Does market competition weaken or enhance the informativeness of the loan loss provision?

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Abstract

This paper studies the relation between competition in the banking industry and managerial discretion in loan loss provision (LLP). Using a panel data of 17 OECD banking systems over the years 2012-2018, we find evidence suggesting managerial discretion reduces LLP when a bank's market power is lower. However, we do not find stock prices are related to managerial discretion in LLP, and this holds regardless of the level of competition. In contrast, we document that earnings deflation via unexpected LLP predicts better quality of the loan book, and more so in more competitive environments. Taken together, our results are suggestive of investors' failure to appreciate the information content of discretionary LLP in banks that operate in different competitive environments.

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1. Introduction

Commercial banks are important to national and global economies, because of their vital role as depository institutions and lenders to both corporations and individuals. It is thus not surprising that national regulators have been concerned with the structure of the local banking sector. In particular, there has been a debate on how competition affects stability in the sector (Boyd & De Nicolo, 2005; Delis, Kokas, & Ongena, 2017; Song & Thakor, 2019). Whereas the effect of accounting policies on bank stability had been traditionally underexplored, the financial crisis of 2007-2008 threw a spotlight on the role of accounting in the destabilization of the banking industry (e.g., Beatty & Liao, 2014; Bushman & Williams, 2015).

Yet, little is known about the role of competition, a primary feature of economic activity that underpins business decisions, on accounting policies in banks. Because of the possible adverse effects of accounting on bank stability and systemic risk (Beatty & Liao, 2011; Bushman & Williams 2012; Nicoletti, 2018), in this paper we aim to better understand how financial reporting in banks varies with competition intensity. Studying accounting reporting choices in banks is additionally motivated by the observation that financial information in banks is more opaque and thus more susceptible to a higher degree of information asymmetry relative to other sectors (Flannery, Kwan, & Nimalendran, 2004).

We first ask whether greater competition among national banks is associated with an unusual loan loss provision (LLP). We term this unusual level "unexpected" LLP (UELLP). Consistent with prior research (Wahlen, 1994; Beaver & Engel, 1996; Beatty & Liao, 2014), we use UELLP as a proxy for accounting discretion used by bank managers. Market competition has a conflicting effect on accounting discretion. One view is our basic argument that greater competition likely exerts pressure on bank managers to show good results as a

means to communicate their sound managerial skills and ability to steer the bank successfully in the face of adversarial market conditions (Shleifer, 2004; Graham, Harvey, & Rajgopal, 2005; Sambharya, 2011). The opposite view is that market competition encourages managers to report higher LLP (and, hence, reduced earnings) to signal their confidence about the bank's future success (Beaver & Engel, 1996; Lobo & Yang, 2001). The pressure on earnings combined with a greater scope for accounting discretion in banks renders our sample particularly useful in assessing the nature of the link between competition and accounting discretion.

Second, to understand how investors interpret opaque accounting information, we explore whether the pricing of UELLP varies with the degree of competition in a cross section of developed countries. If UELLP is purely opportunistic, models such as Stein (1989) predict it will not be priced in informationally efficient markets, even if accounting discretion varies with the degree of competition. On the other hand, UELLP might be inherently related to the unobserved quality of the loan book (Greenawalt & Sinkey, 1988), which likely varies with competition. It is therefore an open question whether bank valuations vary with UELLP, and more so in competitive rather than in less competitive banking sectors.

The possibility that UELLP can convey useful information leads to our third research question. Specifically, we ask whether accounting discretion in LLP is associated with future non-performing loans and future net charge-offs, two measures of the quality of the loan book, and whether such predictive ability varies with competition. Some prior studies argue competition has a positive effect on lending decisions and hence on the quality of the loan book (Boyd & De Nicolo, 2005). A high UELLP could indicate intention and ability on part of bank managers to remedy poor past lending decisions (Wahlen, 1994; Liu, Ryan, & Wahlen, 1997; Kanagaretnam, Lobo, & Yang, 2004; Beatty & Liao, 2014). Under this "commitment" hypothesis, high UELLP should be associated with a reduced problem of non-performing loans and net charge-offs in the future. In contrast, greater competitive pressure might drive risky

lending and hence a poorer quality loan book (Song & Thakor, 2019). If competition consistently drives risky lending decisions, it is unlikely that managers disclosing high UELLP can commit to better lending practices. As a result, poor lending persists and so one would expect high UELLP in competitive sectors to be more strongly associated with non-performing loans and loans write-offs in subsequent periods than in less competitive sectors.

To provide evidence pertaining to these unresolved questions, we analyze a sample of 238 banking groups in 17 OECD countries over the years 2012-2018. We use two measures that capture different aspects of competition. The first is the Lerner (1934) index, which captures an *individual* bank's market power, whereby market power is an inverse measure of the force of competition an individual bank normally faces. The second measure is a *country-wide* measure of concentration and is based on the Herfindahl–Hirschman Index. It is important to keep in mind the two measures capture micro vs. macro dimensions of competition (Bushman, Hendricks, & Williams, 2016), and are largely uncorrelated. We therefore treat them as independent and complimentary constructs of competition.

Our main findings are as follows. First, we find evidence that a bank's market power is negatively associated with UELLP, consistent with earnings inflation in response to competition. Second, we do not find valuation effects of UELLP, and this holds regardless of intensity of competition. Third, we find evidence suggesting that higher UELLP is positively associated with the future quality of the loan book (i.e., reduced non-performing loans and loans write-offs in the subsequent period), and more so in more competitive environments. This evidence is supportive of the view that UELLP is informative of a greater effort to remedy credit issues in the loan book when banks face tougher market conditions.

This paper offers several contributions to the extant literature on LLP. First, we extend the literature by investigating different implications of competition on accounting discretion in LLP. In particular, Jiang, Levine, & Lin, (2016) report that intensification of competition in the US decreases the absolute value of UELLP*,* using the latter as a proxy for reporting quality. In

contrast, we use signed UELLP, which enables us to capture directional effects of competition. Dou, Ryan, & Zou (2018) and Tomy (2019) show that the removal of restriction on interstate branching in the US is associated with higher LLP, but without examining the effects on discretionary reporting. Unlike Jiang et al. (2016), Dou et al. (2018) and Tomy (2019), we investigate the pricing of UELLP and how this varies with competition. Interestingly, previous US-based research documents that a higher UELLP is associated with higher bank valuations (e.g., Beaver and Engel, 1996). In contrast, we fail to find a similar result, suggesting investors do not pay attention to UELLP.

Second, there have been theoretical and empirical attempts to link competition to the quality of the loan book, but with mixed results (Boyd & De Nicolo, 2005; Bushman et al., 2016; Delis et al., 2017; Song & Thakor, 2019). However, these papers do not test whether UELLP is informative with respect to the quality of the loan book. Our findings suggest this is the case.

Third, while most of the existing literature on LLP focuses on US banks, we provide international evidence from other developed economies. This is important because it is not clear that US evidence is generalizable to other settings: The US banking sector is much larger than any other national sector, especially following the mid-1990s reforms to remove inter-state entry barriers. National sectors are arguably more isolated and less exposed to out-of-state competition. Furthermore, although the accounting treatment of LLP has been similar in the US and in other developed countries (Camfferman, 2015), prior research indicates that reporting incentives vary with national institutions (Ball, Kothari, & Robin, 2000; Ball, Robin, & Wu, 2003). In particular, the regulation and monitoring of banks and their auditors, litigation risk and corporate governance mechanisms differ in our sample countries and the US.[1] Consistent

[1] For example, shareholding is US banks is generally more dispersed than in other countries, as evidenced by institutional ownership (Lemma, Negash, Mlilo, & Lulseged, 2018). When shareholding is more concentrated, managers likely communicate privately, and in a timely manner, with large shareholders (e.g., pension funds). The implication is that large shareholders rely less on accounting information and managers face weaker demand for high quality disclosures. Consistent with this, Fan & Wong (2002) find that earnings informativeness is inversely

with this argument, we note that whereas Dou et al. (2018) and Tomy (2019) report evidence that the intensification of competition in the US is associated with higher LLP, we report evidence that LLP and competition are inversely related.

The paper is organized as follows: Section 2 provides an overview of related literature and develops the research questions. Section 3 describes the research design. Section 4 describes the sample and reports the main results. Additional analyses and robustness checks are reported in section 5. Section 6 concludes.

2. Related Literature and Research Questions

2.1 Prior Literature

LLP is the largest and most prominent accrual for banks.[2] Because LLP is a non-cash expense recognized with respect to expected future losses, it is based on managers' estimates and hence subject to discretion (Gebhardt & Novotny-Farkas, 2011).[3] Bank managers can use accounting discretion to portray good performance and extract higher pay (Livne, Markarian, & Milne, 2011; Beatty & Liao, 2014). In contrast to the self-serving hypothesis, the literature has also proposed the signaling hypothesis. It builds on Akerlof (1970), whereby strong banks distinguish themselves from weak banks by showing unusually high level of LLP. Specifically, an increase in LLP reduces profitability, which is costly to banks and their managers. This costly signal therefore credibly indicates that bank managers believe their firm is strong enough to absorb future potential losses (Lobo & Yang, 2001). In other words, the signaling hypothesis predicts that a high LLP conveys "good news" regarding the bank's future earnings, hence it should be positively priced by investors. Several papers provide evidence consistent with this

related to ownership concentration. Lemma et al. (2018) also find that earnings management increases with institutional ownership.

[2] Beatty & Liao (2014) report that LLP explains much of the variability in total accruals, as it constitutes about 56% of the total accruals (nearly twice the value of the next largest accrual), and about 34% of the variance of total accruals (more than double the value of the accrual with the second highest explanatory power).

[3] IFRS 9 introduces an expected loss model for the recognition and measurement of LLP, allowing bank managers to expand their discretion over LLP estimation. This standard became effective in 2018 and since our sample stops in 2018, we only control for IFRS adoption.

hypothesis (Beaver, Eger, Ryan, & Wolfson, 1989; Wahlen, 1994; Beaver & Engel, 1996; Liu et al., 1997; Elnahass, Izzeldin, & Abdelsalam, 2014). For example, Kanagaretnam et al. (2004) find that managers of undervalued banks use UELLP to signal bank's future earnings prospects. However, other papers fail to find evidence supporting the signaling hypothesis (Ahmed, Takeda, & Thomas, 1999; Anandarajan, Hasan, & McCarthy, 2007).

