Intended and Unintended Consequences of Adoption of the Expected Loan Loss Provision Model in IFRS 9

Abstract

In this paper, we examine the effect of loan loss provisions recognized under the new Expected Credit Loss model in IFRS 9 to the financial soundness of banks in European countries having market- and bank-based financial systems. Our results show that, contrary to common expectations, the adoption of the IFRS 9 did not increase the recognition of loan loss provisions in the banking industry. We also find that loan loss provisions under the new model are positively associated with the asset quality, earnings, capital adequacy, and management quality of banks in the countries with the bank-based financial system. Finally, we find some, albeit weak, evidence that the loan loss provisions recognized under IFRS 9 negatively affect the asset quality of banks in countries with a market-based system.

JEL Classification: G21; G28; G32

Keywords: IFRS 9, loan loss provision, financial reporting

1. Introduction

> *"Can Banks Weather This Storm?... Concerns have also been voiced by many about the effect of the new IFRS 9".* (Judd Caplain, global head of banking and capital markets at KPMG, June 2020)

"*Too little too late*" was an often stated criticism against the incurred loss provisioning framework (ICL) of IAS 39 after the global financial crisis. In particular, it has been suggested that the delay in recognizing the impairment of financial assets until it actually occurs was one of the reasons that exacerbated the crisis and contributed to procyclicality in financial markets (e.g., Curcio & Hasan, 2015; Agénor & Zilberman, 2015; Novotny-Farkas, 2016). As a response to this criticism, the International Accounting Standards Board (IASB) replaced IAS

39 with IFRS 9, in which the loan loss provisions (LLPs) are recognized by using the Expected Credit Loss approach (ECL).

IFRS 9 applies a dual credit-loss measurement method in which banks recognize only predicted credit losses for the next 12 months. Banks are expected to examine changes in credit quality at the end of each reporting period to evaluate whether the default risk of a loan portfolio has considerably deteriorated since the loan was initially recognized. If the response is affirmative, the bank should recognize provisions for the asset's remaining lifetime, otherwise, a 12-month estimate of provisions should be used. The new ECL model aims to address two major flaws in the old ICL approach, namely (1) delaying recognition of impairment losses until objective evidence of asset impairment is present and estimable, and (2) prohibiting banks from using forward-looking information in estimating expected future events, regardless of whether the loss is probable (Gomaa et. al., 2019). Consequently, the ECL model was expected to reduce the procyclicality in LLPs (Bushman & Williams, 2012; Krüger et al., 2018; ESRB, 2017; Novotny-Farkas, 2016; Huizinga & Laeven, 2019).

In this paper, we investigate how the new ECL approach has influenced the amount of recognized LLPs and the relationship between LLPs and the financial soundness of European banks. We contribute to the literature at least in two main ways. First, Oberson (2021) finds that the application of the IFRS 9 ECL model is positively associated with the timeliness of LLPs. We extend Oberson (2021) by exploring the association between the application of the IFRS 9 ECL model and the levels of recognized LLPs and by exploring whether the LLPs recognized under the ECL model in IFRS 9 affect the financial soundness of banks. Second, our paper is the first to explore the role of the financial structure of a country in the relationship between LLPs and the financial soundness of banks. We argue that the adoption of IFRS 9 is likely to have a different effect on banks operating in bank- vs. market-based financial systems, because the nature of bank ownership in the two systems affects banks' management discretion

and their willingness to smooth income through the management of LLPs (Fonseca & Gonzalez, 2008). In addition, prior literature suggests that both systems may act distinctly during financial crises (e.g. Bats & Houben, 2020; Gambacorta et al., 2014; Blavy & Allard, 2011; Allen et al., 2012).

Our empirical results show that the adoption of IFRS 9 did not increase LLPs among banks, which is in sharp contrast to what was expected when pursuing the ECL model (e.g. Novotny-Farkas, 2016; EBA, 2016; 2017; Gomaa et al., 2019; Gomaa et al., 2021). In fact, we find that LLPs **decreased** in countries with a bank-based financial system. We also find that the LLPs based on the ECL model increase the asset quality and management quality of banks in bank-based systems. Interestingly, we find that LLPs based on the ECL model are positively associated with earnings and capital adequacy in banks operating in bank-based systems. These results are inconsistent with the prior literature, which has suggested that the ECL model of IFRS 9 results in a significant rise in the level of LLPs coupled with a diminishing of capital ratios (Gomaa et al., 2019) and earnings of banks (Novotny-Farkas, 2016). By contrast, we also find some, albeit weak, evidence that LLP decreases banks' asset quality in countries with market-based financial systems. Finally, our results show the LLPs based on the ECL model are positively associated with the financial soundness of banks in bank-based financial systems. We address endogeneity concerns by using GMM estimation as in Lewbel (2012) and get results that are similar to our main results reported in the tables.

As policy implications, we believe that our results are of interest to regulatory authorities and accounting standards setters, especially our identification of the real effects of IFRS 9 on banks, as some of our results are contrary to the predicted literature outcomes for adoption of IFRS9. The remainder of the paper is divided into four sections. In Section 2, we review the related literature. Section 3 describes the data and introduces the methodology applied in this

study. Section 4 reports and discusses the results of the analyses. Finally, we provide concluding remarks in Section 5.

2. Literature review

2.1. Recognition of loan loss provisions in IAS 39 and IFRS 9

The incurred credit loss approach in IAS 39 was the subject of fierce criticism after the global financial crisis. The model led to significant overstatements of financial assets by placing tight restrictions on the recognition of loan losses (e.g. Camfferman, 2015; O'Hanlon, 2013; Hashim et al., 2016). Prior research evidence shows that this approach prohibited an appropriate level of prudence in recognizing credit losses combined with restrictions on LLPs recognition (Novotny-Farkas, 2016; Angklomkliew et al., 2009; Agénor & Zilberman, 2015). As a result, the incurred loss model of credit provisioning was clearly procyclical (Borio & Lowe, 2001) and made banks more subject to capital crunches and drops in their lending (Beatty & Liao, 2011).

By contrast, the ECL model based on expected credit losses is supposed to be more prudent (e.g. Novotny-Farkas, 2016; Montanaro, 2019) and, consequently, the adoption of the ECL model in IFRS 9 was expected to increase conservatism in loan loss recognition by reducing incentives for banks to invest in risky loans and by reducing adverse selection problems (Giner & Mora, 2019). On the other hand, it has also been suggested that loan loss provisioning under the ECL model of IFRS 9 is likely to be less procyclical because the ECL model requires banks to set loan loss provisions for all loans rather than just for loans where loss is probable or has already occurred, as under the ICL model of IAS 39. Hence, the application of the ECL model to all loans should lead to an increase in the LLP and mitigate the negative relationship between provisioning and economic growth which means a reduced procyclicality (ESRB, 2017; Huizinga & Laeven, 2019).

It was moreover expected that there will be a significant increase in LLPs after the adoption of the ECL model of IFRS 9 (e.g. EBA, 2016; 2017; Novotny-Farkas, 2016; Gomaa et al., 2019; 2021). However, the results of a few published papers suggest that this might not be the case. Specifically, Seitz et al. (2018) report that the simulated ECL reserves of banks from 2005 to 2018 did not increase after the regulatory change from IAS 39 to IFRS 9.

2.2. Why the bank- vs. market-based financial system distinction matters to loan loss provisions

In countries with a bank-based financial system, firms rely mainly on banks and other financial intermediations when seeking capital. By contrast, markets serve as forums where debt and equity securities are traded in these countries. Fonseca and Gonzalez (2008) found that as bank ownership is more dispersed in market-based systems than bank-based systems, the ownership in market-based system may boost bank managers' incentives to smooth earnings through the management of LLPs. In particular, the greater number of users of financial statements in the market-based financial system creates incentives for managers to report more stable profits through influencing the LLPs.

