonably estimated, still carries a high degree of subjective judgement. Therefore, under IAS 39 rules, the bank managers could incorporate into their LLPs expected losses triggered only by events that have occurred by the end of reporting period, irrespective if they were specifically identified or not. This did not completely forbid *ex-ante* provisions, but they were conditional on the occurrence of triggering events. If no such triggering event occurred, no losses can be covered by LLPs, no matter how likely they were.

The newly proposed IFRS 9 *Financial Instruments*, which come into effect between 2018 and 2021, introduce a new standard for LLPs based on the expected credit loss model. The main difference compared to the actual standard (IAS 39) is *that banks can incorporate into their LLPs future credit losses even if no triggering events have yet occurred*. Banks could not only use historical and current information, but for the first time *they may use forecast information*, thus taking into account the effects of possible future credit loss events (Cohen & Edwards, 2017). This new approach will speed up the recognition of credit losses, thus mitigating the pro-cyclical effect of the incurred-loss model. Being in harmony with the supervisory requirements, the tension between central banks and accounting setters is eliminated. Basel II (published in 2004, implemented in 2007) already allowed banks to incorporate loan losses before they materialise, but the IAS 39 accounting standard (adopted by EU in 2004, effective from 2005) bound those losses to the occurrence of a triggering loss event.

In this context of reform with a potentially huge impact on the whole banking industry, the paper investigated LLPs as first order determinant of bank-specific ETRs. In doing so, we collected data for commercial, savings and cooperative banks from EU over 2007–2014 period, when IAS 39 was applicable. Our results reveal that LLPs have had a statistical significant effect of lowering the bank-specific ETR irrespective of estimators, sample sizes or definitions of dependent variable.

The paper brings several contributions to the field: i) it is the first paper that investigates the determinants of bank-specific ETRs in EU setting; ii) it discloses the effects of LLPs as an industry-specific first order determinant of bank-specific ETRs; iii) it investigates the determinants of bank-specific ETRs by looking upon different types of banking entities; iv) it makes policy recommendations accordingly by linking taxes to LLPs. Therefore, the novelty of our paper resides not only in investigating the firm-specific determinants for banking entities' ETRs, but also in empirically testing our main research hypothesis which states that LLPs are systematically associated with a lower bank-specific tax bill.

The rest of the paper is organized as follows: section 2 presents a brief literature review on firm-specific ETRs, section 3 describes the research design and hypotheses, section 4 presents data and methodology, section 5 present the results, while section 6 concludes.

2. Literature review

The literature on firm-specific ETRs is vast and while it dates back to the 80s, the number of countries covered expanded ever since. The existing research deals with non-financial companies mainly in a single country scenario. Our research brings a new perspective in the field by looking upon banking entities in a multi-country setting.

The firm-specific ETR related research originates in the US, and at the early stages it dealt with the investigation of the relation between ETR and firm size in univariate setting (Zimmerman, 1983; Porcano, 1986). Latter, the investigation moved to multivariate framework, determinants such capital intensity, asset mix and leverage being

intensively used (Stickney & McGee, 1982; Shevlin & Porter, 1992; Gupta & Newberry, 1997).

More recently, the ETR related research extended to other countries in the world: Netherlands (Buijink & Janssen, 2000; Janssen, 2005), Australia (Richardson & Lanis, 2007), Germany (Kraft, 2014), Romania (Lazăr, 2014), China (Liu & Cao, 2007; Chiou et al., 2012; Huang et al., 2013; Wu et al., 2013; Cao & Cui, 2017), Malaysia (Adhikari et al., 2006). Moreover, the research has been extended to multi-country setting, (e.g. Pacific Basin countries in Kim & Limpaphayom, 1998); US and several EU countries in Fernández Rodríguez & Martínez Arias, 2011a; and BRIC countries in Fernández Rodríguez & Martínez Arias 2011b).

With respect to determinants investigated, for the sake of clarity, we grouped them into two broad categories: core determinants and supplemental determinants. While core determinants are those that are common to all studies, no matter the country covered, the methodology or data sample involved, supplemental determinants are specific to different studies, thus displaying higher heterogeneity. Consequently, most of the papers had agreed on determinants like firm size, capital intensity, leverage (core determinants), while differences among supplemental determinants also exist. With regard to core determinants, the results are mixed especially for firm size, while for capital intensity and leverage it seems that both negatively affect ETRs through capital allowances and interest deduction. An exhaustive meta-regression that reviews the literature on the relation between ETR and firm size can be found in Belz et al. (2017).

All these papers investigated firm-specific ETRs only for non-financial companies. The only study up to date that dealt with bank entities ETRs is of Fonseca Diaz, Rodriguez and Arias (2011) that investigated the determinants of ETRs for Spanish commercial and savings banks over 1993-2004 period. They found that larger entities with higher fixed assets and lower equity have a lower tax burden, while commercial banks had a slightly higher ETR than savings banks (1 percentage point).

The literature on banks LLPs is vast and is dealing mostly with the effect of provisions on earnings management, capital regulation, signalling and taxes (Curcio & Iftekhhar, 2015; Ozili & Outa, 2017). The most covered topic is the one that deals with earnings management, especially income smoothing (Laeven & Majnoni, 2003; Bikker & Metzmakers, 2005; Fonseca & Gonzalez, 2008; Adams et al., 2009; Bouvatier et al., 2014; Balla & Rose, 2015). An excellent review on the LLPs related literature can be found in Wall and Koch (2000) and more recently in Ozili and Outa (2017). Meanwhile, taxes enjoyed little attention, especially in new millennia (Scholes, Wilson & Wolfson, 1990; Collins, Shackelford & Wahlen, 1995; Merz & Overesch, 2016; Andries et al. 2017). In that stream of literature, our paper is the first that looks upon bank-specific ETRs as the dependent variable under the effect of banks' LLP as the main variable of interest, in a multi-country setup over 2007–2014 period.