Competition in the banking industry has been a topic of great interest, as it has repercussions for the quality of financial services (Ruckes, 2004), the allocation of capital among borrowers (Favara & Giannetti, 2017; Gormley, Gupta, & Jha, 2018), the degree of lending quality standards and allocative efficiency (Ruckes, 2004; Schaeck, Cihak, & Wolfe, 2009; Bai, Krishnamurthy, & Weymuller., 2018; Gormley et al., 2018), and the level of stability in the banking system (Keeley, 1990; Boyd & De Nicolo, 2005; Allen, Chan, Milne, & Thomas, 2012; Fiordelisi & Mare, 2014; Goetz, 2018). However, prior research seems to disagree on whether greater competition is beneficial or detrimental to the banking sector. Evidence supporting beneficial effects include, higher stability of the financial system (Mishkin, 1999; Boyd & De Nicolo, 2005; Anginer, Demirguc-Kunt & Zhu, 2014; Fiordelisi & Mare, 2014), fewer cases of restatement in financial reports (Jiang et al., 2016), increased voluntary disclosures of information through press releases (Burks, Cuny, Gerakos, & Granja, 2018), reduction in non-performing loans (Goetz, 2018), more efficient screening and monitoring processes of borrowers (Dell'Ariccia, Friedman, & Marquez, 1999; Hauswald & Marquez, 2003; Chen, 2007; Bertrand, Schoar, & Thesmar., 2007; Dick & Lehnert, 2010), growth in bank activity via wider range of financial products (Cetorelli & Gambera, 2001), and higher degree of product innovation and quality (Clark, Allen, & Houde,, 2008; Schaeck & Cihak, 2010). In contrast, there is also theoretical and empirical evidence indicating that *less* intense competition and *greater* market power at the bank level are associated with higher earnings of banks (Stigler, 1961; Berger, Bonime, Covitz, & Hancock, 2000; Goddard, Liu, Molyneux, & Wilson., 2011), better lending standards and reduced risk taking (Keeley, 1990; Allen & Gale, 2000; Bushman

et al., 2016; Delis et al., 2017), lower effort in locating safe loans (Song & Thakor, 2019), and higher abnormal returns due to decrease in operational costs (Berger et al., 2000; Goddard et al., 2011)..

Markarian & Santalo (2014) show that market competition is associated with higher abnormal accruals in industrial firms. Datta, Iskandar-Datta, & Singh (2013) argue that a higher degree of earnings management is used in competitive industries to obfuscate real performance. Further evidence on a positive relation between competition and earnings management is also reported in an international setting (Lemma et al., 2018), and using textual-based measures of competition (Shi, Sun, & Zhang, 2018). At the same time, a few papers have shown that earnings management is more prevalent in less competitive industries. For instance, Marciukaityte & Park (2009) show that market competition mitigates managerial incentives to engage in earnings manipulation, because managers are more harshly punished by the stock market for misleading reporting. Dhaliwal, Huang, Khurana, & Pereira (2014) find that in more competitive product markets accounting conservatism is higher, whereby managers recognize losses faster when competition is more intense. Hung, Jiang, Liu, & Tu (2018) argue that more intense competition leads to lower level of earnings management due to increased cost of misreporting (e.g., shareholders abandonment, loss of customers and suppliers, damage of reputation) in a more competitive environment.

Evidence on the link between competition and earnings management in banks is relatively sparse and mixed. A small number of recent papers have directly examined the effect of competition on LLP using the deregulation of inter-state banking in the US in 1994. Jiang et al. (2016) find that this regulation reduced the volatility of UELLP and conclude that competition reduces opacity. Dou et al. (2018) exploit interstate restrictions on branching that were still allowed after 1994 to measure entry threat to local markets. They find that incumbent banks attempt to deter entry by reporting lower LLP to give impression of underwriting quality. This is broadly consistent with Bagnoli & Watts's (2010) model in which managers bias their

financial reports intentionally to create an impression that a firm's costs are lower than they actually are. Bushman et al. (2016) construct a bank-specific text-based measure of competition to assess the effect of deregulation on the timing of the reporting of LLP. They find that managers that perceive their banks to face more intense competition tend to delay recognition of LLP. In contrast, Tomy (2019) finds that threatened banks increased LLP to deter entry by reducing reported profit.

We extend this literature by looking at 17 OECD countries to take advantage of variations in measures of competition. As most prior research focuses on the large banking industry in the US, evidence from this research need not generalize to smaller banking sectors that are characterized by a relatively small number of banks. We also note that the aforementioned papers, with the exception of Jiang et al. (2016), do not attempt to directly measure the unexpected component in LLP. Jiang et al. (2016), however, do not test whether the accounting discretion works to inflate or deflate earnings. Furthermore, these papers do not explore how the pricing of accounting discretion varies with competition. Finally, we extend the literature by testing the predictive power of accounting discretion in LLP for non-performing loans and net charge-offs under different measures of competition.

2.2 Research Questions

Our first research question relates to the basic relation between earnings managements and market competition. However, as discussed above, the ex-ante association between market competition and accounting discretion is unclear. On the one hand, in highly competitive environments managers are under greater pressure to decrease UELLP (i.e., to increase earnings), either to meet earnings expectations (Shleifer, 2004; Graham et al., 2005; Sambharya, 2011), or to increase their pay (Watts & Zimmerman, 1978; Carter, Lynch, & Zechman, 2009; Markarian & Santalo, 2014; Shi et al., 2018). These incentives suggest a *negative* association between UELLP and market competition. On the other hand, according to the signaling hypothesis, managers increase UELLP to indicate their confidence in the bank's

future success (Beaver & Engel, 1996; Lobo & Yang, 2001; Kanagaretnam, Krishnan, & Lobo, 2009) and this signal is likely more important when competition is intensive. This establishes a *positive* association between UELLP and market competition, as in more competitive markets managers choose to deflate earnings to persuade investors that they believe their bank can prosper notwithstanding tough competition. In short, a negative relation between competition and EULLP supports the view that competitive pressure acts as an incentive to manage earnings upward whereas a positive relation supports the signaling hypothesis.

Our next question concerns the market valuation of UELLP as competition becomes more intense, either from an individual bank's perspective or from a sector-wide perspective. According to the signaling hypothesis, a higher UELLP is associated with higher stock prices because investors perceive overstated provisioning as a signal of bank strength and of the willingness of managers to improve lending standards. Prior evidence is largely consistent with the signaling hypothesis (Wahlen, 1994; Beaver & Engel, 1996; Kanagaretnam et al., 2004; Elnahass et al., 2014). This evidence, however, assumes that signaling through discretionary accounting is the optimal channel for managers to communicate their confidence.[4] Competition may also reduce bank opacity (Jiang et al., 2016) suggesting UELLP is informative and thus should be priced. Signaling aside, we would then expect UELLP to be inversely related to price and more so in more competitive environments, where improving bank performance is more challenging. However, it is also possible that investors regard accounting discretion as self-serving and thus uninformative. Providing evidence as to whether UELLP is priced and whether prices vary with competition is important for understanding how investors perceive accounting discretion across banking sectors.

[4] Managers often use conference call to discuss and explain quarterly results. Price, Doran, Peterson and Bliss (2012) find that managers' linguistic tone in such conference calls is predictive of abnormal returns. Moreover, the tone used by managers dominates earnings news, consistent with the argument that managers use alternative communication channels to credibly convey private information.

The last research question also relates to the informativeness of UELLP. Specifically, in addition to examining market perceptions of UELLP, we are interested in whether UELLP has predictive power for the quality of the loan book in different competitive environments. The stability of a banking system is assessed by, among other things, the quality of its loan book, although whether competition enhances asset quality or not has been debated. Bushman et al. (2016) and Goetz (2018) examine the effects of removing state restrictions on bank branching in the US for future net charge-offs and non-performing loans, respectively. However, both papers do not investigate whether UELLP predicts deterioration or improvement in the quality of the loan book, and whether any such relation is moderated by competition.

Accounting standards require managers to anticipate future write-offs and non-performing loans. Adhering to these rules implies a positive relation between LLP and future write-offs and non-performing loans. If managers follow accounting rules without bias, we should not expect to find any relation between UELLP and the quality of the loan book, as UELLP would simply capture random measurement errors.[5] However, managers may not adhere to these rules and deviations are likely to be captured in EULLP. Bank managers can inflate LLP (i.e., reduce reported profit), sending a positive message about their commitment to improve lending practices. However, as we discuss above, prior research reports conflicting evidence on the validity of the signaling hypothesis, nor is it clear that intentionally increasing LLP is the most efficient way to communicate to outsiders a high-quality loan book. Deflating UELLP (to improve reported profit) sends the opposite message, but managers might still prefer a negative message due to compensation and debt-contracting incentives. These arguments suggest a negative relation between EULLP and subsequent periods' reporting of net charge-offs and non-performing loans. To the extent that UELLP is informative with respect to the

[5] However, the expected component of LLP nevertheless should be positively related with subsequent non-performing loans and net charge-offs.

quality of the loan book in subsequent periods (in either direction), we expect it to be more pronounced when competition is more intense, owing to the heightened pressure on profits.

3. Research Design

3.1 Measurement of the Competition Variables

The two common approaches for assessing competition in a given market are either by referring to a measure of industry-wide concentration, or using a bank-specific measure of exposure to competition. In this paper, we use two measures pertaining to market competition (*COMP*). The first, the Lerner (1934) index (LI), is a bank-specific measure capturing its market power. The second, an industry-wide measure of concentration, is the Herfindahl–Hirschman Index (HHI). These two indices had been used before in many prior studies (Berger et al., 2000; Goddard, Molyneux, & Wilson, 2004; Habib & Ljungqvist, 2005; Beiner, Schmid, & Wanzenried, 2011; Lemma et al., 2018). We describe the methodology of calculating each measure in the Appendix.

3.2 Measuring Unexpected LLP (*UELLP*)

To test the aforementioned hypotheses, we run a loan loss provision model, and use its residual as a measure of discretionary LLP. We build on both Beatty & Liao (2014) and Nicoletti (2018), which regress total loan loss provision on the periodic net charge-offs of existing loans the change in the amount of total outstanding loans, the amount of non-performing loans, and the change in non-performing loans. Since prior research has also established that regulatory capital ratios also influence the level of provisioning research (Moyer, 1990; Beatty, Chamberlain, & Magliolo 1995; Collins, Shackelford, & Wahlen, 1995; Chen & Daley 1996; Kim & Kross 1998; Ahmed et al., 1999), we also include lagged capital ratio. Specifically, we use the following loan loss provision model:[6]

[6] In estimating equation (1), we follow Fama-McBeth (1973) two-step procedure. According to this model, we first run the model for each country separately (step one), and then the coefficient is obtained as the average of the first step separate coefficients (step two). This procedure allows us to overcome the cross-sectional dependence of

$$LLP_{it} = \alpha_0 + \alpha_1 NCO_{it} + \alpha_2 NPL_{it} + \alpha_3 \Delta NPL_{it} + \alpha_4 \Delta NPL_{it-1} + \alpha_5 \Delta NPL_{it-2} + \alpha_6 \Delta LOAN_{it} + \\ + \alpha_7 NI_{it} + \alpha_8 \Delta NI_{it} + \alpha_9 CAP_{it-1} + \alpha_{10} SIZE_{it-1} + \alpha_{11} \Delta GDP_{jt} + \alpha_{12} CPI_{jt} + \alpha_{13} \Delta UNEMP_{jt} \\ + Year_t + \varepsilon_{it} \quad (1)$$

where the subscripts *i*, *j*, and *t* refer to the bank, year, and country, respectively. *LLP* is the loan loss provision reported in the income statement, *NCO* is the net loan charge-offs, *NPL* is the balance of nonperforming loans in the balance sheet, *ΔNPL* is the change in nonperforming loans, *ΔLOAN* is the change in total outstanding loans in the balance sheet, *NI* is the net income before the effect of *LLP* (i.e., net income plus loan loss provision), *ΔNI* is the change in *NI*. We also control for lagged bank size (*SIZE*), which is the natural logarithm of total assets, and lagged bank total capital ratio (*CAP*), which is the amount of a bank's capital in relation to the amount of risk it is taking. *ΔGDP*, *CPI* and *ΔUNEMP* are country-year variables for the annual change in *GDP*, inflation rate, and change in unemployment rates, respectively. All variables (except *CAP* and country-level variables) are scaled by beginning total assets. The fitted values from equation (1) proxy the non-discretionary component of *LLP* (*ELLP*), while the residual is our measure of the unexpected *LLP* (*UELLP*).