Since the IFRS 9 was issued as a result of the global financial crisis, it is crucial to understand how both systems act during financial crises. Gambacorta et al. (2014) found that bank-based economies are more resilient and banks are able to keep lending more than markets during normal downturns, but bank-based systems' shock-absorbing ability is impaired when the downturn coincides with a financial crisis. Bats and Houben (2020) found that the probability of banks' default is significantly higher in bank-based than in market-based economies and that, because of the drop in the value of collaterals, banks may reduce their lending and pursue more conservative policies. However, market-based financial structures experience significantly stronger rebounds and faster recoveries than bank-based structures (Blavy & Allard, 2011; Allen, Gu, & Kowalewski, 2012).

2.3. Effect of loan loss provision on the financial soundness of banks

2.3.1. Asset quality

LLPs are regarded as a way to detect and cover high levels of credit loss for banks' loans. Hence, greater LLPs indicate a greater amount of non-performing loans (Chaibi & Ftiti, 2015). It has been suggested that the association between LLPs and non-performing loans will be strengthened after the application of the ECL model (Lee et al., 2020). Specifically, the increase in LLPs due to early recognition of projected loan losses, which can reach the total amount of the loans according to the staging concept, will be directed to cover non-performing loans and lead to more sound banks (Bholat et al., 2018; Giner & Mora, 2019).

By contrast, Albrahimi (2019) argues that non-performing loans were one of the determinants of LLPs in IAS 39 due to the incurred credit loss, but IFRS 9 may change the relationship between non-performing loans and LLPs. In particular, the introduction of the new forward-looking impairment model requires banks to use reasonable future forecasts of economic conditions to reflect deteriorations or improvements in the credit quality of loans. Hence, the association between LLPs and non-performing loans should be significantly lower after adopting IFRS 9 due to the forward-looking factors, which are expected to be the new drivers of LLPs. Finally, Bholat et al. (2018) argue that IFRS 9 may change the relationship between non-performing loans and LLPs, because the calculation of future expected loss necessarily involves a high degree of bank management discretion, which in turn may lead to greater divergence in practice than is the case under incurred loss.

2.3.2. Earnings

It has been suggested that the LLPs under the ECL model will reduce the reported earnings of banks. Novotny-Farkas (2016) posits that earlier recognition of losses will lead to reporting higher LLPs, thus reducing banks' earnings. Levy et al. (2017) and Levy and Zhang (2018) suggest that banks will have volatile earnings after the application of IFRS 9. Levy et al. (2017)

show that, based on the ECL model, banks should keep LLPs for either 12-month or lifetime expected loss, and since the provisions are calculated based on the probability of default, which tends to vary over time, these circumstances will result in significant volatility in LLPs and the earnings of banks. Levy and Zhang (2018) and Levy and Liang (2018) find that stage transitioning can have a material impact on earnings. In particular, LLPs are likely to show large spikes when the loans move from "Stage 1" to "Stage 2" as the LLP transitions from a one-year to a lifetime measure.

By contrast, the EBA (2017, 2018), Gomaa et al. (2019), Gomaa et al. (2021), and Bushman and Williams (2012) have argued that the LLPs would not reduce the earnings of banks. The EBA (2017, 2018) has shown that European banks did not undergo any major transitions between "Stage 1" and "Stage 2", as expected in the studies conducted before the application of IFRS 9, which in turn will neither affect the size of LLPs nor banks' earnings. Bushman and Williams (2012) argue that banks can control earnings more after the application of IFRS 9 as the ECL model allows management discretion, enabling LLPs to be built up during good times and used during downturns, leading to less volatile earnings. Gomaa et al. (2019, 2021) suggest that IFRS 9 allows managers to exercise judgment in selecting from alternative methods of incorporating forward-looking information into periodic estimates of LLPs, and that this can lead to better periodic reserve decisions and control over earnings.

2.3.3. Capital adequacy

Higher LLPs have a negative effect on shareholders' equity, which in turn reduces the regulatory capital level (Ng & Roychowdhury, 2014). Prior research suggests that the ECL model of IFRS 9 results in a significant rise in the level of LLPs coupled with a diminishing of capital ratios (Gomaa et al., 2019). Specifically, overestimating credit losses through business-model in accordance with the ECL model affects banks' earnings, thereby reducing the regulatory capital of banks (Krüger et al., 2018; Peterson & Arun, 2018). Bholat et al. (2018)

propose that the current regulatory capital requirements give banks strategic reasons for keeping LLPs low. Since higher LLPs are taken as losses when they are recognized, they reduce retained earnings and hence the CET1 and Tier 1 capital ratios. This implies a trade-off between reporting higher capital ratios, on the one hand, and maintaining adequate LLPs, on the other hand.

Interestingly, the EBA (2017, 2018) reports that the ECL model does not have a negative effect on the regulatory ratios of capital. Notably, banks can dilute the reduction of own funds due to the increase in provisions resulting from IFRS 9 because, according to regulation (EU) 2017/2395 of the European Parliament and the Council of 12 December 2017, banks can add back these major provisions to their capital in a decreasing amount over five years to address the possible capital shock.

2.3.4. Management quality

Management quality refers to whether or not the bank is well managed. Despite the difficulties in measuring management quality with quantitative indicators, already DeYoung (1998) argued that management quality can be reflected in cost efficiency. More recently, Carson and Ingves (2001), Roman and Şargu (2013) and Keffala (2018) use the ratio of operating expense to the total assets of the bank as an indicator of management quality. Results of the few studies examining the effect of the ECL model on management quality theoretically suggest that the new provisioning model increases the management quality of banks (ESRB, 2017; Frykström & Li, 2018). The ESRB (2017) has reported that the ECL model requires banks to use updated internal systems and forward-looking models to monitor and measure the credit risk of loan portfolios and that, therefore, the high quality of internal information and decision making regarding loans impairments can increase the management quality of banks. Frykström and Li (2018) however show that although IFRS 9 may improve the quality of

management of banks, the operating costs of implementation and data gathering are not negligible.

2.3.5. Sensitivity to market risk

Non-interest income has generally been regarded as a proxy for the sensitivity of banks to market risk, since the level of non-interest income implies bank participation in financial markets. The higher the degree of sensitivity to market risk, the better response of the bank to market risk (Keffala, 2018; Chiaramonte, et al., 2015).

Pennathur et al. (2012) found that banks with a higher LLP ratio earn higher non-interest income. In addition, Ahamed (2017) showed that higher LLPs increase the non-interest income of banks because LLPs are a forward-looking measure of the loan quality of banks, which reflects a bank's assessment of the quality of its loans (Mergaerts & Vander Vennet, 2016). Therefore, banks with higher LLPs are more likely to shift toward non-interest income to reduce their reliance on interest-yielding income (Ahamed, 2017). To our knowledge, there is no previous research on the relationship between LLP under the ECL model and sensitivity to market risk.

3. Data and Methodology

3.1. Sample selection

Our sample consists of the 50 largest European banks as measured by total assets for the period from 2015 to 2019. The data was collected from Thomson Reuters DataStream and from annual reports for banks not available on that database. We excluded two banks from our sample, namely Raiffeisen gruppe Switzerland and Zürcher Kantonalbank, as they do not follow IFRS 9. The final sample consists of 240 bank-year observations for the sample period from 2015 to 2019. We divided the sample into two subsamples consisting of banks operating in countries having either a bank- or market-based financial structure based on the categorizing

of countries in Levine (2002), Cuong and Vinh (2019) and Bats and Houben (2020). All of the banks in the sample prepared their financial statements according to IAS 39 until 2017, and then began to apply IFRS 9 as of 1 January 2018.