For banking industry, LLPs represent a metric of special interest when investigating the determinants of firm-specific ETRs. Merz and Overesch (2016) arguing that “although LLPs value as an indicator for future deduction from taxable base, the potential tax response of LLPs has not yet been analyzed empirically”, found that banks' LLPs increase with *country-specific* statutory corporate income tax rate (STR),

mainly because LLPs may serve as a proxy for credit risk allocation and bad debt allocation in high-tax countries. Since this will most probably trigger a reduction of the *bank-specific ETR*, we argue that the association between banks' LLPs and *bank-specific ETR* would be negative, as Chiorazzo and Milani (2011) found in a different setting. While Merz and Overesch (2016) looked upon LLPs as dependent variable and *country-specific STR* as independent variable, we instead investigate *bank-specific ETR* as dependent variable and LLPs as independent variable, while controlling for country tax reforms through Devereux-Griffith effective average tax rates (EATR). The distinction between *country-specific STR* and *bank-specific ETR* is crucial in understanding the contribution of our paper. While the former is *ex-ante* and depends only on tax legislation, the latter is *ex-post* and depends not only on tax legislation, but also on banks operations, including those related to LLPs. Merz and Overesch (2016) empirically showed that “banks attempt to allocate loans with a high default risk (proxied by LLPs) in countries with high STR ... to benefit from tax deductibility”, but did not investigate the effect of such practice on bank-specific ETRs. By looking on bank-specific tax figures, we have been able to provide evidence that LLPs are negatively associated with bank-specific ETR.

Another closely related paper is that of Chiorazzo and Milani (2011) who found a negative effect of bank-specific ETRs (independent variable) on LLPs (dependent variable). They looked upon taxes paid by banks having a pass-through effect on profit before taxes, i.e. “banks facing a tax rise tend to increase pre-tax profits, relative to the scale of activities, in order to leave bank stock net returns unchanged”. Given the argument of Merz and Overesch (2016), we argue that the causality invoked by Chiorazzo and Milani (2011) is more likely to be the other way around, namely LLPs to influence bank-specific ETRs. Since the banks know *ex-ante* the country-specific STR tax rate, they may allocate LLPs in high tax jurisdictions in order to benefit from tax deductibility, which consequently would lead to a lower bank-specific ETR.

Finally, the most recent related paper to ours is of Andries et al. (2017). Exploiting the variation across countries and over time of tax deductibility rules of general provisions, the paper found that LLPs are positively associated with the country-specific STR when general LLPs are tax deductible, which is in line to findings of Merz and Overesch (2016). A deduction always values more when statutory corporate income tax rate is higher, because it triggers higher tax savings, thus leading to lower firm-specific ETR. Therefore, we argue that since LLPs are positively affected by *country-specific STRs (ex-ante)*, their effect on *bank-specific (ex-post) ETR* is expected to be negative.

Moreover, for banking industry, unlike for any other industry, LLPs are not only accounting driven, but also supervisory driven. Such conjunction may significantly lower the tax burden that banking entities are facing. Therefore, we hypothesize that LLPs reduce bank-specific ETRs and empirically investigate this for bank entities from EU over 2007–2014 period. We differentiate from other papers dealing with LLPs by investigating their effect on firm-specific tax bill, proxied by ETR. In order to capture the features of national tax systems to the extent possible, we used Devereux-Griffith (Devereux & Griffith, 1999; 2002; 2003) effective average tax rates (EATR).

3. Research design and hypotheses

In dealing with ETRs deterministic investigation several cautions have to be accounted for. First, caution has to be taken when defining the firm-specific ETR. Since ETR is a ratio, choosing the numerator and denominator has significant impact on the results and their interpretation. Two aspects are involved here. First, with respect to numerator, choosing the current tax obligation or total tax expense may generate inconsistency in results especially when the differences between the two are significant. In order to overcome this, we choose in our sample bank entities that report under IFRS rules, thus assuring conformity over the total sample. Second, when computing the bank-specific ETR, more important consideration has to be paid to denominator used (Hanlon & Heitzman, 2010), since there are tax induced distortions that affect both the numerator and denominator, thus making the interpretation of the results difficult. One way of dealing with this is to choose a denominator before any deductions that generates this kind of tax distortions (or at least as much as data availability allows). In that respect, choosing profit before taxes as the denominator for bank-specific ETR is not appropriate since it already include deductions of LLPs, our main variable of interest. Therefore, we choose banks' operating income as the proper denominator for our main bank-specific ETR (ETR1), since this metric is before any provisions and other tax related deductions (such for instance depreciation) that may drive the results. As the structure of data reveals, banks' operating income is the most comprehensive metric for bank entities being somehow similar to turnover for non-financial companies¹. As alternative checks, we also used an *alternative effective tax rate* built around profit before taxes as denominator (ETR2).

Second, a firm-specific ETR investigation that specifically targets bank entities has to take into account the special characteristics of the industry. Being a highly regulated industry, banks are subject to capital requirements and provisions that strongly impact on their actions. Given that LLPs are an important features of banks activity upon which they have substantial latitude to manipulate (Fonseca & Gonzalez, 2008), it is likely that LLPs may have a stronger impact on ETRs for banks than for non-financial companies. Furthermore, traditional determinants such capital intensity may have little economic significance, since fixed assets have a lower share of the total assets for banks than for non-financial companies. The main point is that the independent variables for banking industries may be different that those generally accepted for non-financial industries, thus calling for a careful selection of explanatory variables, and consequently providing new insights into determinants of ETRs and new policy recommendations