3.3 *UELLP* and Competition

To find how *UELLP* varies with market competition (H1), we follow Jiang et al. (2016) and Tran, Hassan, & Houston (2019), and regress the following model:

$$UELLP_{it} = \beta_0 + \beta_1 COMP_{it} + \beta_2 SIZE_{it} + \beta_3 EQR_{it} + \beta_4 ROE_{it} + \beta_5 LOSS_{it} + \\ + \beta_6 IFRS_{it} + \beta_7 FOREIGN_{it} + fixed\ effects + u_{it} \quad (2)$$

where *COMP* is the two measures vary with market competition (*LI* or *HHI*). Consistent with prior research, we control for several bank-specifics: (1) bank size (*SIZE*); (2) shareholder equity ratio (*EQR*), which is total equity over total assets; (3) return on equity (*ROE*), which is net income over total equity; (4) reported loss (*LOSS*) indicator, that equals 1 for banks with a negative income, and 0 otherwise. In all models, we include country and year fixed effects. By

standard errors when there is large number of cross-sectional units and a relatively small time series for each cross-sectional unit.

including country fixed effects, we control for cross-country institutional differences in regulation, supervision and corporate governance (Casu, Girardone, and Molyneux, 2015), and other country-level factors that may affect LLP (Fonseca and Gonzales, 2008). Following Petersen (2009), we cluster standard errors at the bank level. We do not include bank fixed effects because both *LI* and *HHI* exhibit very low variability over time. Therefore, their effect on the dependent variables is subsumed by bank fixed effects, if we include them.

Finding that is negative is consistent with competitive pressure incentivizing managers to inflate earnings. On the other hand, finding that is positive is consistent with competition engendering conservative reporting.

3.4 Competition and Valuation Implications of *UELLP*

To assess how the pricing of *UELLP* varies with market competition (H2), we build on Beaver & Engel (1996) and estimate the following valuation model:

$$\begin{aligned} MV_{it} \text{ or } PB_{it} = {} & \gamma_0 + \gamma_1 COMP_{it} + \gamma_2 UELLP_{it} + \gamma_3 UELLP_{it} \times COMP_{it} + \gamma_4 ELLP_{it} + \\ & + \gamma_5 ELLP_{it} \times COMP_{it} + \gamma_6 NI_{it} + \gamma_7 EQR_{it} + \gamma_8 IFRS_{it} + \gamma_9 FOREIGN_{it} + \\ & + fixed\ effects + v_{it} \end{aligned} \quad (3)$$

where *MV* is the natural log of equity market value three months after financial statements release date and *PB* – price-to-book (P/B ratio), calculated as equity market value three months after financial statements release date divided by book value of equity. P/B ratio is typically used as a measure of growth, which allows us also to examine whether market perceptions of growth opportunities vary with *UELLP* across competition measures.

Under the competition-fragility view, higher competition is associated with eroded market power, lower future bank profits, and lower survival probabilities (Keeley, 1990; Allen & Gale, 2004; Acharya, Hasan, & Saunders, 2006; Berger, Öztekin, & Roman, 2019). Therefore, we predict γ_1 to be negative, such that market competition contributes to reduced market value of banks. Consistent with this prediction, Jiang, Levine, & Lin (2018) and Corbae & Levine (2019) report evidence of reduced profits and lower charter values of banks in more

competitive environments. If *UELLP* is informative to investors, we expect the coefficient γ_2 to be statistically different from zero. A positive value of γ_2 is consistent with indicating investors regard positive (negative) values of *UELLP* as good (bad) news. In contrast, a negative coeffcient implies that a higher (lower) *UELLP* conveys bad (good) information. Furthermore, if the degree with which *UELLP* is interepreted as good or bad news varies with compitition, we expect γ_3 to be statistically different from zero. Specifically, a positive γ_3 is consistent with investors perceiving a positive *UELLP* in more competitive environments as better news than a similar *UELLP* in less competitive markets, cosistent with the idea that competition disciplines poor lending decisions. In contrast, a negative γ_3 is consistent with more adverse pricing implications of *UELLP* in more competitive markets than less competitive markets. We also include the predicted level of LLP (*ELLP*) using the regression line from model (1), and its interaction with the two competition measures. This allows us to assess the pricing implication of fundamental (unmanaged) accounting numbers. Since investors are likely to interpret an increase in *ELLP* as bad news, attributable to poor loan portfolio management and higher default risk (Beaver & Engle, 1996), we predict γ_4 to be negative. If it is more difficult for managers to improve profitability when competition is more intense, investors would interpret a higher *ELLP* as worse news in banks operating in a highly competitive market than in banks operating in less competitive markets. We therefore expect to find a negative association between *ELLP* and stock prices in more competitive banking sectors (that is, γ_5 is expected to be negative).

3.5 Loan Book Quality and *UELLP*

To test whether UELLP is informative with respect to the quality of the loan book (H3), we use two indicators of quality. The first is the intensity of non-performing loans in a bank's balance sheet and the second is the magnitude of net charge-offs. High-quality loan books are characterized by fewer non-performing loans and smaller write-offs. We build on a model

analyzed by Louzis, Vouldis, & Metaxas (2012) whereby a bank non-performing loans are determined both by macroeconomics and bank specific factors. We augment it with our measures of market competition, and estimate the following forward-looking model:

$$\begin{aligned} NPL_{it+1/t+2/t+3} \text{ or } NCO_{it+1/t+2/t+3} = {} & \delta_0 + \delta_1 COMP_{it} + \delta_2 UELLP_{it} + \delta_3 UELLP_{it} \times COMP_{it} + \\ & + \delta_4 GDP_t + \delta_5 UNEMP_t + \delta_6 Z_{it} + \delta_7 ROE_{it} + \delta_8 INEF_{it} + \\ & + \delta_9 NII_{it} + \delta_{10} LR_{it} + \delta_{11} IMP_{it} + \delta_{12} IFRS_{it} + \\ & + \delta_{13} FOREIGN_{it} + \textit{fixed effects} + \varepsilon_{it} \end{aligned} \quad (4)$$

In addition to variables previously defined, our model features (1) solvency ratio (*Z*), which is measured by the aggregation of bank return on assets (*ROA*) and shareholder capital ratio (*EQR*) divided by the standard deviation of *ROA*;[7] (2) return on equity (*ROE*), which is measured by net income over total equity; (3) inefficiency level (*INEF*), which is measured by the ratio of operating expense to operating income; (4) non-interest income deflated by total income (*NII*); (5) leverage ratio (*LR*), which is measured by total liabilities over total assets, and (6) impaired loans over equity (*IMP*).[8] If higher *UELLP* arise when managers recognize credit losses and, at the same time, take action to improve lending decision, we expect δ_2 to be negative. If, in contrast, higher *UELLP* is indicative of lax lending decisions, we expect coefficients δ_2 to be positive. Finding that δ_3 is negative is consistent with competition acting as a disciplinary mechanism for lending decisions, although we do not make directional prediction with respect to δ_3.

All variable definitions are provided in Table 1.

[Insert Table 1 about here]

[7] *Z* is a bank-level indicator of financial stability, which reflects the extent to which banks can absorb losses before going bankrupt. *Z* has a negative relationship to the probability of a bank's insolvency, such that higher ratio indicates greater financial stability and lower risk (Boyd & Graham, 1988; Boyd & Runkle, 1993; Laeven & Levine, 2009; Hung et al., 2018). We measure the standard deviation of *ROA* based on the entire sample period of each bank.

[8] We also measure *IMP* as impaired loans over beginning total assets with no change in the results.

4. Sample and Main Results

4.1 Sample

We collect annual consolidated balance sheet and income statement data from BankFocus, which gathers bank-level financial data including sock prices (in thousands of euros) on various types of financial institutions. We use data for holdings, commercial and cooperative banks only, filtering out investment banks, savings banks, insurance companies, mutual funds and others. The analysis is based on panel data for a sample of 17 OECD countries from 2012 to 2018. To be included, we require that the banking system in the OECD country has at least five publicly traded banking groups per year. Continuous variables are winsorized at the 1st and 99th percentiles to mitigate the influence of outliers, with no qualitative effect on the results. Other than excluding banks with missing financial data, banks that are subsidiaries of other banks, and banks with assets value below 1 million euros, the data set is representative and not affected by selection problems.[9] The winsorized sample consists of 1,539 bank-year observations for 238 listed banks.

Panel A of Table 2 reports the descriptive statistics for the entire sample. Note that the number of observations varies across variables. In Table 2 *LI* and *HHI* are both inverse measures of market competition, such that the higher the index, the lower the level of competition, but in the regression models, higher values imply more intense competition. The mean (median) *LLP* is 0.6% (0.3%) of total assets. Although this seems small in magnitude, relative to mean (median) net income before *LLP* (*NI*), mean (median) *LLP* is much larger at 43% (27%). In other words, LLP has a very significant impact on bank profitability. The loan book (*LOAN*) is 60% of beginning total assets, on average, indicating the importance of the

[9] We include banking groups that have subsidiaries operating in countries other than the parent's home country. Theoretically, this could influence the accuracy of our HHI measure, as it should be a weighted average HHI across the various markets in which the subsidiaries operate. However, such cases are rare in our sample.

loan book in banks' balance sheets. The average bank is profitable and, owing to high leverage (*LR* is 0.86, on average).

Panel B reports average values of the various variables analyzed by country. The average *LI* is highest (indicating high market power at the bank-level) in Australia (0.665) and lowest in Germany (0.287), while the *HHI* indicates that sector concentration is lowest in Turkey (0.081) and highest in Sweden (0.325).

Panel C reports univariate analysis comparing banks benefiting from strong market power vs. banks with low market power. Specifically, firm-year observations which are above (below) the median *LI* indicate stronger (weaker) market power. The differences in means and medians between subsamples are significant for most variables. In particular, strong market power is associated with larger market caps (*MV*) and larger market-to-book ratios (*PB*). Stronger market power is also associated poorer quality loan book, as is seen from the comparison of *NPL*. Consistent with this observation, banks with stronger market power report larger loan loss provisions.

[Insert Table 2 about here]

Table 3 reports the pairwise correlations. Generally, the correlations are not very large. In particular, the correlation between the two proxies for market competition, *LI* and *HHI*, is negative but very small and insignificant (-0.013). This is consistent with the notion that *LI* and *HHI* measure different aspects of competition (i.e., bank-level vs. country level, respectively).

[Insert Table 3 about here]

4.2 Main Results

Table 4 presents the results for estimating equation (1), whereby *LLP* is a function of several determinants. *NCO* and *NPL* have the predicted positive and significant association with *LLP*. However, the insignificant coefficient for *ΔLOAN* indicates that banks choose not to increase *LLP* during periods of credit growth. Banks that are more profitable prior to setting

LLP report higher *LLP*, as the positive coefficient on *NI* indicates. Stated differently, pressure on profits translates to lower *LLP*.