3.2. Model specifications

To examine whether application of the IFRS 9 affects the amount of loan loss provisions, we estimated multivariate regressions in which the loan loss provisions, LLP_{it}, is the dependent variable. Specifically, we estimated the following OLS regression from our data:

$$(1) \qquad LLP_{it}=\beta_0+\beta_1 ADP+\beta_2 SIZE_{it}+\beta_3 LEV_{it}+\beta_4 AGE_{it}+\beta_5 GDP_{jt}+\text{Fixed effects}+\varepsilon_{it},$$

where *i* denotes the bank, *j* the country, and *t* the year. We used the variable *ADP*, which is a dummy variable for the application of IFRS 9 taking a value of one for the years 2018 and 2019, and otherwise zero. We included in the model a set of control variables as well as firm and year fixed effects. The dependent and independent variables in Model (1) are as described in Sections 3.3.1 and 3.3.2.

To test the association between the adoption of IFRS 9 and the measures of financial soundness of banks, we estimated the following OLS regression from our data:

$$(2) \qquad FS_{it}=\beta_0+\beta_1 ADP+\beta_2 LLP_{it}+\beta_3 SIZE_{it}+\beta_4 LEV_{it}+\beta_5 AGE_{it}+\beta_6 GDP_{jt}+\text{Fixed effects}+\varepsilon_{it},$$

where *i* represents the bank, *j* the country, and *t* the year. The dependent variable FS_{it} is either NPL_{it}, ROA_{it}, CAD_{it}, OPC_{it}, SEN_{it} or $Z\text{-}score_{it}$. We included in the model a set of control variables as well as firm and year fixed effects. The dependent and independent variables in Model (2) are as described in Sections 3.3.1 and 3.3.2.

Finally, we estimated the following OLS regression with an interaction variable $LLP_{it} \times ADP$ from our data to explore the relationship between LLPs under the ECL model and the measures of financial soundness of banks.

$$(3) \quad FS_{it}=\beta_0+\beta_1 LLP_{it}\times ADP+\beta_2 LLP_{it}+\beta_3 ADP+\beta_4 SIZE+\beta_5 LEV_{it}+\beta_6 AGE_{it}+\beta_7 GDP_{jt} +\text{Fixed effects}+\varepsilon_{it},$$

where *i* denotes the bank, *j* the country, and *t* the year. We included in the model a set of control variables as well as firm and year fixed effects. The dependent and independent variables in Model (3) are as described in Sections 3.3.1 and 3.3.2.

To mitigate concerns that our findings could be attributed to the joint determination of capital levels, bank-level decisions, and loan loss provisions, we use the Lewbel (2012) GMM estimation, which has recently been used in the banking literature (e.g. Oberson, 2021; Mavis et al., 2020; Arcand er al., 2016; and Schlueter et al., 2015). This method can be utilized when proper instruments are not accessible. It suggests employing internal constructed instruments which are heteroskedasticity-based instruments. The identification results from having regressors that are uncorrelated with the product of heteroscedastic errors, which has been demonstrated to be a characteristic of many models in which error correlations are caused by an unobserved common factor.

3.3. Variable measurement

3.3.1. Dependent variables

Asset Quality. We used non-performing loans ratio as an inverse measure of banks' asset quality. Specifically, we constructed a variable NPL_{it}, which is the ratio of non-performing loans to gross loans as reported in the financial statement of the bank *i* in year *t*. The advantage of using the non-performing loans ratio is that NPLs have been associated with bank failure and have even been considered an alarming indicator of an impending banking crisis (Riahi, 2019).

Earnings. Return on assets is a common ratio to measure the profitability of banks (e.g. Wanke et al., 2016). We constructed a variable, ROA_{it}, which equals the ratio of earnings

reported at the end of year *t* to the average of total assets reported at the beginning and the end of the year of bank *i*. Use of return on assets also removes the influence of pure scale effects that may arise from the noted relationship between primary market habitat and firm size. Return on assets also requires a less restrictive implicit assumption about investment policy for interpreting tests for temporal shifts in earnings (Hansen & Crutchley, 1990).

Capital Adequacy. Capital adequacy is one of the vital indicators for bank soundness as it strives to act as a risk buffer against the potential credit losses of the bank (BCBS, 2006). To measure the capital adequacy we demonstrate a variable, CAD_{it}, representing the ratio of the bank's regulatory capital as reported in the financial statement of the bank *i* in year *t*. Regulatory capital is the sum of tier 1 capital (going-concern capital), comprising common equity tier 1 and additional tier 1, and tier 2 capital (gone-concern capital).

Management Quality. Our proxy for the management quality of banks is OPC_{it}, which is the ratio of total operating expenses divided by total assets as reported in the financial statement of the bank *i* in year *t*, with low OPC_{it} indicating high management quality (Keffala, 2018).

Sensitivity to Market Risk. This variable shows how banks may mitigate market and insolvency risks by diversifying their investments and expanding beyond traditional credit giving activities to non-traditional sources of income, such as securities trading, asset management services, commissions, and fees. Sensitivity is measured by the ratio of the bank's non-interest income to total assets as reported in the financial statement of the bank *i* in year *t* (Chiaramonte et al., 2015) and it is expressed as $SEN_{it.}$ The non-interest income represents the sum fees and commissions, insurance commissions, fees and premiums, credit card fees and other customer services, real estate operation gain, dealer trading account profit, investment securities and foreign currency gains, unrealized gains, minimum pension liability gain, and other unusual income.

Z-Score. Z-score is a widespread accounting measure of bank financial soundness (Vazquez & Federico, 2015; Chiaramonte et al., 2015). Higher values of Z-score indicate lower probability of insolvency risk and greater bank stability (Chiaramonte et al., 2015). We constructed a variable, $Z\text{-}score_{it}$, which is the number of standard deviations by which returns would have to fall from the mean to wipe out the bank equity. Specifically, $Z\text{-}score_{it} = \frac{ROA_{it}+Eq_{it}/TA_{it}}{\sigma ROA_T}$, where Eq/TA denotes the equity to total assets ratio and σROA represents the standard deviation of ROA.

3.3.1. Independent variables

3.3.1.1. Loan loss provision

Banks recognize loan loss provisions in their financial statements for possible defaults in loans. We constructed a variable, LLP_{it}, which is the natural logarithm of the loan loss provision as reported in the financial statement of the bank *i* in year *t*. In the years from 2015 to 2017, LLP_{it} is based on IAS 39, and in the years from 2018 onwards, LLP_{it} is based on IFRS 9.

3.3.1.2. Control variables

Bank Size. Bank size is an essential factor in many prior studies on bank soundness. It can be measured by total assets (De Haan & Poghosyan, 2012; Čihák & Hesse, 2010). We used bank size as a bank-specific control variable because it has been shown to have a significant impact on improving bank earnings and thus reducing financial fragility by providing higher capital buffers that protect banks from external macroeconomic and liquidity shocks (Boyd & De Nicoló, 2005). Furthermore, Michalak, and Uhde (2012) believe that larger banks may enhance their financial soundness through efficiently diversified loan portfolio risks due to competitive advantages in providing credit monitoring services and better economies of scale and scope in general. We constructed a variable, $SIZE_{it}$, which is measured by the natural

logarithm of the total assets of the bank as reported in the financial statement of the bank *i* in year *t*.

Leverage. The degree of financial leverage shows whether the bank is more debt or capital-funded (Dell'Ariccia et al., 2014). We measured leverage by the variable LEV_{it}, which is the ratio of the total liabilities to the bank's total assets as reported in the financial statement of the bank *i* in year *t*.

Bank Age. The financial soundness of banks might be affected by bank age, which can be used as a proxy for bank experience; older banks are more experienced and benefit from an extensive network of branches and are likely to have long-term relationships with their clients, while younger banks are less experienced and prefer to act more prudently (Abedifar et al., 2013; Bitar et al., 2017). We proxy for bank age using the variable AGE_{it}, which is the natural logarithm of the number of years since incorporation.