The main variable of interest is LLPs. LLPs are funds set aside by the company in order to cover anticipated loan losses on their portfolio. When there is evidence that a loan or a group of loans have become doubtful, a provision should be established in order to reflect the expected losses. The provision represents a normal business expenditure that lowers bank profit, being in that sense, similar to depreciation of tangible assets. When relating LLPs to taxes, the most important feature that has to be taken into account is their tax deductibility. The literature on LLPs tax deductibility is extremely scarce and often contradictory. For instance, Bikker and Metzmakers (2005) claimed that both specific and general provisions are tax deductible in most

countries, while Cortavarria et al (2000) stated that “general provisions are often not tax deductible”. With respect to LLPs tax deduction rules, there are two broad approaches: the charge-off method and the reserve method. The *charge-off method* does allow for the tax deductions of LLPs only upon the occurrence of the final event that clearly makes the recovery of the corresponding loan impossible (e.g. the borrower has declared bankruptcy). Given the different financial accounting and tax treatment of LLPs, this method is over-restrictive (especially when the bankruptcy country-specific procedures require a long time), in the sense that it delays the tax deductibility of LLPs, by creating a deferred tax asset equal to value of the future tax deduction. However, because of deferred tax accounting the bank overall earnings are not affected. Alternatively, under the *reserve method* banks can deduct LLPs in the current period, as any other normal business expenditure. This method provides timely tax deductibility of LLPs compared to the charge-off method, by allowing banks to deduct the cost of provisions in the current period rather than wait until loans are charged-off (which is particularly important during crises). Consequently, there are no deferred tax assets implied, thus providing a higher degree of conformity between accounting and tax rules. Charge-off method is applied in USA (for banks with total assets exceeding 500 million USD), Australia, New Zealand; Korea, Argentina, Malaysia and Philippines (Andries et al., 2017; Sunley, 2002), while European countries prefer the reserve method with different rules regarding the deductibility of specific and general provisions. While specific provisions are tax deductible in most European countries, the picture for general provisions is not so clear. Providing the precise deductibility rules for banks provisions during the whole period of our analysis is a task beyond our investigation possibilities. The closest existing survey that deals with taxation of banking entities is European Commission (2012a), but the data collected refers to only one year, namely 2011. The most comprehensive recent source in this matter is Andries et al. (2017), but it does not cover all EU countries, nor the entire period of our analysis. Nevertheless, it gives important clues on the deductibility of general provisions. In most European countries and for most years in our sample (2007–2014), the general provisions were not tax deductible. Moreover, even when tax deductibility of LLPs is permitted, there are limitations on the amount deducted (Andries et al., 2017). When general provisions are not tax deductible, permanent differences² between tax income and book income appear, which may drive the ETR up, especially when ETR is built around profit before taxes as denominator. Therefore, since we do not control for the precise country-year LLPs deductibility rules, our setting is expected to lead to conservative estimates of the effect of LLPs on bank-specific ETRs.

Moreover, one must take into account that profit before taxes already has LLPs subtracted, in which case, any variation of LLPs affects both the numerator and denominator simultaneously, thus making the interpretation of the results difficult and tricky. Since we want to capture the variation of the tax bill of the company under the effect of LLPs, we should *isolate the tax effect only at the numerator of ETR*, and the best way to do that is to construct the corresponding ETR around a denominator before any LLPs deductions³. Doing so, we get rid of the mechanical effects that simultaneously affect both the numerator and denominator of ETRs.

However, as robustness checks, we also used ETR build around profit before taxes and the results are similar. Consequently, we expect that higher provisions, which at least in part are tax deductible, to trigger a lower bank-specific ETR. Without resuming the detailed discussion from section 2, we expect that the effect of LLPs on *bank-specific (ex-post) ETR* to be negative, mostly because banks may allocate loans with a high default risk (proxied by LLPs) in jurisdictions with higher *country-specific STRs (ex-ante)*, in order to benefit from their tax deductibility (Chiorazzo & Milani, 2011; Merz & Overesch, 2016; Andries et al., 2017). Another bank-specific determinant intensively used in ETR related literature is leverage. When computing taxable income, interest is deductible, whereas dividends are not. This creates a tax shield for debt that makes firm-specific ETRs go down. The higher the leverage, the lower the ETR is. While in related literature, the effect of leverage on ETRs was investigated only for non-financial companies, banks make no exception from the interest deductibility rules, and therefore one should expect that the effect of leverage on bank-specific ETR is also negative. However, banks are also subject to stricter capital requirements, which limits their leverage, mainly because there are minimum thresholds for equity to which banks have to comply. Under Basel II agreement, equity is part of Tier I capital and acts as a buffer against unexpected shocks. Therefore, banks are more interested in maintaining the proper level of equity in synergy with the risk of their assets. From this perspective, instead of leverage, we shall look upon equity as bank-specific determinant of ETR. We hypothesize that the higher the equity is, the lower the leverage and the corresponding interest deductions, therefore the higher the bank-specific ETR will be.

With regard to firm size (natural logarithm of the total assets), there are two opposing views on how it affects the corporate ETRs: the political power theory (Stigler, 1971; Becker, 1983) and the political cost theory (Zimmerman, 1983; Watts & Zimmerman, 1986). According to the former, larger companies are engaging more aggressively in tax planning and are using their influence in order to promote tax provisions that are in their favour, thus achieving larger tax savings. Oppositely, the political cost theory states that given the increased public opinion scrutiny on larger firms, triggered by their visibility and success, these are more prone to be the target of tax provisions that impact more aggressively on them. Consequently, the ETR is expected to be higher for larger companies. However, it is hard to hypothesise what theory prevails, consequently, we cannot predict a sign for the effect of size on bank-specific ETR.

Capital intensity is another intensively investigated determinant of firm-specific ETR. While for non-financial companies the effect is straightforward and materializes through depreciation related tax incentives (i.e. generous capital allowance such as accelerated depreciation or writing-off the cost of tangible assets over periods shorter than their economic lives), for banking entities the effect is still there, but given the low shares of fixed assets in total bank assets, its economic significance, if any, is expected to be extremely low. Our expected sign is negative.

Profitability (return on assets) also influences bank-specific ETRs. More profitable firms pay higher taxes, as Wilkie (1988) showed. He argued that more profitable firms pay higher taxes, because holding tax preferences, tax rate and total assets

Table 1. The expected sign of independent variables.

Independent variables	Expected sign
Loan loss provisions (LLP)	-
Equity (EQ)	+
Size (SIZE)	+/-
Capital intensity (K)	-
Profitability (ROA)	+/-
Country-specific effective average tax rate (EATR)	+

Source: Own computations.

constant, an increase in ROA will lead to an increase in ETR. Moreover, profitable companies pay more taxes as an effect of the progressive taxation and of the lack of net operating losses which could lower taxes in subsequent years. ROA may also stand as a proxy for tax planning, since more profitable firms are more likely to engage in tax planning activities (Zinn & Spengel, 2012, p. 16), thus reducing their corporate tax burden. As a result, we cannot predict any sign.