[Insert Table 4 about here]

Table 5 presents the results for equation (2), where we regress *UELLP* – the regression residual from the *LLP* model – on several covariates and the two measurers of competition. In column 1 we leave out the two competition variables and find that only *SIZE* is significantly related to *UELLP*, albeit at the 10% level. Specifically, larger banks manage *UELLP* downward more than smaller banks, suggesting that larger banks use accounting discretion more aggressively to increase reported income. The other covariates are insignificant. In columns 2 and 3 we add in turn the *LI* and *HHI* variables, respectively. As can be seen in column 2, lower market power is associated with lower *UELLP* (coefficient on *LI* is negative and highly significant). This is consistent with the notion that a loss of market power exerts pressure on managers to increase reported earnings. In economic terms, an increase of one standard deviation in *LI* translates to a decrease of one third of standard deviation of *UELLP*. As in column 1, *SIZE* is negatively related to *UELLP*. In addition, we find that higher *UELLP* is associated with reporting losses, consistent with managers of loss-making banks taking a "bigger bath" in a loss year. Column 3 reveals that *HHI* is not associated with *UELLP*. Column 4 reports the results after including both competition variables and is qualitatively similar to column 2. Note that *HHI* remains insignificant in column 4. Overall, the findings suggest that *UELLP* is lower when market power is lower, suggesting that in a more competitive environment, bank managers exploit discretion in LLP to report higher earnings.

[Insert Table 5 about here]

Panel A in Table 6 presents the results for the baseline valuation model, as described in equation (3), by regressing the market value of equity and price-to-book on the two measurers of competition and their interactions with *UELLP* and *ELLP*. In columns 1-3 both measures of market competition are associated with markets values, but with different signs (negative for

LI, and positive for *HHI*). We infer from this that banks in countries with lower banking concentration attract higher valuations, possibly because in less concentrated sectors there is a greater pressure on bank managers to run efficient operations. In contrast, at the individual bank level, weaker market power translates to lower valuation, holding the sector concentration fixed. *UELLP* and its interactions with the two competition measures are not associated with market value of equity implying that investors do not consider *UELLP* as informative, and this holds regardless to the level of competition in the banking sector. In contrast, the expected component of *LLP* (*ELLP*) is negatively associated with banks market values, and this relation is highly significant in column 3. Moreover, *ELLP* is incrementally and negatively related to bank valuations in less concentrated national sectors. Among the control variables, we find that the coefficient on *EQR* is negative, indicating that market values are positively related to bank leverage, and that the coefficient on *IFRS* is positive, consistent with a positive effect of IFRS adoption on cost of capital (Li, 2010). In columns 4-6 we regress the market-to-book ratio, a measure of expected growth, on the same set of variables. We find evidence that weaker market power is associated with lower growth opportunities. The findings for *ELLP* in column 6 are noteworthy. While the coefficient on *ELLP* is insignificant, the coefficient on the interaction between *ELLP* and *LI* is positive. The interpretation is that expected growth opportunities are constrained in banks with lower market power who report higher *ELLP* than in banks with stronger market power reporting similar *ELLP*. The coefficient on *ELLP***HHI* is of similar to its sign in column 3. In contrast, the coefficients on *UELLP*, and its interactions with *LI* and *HHI* are insignificant. Finally, the coefficient for *NI* is positive and highly significant (columns 4-6), suggesting higher pre-LLP profits are associated with higher growth opportunities.

[Insert Table 6 about here]

In our baseline valuation model, we find that discretionary loan loss provision is not priced in capital markets. One explanation for this finding is that investors overlook the information contained in *UELLP*. We therefore next test if *UELLP* has predictive power for the

quality of the loan book in subsequent periods. Table 7 (Panel A and Panel B) presents the results for the forward-looking model, as described in equation (4), by regressing future *NPL* and future *NCO* (for one, two, and three years ahead) on the two measurers of competition, *UELLP*, and the interactions between *UELLP* and competition. In Panel A of Table 7 we find that the coefficient on *UELLP* is negative and statistically significant at the 5% level in the one-year-ahead prediction model, but not beyond this forecasting horizon. This suggests that higher *UELLP* in the current period predicts better loan book quality in the immediate subsequent period. This finding, therefore, is consistent with the idea that bank managers report higher than expected LLP to signal a commitment to better lending decisions. We find that the coefficient on the interaction between *UELLP* and *LI* is insignificant, indicating that market power does not moderate the information content of *UELLP*. However, using *HHI* after controlling for *LI*, we find evidence supporting the idea that in less concentrated banking sectors *UELLP* conveys better news regarding future NPL than in more concentrated industries (column 3). In Panel B of Table 7 we find a negative relation between *UELLP* and one year ahead *NCO* (column 3). This reinforces the idea that *UELLP* conveys good news about future performance of bank loan book. The results in column 3 also suggest that the degree of good news in *UELLP* is more pronounced in more competitive markets, although the coefficient on $UELLP_t*HHI_t$ is significant only at the 10% level. Finally, in both Panels (columns 3, 6, 9), we find evidence that the two measures of market competition are negatively related to future *NPL* and future *NCO* (with the exception of column 9 in Panel A), implying that stronger competition between banks functions as a disciplinary mechanism for banks' lending decisions.

[Insert Table 7 about here]

5. Robustness Tests

In this section we perform several robustness checks to examine if our previous results still hold for alternative models and other proxies of market competition.

5.1 A Single-equation Approach

Our first robustness check derives from McNichols & Stubben (2018), who show that the two-step discretionary accruals model is a noisy proxy for earnings management, which produce biased results. Moreover, Chen, Hribar, & Melessa (2018) argue that implementation of the two-step procedure generates biased coefficients and standard errors, such that the magnitude of the bias is a function of the correlations between model regressors used in the two steps. To avoid such a bias, we build on Chen et al. (2018) and Christodoulou, Ma, & Vasnev, (2018), who recommend on running a "single-step" model. Specifically, we run a model, in which the variables from the first-step regression model (equation 1) are combined with the control variables in the second-step regression (equations 2 & 3), as follows:[10]

$$\begin{aligned} LLP_{it} = {} & \alpha_0 + \alpha_1 COMP_{it} + \alpha_2 EQR_{it} + \alpha_3 ROE_{it} + \alpha_4 LOSS_{it} + \alpha_5 NCO_{it} + \alpha_6 NPL_{it} + \\ & + \alpha_7 \Delta NPL_{it} + \alpha_8 \Delta NPL_{it-1} + \alpha_9 \Delta NPL_{it-2} + \alpha_{10} \Delta LOAN_{it} + \alpha_{11} NI_{it} + \alpha_{12} \Delta NI_{it} + \\ & + \alpha_{13} SIZE_{it-1} + \alpha_{14} IFRS_{it} + \alpha_{15} FOREIGN_{it} + fixed\ effects + \varepsilon_{it} \end{aligned} \quad (7)$$

Tables 8 presents the results for the single-step regression model, as described in equation (7). We find that, consistent with the two-step regression model (Table 5), there is a significant and negative association between the loan loss provision and *LI*, while *HHI* is unrelated to *LLP*. That is, loss of market power drives the LLP down and earnings up.

[Insert Table 8 about here]

We next turn to the analysis of valuation implications. Specifically, we run equation 8 whereby we replace *UELLP* and *ELLP* in equation 3 with LLP, as follows:

$$\begin{aligned} MV_{it} \ or \ PB_{it} = {} & \beta_0 + \beta_1 COMP_{it} + \beta_2 LLP_{it} + \beta_3 LLP_{it} \times COMP_{it} + \beta_4 NI_{it} + \beta_5 EQR_{it} + \\ & + \beta_6 IFRS_{it} + \beta_7 FOREIGN_{it} + fixed\ effects + v_{it} \end{aligned} \quad (8)$$

[10] For brevity, we report the regression specification, which includes both competition measures.

The results are reported in Table 9. We again find that market valuations are negatively related to *LI* (column 1). This indicates that banks with lower market power (i.e., *LI* is higher), attract lower valuations. However, we find no relation between *LI* and growth opportunities (column 2). In columns 1 & 2 we also find that a higher *LLP* is not associated with valuations, which is inconsistent with prior US-based studies and the signaling hypothesis (Wahlen, 1994, Beaver & Engel, 1996; Liu et al., 1997; Lobo & Yang, 2001; Kanagaretnam, Lobo, & Yang., 2005; Tran et al., 2019). Finally, we see that in both models the interactions between *LLP* and the two measures of competition are not associated with market values (with the exception of column 1 in respect to *LI*), suggesting again that capital markets do not differentiate between valuation effects of LLP based on the intensity of market competition.

[Insert Table 9 about here]

Finally, in Table 10 we test the predictive ability of *LLP* with respect to the future quality of the loan and whether this ability varies with market competition. Essentially, we replicate Table 7 whereby we replace *UELLP* with *LLP*. In Panel A we use future *NPL* as the measure of the quality of the loan book, whereas in Panel B we use *NCO* as a proxy for this quality, as follows:

$$\begin{aligned} NPL_{it+1/t+2/t+3} \text{ or } NCO_{it+1/t+2/t+3} = {} & \delta_0 + \delta_1 COMP_{it} + \delta_2 LLP_{it} + \delta_3 LLP_{it} \times COMP_{it} + \\ & + \delta_4 GDP_t + \delta_5 UNEMP_t + \delta_6 Z_{it} + \delta_7 ROE_{it} + \\ & + \delta_8 INEF_{it} + \delta_9 NII_{it} + \delta_{10} LR_{it} + \delta_{11} IMP_{it} + \delta_{12} IFRS_{it} + \\ & + \delta_{13} FOREIGN_{it} + \textit{fixed effects} + \varepsilon_{it} \end{aligned} \quad (9)$$

Starting with Panel A, we find strong evidence that *LLP* is negatively related to future *NPL*. This supports the finding for *UELLP* reported in Panel A of Table 7, which shows that higher *UELLP* predicts a reduction in non-performing loans. The coefficients on the interactions of *LLP* with *LI* are negative and significant in all columns, consistent with the idea that *LLP* is associated with higher quality of the loan book when a bank market power is lower. The interaction between *LLP* and *HHI* is also negative and significant, albeit only in the one-

year and two-year ahead prediction model.[11] Panel B shows that using future *NCO* as a quality measure yields similar results. Specifically, higher *LLP* is associated with lower net charge-offs in the subsequent three years and this relation is more pronounced the lower is a bank's market power and the level of market concentration.

[Insert Table 10 about here]

Taken together, using the single-equation approach yields results that are largely consistent with our main results.

5.2. Adoption of IFRS 9 in 2018

The next robustness check relates to a change in the accounting treatment of LLP that took place in 2018. In particular, starting January 2018, banks reporting under IFRS need to follow IFRS 9 ("*Financial Instruments*"), which replaces IAS 39. The key changes between IFRS 9 and IAS 39 in the context of banking are (1) transition from "Incurred Loss Model", which allows to delay the recognition of credit losses until there is objective evidence of impairment, to an "Expected Credit Loss Model", in which expected credit losses are recognized at each reporting period, even if no actual loss events have taken place; (2) when determining the amount of impairment, not only past events and current conditions are considered, but also reasonable and supportable forward-looking information. Although we have only 2018 in our sample period and control for it by using time fixed effects, we repeat the analysis after excluding 2018. We find that our main results are similar in 2012-2017 to aforementioned reported results.