GDP Growth. Macroeconomic stability and banking soundness are inextricably linked so that what happens in one affects the other (Navajas & Thegeya, 2013). Many studies show that GDP growth as a macroeconomic variable can be considered one of the main determinants of banking financial soundness. GDP growth significantly affects the asset quality, capital adequacy and earnings of banks, as discussed above (Kaufman, 2004; Akhter & Daly, 2009). We measure the GDP growth of a country using the variable GDP_{jt}, which is the change in GDP growth of country *j* in year *t.*

GDP growth significantly affects the asset quality, capital adequacy and earnings of banks, as discussed above (Kaufman, 2004; Akhter & Daly, 2009). We measure the GDP growth of a country using the variable GDP_{jt}, which is the change in GDP growth of country *j* in year *t.*

4. Empirical results

4.1. Descriptive statistics

Table 1 reports descriptive statistics for financial statement items, ratios, and the variables used in the analyses. The results show that banks operating in bank-based financial structure countries recognize significantly higher LLPs and non-performing loans ratios compared to banks in market-based financial structure countries. On the other hand, banks in market-based financial structure countries report significantly higher return on assets than banks in bank-based financial structure countries. This result is consistent with Fonseca and Gonzalez (2008), who suggest that banks in market-based financial systems may have more incentives to report higher profits through the management of LLPs. We used the t-test (Wilcoxon rank-sum test) to test whether the means (medians) of the variables are different between banks operating in bank- and market based financial structure countries; the results of these tests are reported in Appendix 1.

(Insert Table 1 about here)

Table 2 reports the Spearman correlations between selected variables for financial soundness and the adoption of IFRS 9. The results show significantly negative correlations between *ADP* (a dummy variable for the adoption of IFRS 9) and the non-performing loans ratio NPL_{it} and operating expenses ratio OPC_{it}. Regarding the other variables in Table 2, the results show that many of the correlations between the variables used in Models (1-3) are significant, but none of them are large in magnitude.

(Insert Table 2 about here)

4.2. Univariate analysis

Table 3 reports the results of the univariate analyses of testing whether the adoption of IFRS 9 affects the financial statement items and ratios of the banks. We use the t-test (Wilcoxon rank-sum test) to test whether the means (medians) of the variables are different between IAS 39 and IFRS 9. Regarding the banks in countries with a bank-based financial system, the results reported in panel A of Table 3 show that the changes in the mean and median of the loan loss provisions (LLP_{it}) from IAS 39 to the new ECL model in IFRS 9 are insignificant. We found that the mean and median of non-performing loans ratio (NPL_{it}) are significantly lower for the period of application of IFRS 9 compared to the period of using IAS 39. Consistently, the mean of the ratio of loan loss provisions to the non-performing loans *(LLPs/NPLs)* is significantly higher for the period of application of IFRS 9 compared to the period of using IAS 39. This result shows that this ratio has increased because of the decrease in non-performing loans after the application of IFRS 9 – not because of the change in the loan loss provisions recognized under the ECL model. We also found that the means and medians of operating expenses ratio (OPC_{it}) and GDP growth (GDP_{jt}) are significantly lower for the period of application of IFRS 9 compared to the period of using IAS 39.

As for the banks in countries with a market-based financial system, the results reported in Panel B of Table 3 show that the mean of return on assets (ROA_{it}) is significantly higher for the period of application of IFRS 9 compared to the period of using IAS 39. Regarding the other variables in Panel B of Table 3, the changes in the mean and median of these variables from IAS 3 to the new ECL model in IFRS 9 were shown to be insignificant.

(Insert Table 3 about here)

4.3. Multivariate regressions

Table 4 reports the results of estimating Models (1-2) to explore whether the adoption of IFRS 9 affects the level of LLPs and the levels of financial soundness proxies. Regarding the adoption of IFRS 9 by the banks in countries with bank-based financial structure, the results reported in Panel A Table 4 show that, contrary to common expectations, the adoption of IFRS 9 decreases the level of loan loss provisions (LLP_{it}). This result is inconsistent with the EBA (2016, 2017), Novotny-Farkas (2016), and Gomaa et al. (2019, 2021), who expected that the adoption of IFRS 9 would increase the LLPs. We found that the levels of non-performing loans (NPL_{it}), return on assets (ROA_{it}) and operating expenses (OPC_{it}) significantly decreased after the adoption of IFRS 9. Interestingly, we also found that the adoption of IFRS 9 significantly increased the level of regulatory capital (CAD_{it}). This result is also inconsistent with Gomaa et al. (2019), who report that the ECL model is expected to result in a significant rise in the level of provisioning coupled with a diminishing of capital ratios.

We also found that the adoption of IFRS 9 significantly decreased the sensitivity to market risk. This result means that banks decrease their non-interest income activities and tend to concentrate on traditional financing activities. We interpret this result as an increase in asset quality, expressed as a decrease in non-performing loans, consistent with Ahamed (2017) who reports that banks with high asset quality might decrease their non-interest income activities as they are not rewarding enough compared to high-quality loans. Finally, we found that the adoption of IFRS 9 significantly decreased the number of standard deviations by which returns would have to fall from the mean to wipe out bank equity ($Z\text{-}score_{it}$), used as a proxy for the financial soundness of banks.

The results of banks in countries with market-based financial structure are reported in Panel B, Table 4. These results show that the adoption of IFRS 9 decreased the level of non-performing loans (NPL_{it}). We also found albeit weak evidence that the application of IFRS 9 increases return on assets (ROA_{it}), and sensitivity to market risk (SEN_{it}).

(Insert Table 4 about here)

Table 5 reports the results of estimating Model (3) to explore whether the LLPs recognized under the new ECL model in IFRS 9 affect the financial soundness of the banks. These results show that the estimated coefficient of the interaction variable $LLP_{it}\times ADP$ is significantly negative when NPL_{it} is the dependent variable. This result suggests that the LLPs under IFRS 9 increase the asset quality, which is inconsistent with Ahamed (2017) and with Mergaerts and Vander Vennet (2016), who report that high LLPs indicate low asset quality. We interpret our results as showing that the future oriented IFRS 9 impairment model makes banks more conservative and selective about granting credit (Giner & Mora, 2019). Hence, a more prudential approach towards lending results in a fall in the NPL ratio of the bank's overall loan portfolio. Consequently, the high quality of loans discourages banks from booking large LLPs.

Regarding the earnings of banks, ROA_{it}, and capital adequacy, CAD_{it}, in Panel A, Table 5, interestingly, we found that the estimated coefficients of the interaction variable $LLP_{it}\times ADP$ are significantly positive when ROA_{it} and CAD_{it} are the dependent variables. These results are inconsistent with the prior literature, which has suggested that the increase in the LLPs recognized under the new ECL model in IFRS 9 decreases earnings and capital adequacy, since the LLPs are taken as losses in the period of their recognition. We argue that the high quality of loans reflected by IFRS 9 leads to a reduction in the booked LLPs, which increases the return on assets. Taken together, this increase in earnings, along with the dilution of the negative effect of recognized LLPs under IFRS 9 on capital as a result of the European Parliament's regulation (EU) 2017/2395, which enables the European banks to add back the provisions of IFRS 9 to their capital. Hence, the recognition of LLPs under the ECL model in IFRS 9 increases capital adequacy.