Apart from bank-specific determinants, bank-specific ETRs are under the influence of the national tax systems characteristics. Among these, changes in the corporate statutory tax rates have by far the largest effect. Moreover, subtler and less visible changes in the corporate tax bases also modify the corporate tax bill. In order to capture the effect of national tax systems characteristics and country tax reforms we used Devereux-Griffith effective average tax rate (EATR), which aggregates the most important national tax law provisions on annual basis. EATR is a country-specific tax rate that “depends only on tax legislation” (Devereux & Griffith, 2002). By doing so, we are able to control both for the effects induced by changes in statutory tax rates or surcharges rates (if any) and changes in tax bases (i.e. depreciation rate). Since EATR is finely tuned to capture the most significant country-specific tax changes, it is the best proxy for countries’ tax reforms. Consequently, EATR displays larger variation as compared to statutory tax rates, which make it more suitable for our investigation not only from tax point of view, but also from methodological standpoint. Moreover, since LLPs might be under the influence of tax systems characteristics, by explicitly controlling for country-specific tax features, we manage to sort them out from the error term, which removes the correlation between the error term and the LLPs, thus alleviating the potential endogeneity problem. The expected sign for EATR is positive. The expected signs are presented in Table 1.

4. Data and methodology

We used financial data for the main types of banking entities (commercial/cooperative/savings) taken from Orbis database, covering 2007–2014 period. This renders an initial sample of 2943 bank entities, thus having 23544 firm-years. After eliminating firms with no tax data, the sample dropped to 11965 firm-years. Moreover, when we restrict the sample to contain data simultaneously for both the dependent variable (ETR) and the main variable of interest (LLPs), the number of observations dropped to 8491 firm-years (Country distribution of bank entities is presented in Appendix A).

Table 2. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	p1	p50	p99	Max
Effective tax rate	8491	5,63	5,96	0	0	4,73	100	100
Alternative Effective tax rate	8491	30,77	21,96	0	0	25,19	100	100
Loan loss provisions	8491	0,46	1,18	-5,06	-1,04	0,22	4,55	54,94
Size	8491	13,17	2,08	6,11	9,74	12,76	19,87	21,54
Equity	8491	10,13	6,51	-134,46	1,67	9,15	60,32	99,51
Capital intensity	8491	1,36	1,36	0	0,01	1,10	5,81	44,18
Return on assets	8491	0,42	1,77	-62,07	-5,34	0,48	3,67	67,55
Country-specific EATR	8491	25,02	4,31	9	11,6	27,5	35,4	39,40

Source: Own computations.

Specifically, we estimate the following model:

$$\begin{aligned}
 ETR_{i,j,t} = & \alpha + \beta \times LLP_{i,j,t} + \delta \times ETR_{i,j,t-1} + \gamma_1 \times SIZE_{i,j,t} + \gamma_2 \times KINT_{i,j,t} + \gamma_3 \\
 & \times EQ_{i,j,t} + \gamma_4 \times ROA_{i,j,t} + \gamma_5 \times EATR_{j,t} + v_i + \mu_j + \varepsilon_{i,j,t}
 \end{aligned} \quad (1)$$

In this equation, $ETR_{ij,t}$ represents *Effective tax rate* for bank i from country j , in the year t . $LLP_{i,j,t}$ is the *Loan loss provisions* (LLP to total assets ratio) for bank i from country j in year t . To control for differences in bank characteristics across our sample, we employ the following bank-level control variables: (1) *SIZE* - *Bank size* (natural logarithm of total assets); (2) *KINT* - *capital intensity* (*fixed assets to total assets ratio*); (3) *EQ* - *Equity* (*equity to total assets ratio*); (4) *ROA* - *Return on assets* (*pre-tax income to total assets ratio*). Also, we control for the effect of national tax systems characteristics using the Devereux-Griffith effective average tax rates (EATR). v_i - year fixed effect; μ_j - country fixed effect; $\varepsilon_{ij,t}$ - error term.

In order to deal with firm-specific ETRs that are of unusual magnitude or have little economic meaning we applied a recoding to bank-specific ETR, our dependent variable. In line with previous firm-specific ETRs related papers, the data was censored between 0 and 100 (Gupta & Newberry, 1997; Richardson & Lanis, 2007). Descriptive statistics are presented in Table 2.

The mean for the *Effective tax rate* (ETR1) is 5.63%, while the median is slightly lower (4.73%). For the *Alternative Effective tax rate* (ETR2), the mean is 30.77, and the median is also slightly lower (25.19). While the numerators are the same, the significant difference between the two bank-specific ETRs is explained by their different “tax bases” or denominators. While *ETR1* is constructed around operating income, which aggregates all income before any deductions, *ETR2* is developed around profit before taxes, which already contained the inherent business deductions. As we already show in Section 3, we focus on *ETR1* since its design is free from any tax induced distortions that affects simultaneously both the numerator and denominator, and we use *ETR2* just for additional checks.

Given that *LLPs* presents higher skewness, we winsorize *LLPs* variable at the 1 percent and 99 percent levels. Positive values of *LLPs* means recognized provisions (increase of loan loss reserves), while the negative values of *LLPs* means recovered provisions (decrease of loan loss reserves).

The mean for *Size* is 13.17, while the median is rather close at 12.76. The mean for *Equity* is 10.13 that is above the minimum Tier 1 capital ratio of 8% set by Basel 2 agreement. While our sample contains banks with negative equity, they are few in

numbers and have been accounted when we winsorize the sample at the 1 percent and 99 percent levels. With respect to *Capital intensity*, the mean and median are close, but low, which makes sense considering the characteristics of banking industry. The maximum values for capital intensity are outliers, which were dealt with when performing winsorized regressions. The same scenario applies also to profitability (low, but quite similar values for the mean and median, with outliers at the both tails of the distribution). *Country-specific effective average tax rate (EATR)* controls for the major changes in each country's taxation. Bulgaria holds the minimum *EATR*, while France records the maximal *EATR* value. The mean and the median are around 24. Usual checking did not reveal any concerns with regard to multicollinearity between explanatory variables. There is no correlation between explanatory variables in excess of 0.4.