5.3 Alternative Measures of Competition

Our last set of robustness checks seeks to find whether our results are sensitive to the way competition is defined and measured. To do that, we use three different measurers of market

[11] Recall that in Panel A of Table 7 the interactions between *UELLP* and *LI* are insignificant, but the interactions between *UELLP* and *HHI* are negative and significant in the one year ahead prediction model.

competition, as presented below. In general, we confirm that our main results still hold for all alternative proxies of competition.

The first measure we use is the *k-Bank Concentration Ratio* (CR_k). According to this index, concentration level in the banking system is given by a summation of market shares only for the k largest banks in the industry, as follows:[12]

$$CR_k = \sum_{i=1}^{k} s_i$$

note that the higher the index, the higher the concentration level, hence competition is lower.

The second measure of competition is the *H-statistic*. This index, introduced by Panzar & Rosse (1987), relies on the premise that banks will employ different pricing strategies in response to a change in input costs, depending on the market structure in which they operate. In other words, market power is measured by the extent to which changes in factor prices (unit price of funds, capital, labor, etc.) are reflected in bank revenues (interest income or total revenue). To examine the level of competition, we implement the following model for each country:

$$ln(P_{it}) = \beta_0 + \beta_1 ln(W_1)_{it} + \beta_2 ln(W_2)_{it} + \beta_3 ln(W_3)_{it} + \beta_4 ln(Y_1)_{it} + \beta_5 ln(Y_2)_{it} + \\ + \beta_6 ln(Y_3)_{it} + \beta_7 IFRS_{it} + \beta_8 FOREIGN_{it} + fixed\ effects + u_{it}$$

where P is the ratio of gross interest revenue to total assets, W_1 is the ratio of total interest expenses to total deposits and money market funding, W_2 is the ratio of personnel expense to total assets, W_3 is the ratio of other operating expense to total assets, Y_1 is a control variable for the ratio of equity to total assets, Y_2 is a control variable for the ratio of net loans to total assets, and Y_3 is a control variable for the logarithm of total assets. The *H-statistic* is given by the sum of the elasticities of the total revenue with respect to bank's input prices ($H = \beta_1 + \beta_2 + \beta_3$), which reflects the level of competition in the system (the higher the index, the greater the market competition).

[12] In our analysis, we used CR_3 and CR_5.

Our last measure of market competition is the *Boone indicator*. This index, introduced by Boone (2008), gauges competition by the strength of the relation between efficiency (measured in terms of average cost) and bank performance (measured in terms of profitability). To examine the level of competition, we implement the following model for each country:

$$ln(\pi_{it}) = \beta_0 + \beta_1 ln(C_{it}) + \beta_2 IFRS_{it} + \beta_3 FOREIGN_{it} + fixed\ effects + u_{it}$$

where π is bank profitability (measured by *ROA*) and *C* is the ratio of average cost (sum of interest expense, personnel expense and administrative and other operating expenses) to total income (sum of total revenue from interest and total non-interest revenue). The estimated Boone indicator βi is negative. Lower values, i.e., more negative values, of βi signify a bank is less efficient and faces more intense competition. The *Boone indicator* is given by the coefficient β_1 (the higher the index, the lower the market competition).

6. Conclusion

In this paper we show that when competitive pressure is more intense and a bank's market power decreases, bank managers use discretionary *LLP* more aggressively to increase reported earnings. However, we find that capital markets overlook the discretionary element in LLP. Specifically, we report evidence that *UELLP* is not priced, and this holds regardless of the intensity of the competition. Yet, we report that *UELLP* conveys positive information about banks' future non-performing loans and future net charge-offs, and this effect is more pronounced when competition is stronger. Our results suggest the possibility that market participants fail to understand the information content of accounting discretion in banks that operate in different competitive environments.

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Appendix: The Lerner Index and the Herfindahl–Hirschman Index

Lerner Index (LI):

The LI is measured for each bank-year and is defined as the percentile deviation of the equilibrium product price (*P*) from its marginal cost (*MC*), as follows:

$$LI = \frac{P - MC}{P}$$

We follow Berger, Klapper, & Turk-Ariss (2009), Beck, De Jonghe, & Schepens (2013), Ryan et al. (2014) to measure P as the ratio of total revenues to total assets, and estimating MC on the basis of a translog cost function with one output factor (total assets) and three input price factors (labor price, physical capital price, borrowed funds price). Therefore, we estimate the following cost function model:

$$ln(C) = \alpha + \beta_1 ln(Q) + \beta_2 \left[ln(Q)\right]^2 + \sum_{j=1}^{3} \gamma_j ln(W_j) + \sum_{j=1}^{3}\sum_{k=1}^{3} \gamma_{j,k} ln(W_j) ln(W_k) +$$

$$+ \sum_{j=1}^{3} \delta_j ln(W_j) ln(Q) + IFRS + FOREIGN + fixed\ effects\ + \varepsilon$$

where *C* is the total operating costs (interest, personnel, administrative, and other operating expense), *Q* is the bank total assets, W_1 is the ratio of personnel expense to total assets, W_2 is the ratio of other non-interest expenses to fixed assets, W_3 is the ratio of interest paid on customer deposits and short-term funding. We also control for the set of accounting standards in force (*IFRS*) by using a dummy equal to 1 if a bank reports according to IFRS (and 0 otherwise), and for non-domestic banks (*FOREIGN*) by using a dummy, equals to 1 if a bank has foreign ownership (and 0 otherwise).[13]

[13] In some countries (e.g., Denmark, France, Germany, Israel, and Mexico) banks can report according to local GAAP.

We also impose the following constraints for homogeneity (De Cesari, Gilder, Huang, & Onali, 2019):

$$\gamma_1 + \gamma_2 + \gamma_3 = 1$$
$$\gamma_{1,1} + \gamma_{1,2} + \gamma_{1,3} = 0$$
$$\gamma_{2,2} + \gamma_{2,1} + \gamma_{2,3} = 0$$
$$\gamma_{3,3} + \gamma_{3,1} + \gamma_{3,2} = 0$$
$$\delta_1 + \delta_2 + \delta_3 = 0$$

The estimated coefficients ($\beta_1, \beta_2, \delta_1, \delta_2, \delta_3$) of the above equation are then employed to obtain the marginal costs, such that:

$$MC = \frac{C}{Q}\left[\beta_1 + 2\beta_2 ln(Q) + \sum_{j=1}^{3}\delta_j ln(W_j)\right]$$

Since a higher LI means greater market power, or lower competition, we multiply it by -1 so higher values imply greater competition.

Herfindahl–Hirschman Index (HHI):

The HHI is given by a summation over the squares of market shares (measured by total assets of the bank) for all banks in a country-year, as follows:[14]

$$HHI = \sum_{i=1}^{n} s_i^2$$

where s_i is the market share of bank *i* in respect to the book value of bank total assets, and *n* is the annual number of active banks in the economy.[15] As with LI, we multiply HHI by -1 to obtain a measure that captures lower concentration rate (or higher level of competition).

Note that since our measure of competition in this paper derives both from the perspective of market competition (LI) and market concentration (HHI), it is important to understand the reciprocation between these two perspectives. Factually, prior literature has

[14] The US Department of Justice regards HHI between 0.15 and 0.25 as an indicator of moderate concentration and HHI above 0.25 as highly concentrated (see: https://www.justice.gov/atr/herfindahl-hirschman-index).
[15] Previous research usually used either: (1) bank's total assets, (2) bank's loans, or (3) bank's deposits from customers as an estimator of the bank's market share (s_i).

found conflicting results. For example, Bikker & Haaf (2002) suggest an inverse relationship between competition and concentration, based on the assumption that the more centralized the market, the less need for cartelistic pacts between other banks in the market, hence competition level is lower. However, other papers have argued that concentration is a poor proxy for competition (Shaffer, 2004; Berger, Demirgüç-Kunt, Levine, & Haubrich, 2004; Claessens & Laeven 2004; Casu & Girardone, 2006; Bremus, 2015). The reason for that is that market concentration ignores an important feature of the competitive pressures facing banks, therefore does not always consistent with market competition (for example, in a market with large numbers of firms and weak regulation, we would expect low concentration and low competition to co-exist).

Table 1: Variable definitions

Variable Name	Description
Dependent variables	
LLP	Loan loss provision scaled by beginning total assets.
UELLP	Unexpected component of *LLP* (reflecting bank managers' subjective judgement in determining *LLP*) estimated as the residual of equation 1 (see Table 4).
MV	Natural logarithm of market value of equity measured three months after financial statements release date
PB	Price-to-book (P/B ratio), calculated as equity market value three months after financial statements release date divided by book value of equity.
NCO	Net charge-offs scaled by beginning total assets.
NPL	Non-performing loans scaled by beginning total assets.
Independent variables	
CAP	Bank total capital ratio.
CPI	Annual inflation rate.
ELLP	Expected component of *LLP* (reflecting the fundamental accounting measure of loan loss provision), estimated as the fitted value of equation 1 (see Table 4).
EQR	Total equity over total assets.
FOREIGN	Dummy indicator for non-domestic banks (equals to 1 if a bank has foreign ownership and 0 otherwise).
HHI	The Herfindahl-Hirschman index ($\mathrm{HHI} = \sum_{i=1}^{n} s_i^2$). s_i represents the market share in total assets of bank i in a given year. See the Appendix for further details.
IFRS	Dummy indicator for the set of accounting standards in force (equals to 1 if a bank reports according to IFRS and 0 otherwise).
IMP	Impaired loans over total equity.
INEF	Operating expenses over operating income.
LI	The Lerner index ($\mathrm{LI} = \frac{P-MC}{P}$). P is the equilibrium product price for the bank, and MC is bank marginal cost. See the Appendix for further details.
LOAN	Gross loans scaled by beginning total assets.
LOSS	Dummy indicator for banks with a negative income (equals to 1 if a bank reports on a loss and 0 otherwise).
LR	Total liabilities over total assets.
NI	Net income before loan loss provision scaled by beginning total assets.
ROE	Net income over total equity.
SIZE	Natural logarithm of total assets book value.
Z	An indicator of bank stability, measures by the sum of bank return on assets (ROA) and its shareholder equity ratio (*EQR*) over the standard deviation of ROA.
*TIER*1	Ratio of Tier 1 capital to risk weighted assets.
ΔGDP	Annual change in GDP.
ΔLOAN	Change in *LOAN* scaled by beginning total assets.
ΔNI	Change in *NI* scaled by beginning total assets.
ΔNPL	Change in *NPL* scaled by beginning total assets.
ΔUNEMP	Annual change in unemployment rates.

This table provides notations and definitions for all tested variables in the empirical models.