We also found that the estimated coefficient of the interaction variable LLP_{it}×ADP is significantly negative when OPC_{it} is the dependent variable, indicating that the LLPs recognized under the new ECL model in IFRS 9 increase management quality. This result is consistent with the ESRB (2017), which reports that successful implementation of IFRS 9 can positively affect the management quality of the banks. We also suggest that the LLPs recognized under the new ECL model in IFRS 9 can increase management quality by reducing operating expenses, as IFRS 9 requires institutions to estimate the ECL by taking into account "*reasonable and supportable information that is available without undue cost or effort at the reporting date about past events, current conditions and forecasts of future economic conditions*" (IFRS 9, paragraph 5.5.17 (c)), which means that the application of IFRS 9 requires that the costs of obtaining information should be within reasonable limits without any excessive increases.

The results of Panel A in Table 5 show that the estimated coefficient of the interaction variable LLP_{it}×ADP is significantly positive when $Z\text{-}score_{it}$ is the dependent variable. Taken together, the results reported in Model (3) in Panel A, Table 5 suggest that the LLPs recognized under the new ECL model in IFRS 9 are positively associated with the financial soundness of banks in bank-based financial systems.

The results for European banks operating in countries with a market-based financial structure are reported in Panel B, Table 5. Interestingly, we find no evidence that LLPs recognized under the new ECL model in IFRS 9 affect financial soundness except for NPL_{it}, for which we find positive albeit weak results. We interpret this result as showing that LLPs under IFRS 9 do not affect the financial soundness of banks in countries with a market-based financial system because these banks are keen to eliminate the effect of these LLPs on their profitability. In particular, ownership is more distributed in these banks and there are a large number of users of financial statements who are interested in the high profitability of banks. In

addition, IFRS 9 allows the use of management judgment in estimating LLPs that enables banks to influence these provisions for income smoothing.

(Insert Table 5 about here)

Finally, to address the issue of possible endogeneity, we use the Lewbel (2012) GMM estimation technique to alleviate concerns that our findings could be jointly determined by capital levels, bank-level decisions, and loan loss provisions. Specifically, we regress the endogenous variable LLP_{it}×ADP on the other independent variables of the model, which are all exogenous variables. The estimated residuals are then multiplied by the demeaned values of a subset of independent variables that is uncorrelated with the product of the first and the second stage errors. In other words, we use moments based on Cov(Z, ε_1 ε_2) = 0, where Z corresponds to the exogenous variables in the model and ε_1 ε_2 corresponds to the product of the first and the second stage errors. Finally, we use the generated variables as instruments for the LLP_{it}×ADP using the GMM method.

Table 6 reports the results of the Lewbel (2012) GMM estimation. These results show that the coefficient estimates of LLP_{it}×ADP remain statistically significant when NPL_{it}, ROA_{it} , CAD_{it}, $Z\text{-}score_{it}$ are the independent variables, thus confirming our earlier findings on the effect of loan loss provisions under the ECL model in IFRS 9 in the banks operating in bank-based financial systems. We also find that the results do not differ for banks operating in the market-based financial systems, except for the positive relationship between LLP_{it}×ADP and SEN_{it}, which indicates that the LLPs under IFRS 9 give the banks more inclination to invest in non-interest income activities at the expense of traditional lending activities. This result is also consistent with our earlier findings that the banks in the countries with market-based structures

are attempting to eliminate the effect of LLPs on their profitability, and the orientation towards non-interest income activities can be an effective way to avoid the effect of LLPs on their profitability. Hansen's *J*-statistic of overidentification restriction shows that the instruments are valid.

(Insert Table 6 about here)

5. Conclusions

In this study, we examined how the new expected credit loss model in IFRS 9 has affected the amount of loan loss provisions and the relationship between loan loss provisions and the financial soundness of banks in European countries having bank- or market-based financial systems. Our empirical results show that adoption of IFRS 9 did not increase loan loss provisions among banks, which is contrary to what was expected when applying the ECL model. In fact, we found that IFRS 9 decreased the amount of loan loss provisions in countries with a bank-based financial system. We also found that loan loss provisions based on the ECL model increase the capital adequacy, asset quality, management quality, and earnings of banks operating in bank-based countries. By contrast, we also found some, albeit weak, evidence that loan loss provision decreases banks' asset quality in countries with market-based financial systems. Finally, our results show that the loan loss provisions based on the ECL model are positively associated with the financial soundness of banks in bank-based financial systems.

We contribute to the literature in the following ways. First, to the best of our knowledge, this is the first paper to empirically explore the effect of the adoption of IFRS 9 and the ECL model on the loan loss provisions of banks and the relationship between the loan loss provisions recognized under the ECL model and the financial soundness of banks. Second, our paper is the first to explore the role of the financial structure of a country in the relationship between the loan loss provisions based on the ECL model and the financial soundness of banks. We

believe that our results are of interest to regulatory authorities and accounting standards setters, particularly our identification of the actual effects of IFRS 9 on banks, as some of our results are contrary to the literature, which reveals that the application of IFRS 9 led to some unintended consequences.

Appendix 1
Univariate analyses of the comparison of financial statement items and ratios in bank- and market-based financial systems

	Bank-based financial system		Market-based financial system		Test for difference	
	Mean	Median	Mean	Median	Mean	Median
LLP_{it}	21.397	21.244	21.537	21.219	-0.139	0.025
$LLPs/Loans_{it}$	0.005	0.003	0.004	0.001	**0.002****	**0.002*****
$LLPs/Assets_{it}$	0.003	0.001	0.002	0.001	**0.001****	**0.000*****
NPL_{it}	0.053	0.037	0.028	0.025	**0.026*****	**0.012*****
$LLPs/NPLs_{it}$	0.136	0.076	0.115	0.093	0.022	-0.016
ROA_{it}	0.003	0.003	0.005	0.005	**-0.003*****	**-0.002*****
CAD_{it}	0.178	0.176	0.216	0.213	**-0.037*****	**-0.037*****
OPC_{it}	0.258	0.247	0.315	0.267	**-0.057****	-0.020
SEN_{it}	0.013	0.012	0.014	0.012	-0.001	0.000
LEV_{it}	0.942	0.941	0.933	0.942	**0.009*****	**-0.001****
$SIZE_{it}$	26.687	26.356	26.852	26.992	-0.166	**-0.636*****
GDP_{jt}	0.026	0.029	0.027	0.028	-0.001	0.001

Notes:

1. The table reports the results of univariate analyses of the 150 firm-year observations of banks in bank-based financial structure European countries and 90 firm-year observations of banks in market-based financial structure European countries. The sample consists of the largest 48 banks in Europe over the period 2015-2019. We use the t-test (Wilcoxon rank-sum test) to test whether the means (medians) of the variables are different between bank- and market-based financial systems.
2. *LLPs/Loans* is the ratio of loan loss provisions divided by total loans. LLPs/Assets is the ratio of loan loss provisions divided by total assets. *LLPs/NPLs* is the ratio of loan loss provisions divided by non-performing loans.
3. All continuous variables are Winsorized to the 1st and 99th percentiles of their distributions.
4. *, ** and *** denote a statistically significant difference at the 0.10, 0.05, and 0.01 (two-tailed) level, respectively.