We estimate [equation 1](#) using different econometric methodologies. The general approach when dealing with panel models with a lagged dependent variable and other potential endogenous variables is the general method of moments (GMM) estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998). This method allows controlling for endogeneity bias by including lagged values of the regressors. *LLPs* variable is considered endogenous, being instrumented with lagged differences from 1 to 2 in the levels equation. The other regressors are considered exogenous and are instrumented with their level. The validity of the instrumental variables set is tested using the Hansen J statistic, while the serial correlation between residuals is assessed using the Arellano-Bond test.

Secondly, we use fixed-effects OLS estimator, which was chosen based on the Hausmann test that suggests the fixed-effects estimator is preferable to the random-effects estimator because the regressors are shown correlated with the time-invariant bank-specific variables. We use heteroskedasticity and within-panel serial correlation robust standard errors in our estimations, and cluster standard errors at the country-level.

We also report estimates with panel-corrected standard errors (Beck & Katz, 1995). This correction controls for bank-level heteroscedasticity and an AR(1) process in the error structure, and with multilevel linear regression (MLR). MLR is superior to OLS because it accounts for the fact that our data have different levels of aggregation and it provides error terms that control for the potential dependency due to nesting effects, which is not the case with OLS. In particular, by modelling simultaneously regressions at both the bank- and country-level, multilevel models consider that banks within a country are more similar to one another than banks from different countries.

5. Results

5.1. Base results

This section presents the empirical estimates of the regression specifications presented in [Section 4](#), outlining the response of bank-specific ETRs to changes in the provisions. All models include country and time fixed effects and allow for clustering of standard errors at country level. The results are shown in [Table 3](#).

Table 3. Base results.

Dependent:ETR1	GMM (1)	OLS (2)	PCSE (3)	MLR (4)
LLPs	-0.7067*** (0.2521)	-1.0641*** (0.2196)	-0.9156*** (0.2124)	-1.0528*** (0.1030)
ETR(-1)	0.6480*** (0.1217)	0.2244*** (0.0713)	0.3422*** (0.0452)	0.2579*** (0.0114)
Size	-0.7067*** (0.3363)	0.1928*** (0.0689)	0.1703*** (0.0533)	0.2128*** (0.0492)
Equity	-0.1117 (0.0809)	0.0807 (0.0896)	0.0456 (0.0540)	0.0839*** (0.0148)
Capital intensity	-0.2331* (0.1345)	-0.4838*** (0.1378)	-0.3854*** (0.0688)	-0.5479*** (0.0727)
ROA	0.8914*** (0.2934)	0.6910** (0.3275)	0.6648*** (0.2245)	0.6862*** (0.0686)
EATR	0.3715** (0.1746)	-0.1178* (0.0636)	-0.1339* (0.0732)	0.0613** (0.0307)
Constant		1.7634 (1.6897)	2.1020 (1.8045)	-0.2485 (1.0789)
AR(1) test statistic	-2.6656			
p value of AR(1) statistic	0.0077			
AR(2) test statistic	-0.1157			
p value of AR(2) statistic	0.9079			
Sargan statistic	2.0619			
p value of Sargan statistic	0.3567			
R-squared		0.4102	0.4192	
LR test- χ^2				1431.81***
Number of obs.	6142	6142	6142	6142

Notes: Year and country effects are not reported. Country level clustered robust standard errors in parentheses⁵. The Arellano-Bond test for autocorrelation has a null hypothesis of no autocorrelation. The null hypothesis of no AR (1) is rejected, while that of no AR (2), which is more important in dynamic panel data estimation is not. Meanwhile, the Sargan test of over identifying restrictions has a null hypothesis of “the instruments as a group are exogenous.” The test results indicate that the null hypothesis cannot be rejected, confirming the joint validity of the instruments. *** $p < .01$; ** $p < .05$; * $p < .1$.

Source: Own computations.

Empirical results presented in Table 3 indicate that the relationship between ETRs and LLPs is negative and statistically significant, irrespective of the estimator. One percentage point (p.p.) increase in the LLP level is associated with a reduction between 0.7 (GMM) and 1.06 (OLS) in bank-specific ETR. This is important evidence that LLPs systematically act towards the reduction of taxes paid by the banking sector.

With respect to control variables, size, capital intensity and profitability show statistically significant effect for all estimators, while equity does not have any significant effect on bank-specific ETR, except for the MLR. The coefficient for size is changing its sign from negative in GMM setting to positive in the OLS, PCSE and MLR settings, which suggests inconsistency with regard to the effect of the size on bank-specific ETR. Consequently, we cannot say whether the political power theory or political cost theory prevails in banking industry. Capital intensity negatively affects the bank-specific ETRs in all scenarios, albeit at different statistical significance. Profitability (ROA) shows a positive effect on bank-specific ETRs for all scenarios. The theory that more profitable firms pay higher taxes (Wilkie, 1988) holds. Since equity is not statistically significant, we cannot provide empirical evidence that the resulting leverage acts in favour of reducing bank-specific ETRs in the same manner as for non-financial companies. Due to the nature of their business, banks are more preoccupied with maintaining the regulators’ required level of equity in synergy with

Table 4. Types of banks.