Table 2: Descriptive statistics

Panel A: Full sample

	N	Mean	Standard deviation	25% quantile	Median	75% quantile	Minimum	Maximum
LLP	1,333	0.006	0.010	0.001	0.003	0.008	-0.012	0.163
UELLP	676	0.000	0.002	-0.001	0.000	0.001	-0.011	0.019
MV	1,210	13.997	2.366	12.251	14.195	15.719	7.828	18.864
PB	1,210	1.207	1.173	0.552	0.882	1.481	-0.431	10.882
NPL	1,319	0.044	0.068	0.006	0.018	0.050	0.000	0.663
NCO	1,155	0.001	0.006	0.000	0.001	0.002	-0.050	0.055
CAP	1,233	0.169	0.050	0.139	0.157	0.184	0.095	0.402
CPI	1,539	0.022	0.030	0.005	0.012	0.024	-0.017	0.163
ELLP	676	0.006	0.009	0.001	0.003	0.008	-0.007	0.158
EQR	1,539	0.142	0.166	0.062	0.086	0.135	0.018	0.898
HHI	1,539	0.161	0.069	0.100	0.147	0.217	0.080	0.349
IMP	1,341	0.496	0.856	0.066	0.195	0.503	0.000	9.011
INEF	1,535	0.630	2.307	0.535	0.649	0.778	-65.561	38.353
LI	1,390	0.455	0.230	0.335	0.494	0.622	0.000	0.867
LOAN	1,425	0.596	0.256	0.443	0.656	0.779	0.009	0.986
LR	1,539	0.857	0.169	0.866	0.914	0.938	0.006	1.033
NI	1,333	0.014	0.016	0.005	0.011	0.019	-0.035	0.091
ROE	1,539	0.055	0.245	0.032	0.080	0.124	-5.507	2.198
SIZE	1,539	16.377	2.503	14.630	16.501	18.097	7.530	21.536
Z	1,539	42.325	46.348	13.447	29.523	54.368	0.195	313.218
*TIER*1	1,103	0.151	0.068	0.116	0.137	0.168	0.034	0.954
ΔGDP	1,539	0.022	0.020	0.013	0.021	0.029	-0.073	0.085
ΔLOAN	1,422	0.030	0.084	-0.009	0.017	0.058	-0.220	0.265
ΔNI	1,314	0.001	0.012	-0.001	0.000	0.003	-0.060	0.061
ΔNPL	1,293	0.001	0.024	-0.002	0.000	0.003	-0.345	0.246
ΔUNEMP	1,539	-0.001	0.008	-0.005	-0.002	0.001	-0.022	0.066

This panel reports the descriptive statistics of the variables used in this study. See Table 1 for variable definitions.

Panel B: Average statistics by country

	Banks	**N**	***LLP***	***NCO***	***NPL***	***LOAN***	***NI***	***SIZE***	***EQR***	***CAP***	***MV***	***PB***	***LI***	***HHI***
Australia	12	76	0.002	0.001	0.010	0.720	0.010	17.596	0.108	0.129	16.025	1.513	0.665	0.181
Austria	9	60	0.003	0.000	0.032	0.693	0.008	16.598	0.089	0.155	13.449	0.678	0.359	0.108
Canada	16	104	0.002	0.001	0.003	0.716	0.012	17.143	0.136	0.147	14.945	1.290	0.515	0.145
Denmark	24	161	0.009	0.002	0.094	0.646	0.016	14.289	0.124	0.180	11.821	0.842	0.433	0.275
France	12	78	0.002	0.001	0.029	0.596	0.006	17.252	0.062	0.136	16.123	0.625	0.499	0.085
Germany	10	66	0.006	0.000	0.009	0.352	0.007	16.431	0.241	0.200	13.754	1.577	0.287	0.160
Greece	6	42	0.024	0.011	0.305	0.773	0.013	17.089	0.115	0.145	13.521	0.323	0.471	0.243
Israel	8	54	0.001	0.002	0.009	0.691	0.006	16.921	0.067	0.155	13.911	0.770	0.427	0.220
Italy	25	166	0.007	-0.005	0.082	0.557	0.011	17.019	0.089	0.167	14.350	1.534	0.504	0.127
Mexico	15	99	0.012	0.006	0.011	0.496	0.027	16.670	0.119	0.149	14.543	1.847	0.373	0.099
Netherlands	7	47	0.001	0.002	0.013	0.422	0.005	17.670	0.103	0.221	14.802	0.783	0.448	0.263
Poland	13	86	0.007	0.004	0.058	0.749	0.016	16.433	0.111	0.156	14.287	1.251	0.525	0.087
Slovakia	5	33	0.007	0.005	0.061	0.801	0.011	15.214	0.090	0.157	11.519	0.505	0.454	0.171
Sweden	6	35	0.005	0.002	0.022	0.533	0.017	17.629	0.069	0.192	15.593	3.057	0.623	0.325
Switzerland	18	123	0.001	0.002	0.006	0.412	0.008	16.048	0.198	0.212	14.093	1.412	0.302	0.205
Turkey	29	176	0.007	0.000	0.022	0.536	0.024	15.417	0.244	0.153	13.386	0.828	0.434	0.081
United Kingdom	23	133	0.004	0.003	0.026	0.660	0.013	16.548	0.215	0.199	14.953	1.515	0.465	0.166
Total	**238**	**1,539**												

This table provides average statistics of the main variables for all countries in our sample. All variables in each country are averaged within the years 2012-2018. Banks is the number of active banking groups in each country. N is the number of total observations per country in all years. Table 1 provides variable definitions. Both competition indices (*LI* and *HHI*) are in actual values, such that higher (lower) index value indicates a lower (higher) level of market competition.

Panel C: Variable means and medians by high/low market power

Level of market power	High	Low			High	Low		
	Mean	Mean	Difference	*p*-value	Median	Median	Difference	*p*-value
LLP	0.007	0.005	0.002	0.013	0.003	0.001	0.002	0.000
UELLP	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.084
ELLP	0.006	0.005	0.001	0.060	0.003	0.002	0.002	0.002
NCO	0.002	0.001	0.001	0.006	0.001	0.000	0.001	0.000
NPL	0.049	0.044	0.005	0.245	0.021	0.017	0.005	0.041
ΔNPL	0.004	-0.002	0.006	0.000	0.000	0.000	0.001	0.000
LOAN	0.682	0.525	0.157	0.000	0.716	0.586	0.130	0.000
ΔLOAN	0.035	0.022	0.013	0.007	0.020	0.014	0.006	0.035
NI	0.014	0.010	0.004	0.000	0.011	0.008	0.003	0.000
ΔNI	0.002	0.000	0.002	0.013	0.001	0.000	0.001	0.000
SIZE	17.169	15.758	1.411	0.000	17.194	15.424	1.770	0.000
EQR	0.095	0.173	-0.078	0.000	0.076	0.090	-0.014	0.000
CAP	0.163	0.179	-0.016	0.000	0.153	0.163	-0.010	0.000
ROE	0.083	0.012	0.071	0.000	0.094	0.056	0.038	0.000
INEF	0.571	0.696	-0.125	0.338	0.560	0.751	-0.192	0.000
LR	0.905	0.827	0.078	0.000	0.924	0.910	0.014	0.000
IMP	0.576	0.477	0.100	0.045	0.245	0.187	0.058	0.007
MV	14.823	13.241	1.582	0.000	14.863	13.192	1.671	0.000
PB	1.354	0.984	0.370	0.000	1.017	0.726	0.291	0.000
LI	0.636	0.274	0.362	0.000	0.622	0.335	0.287	0.000
HHI	0.160	0.170	-0.010	0.006	0.146	0.166	-0.020	0.000

This table provides univariate analyses of differences in the means and medians of two subsamples based on a split above and below the median of the *LI* index. Table 1 provides variable definitions. Both competition indices (*LI* and *HHI*) are in actual values, such that higher (lower) index value indicates a lower (higher) level of market competition.

Table 3: Correlation matrix

	LLP	*UELLP*	*ELLP*	*NCO*	*NPL*	*ΔNPL*	*LOAN*	*ΔLOAN*	*NI*	*ΔNI*	*SIZE*	*EQR*	*CAP*	*ROE*	*INEF*	*LR*	*IMP*	*MV*	*MB*	*LI*
UELLP	**0.268**																			
ELLP	**0.963**	0.000																		
NCO	**0.243**	0.000	**0.211**																	
NPL	**0.594**	-0.001	**0.627**	**0.116**																
ΔNPL	**0.301**	0.001	**0.385**	0.034	**0.180**															
LOAN	**0.200**	0.000	**0.246**	**0.092**	**0.317**	**0.125**														
ΔLOAN	-0.022	0.000	**-0.083**	-0.006	**-0.118**	**0.246**	**0.414**													
NI	**0.294**	0.000	**0.465**	**0.128**	**0.135**	**0.153**	**0.075**	**0.147**												
ΔNI	**0.150**	0.000	**0.183**	**0.064**	0.030	**0.176**	0.030	**0.095**	**0.422**											
SIZE	**-0.148**	-0.001	**-0.163**	-0.022	**-0.149**	-0.031	-0.024	**-0.121**	**-0.212**	0.013										
EQR	0.016	**-0.085**	**0.254**	0.022	-0.023	-0.028	-0.372	-0.073	**0.464**	-0.019	-0.515									
CAP	**-0.216**	-0.044	**-0.207**	-0.033	**-0.160**	-0.050	**-0.396**	**-0.060**	0.016	-0.031	**-0.197**	**0.448**								
ROE	**-0.299**	**-0.249**	**-0.374**	**-0.131**	**-0.240**	-0.044	0.013	**0.072**	**0.344**	**0.262**	**0.087**	-0.009	**0.115**							
INEF	0.009	-0.069	0.019	-0.038	0.017	**0.091**	-0.011	**0.095**	**-0.157**	**-0.115**	0.001	**-0.054**	**0.132**	0.023						
LR	-0.012	**0.085**	**-0.254**	-0.019	0.026	0.028	**0.372**	**0.073**	**-0.464**	0.023	**0.514**	**-0.999**	**-0.449**	0.009	**0.054**					
IMP	**0.516**	**0.107**	**0.562**	**0.079**	**0.832**	**0.120**	**0.271**	**-0.196**	-0.026	-0.017	-0.041	**-0.136**	**-0.219**	**-0.478**	0.005	**0.135**				
MV	**-0.219**	-0.035	**-0.242**	-0.020	**-0.301**	0.013	**-0.116**	-0.034	-0.057	0.020	**0.908**	**-0.303**	-0.049	**0.195**	0.000	**0.302**	**-0.229**			
PB	**-0.080**	-0.018	**-0.156**	0.037	**-0.262**	0.058	**-0.204**	**0.212**	**0.189**	0.043	**-0.097**	0.015	**0.237**	**0.079**	0.027	-0.015	**-0.261**	**0.152**		
LI	0.040	**0.079**	**0.085**	0.049	0.052	**0.092**	**0.466**	**0.075**	**0.084**	**0.087**	**0.393**	**-0.464**	**-0.274**	**0.208**	-0.016	**0.464**	**0.076**	**0.390**	**0.095**	
HHI	0.014	0.000	-0.015	**0.098**	**0.216**	0.008	0.001	**-0.081**	**-0.114**	0.028	**-0.077**	**-0.071**	**0.244**	-0.042	-0.025	**0.072**	**0.130**	**-0.151**	0.014	-0.013

This table provides Pearson correlations for the main variables during the years 2012-2018. Table 1 provides variable definitions. Bold face indicates correlations that are significant at 5%, or better.