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Table 1.
Descriptive statistics of the variables used in the analyses

Variable	Mean	Median	St.dev.	Min	Max
Panel A: Bank-Based Financial Structure (N = 150)					
LLP_{it}	21.397	21.244	0.660	20.467	23.282
$LLPs/Loans_{it}$	0.005	0.003	0.007	-0.002	0.040
$LLPs/Assets_{it}$	0.003	0.001	0.004	-0.001	0.021
NPL_{it}	0.053	0.037	0.062	0.004	0.354
ROA_{it}	0.003	0.003	0.005	-0.015	0.013
CAD_{it}	0.178	0.176	0.027	0.117	0.273
OPC_{it}	0.258	0.247	0.144	0.075	0.734
SEN_{it}	0.013	0.012	0.009	0.000	0.039
ADP	0.400	0.000	0.492	0.000	1.000
LEV_{it}	0.942	0.941	0.013	0.913	0.978
$SIZE_{it}$	26.687	26.356	0.865	25.441	28.403
AGE_{it}	4.269	4.916	1.264	1.386	6.306
GDP_{jt}	0.026	0.029	0.011	0.003	0.044
Panel B: Market- Based Financial Structure (N = 90)					
LLP_{it}	21.537	21.219	1.311	20.467	26.505
$LLPs/Loans_{it}$	0.004	0.001	0.006	-0.002	0.040
$LLPs/Assets_{it}$	0.002	0.001	0.003	-0.001	0.017
NPL_{it}	0.028	0.025	0.022	0.004	0.110
ROA_{it}	0.005	0.005	0.006	-0.007	0.027
CAD_{it}	0.216	0.213	0.049	0.117	0.361
OPC_{it}	0.315	0.267	0.227	0.087	1.074
SEN_{it}	0.014	0.012	0.008	0.001	0.039
ADP_{it}	0.400	0.000	0.493	0.000	1.000
LEV_{it}	0.933	0.942	0.021	0.877	0.957
$SIZE_{it}$	26.852	26.992	0.960	23.915	28.433
AGE_{it}	4.849	5.088	0.728	3.219	5.799
GDP_{jt}	0.027	0.028	0.010	0.002	0.042

Notes:

1. The table reports descriptive statistics of the variables used in the analyses. The sample includes the largest 48 banks in Europe over the period 2015-2019.
2. Panel A (Panel B) reports descriptive statistics for 150 (90) year observations of the banks in bank-based (market-based) financial structure European countries.
3. *LLPs/Loans* is the ratio of loan loss provisions divided by total loans. LLPs/Assets is the ratio of loan loss provisions divided by total assets.

All continuous variables are Winsorized to the 1st and 99th percentiles of their distributions.

Table 2.
Correlation matrix for selected variables

Variables	NPL_{it}	ROA_{it}	CAD_{it}	OPC_{it}	SEN_{it}	LLP_{it}	ADP	LEV_{it}	$SIZE_{it}$	AGE_{it}
ROA_{it}	**-0.225*****									
CAD_{it}	**-0.417*****	0.052								
OPC_{it}	**0.391*****	**0.123***	**-0.511*****							
SEN_{it}	**0.339*****	**0.245*****	**-0.371*****	**0.602*****						
LLP_{it}	**0.171*****	**-0.142****	**-0.274*****	**0.360*****	**0.261*****					
ADP	**-0.188*****	0.088	0.009	**-0.133****	-0.033	-0.025				
LEV_{it}	**-0.161****	**-0.561*****	**0.143****	**-0.330*****	**-0.247*****	-0.047	-0.076			
$SIZE_{it}$	**-0.144****	-0.081	**-0.129****	**0.172*****	**0.286*****	**0.386*****	0.009	**0.273*****		
AGE_{it}	**0.120***	-0.026	0.056	**0.192*****	**0.195*****	**0.152****	0.024	-0.085	**0.143****	
GDP_{jt}	**-0.330*****	-0.098	**0.125***	**-0.294*****	**-0.302*****	**-0.177*****	**-0.122***	**0.232*****	0.059	-0.082

Notes:

1. The table reports pair-wise Spearman correlations between selected variables used in the analyses for the sample of 235 bank-year observations. The sample includes the largest 48 banks in Europe over the period 2015-2019.
2. *, ** and *** indicate significance at the 10, 5 and 1 percent levels, respectively.
3. All continuous variables are Winsorized to the 1st and 99th percentiles of their distributions.

Table 3.
Univariate analyses of the change in financial statement items and ratios from IAS 39 to IFRS 9

	IAS 39 (Years 2015-17)		IFRS 9 (Years 2018-19)		Test for difference	
	Mean	Median	Mean	Median	Mean	Median
Panel A: Bank-Based Financial Structure						
LLP_{it}	21.416	21.294	21.372	21.188	-0.044	-0.106
$LLPs/Loans_{it}$	0.005	0.003	0.005	0.003	-0.001	0.000
$LLPs/Assets_{it}$	0.004	0.001	0.003	0.001	-0.001	0.000
NPL_{it}	0.066	0.042	0.036	0.031	**-0.029*****	**-0.011*****
$LLPs/NPLs_{it}$	0.106	0.074	0.202	0.080	**0.096****	0.006
ROA_{it}	0.003	0.003	0.004	0.003	0.001	0.000
CAD_{it}	0.176	0.175	0.180	0.177	0.004	0.002
OPC_{it}	0.280	0.266	0.224	0.216	**-0.056****	**-0.050****
SEN_{it}	0.013	0.013	0.012	0.011	-0.002	-0.002
LEV_{it}	0.944	0.943	0.941	0.939	-0.003	-0.004
$Size_{it}$	26.677	26.339	26.701	26.372	0.025	0.033
GDP_{jt}	0.028	0.032	0.025	0.028	**-0.004***	**-0.004****
Panel B: Market-Based Financial Structure						
LLP_{it}	21.151	21.158	21.506	21.233	0.356	0.074
$LLPs/Loans_{it}$	0.005	0.001	0.003	0.002	-0.002	0.001
$LLPs/Assets_{it}$	0.002	0.001	0.002	0.001	-0.001	0.000
NPL_{it}	0.030	0.030	0.025	0.020	-0.005	-0.009
$LLPs/NPLs_{it}$	0.107	0.081	0.126	0.102	0.018	0.020
ROA_{it}	0.005	0.004	0.007	0.005	**0.002***	0.001
CAD_{it}	0.218	0.212	0.216	0.213	-0.002	0.001
OPC_{it}	0.338	0.278	0.290	0.253	-0.048	-0.025
SEN_{it}	0.013	0.012	0.015	0.013	0.001	0.001
LEV_{it}	0.934	0.941	0.931	0.942	-0.003	0.001
$Size_{it}$	26.849	26.963	26.855	27.025	0.005	0.061
GDP_{jt}	0.026	0.030	0.026	0.026	-0.001	-0.003

Notes:

1. The table reports the results of univariate analyses of the 150 bank-year observations of banks in bank-based financial structure European countries (Panel A) and 90 bank-year observations of banks in market-based financial structure European countries (Panel B) in the sample. The sample consists of the largest 48 banks in Europe over the period 2015-2019. Each financial structure group is classified in two sub-groups, namely the financial statements items and financial ratios over the period (2015-2017) when the banks were using IAS 39 and (2018-2019) when the banks started to adopt IFRS 9. We use the t-test (Wilcoxon rank-sum test) to test whether the means (medians) of the variables are different between IAS 39 and IFRS 9.
2. *LLPs/Loans* is the ratio of loan loss provisions divided by total loans. LLPs/Assets is the ratio of loan loss provisions divided by total assets. *LLPs/NPLs* is the ratio of loan loss provisions divided by non-performing loans.
3. All continuous variables are Winsorized to the 1st and 99th percentiles of their distributions.

4. *, ** and *** denote a statistically significant difference at the 0.10, 0.05, and 0.01 (two-tailed) level, respectively.

Table 4
Multivariate analyses of the change in financial statement ratios and the level of loan loss provision from IAS 39 to IFRS 9.