Dependent:ETR1	All banks	Commercial	Savings	Cooperative
LLPs	-1.0641*** (0.2196)	-0.9461*** (0.3220)	-1.1471 (0.7075)	-0.0988 (0.1877)
ETR1(-1)	0.2244*** (0.0713)	0.1054 (0.0819)	0.4159*** (0.0388)	0.2387*** (0.0826)
Size	0.1928*** (0.0689)	0.0528 (0.0900)	0.1698*** (0.0556)	0.2108** (0.0929)
Equity	0.0807 (0.0896)	0.1428 (0.1204)	-0.0396** (0.0179)	0.0335 (0.0397)
Capital intensity	-0.4838*** (0.1378)	-1.0850*** (0.3808)	-0.2219* (0.1168)	-0.2580 (0.1943)
ROA	0.6910** (0.3275)	0.1045 (0.4510)	1.4375*** (0.4252)	1.6757*** (0.5427)
EATR	-0.1178* (0.0636)	-0.0817 (0.1195)	-1.4681* (0.8816)	0.0011 (0.0897)
Constant	1.7634 (1.6897)	2.7702 (3.4364)	(21.0515)	-1.8788 (1.5319)
Method	OLS	OLS	OLS	OLS
R-squared	0.4102	0.1892	0.5485	0.6390
Number of obs.	6142	1113	2887	2142

Note: Country level clustered robust standard errors in parentheses. Year and country effects are not reported.

*** $p < .01$; ** $p < .05$; * $p < .1$.

Source: Own computations.

the risk of their assets and consequently debt related tax savings strategies are less important.

5.2. Further analysis and robustness checks

In this section we further investigate the impact of LLPs on bank-specific ETRs considering the type of banks (commercial/savings/cooperative) and the size of banks (small/large). Also, we provide robustness checks by using different sample selection strategies, different definition of dependent variable (ETR2), or different proxies for LLPs, the main variable of interest (Table 4).

Taking into consideration the banking entity type (commercial/savings/cooperative), the results for LLPs are statistically significant for commercial banks only. A possible explanation for this may reside in their business model which is more profit maximization oriented, thus triggering a more aggressive tax avoidance behaviour. Oppositely, savings banks and cooperative banks may have multiple objectives that alleviate the preoccupation for reducing the tax burden. For instance, according to Ayadi et al. (2016), European savings banks “have in common that they originally focused on providing access for financial services to less wealthy amongst the population”. Also, the business model of European cooperative banks which emphasize “value creation for their members and a long-term relationship of trust, opposed to the profit maximization approach of the mainstream banks” and which is focused on “financing the real economy” (European Association of Co-operative Banks, n.d.) makes them less preoccupied by tax planning strategies meant to reduce the bank-specific ETR. Moreover, the key principle in cooperative business, namely one person – one vote, together with the fact that the such banks are owned by their members/customers leads to sound corporate governance and higher social responsibility, which also acts towards lower tax planning activities. In fact, according to Ayadi et al

Table 5. Different sample selection strategies.

Dependent variable:ETR1	PBT > 0& TAX > 0 (5)	LLP unwinsorized (6)	LLP unwinsorized and PBT > 0&TAX > 0 (7)
LLPs	-1.9161*** (0.2929)	-0.0151 (0.5024)	-1.8813*** (0.2966)
ETR1(-1)	0.2438*** (0.0523)	0.2302*** (0.0679)	0.2440*** (0.0524)
Size	0.1930** (0.0750)	0.1801*** (0.0687)	0.1923*** (0.0746)
Equity	-0.0820** (0.0341)	0.0671 (0.0913)	-0.0846** (0.0333)
Capital intensity	-0.3533*** (0.0732)	-0.4717*** (0.1473)	-0.3564*** (0.0740)
ROA	2.4796*** (0.2141)	1.0772*** (0.2896)	2.4861*** (0.2173)
EATR	0.0144 (0.1093)	-0.0791 (0.0710)	0.0163 (0.1096)
Constant	-0.6565 (2.8267)	0.5831 (1.8305)	-0.6762 (2.8248)
Method	OLS	OLS	OLS
R-squared	0.6053	0.4025	0.6053
Number of obs.	5437	6142	5437

Note: Country level clustered robust standard errors in parentheses. Year and country effects are not reported.

*** $p < .01$; ** $p < .05$; * $p < .1$.

Source: Own computations.

(2016), a rough distinction between commercial banks and savings/cooperative banks, is that the former is shareholder-value oriented, while the latter are stakeholder-value oriented. In fact, looking at mean values for each type of bank (Appendix B), cooperative banks display the highest bank-specific ETR: 5.86% as oppose to 5.01%/5.54% for savings/commercial banks in the case of *ETR1* and 33.88% as oppose to 28.86%/26.18% for savings/commercial banks in the case of *ETR2*.

With regard to capital intensity, the economic effect is substantially larger for commercial banks (-1.08) when contrasted with savings (-0.22) and cooperative banks (-0.25). Looking at Appendix B, commercial banks display the lowest capital intensity among all three types of banks, however they manage to maximise the underlying tax savings due to accelerated depreciation and writing-off the cost of tangible assets over periods shorter than their economic lives, which also suggests more aggressive tax planning.

With regard to ROA, the case of commercial banks comes under scrutiny again. Appendix B shows that commercial banks display the lowest ROA, while having the highest income to total assets ratio (5.38% as oppose to 3.24%/2.99% for cooperative/savings banks) and highest provisions (0.88% as oppose to 0.46%/0.26% for cooperative/savings banks). This suggests a higher predisposition for commercial banks to make use of provisions which leads to a lower ROA, which subsequently may trigger lower taxes.

As we described in the previous section, we constricted all ETRs to lie between 0 and 100%, by setting all negative ETRs to 0 and all ETRs above 100% to 100% and then we winsorized the *LLPs* variable at the 1% and 99% levels. In order to test the robustness of our results we perform additional checks by using different sample selections, for which the results are presented in Table 5.

Since we set all negative ETRs to 0, the distribution for both ETRs is skewed to the right, so we performed additional checks that addresses this issue by setting the condition that both tax (TAX) and profit before taxes (PBT) to be greater than 0 and

Table 6. Large banks vs. small banks.

Dependent variable:ETR1	Large (8)	Small (9)
LLPs	-1.1930** (0.5666)	-0.9959*** (0.2505)
ETR1(-1)	0.4345*** (0.1337)	0.1924** (0.0847)
Size	-0.2547 (0.1673)	0.3342** (0.1345)
Equity	0.0593 (0.1350)	0.0901 (0.0952)
Capital intensity	-1.6505*** (0.5322)	-0.4256*** (0.1215)
ROA	-0.0761 (0.6073)	0.8826*** (0.3006)
EATR	-0.2896*** (0.0724)	0.0294 (0.1565)
Constant	13.5180*** (3.9538)	-3.4037 (3.6421)
Method	OLS	OLS
R-squared	0.4156	0.4155
Number of obs.	741	5401

Note: Country level clustered robust standard errors in parentheses. Year and country effects are not reported.