Table 4: The determinants of the loan loss provision

$$LLP_{it} = \alpha_0 + \alpha_1 NCO_{it} + \alpha_2 NPL_{it} + \alpha_3 \Delta NPL_{it} + \alpha_4 \Delta NPL_{it-1} + \alpha_5 \Delta NPL_{it-2} + \alpha_6 \Delta LOAN_{it} + \alpha_7 NI_{it} + \alpha_8 \Delta NI_{it} + \\ + \alpha_9 CAP_{it-1} + \alpha_{10} SIZE_{it-1} + \Delta GDP_{jt} + CPI_{jt} + \Delta UNEMP_{jt} + Year_t + \varepsilon_{it}$$

Dependent variable	***LLP***
Intercept	0.009
	(0.879)
NCO_t	0.415***
	(3.454)
NPL_t	0.057***
	(3.048)
ΔNPL_t	0.037
	(1.569)
ΔNPL_{t-1}	-0.024
	(-0.533)
ΔNPL_{t-2}	0.008
	(0.244)
$\Delta LOAN_t$	-0.000
	(-0.136)
NI_t	0.253**
	(2.708)
ΔNI_t	-0.044
	(-1.247)
CAP_{t-1}	-0.039
	(-1.247)
$SIZE_{t-1}$	-0.000
	(-0.647)
ΔGDP_t	-0.130
	(-0.945)
CPI_t	0.025
	(0.565)
$\Delta UNEMP_t$	0.030
	(0.167)
Year FE	YES
Country FE	NO
R-squared	0.489
N	17 Country-level Regressions (676 observations)

This table reports results for the first-stage regression. The dependent variable is loan loss provision (*LLP*). All explanatory variables are defined in Table 1. *UELLP* and *ELLP* are given by aggregation of residuals and fitted values, respectively, of estimating the model for each country separately (Fama & McBeth, 1973). Standard errors are clustered at the bank level. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Table 5: Unexpected loan loss provision (*UELLP*) and competition

$$UELLP_{it} = \beta_0 + \beta_1 COMP_{it} + \beta_2 SIZE_{it} + \beta_3 EQR_{it} + \beta_4 ROE_{it} + \beta_5 LOSS_{it} + \beta_6 IFRS_{it} + \beta_7 FOREIGN_{it} + fixed\ effects + u_{it}$$

Dependent variable	***UELLP***			
COMP	**-**	***LI***	***HHI***	***LI* and *HHI***
	(1)	**(2)**	**(3)**	**(4)**
Intercept	0.001**	-0.001	0.001	-0.000
	(2.083)	(-1.376)	(1.425)	(-0.539)
LI_t		-0.003***		-0.002***
		(-3.371)		(-3.634)
HHI_t			0.000	-0.001
			(0.081)	(-0.415)
$SIZE_t$	-0.001*	-0.001**	-0.001*	-0.001**
	(-1.788)	(-2.158)	(-1.821)	(-2.199)
EQR_t	-0.005	-0.003	-0.006*	-0.006*
	(-1.197)	(-0.757)	(-1.899)	(-1.966)
ROE_t	-0.004	-0.004	-0.003	-0.003
	(-1.567)	(-1.528)	(-1.607)	(-1.521)
$LOSS_t$	0.001	0.001**	0.001	0.001*
	(1.451)	(2.096)	(1.321)	(1.874)
IFRS	-0.001	-0.000	-0.000	-0.000
	(-1.267)	(-0.768)	(-1.142)	(-1.256)
FOREIGN	0.000	0.000	0.000	0.000
	(0.721)	(0.649)	(0.850)	(0.655)
Year FE	YES	YES	YES	YES
Country FE	YES	YES	NO	NO
Adj. R-squared	0.053	0.078	0.067	0.083
N	676	633	676	633

This table reports results for the second-stage regression for the relationship between market competition and unexpected loan loss provision. The dependent variable is *UELLP*, which is the residual of the model reported in Table 4. All explanatory variables are defined in Table 1. Standard errors are clustered at the bank level. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Table 6: Market value, price-to-book and loan loss provision

$$MV_{it} \text{ or } PB_{it} = \gamma_0 + \gamma_1 COMP_{it} + \gamma_2 UELLP_{it} + \gamma_3 UELLP_{it} \times COMP_{it} + \gamma_4 ELLP_{it} + \gamma_5 ELLP_{it} \times COMP_{it} + \gamma_6 NI_{it} + \gamma_7 EQR_{it} + \\ + \gamma_8 IFRS_{it} + \gamma_9 FOREIGN_{it} + \text{fixed effects} + v_{it}$$

Dependent variable	***MV***			***PB***		
COMP	***LI***	***HHI***	***LI and HHI***	***LI***	***HHI***	***LI and HHI***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Intercept	14.474***	17.313***	15.619***	0.781*	1.914***	1.144***
	(10.863)	(21.940)	(15.241)	(1.704)	(3.835)	(2.756)
LI_t	-2.407**		-2.728***	-1.164*		-1.225**
	(-2.049)		(-2.797)	(-1.739)		(-2.435)
HHI_t		7.079***	6.622**		2.453*	2.134
		(2.622)	(2.486)		(1.822)	(1.569)
$UELLP_t$	8.822	-147.827	-106.994	-16.074	-11.163	-20.465
	(0.098)	(-1.504)	(-0.725)	(-0.300)	(-0.345)	(-0.245)
$UELLP_t*LI_t$	99.032		15.198	-7.599		-4.552
	(0.481)		(0.072)	(-0.069)		(-0.035)
$UELLP_t*HHI_t$		-406.429	-254.213		5.149	-45.357
		(-0.896)	(-0.572)		(0.037)	(-0.279)
$ELLP_t$	-73.225	-145.267**	-232.682***	11.505	-94.574**	-32.116
	(-1.281)	(-2.283)	(-2.950)	(0.333)	(-2.300)	(-0.990)
$ELLP_t*LI_t$	-78.310		-119.460	88.190		146.725**
	(-0.770)		(-0.952)	(1.109)		(2.207)
$ELLP_t*HHI_t$		-442.963	-580.127**		-285.066*	-319.354**
		(-1.586)	(-2.128)		(-1.751)	(-2.007)
NI_t	-6.907	28.423**	-2.975	36.614***	38.564***	38.542***
	(-0.480)	(2.343)	(-0.216)	(2.672)	(3.727)	(3.263)
EQR_t	-10.171**	-27.082***	-20.229***	-3.523	-5.756	-4.535
	(-2.029)	(-5.384)	(-4.013)	(-0.787)	(-1.521)	(-1.266)
$IFRS_t$	1.499***	1.121**	1.057**	-0.036	-0.051	-0.019
	(2.796)	(2.445)	(2.196)	(-0.213)	(-0.380)	(-0.146)
$FOREIGN_t$	0.506	0.399	0.361	0.107	0.217*	0.206
	(0.868)	(0.794)	(0.763)	(0.641)	(1.666)	(1.594)
Year FE	YES	YES	YES	YES	YES	YES
Country FE	YES	NO	NO	YES	NO	NO
Adj. R-squared	0.536	0.268	0.330	0.272	0.191	0.231
N	527	545	527	527	545	527

This table reports results for the valuation model. The dependent variable is given by: (1) the natural log of bank equity market value three months after financial statements release date (*MV*). (2) price-to-book (*P/B* ratio), calculated as the equity market value three months after financial statements release date divided by book value of equity (*PB*). *UELLP* and *ELLP* are, respectively, the unexpected and non-unexpected component of *LLP*, as estimated by the residuals and fitted values in Table 4. All explanatory variables are defined in Table 1. Standard errors are clustered at the bank level. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Table 7: The effect of market competition on future non-performing loans (NPL) and net charge-offs (NCO)

Panel A: Market competition and future NPL

$$NPL_{it+1/t+2/t+3} = \delta_0 + \delta_1 COMP_{it} + \delta_2 UELLP_{it} + \delta_3 UELLP_{it} \times COMP_{it} + \delta_4 GDP_t + \delta_5 UNEMP_t + \delta_6 Z_{it} + \delta_7 ROE_{it} + \delta_8 INEF_{it} + \delta_9 NII_{it} + \delta_{10} LR_{it} + \delta_{11} IMP_{it} + \delta_{12} IFRS_{it} + \delta_{13} FOREIGN_{it} + \\ + fixed\ effects + \varepsilon_{it}$$

Dependent variable	***NPL$_{t+1}$***			***NPL$_{t+2}$***			***NPL$_{t+3}$***		
COMP	***LI***	***HHI***	***LI and HHI***	***LI***	***HHI***	***LI and HHI***	***LI***	***HHI***	***LI and HHI***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Intercept	0.344***	0.456***	0.481***	0.175***	0.307***	0.417***	0.111*	0.301***	0.316***
	(7.084)	(10.172)	(10.065)	(2.906)	(6.047)	(7.115)	(1.782)	(4.511)	(4.533)
LI_t	-0.010		-0.049***	0.016		-0.040**	-0.012		-0.073***
	(-0.679)		(-3.522)	(0.857)		(-2.206)	(-0.526)		(-2.919)
HHI_t		-0.079***	-0.074***		-0.056*	-0.058*		-0.042	-0.044
		(-3.290)	(-2.850)		(-1.872)	(-1.810)		(-1.050)	(-1.032)
$UELLP_t$	-0.589	-3.455**	-5.242*	2.373	-2.629	-2.044	3.183	-0.783	-2.893
	(-0.313)	(-2.173)	(-1.696)	(1.022)	(-1.368)	(-0.528)	(1.222)	(-0.324)	(-0.575)
$UELLP_t$*LI_t	-1.199		-1.786	3.568		3.281	0.709		-2.230
	(-0.327)		(-0.393)	(0.805)		(0.589)	(0.145)		(-0.327)
$UELLP_t$*HHI_t		-17.081*	-21.299**		-15.428	-19.306		-5.096	-11.296
		(-1.874)	(-2.169)		(-1.406)	(-1.631)		(-0.376)	(-0.741)
ΔGDP_t	-0.221	-0.388***	-0.546***	-0.242	-0.495***	-0.652***	-0.332	-0.319*	-0.545***
	(-1.202)	(-3.367)	(-4.370)	(-1.045)	(-3.282)	(-4.115)	(-0.882)	(-1.804)	(-2.781)
$\Delta UNEMP_t$	-0.558	-1.532***	-1.679***	0.429	-1.273***	-1.364***	1.442*	-1.159***	-1.278***
	(-1.134)	(-5.623)	(-5.982)	(0.732)	(-4.038)	(-4.244)	(1.968)	(-3.092)	(-3.329)
Z_t	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	-0.000**	-0.000**	-0.000**
	(-3.573)	(-4.270)	(-3.999)	(-3.090)	(-3.565)	(-3.802)	(-2.168)	(-2.454)	(-2.121)
ROE_t	0.079***	0.064***	0.063***	0.074***	0.066***	0.047**	0.148***	-0.013	0.002
	(4.713)	(3.282)	(3.120)	(4.018)	(3.065)	(2.107)	(4.517)	(-0.315)	(0.054)
$INEF_t$	0.012	-0.019*	0.021	-0.024	-0.017	-0.000	0.045	-0.041*	0.025
	(0.766)	(-1.832)	(1.249)	(-1.199)	(-1.421)	(-0.007)	(1.604)	(-1.839)	(0.749)

Panel A: Market competition and future NPL (cont.)