	(1)	(2)					
Variable	LLP_{it}	NPL_{it}	ROA_{it}	CAD_{it}	OPC_{it}	SEN_{it}	$Z\text{-}score_{it}$
Panel A: Bank-Based Financial Structure							
ADP	**-0.184***	**-0.036*****	**-0.003*****	**0.008***	**-0.045****	**-0.003*****	**-0.517*****
	(-1.96)	(-2.92)	(-3.15)	(1.69)	(-2.23)	(-3.33)	(-2.73)
LLP_{it}		**0.033*****	**-0.004*****	-0.001	**0.067****	0.000	**-0.958*****
		(2.65)	(-2.66)	(-0.31)	(2.52)	(0.15)	(-2.69)
LEV_{it}	10.484	0.015	**-0.263****	**-1.285*****	**4.961****	-0.056	**-235.636*****
	(1.31)	(0.02)	(-2.51)	(-3.90)	(2.53)	(-1.27)	(-11.26)
$SIZE_{it}$	0.121	-0.054	**0.021*****	-0.027	-0.010	**0.007***	**3.524*****
	(0.35)	(-1.16)	(3.98)	(-1.56)	(-0.12)	(1.90)	(3.31)
AGE_{it}	**1.435*****	0.020	-0.000	0.010	0.025	0.002	0.060
	(2.83)	(0.55)	(-0.11)	(0.56)	(0.36)	(0.60)	(0.08)
GDP_{jt}	**15.837****	0.494	-0.059	-0.012	-0.537	**-0.083***	-11.134
	(2.25)	(1.13)	(-1.22)	(-0.04)	(-0.51)	(-1.67)	(-1.09)
Intercept	1.131	0.747	**-0.235****	**2.103*****	**-5.638****	-0.139	**156.364*****
	(0.15)	(0.65)	(-2.02)	(4.68)	(-2.03)	(-1.46)	(6.47)
Year Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.78	0.81	0.68	0.82	0.84	0.92	0.97
N obs	150	150	150	150	150	150	150
Panel B: Market-Based Financial Structure							
ADP	2.281	**-0.007****	**0.003***	0.012	-0.046	**0.003***	0.298
	(1.25)	(-2.33)	(1.91)	(0.79)	(-0.82)	(1.71)	(1.32)
LLP_{it}		**-0.001****	-0.000	-0.001	-0.002	-0.000	0.010
		(-2.32)	(-0.25)	(-0.85)	(-0.59)	(-1.12)	(0.45)

LEV_{it}	0.000	-0.000	0.000	0.000	-0.000	**0.000****	**-208.282*****
	(0.52)	(-0.71)	(0.70)	(0.57)	(-0.43)	(2.34)	(-19.57)
$SIZE_{it}$	-18.673	**-0.037****	-0.004	-0.068	**-0.414***	-0.009	-0.568
	(-1.44)	(-2.60)	(-0.52)	(-1.22)	(-1.87)	(-1.01)	(-0.50)
AGE_{it}	-18.542	-0.029	0.002	0.039	-0.367	-0.004	2.077
	(-1.14)	(-0.72)	(0.09)	(0.22)	(-0.45)	(-0.21)	(0.50)
GDP_{jt}	63.952	**-0.191***	**0.192*****	0.266	-3.042	**0.136****	**22.317*****
	(1.22)	(-1.75)	(2.68)	(0.57)	(-1.27)	(2.58)	(2.77)
Intercept	643.317	**1.255****	0.090	1.934	**14.066****	0.294	**211.033*****
	(1.47)	(2.36)	(0.46)	(1.06)	(2.09)	(0.92)	(5.47)
Year Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.38	0.91	0.79	0.75	0.88	0.87	0.99
N obs	90	90	90	90	90	90	90

Notes:

1. The table reports the results of estimating Model (1) from the sample of 150 bank-year observations of the banks in bank-based financial structure countries in Panel A and 90 bank-year observations of the banks in market-based financial structure countries in Panel B to test the whether the adoption of IFRS 9 affects the loan loss provision. The sample consists of the largest 48 banks in Europe over the period 2015-2019. Model (1) is as follows:

$$LLP_{it}=\beta_0+\beta_1 ADP+\beta_2 SIZE_{it}+\beta_3 LEV_{it}+\beta_4 AGE_{it}+\beta_5 GDP_{it}+\text{Fixed effects}+\varepsilon_{it}$$

2. The table reports the results of estimating Model (2) from the sample of 150 bank-year observations of the banks in bank-based financial structure countries in Panel A and 90 bank-year observations of the banks in market-based financial structure countries in Panel B to test the whether the loan loss provision after the adoption of IFRS 9 affects the levels of financial soundness indicators. The sample consists of the largest 48 banks in Europe over the period 2015-2019. Model (2) is as follows:

$$FS_{it}=\beta_0+\beta_1 ADP+\beta_2 LLP_{it}+\beta_3 SIZE_{it}+\beta_4 LEV_{it}+\beta_5 AGE_{it}+\beta_6 GDP_{it}+\text{Fixed effects}+\varepsilon_{it}$$

5. The dependent variable is FS_{it}, this variable is either NPL_{it}, ROA_{it}, CAD_{it}, OPC_{it}, SEN_{it}, and $Z\text{-}score_{it}$ which represents the financial soundness indicators. We use (*ADP*) which is a dummy variable in which the application of IFRS 9 takes the value (1) for the years 2018 and 2019 otherwise takes the value (0).
6. All reported results are robust to clustering standard errors, all continuous variables are Winsorized to the 1st and 99th percentiles of their distributions and the firm and year fixed effects are taken into account.
7. Regression analyses use the natural logarithm of (LLP_{it}), ($SIZE_{it}$), and AGE_{it}.
8. *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 (two-tailed) level, respectively

Table 5
Multivariate analyses of the change in financial statement ratios from IAS 39 to IFRS 9

	(3)					
Variable	NPL_{it}	ROA_{it}	CAD_{it}	OPC_{it}	SEN_{it}	$Z\text{-}Score_{it}$
Panel A: Bank-Based Financial Structure						
LLP_{it}×ADP	**-0.017****	**0.002*****	**0.007*****	**-0.034****	-0.001	**0.484*****
	(-2.20)	(3.23)	(2.87)	(-2.22)	(-1.22)	(2.92)
LLP_{it}	**0.043*****	**-0.006*****	-0.005	**0.086*****	0.001	**-1.243*****
	(3.09)	(-3.53)	(-1.30)	(2.91)	(0.74)	(-3.42)
ADP	**0.336****	**-0.054*****	**-0.144*****	**0.682****	0.014	**-10.936*****
	(2.01)	(-3.41)	(-2.67)	(2.11)	(1.03)	(-3.06)
LEV_{it}	0.118	**-0.277*****	**-1.326*****	**5.161*****	-0.051	**-238.507*****
	(0.17)	(-2.91)	(-4.23)	(2.67)	(-1.18)	(-12.60)
$SIZE_{it}$	-0.048	**0.020*****	**-0.029***	0.000	**0.008***	**3.368*****
	(-1.03)	(4.03)	(-1.77)	(0.00)	(1.94)	(3.28)
AGE_{it}	0.006	0.002	0.016	-0.002	0.001	0.455
	(0.17)	(0.43)	(0.90)	(-0.03)	(0.41)	(0.58)
GDP_{jt}	0.511	-0.062	-0.019	-0.504	-0.083	-11.611
	(1.19)	(-1.38)	(-0.07)	(-0.51)	(-1.65)	(-1.22)
Intercept	0.342	-0.180	**2.268*****	**-6.428****	-0.156	**167.700*****
	(0.29)	(-1.64)	(5.35)	(-2.30)	(-1.58)	(7.20)
Year Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.82	0.71	0.82	0.85	0.92	0.97
N obs	150	150	150	150	150	150
Panel B: Market-Based Financial Structure						
LLP_{it} *x* ADP	**0.001***	0.001	-0.004	-0.001	-0.000	0.122
	(1.85)	(1.63)	(-1.56)	(-0.18)	(-0.18)	(1.82)
LLP_{it}	**-0.000****	-0.000	-0.001	-0.002	-0.000	0.016
	(-2.06)	(-0.05)	(-1.02)	(-0.57)	(-1.06)	(0.66)
ADP	**-0.023****	-0.009	0.100	-0.022	0.004	1.848
	(-2.15)	(-1.10)	(1.55)	(-0.12)	(0.64)	(0.61)
LEV_{it}	**0.001***	0.001	-0.004	-0.001	-0.000	**-208.950*****
	(1.85)	(1.63)	(-1.56)	(-0.18)	(-0.18)	(-19.58)
$SIZE_{it}$	-0.000	0.000	0.000	-0.000	**0.000****	-0.224
	(-1.45)	(0.78)	(1.17)	(-0.36)	(2.14)	(-0.20)
AGE_{it}	**-0.035****	-0.002	-0.079	**-0.417***	-0.009	2.684
	(-2.37)	(-0.29)	(-1.38)	(-1.87)	(-0.96)	(0.65)
GDP_{jt}	-0.025	0.005	0.020	-0.372	-0.005	**19.285****
	(-0.61)	(0.21)	(0.11)	(-0.44)	(-0.22)	(2.34)
Intercept	**-0.209***	**0.178****	0.363	-3.015	**0.137****	**198.803*****
	(-1.82)	(2.36)	(0.75)	(-1.21)	(2.40)	(5.13)
Year Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
adj. R^2	0.91	0.79	0.75	0.88	0.87	0.99
N obs	90	90	90	90	90	90