*** $p < .01$; ** $p < .05$; * $p < .1$.

Source: Own computations.

the results (Model 5) show greater statistical significance. In Model 6 we are using the LLP variable unwinsorized and the coefficient is still negative but not statistically significant. Imposing both conditions (LLPs unwinsorized and both tax and profit before taxes greater than 0 – model 7) the estimates are in line with base results.

As cross-sectional tests, we split the sample between small and large banks, taking into account that larger banks usually have more opportunities to engage in tax avoidance activities using LLPs. The threshold used was 5 billion EUR. The results are presented in Table 6.

The effect of LLPs on ETRs keeps its sign and the effect is statistically significant in both subsamples. The economic effect is greater for large banks than for small banks (-1.193 versus -0.996), which suggests that larger banks may lower their tax bill more aggressively than small banks.

To further test if our results are not driven by the how we have defined the dependent variable, we run the base estimations using an *Alternative Effective Tax Rate (ETR2)* indicator measured as Taxes to Profit before Tax ratio (Table 7). The results are similar to base model.

Also, in order to test if our results are not driven by how we have defined the level of LLPs, in Table 8 we present the result of base estimations using following alternative measures: Non Performing Loans (NPLs – Model 14) and Reserves for Non-Performing Loans (RNPLs – Model 15).

The number of observations is much lower in that case, because data on NPLs and RNPLs are much scarce than data for LLPs. In too many cases, the original data extracted from Orbis database did not contain figures for NPLs and RNPLs, but only for LLPs. Nevertheless, the coefficient for NPLs, which we argue that it is the best proxy for LLPs, is negative and statistically significant.

All in all, we found that LLPs systematically reduce the bank-specific ETRs, being statistically significant and negative in all scenarios.

Table 7. Alternative Dependent variable (ETR2 - Taxes to Profit before Tax).

Dependent:ETR2	All banks (10)	Commercial (11)	Savings (12)	Cooperative (13)
Loan loss provisions	-1.0677** (0.5095)	-1.3412*** (0.4318)	-2.7028*** (0.8625)	-0.7609 (1.0449)
ETR2 (-1)	0.3116*** (0.1087)	0.2110*** (0.0667)	0.3067*** (0.0863)	0.3725** (0.1659)
Size	0.7371*** (0.2223)	0.0049 (0.4081)	-0.0174 (0.1391)	0.4150** (0.1901)
Equity	-0.1037 (0.0777)	-0.1597** (0.0715)	-0.2400* (0.1394)	-0.4761* (0.2845)
Capital intensity	0.0326 (0.1426)	0.3684 (0.3275)	0.0676 (0.3677)	-0.0279 (0.1595)
ROA	0.6312* (0.3681)	0.9747*** (0.3270)	0.7603 (1.2599)	0.4633 (0.4895)
EATR	0.0600 (0.4176)	1.2069*** (0.4284)	-2.2110 (1.4985)	-1.2264*** (0.3668)
Constant	-0.1348 (10.3314)	-0.5496 (11.9110)	62.3662* (35.4422)	34.5719*** (7.0762)
Method	OLS	OLS	OLS	OLS
R-squared	0.4853	0.2645	0.6431	0.4716
Number of obs.	6142	1113	2887	2142

Note: Country level clustered robust standard errors in parentheses. Year and country effects are not reported.

*** $p < .01$; ** $p < .05$; * $p < .1$.

Source: Own computations.

Table 8. Alternative Proxies for LLPs.

Dependent: ETR1	NPLs (14)	RNPLs (15)
NPLs	-0.0352** (0.0146)	
RNPLs		-0.0068 (0.0191)
ETR1(-1)	0.3285*** (0.0464)	0.3878*** (0.0660)
Size	0.1288** (0.0573)	0.1037* (0.0612)
Equity	0.0129 (0.0412)	-0.0083 (0.0413)
Capital intensity	-0.4978*** (0.1149)	-0.4461*** (0.1189)
ROA	0.9143*** (0.2326)	0.8917*** (0.2256)
EATR	-0.1525* (0.0787)	-0.1384* (0.0762)
Constant	5.4929* (2.8116)	8.7917** (4.3285)
Method	OLS	OLS
Sample	All banks	All banks
R-squared	0.4047	0.4281
Number of obs.	3145	3245

Note: Country level clustered robust standard errors in parentheses. Year and country effects are not reported.

*** $p < .01$; ** $p < .05$; * $p < .1$.

Source: Own computations.

6. Conclusions

Starting from the fact that banks not only have to comply with the regulator's provisions requirements, but they also have some degree of liberty in their provision policy, the paper investigated LLPs as first order determinant of bank-specific ETRs. LLPs were found as having a statistical significant effect of lowering the bank-specific

ETR irrespective of estimators, sample sizes or definitions of dependent variable used. The investigation was conducted on a sample of 6142 bank-years observations spanning from 2007 to 2014, both on the total sample and on main types of banks (commercial, savings and cooperative banks). Over total sample, the LLPs were found to have a negative and statistically significant effect ($p < .01$), irrespective of the estimation method (GMM, OLS, PCSE, MLR). When considering types of banks, LLPs were statistically significant only for commercial banks, while for savings and cooperative banks there was no effect. We argued that the reason for this mainly resides in the business model of savings and cooperative banks, which being stakeholders-value oriented entities (as oppose to shareholder-value oriented entities as commercial banks) have multiple objectives, for instance adding value for the stakeholders, beyond making profits.

With respect to the other determinants investigated, the results (where statistically significant) confirmed the expected signs. As hypothesized, capital intensity has a negative effect, while profitability has a positive effect. Given the highly regulated character of equity in the banking industry, we investigated equity instead of leverage, but we did not find any statistical effect, which suggests that banks are more preoccupied with maintaining the regulators' required level of equity in synergy with the risk of their assets and consequently debt related tax savings strategies are less important. Concerning size, we cannot say whether the political power theory or political cost theory prevails in banking industry.

Looking at types of banks investigated, the results suggest that among all three categories of banks, commercial banks manage to avoid the increasing effect of some determinants, while maximizing the decreasing effect of others. For instance, although profitability was found as having positive effects over the total sample, when looking into types of banks, this effect persisted only for savings and cooperative banks. Moreover, commercial banks also maximized the tax savings of capital intensity, in spite of having the lowest share of capital intensity among all three types of banks. These suggest that commercial banks may have more appropriate tax planning strategies meant to lower their taxes.

Consequently, LLPs emerged as a significant determinant of bank-specific ETRs, which has significant policy implications. With the adoption of IFRS 9, it is expected that banks provisions will increase significantly (Cohen and Edwards Jr., 2017). Since EU countries prefer the reserve method in provisioning, there is a high degree of conformity between financial and tax rules related to LLPs, and consequently, the bank-specific ETR would decrease even further if additional restrictions in tax deductibility rules with respect to LLPs would not be imposed.

Therefore, from tax revenues perspective, countries with a progressive tax system and which apply the reserve method with respect to LLPs would be most affected by the adoption of IFRS 9. This is especially important when LLPs tax deduction is automatically allowed as long as banks' provisioning policies comply with central bank requirements, as, for instance, is the case of Romania, Lithuania, Spain (European Commission, 2012b, enclosure 8). The most obvious ways to preserve the tax money is either by imposing additional restrictions with respect to tax deductibility of LLPs or to shift from the reserve method to charge-off method. Consequently, subject to

that shift, taxes will become less important in banks' business decisions process, which will level the playing field across tax jurisdictions, which is a good thing considering that "banks seem to be more flexible in terms of shifting their profits compared to the non-banking sector" (Merz & Overesch, 2016).

Controlling for country-year LLPs tax deduction rules with respect to general provisions would have probably provided more robust and in-depth results. Getting comprehensive data for such an industry-specific tax info data has been impossible for our investigation means, in spite of our best efforts⁴. However, given our conservative estimates (see discussion from Section 3), we have been able to provide robust empirical evidence on the negative effects of LLPs on bank-specific ETRs.

When new data on banks' accounts figures after the implementation of IFRS (from 2018 on) becomes available, future developments of present research may reveal if the bank-specific ETRs have indeed went further down under the effect of new LLPs practices.

Notes

1. Looking carefully into Orbis data structure, we found exactly the same numbers for operating revenue (turnover) and operating income. This overlapping which is not customary for non-financial companies is based on the banks' role as financial intermediaries, which makes the largest share of money from the difference between the interest income a bank earns from its lending activities and the interest it pays to depositors (net interest revenue/income).
2. Permanent differences are captured by our ETRs (for a detailed discussion see Hanlon & Heitzman, 2010).
3. Let's suppose a base case scenario in which a bank has 120€book income (BI), equal (for reasons of parsimony) to taxable income (TI), before any provisions created. If the tax rate $t = 10\%$, the corporate income tax (CIT) is 12€, which renders an effective tax rate ETR of 10% ($CIT/BI * 100$). Now, let's suppose that the bank creates LLPs of 20€(general provisions non-deductible for tax purposes). Its new book income before taxes is now 100€, while taxable income remains 120€, and consequently the CIT is 12€. The ETR measured around the denominator which has LLPs subtracted (book income of 100€) have gone up to 12%, while ETR measured around the denominator before any LLPs subtraction (120) did not (still 10%, as the CIT does not change). Similarly, if only 6€of 20€of LLPs were tax deductible, the new TI becomes 114€and the corresponding CIT is 11.4€. The ETR measured around a denominator which have LLPs subtracted (100€) have gone up to 11.4%, while ETR measured around the denominator before any LLPs subtraction (120€) becomes 9.5%. Because of tax deductibility (6€out of 20€), only the ETR constructed around a denominator prior to any LLPs subtractions would meaningfully reflect a decrease in the effective tax burden of the firm (9.5% vs. 10%). Compared to the base case scenario, the ETR constructed around profit before taxes, i.e. having LLPs subtracted (11.4%) would inaccurately indicate a higher tax burden (11.4% vs. 10%) in spite of a lower tax bill triggered by tax deductions (11.4€vs. 12€).
4. LLPs country-year tax info has been requested from International Bureau for Fiscal Documentation (IBFD), European Central Bank (ECB), Organisation for Economic Co-operation and Development (OECD), International Monetary Fund (IMF), De Nederlandsche Bank (DNB) and other bodies, but to no avail. Such granulated tax data is not readily available. See the discussion from Section 3.
5. Clustering the standard errors at bank level do not change the results.

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Appendix A. Distribution of banks by country.

Country	All banks	Commercial	Cooperative	Savings
AT	502	33	103	366
BE	34	26	4	4
BG	24	22	1	1
CY	15	13	1	1
CZ	18	16	2	
DE	928	44	476	408
DK	61	29	4	28
EE	7	7		
ES	148	56	62	30
FI	28	20	2	6
FR	191	98	70	23
GB	108	106		2
GR	8	7	1	
HR	30	28	1	1
HU	17	16	1	
IE	8	8		
IT	558	97	424	37
LT	7	7		
LU	9	8		1
LV	18	18		
MT	10	8	1	1
NL	30	28	1	1
PL	36	34	1	1
PT	27	20	2	5
RO	24	21	1	2
SE	74	25		49
SI	17	14	2	1
SK	6	4		2
Total	2943	813	1160	970

Source: Own computations.

Appendix B. Mean values for types of banks.

Variable	Commercial	Cooperative	Savings
ETR1	5,75	6,09	5,15
ETR2	26,23	34,27	29,80
LLPs	0,88	0,46	0,26
Size	14,97	12,89	12,53
Equity	10,77	9,81	10,12
Capital intensity	1,04	1,43	1,45
ROA	0,24	0,44	0,49
N	1113	2142	2887

Source: Own computations.