Notes:

1. The table reports the results of estimating Model (3) from the sample of 150 bank-year observations of the banks in bank-based financial structure countries in *Panel A* and 90 bank-year

observations of the banks in market-based financial structure countries in *Panel B* to test the whether the adoption of IFRS 9 affects the relationship between the loan loss provision and the financial soundness indicators. The sample consists of the largest 48 banks in Europe over the period 2015-2019. Model (3) is as follows:

$$FS_{it}=\beta_0+\beta_1 LLP_{it}\times ADP+\beta_2 LLP_{it}+\beta_3 ADP+\beta_4 SIZE+\beta_5 LEV_{it}+\beta_6 AGE_{it}+\beta_7 GDP_{it}+\text{Fixed effects}+\varepsilon_{it}$$

2. The dependent variable is FS_{it}, this variable is either NPL_{it}, ROA_{it}, CAD_{it}, OPC_{it}, SEN_{it}, and $Z\text{-}score_{it}$ which represents the financial soundness indicators. We use the variable (ADP) which is a dummy variable in which the application of IFRS 9 takes the value (1) for the years 2018 and 2019 otherwise takes the value (0). The variable ($LLP_{it}\times ADP$) is an interaction variable to determine the relationship between the loan loss provision under IFRS 9 and the bank's financial soundness.
3. All reported results are robust to clustering standard errors, all continuous variables are Winsorized to the 1st and 99th percentiles of their distributions and the firm and year fixed effects are taken into account.
4. Regression analyses use the natural logarithm of (LLP_{it}), ($SIZE_{it}$), and (AGE_{it})
5. *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 (two-tailed) level, respectively.

Table 6
The relationship between financial soundness and loan loss provisions after IFRS 9 adoption: Lewbel (2012) GMM estimation results

Variable	NPL_{it}	ROA_{it}	CAD_{it}	OPC_{it}	SEN_{it}	$Z\text{-}Score_{it}$
Panel A: Bank-Based Financial Structure						
LLP_{it}×ADP	**-0.035****	**0.005*****	**0.014****	-0.043	0.000	**1.084*****
	(-2.31)	(2.80)	(2.33)	(-1.47)	(0.01)	(2.69)
LLP_{it}	**0.053*****	**-0.007*****	**-0.010****	**0.079*****	0.000	**-1.508*****
	(3.54)	(-4.50)	(-2.10)	(3.23)	(0.07)	(-4.49)
ADP	**0.719****	**-0.110*****	**-0.299****	0.880	-0.002	**-23.304*****
	(2.25)	(-2.83)	(-2.34)	(1.42)	(-0.10)	(-2.70)
LEV_{it}	0.639	**-0.280*****	**-1.675*****	**5.703*****	-0.059	**-236.727*****
	(1.13)	(-3.89)	(-6.36)	(4.06)	(-1.57)	(-20.32)
$SIZE_{it}$	**-0.071***	**0.017*****	-0.020	-0.044	**0.006***	**2.476*****
	(-1.93)	(3.53)	(-1.25)	(-0.64)	(1.76)	(2.66)
AGE_{it}	-0.025	0.000	**0.034****	0.020	0.001	0.269
	(-1.07)	(0.08)	(2.25)	(0.37)	(0.20)	(0.45)
GDP_{jt}	0.310	**-0.083***	0.025	0.128	**-0.078****	**-15.214***
	(0.79)	(-1.94)	(0.14)	(0.17)	(-2.10)	(-1.73)
Hansen *J*-statistic	1.165	6.916	6.881	1.576	1.354	6.666
	(0.95)	(0.23)	(0.23)	(0.90)	(0.93)	(0.25)
N obs	150	150	150	150	150	150
Panel B: Market-Based Financial Structure						
LLP_{it} *x* ADP	0.000	0.000	-0.005	0.023	**0.001****	0.007
	(0.09)	(0.04)	(-1.02)	(1.61)	(2.05)	(0.04)
LLP_{it}	**-0.001*****	0.000	0.000	-0.003	-0.000	0.026
	(-4.11)	(1.34)	(0.12)	(-1.27)	(-0.56)	(1.34)
ADP	-0.005	0.000	0.103	**-0.525***	**-0.025****	0.049
	(-0.16)	(0.01)	(0.99)	(-1.66)	(-1.97)	(0.01)
LEV_{it}	**0.335*****	**-0.223*****	**-0.750****	**4.153****	-0.045	**-211.765*****
	(3.21)	(-3.90)	(-2.39)	(1.99)	(-1.13)	(-21.40)
$SIZE_{it}$	**-0.030*****	-0.001	-0.057	**-0.309***	-0.005	-0.104
	(-3.19)	(-0.12)	(-1.54)	(-1.88)	(-1.11)	(-0.12)
AGE_{it}	**-0.087*****	0.019	0.124	-0.218	0.016	3.283
	(-3.10)	(0.90)	(1.01)	(-0.40)	(1.38)	(0.90)
GDP_{jt}	**-0.152****	**0.127*****	-0.068	**-2.667****	**0.062***	**22.008*****
	(-2.03)	(3.08)	(-0.20)	(-1.96)	(1.87)	(3.08)
Hansen *J*-statistic	2.504	8.342	4.153	3.513	1.448	8.342
	(0.78)	(0.14)	(0.53)	(0.62)	(0.92)	(0.14)
N obs	90	90	90	90	90	90

Notes:

1. The table reports the estimates from the Lewbel (2012) GMM estimation used to address the potential endogeneity which may result from the joint determination of capital levels, bank-level decisions, and loan loss provisions. These results are from the sample of 150 bank-year observations of the banks in bank-based financial structure countries in *Panel A* and 90 bank-year observations of the banks in market-based financial structure countries in *Panel B* to test the whether the adoption of IFRS 9 affects the relationship between the loan loss provision and the financial soundness indicators. The sample consists of the largest 48 banks in Europe over the period 2015-2019.

2. The dependent variable is FS_{it}, this variable is either NPL_{it}, ROA_{it}, CAD_{it}, OPC_{it}, SEN_{it}, and $Z\text{-}score_{it}$ which represents the financial soundness indicators. We use the variable (ADP) which is a dummy variable in which the application of IFRS 9 takes the value (1) for the years 2018 and 2019 otherwise takes the value (0). The variable ($LLP_{it} \times ADP$) is an interaction variable to determine the relationship between the loan loss provision under IFRS 9 and the bank's financial soundness.
3. All reported results are robust to clustering standard errors, all continuous variables are Winsorized to the 1st and 99th percentiles of their distributions.
4. Regression analyses use the natural logarithm of (LLP_{it}), ($SIZE_{it}$), and (AGE_{it})
5. *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 (two-tailed) level, respectively.