NII_t	-0.003***	-0.003***	-0.003***	-0.005***	-0.005***	-0.005**	-0.009***	-0.006**	-0.006*
	(-3.345)	(-3.339)	(-3.037)	(-3.132)	(-2.720)	(-2.445)	(-3.729)	(-2.074)	(-1.944)
LR_t	-0.372***	-0.484***	-0.557***	-0.145**	-0.309***	-0.451***	-0.156**	-0.282***	-0.378***
	(-7.170)	(-10.313)	(-10.864)	(-2.207)	(-5.661)	(-7.043)	(-2.160)	(-3.837)	(-4.586)
IMP_t	0.054***	0.066***	0.065***	0.046***	0.059***	0.056***	0.046***	0.054***	0.054***
	(23.307)	(27.176)	(25.924)	(17.777)	(21.033)	(19.066)	(14.047)	(13.382)	(12.911)
$IFRS_t$	-0.002	0.007*	0.001	-0.003	0.006	0.001	0.002	0.007	0.001
	(-0.432)	(1.763)	(0.163)	(-0.403)	(1.147)	(0.140)	(0.195)	(1.174)	(0.179)
$FOREIGN_t$	-0.001	-0.000	0.000	-0.007	-0.002	-0.002	-0.008	-0.005	-0.005
	(-0.297)	(-0.058)	(0.059)	(-1.213)	(-0.308)	(-0.385)	(-1.236)	(-0.652)	(-0.625)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	NO	NO	YES	NO	NO	YES	NO	NO
Adj. R-squared	0.875	0.806	0.807	0.854	0.759	0.766	0.866	0.730	0.735
N	499	532	499	368	392	368	240	253	240

This table reports results for the forward-looking model. The dependent variable (*NPL*) is the non-performing loans, scaled by beginning total assets. *UELLP* and *ELLP* are, respectively, the unexpected and non-unexpected component of *LLP*, as estimated by the residuals and fitted values of the equation in Table 4. All explanatory variables are defined in Table 1. Standard errors are clustered at the bank level. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Panel B: Market competition and future NCO

$$NCO_{it+1/t+2/t+3} = \delta_0 + \delta_1 COMP_{it} + \delta_2 UELLP_{it} + \delta_3 UELLP_{it} \times COMP_{it} + \delta_4 GDP_t + \delta_5 UNEMP_t + \delta_6 Z_{it} + \delta_7 ROE_{it} + \delta_8 INEF_{it} + \delta_9 NII_{it} + \delta_{10} LR_{it} + \delta_{11} IMP_{it} + \delta_{12} IFRS_{it} + \delta_{13} FOREIGN_{it} + \\ + fixed\ effects + \varepsilon_{it}$$

Dependent variable	***NCO$_{t+1}$***			***NCO$_{t+2}$***			***NCO$_{t+3}$***		
COMP	***LI***	***HHI***	***LI and HHI***	***LI***	***HHI***	***LI and HHI***	***LI***	***HHI***	***LI and HHI***
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Intercept	0.022**	0.045***	0.039***	0.024*	0.061***	0.054***	0.024	0.057***	0.056***
	(2.174)	(5.094)	(4.332)	(1.840)	(5.303)	(4.599)	(1.265)	(3.261)	(3.125)
LI_t	0.000		-0.007***	-0.004		-0.012***	-0.001		-0.013**
	(0.114)		(-2.670)	(-0.951)		(-3.543)	(-0.093)		(-2.284)
HHI_t		-0.005	-0.010**		-0.012**	-0.019***		-0.023**	-0.027***
		(-1.056)	(-2.171)		(-1.990)	(-3.055)		(-2.354)	(-2.695)
$UELLP_t$	-1.158***	-0.485	-1.734***	-0.339	-0.223	-0.250	-0.361	-1.035*	-1.509
	(-2.957)	(-1.584)	(-3.062)	(-0.708)	(-0.586)	(-0.338)	(-0.517)	(-1.810)	(-1.320)
$UELLP_t$*LI_t	-1.786**		-1.742**	-0.561		0.051	-0.131		-0.461
	(-2.348)		(-2.092)	(-0.613)		(0.048)	(-0.099)		(-0.295)
$UELLP_t$*HHI_t		-1.463	-3.250*		-0.355	-0.666		-2.701	-4.056
		(-0.832)	(-1.794)		(-0.165)	(-0.296)		(-0.865)	(-1.185)
ΔGDP_t	0.011	0.009	0.010	-0.099**	-0.053*	-0.069**	0.093	-0.012	-0.044
	(0.280)	(0.417)	(0.427)	(-2.039)	(-1.771)	(-2.244)	(0.906)	(-0.289)	(-0.965)
$\Delta UNEMP_t$	-0.168	-0.405***	-0.418***	-0.013	-0.374***	-0.379***	0.576***	-0.316***	-0.329***
	(-1.632)	(-7.751)	(-8.105)	(-0.104)	(-6.042)	(-6.155)	(2.844)	(-3.628)	(-3.725)
Z_t	0.000	0.000	0.000	0.000	-0.000	0.000	0.000	-0.000	0.000
	(0.406)	(0.337)	(0.676)	(1.040)	(-0.477)	(0.553)	(0.545)	(-0.068)	(0.294)
ROE_t	-0.012***	-0.018***	-0.018***	-0.007*	-0.014***	-0.013***	-0.015	-0.039***	-0.036***
	(-3.520)	(-4.658)	(-4.807)	(-1.827)	(-3.142)	(-2.933)	(-1.627)	(-3.913)	(-3.522)
$INEF_t$	-0.008**	-0.005***	-0.003	0.001	-0.007***	0.006	-0.006	-0.013**	-0.001
	(-2.576)	(-2.614)	(-0.980)	(0.231)	(-2.717)	(1.536)	(-0.738)	(-2.414)	(-0.072)

Panel B: Market competition and future NCO (cont.)

NII_t	0.000	-0.000	-0.000	0.001	-0.001*	-0.001	0.001	-0.000	-0.000
	(1.455)	(-1.028)	(-0.646)	(1.351)	(-1.951)	(-1.425)	(1.007)	(-0.610)	(-0.475)
LR_t	-0.016	-0.041***	-0.042***	-0.024*	-0.058***	-0.068***	-0.023	-0.049**	-0.065***
	(-1.425)	(-4.461)	(-4.400)	(-1.691)	(-4.730)	(-5.276)	(-1.053)	(-2.585)	(-3.072)
IMP_t	-0.001**	-0.002***	-0.002***	-0.002***	-0.003***	-0.002***	-0.003***	-0.004***	-0.004***
	(-2.048)	(-3.918)	(-3.701)	(-4.032)	(-4.506)	(-4.315)	(-3.680)	(-4.159)	(-3.979)
$IFRS_t$	-0.001	-0.002***	-0.001	-0.000	-0.002*	-0.001	-0.001	-0.001	-0.001
	(-0.427)	(-2.718)	(-1.079)	(-0.207)	(-1.677)	(-0.617)	(-0.529)	(-0.792)	(-0.595)
$FOREIGN_t$	-0.002	0.001	-0.001	-0.001	0.001	0.000	-0.001	0.001	0.001
	(-1.577)	(0.537)	(-0.585)	(-0.954)	(0.725)	(0.301)	(-0.595)	(0.652)	(0.378)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country FE	YES	NO	NO	YES	NO	NO	YES	NO	NO
Adj. R-squared	0.338	0.187	0.207	0.416	0.185	0.196	0.424	0.167	0.177
N	488	519	488	354	374	354	227	238	227

This table reports results for the forward-looking model. The dependent variable (*NCO*) is the net charge-offs, scaled by beginning total assets. *UELLP* and *ELLP* are, respectively, the unexpected and non-unexpected component of *LLP*, as estimated by the residuals and fitted values of the equation in Table 4. All explanatory variables are defined in Table 1. Standard errors are clustered at the bank level. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Table 8: Alternative estimation of the loan loss provision (single regression approach)

$$LLP_{it} = \alpha_0 + \alpha_1 COMP_{it} + \alpha_2 EQR_{it} + \alpha_3 ROE_{it} + \alpha_4 LOSS_{it} + \alpha_5 NCO_{it} + \alpha_6 NPL_{it} + \alpha_7 \Delta NPL_{it} + \alpha_8 \Delta NPL_{it-1} + \\ + \alpha_9 \Delta NPL_{it-2} + \alpha_{10} \Delta LOAN_{it} + \alpha_{11} NI_{it} + \alpha_{12} \Delta NI_{it} + \alpha_{13} SIZE_{it-1} + \alpha_{14} IFRS_{it} + \alpha_{15} FOREIGN_{it} + fixed\ effects + \varepsilon_{it}$$

Dependent variable	***LLP***
Intercept	0.004
	(1.477)
LI_t	-0.005***
	(-3.535)
HHI_t	0.004
	(1.178)
EQR_t	-0.027**
	(-2.455)
ROE_t	-0.032***
	(-3.828)
$LOSS_t$	0.003**
	(2.188)
NCO_t	-0.020
	(-0.398)
NPL_t	0.040***
	(6.603)
ΔNPL_t	0.086
	(1.593)
ΔNPL_{t-1}	-0.011
	(-0.320)
ΔNPL_{t-2}	0.021
	(1.396)
$\Delta LOAN_t$	-0.004
	(-1.587)
NI_t	0.363***
	(4.991)
ΔNI_t	0.094
	(1.091)
$SIZE_{t-1}$	-0.000
	(-1.396)
$IFRS_t$	-0.000
	(-0.483)
$FOREIGN_t$	0.001
	(1.587)
Year FE	YES
Country FE	NO
Adj. R-squared	0.749
N	687

This table reports results for the one-step approach advocated by Chen et al. (2018) and Christodoulou et al. (2018). The dependent variable is loan loss provision (*LLP*). All explanatory variables are defined in Table 1. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Table 9: Market Value, price-to-book and loan loss provision (single regression approach)

$$MV_{it} \text{ or } PB_{it} = \beta_0 + \beta_1 COMP_{it} + \beta_2 LLP_{it} + \beta_3 LLP_{it} \times COMP_{it} + \beta_4 NI_{it} + \beta_5 EQR_{it} + \beta_6 IFRS_{it} + \beta_7 FOREIGN_{it} + \\ + \textit{fixed effects} + v_{it}$$

Dependent variable	***MV***	***PB***
	(1)	**(2)**
Intercept	12.915***	0.305
	(14.239)	(0.630)
LI_t	-2.831***	-0.635
	(-3.642)	(-1.589)
HHI_t	4.789*	-1.327
	(1.874)	(-0.664)
LLP_t	-28.498	5.285
	(-0.612)	(0.275)
LLP_t*LI_t	136.217**	58.982
	(2.008)	(1.582)
LLP_t*HHI_t	-107.303	-1.298
	(-0.576)	(-0.009)
NI_t	20.056***	17.929***
	(2.708)	(3.599)
EQR_t	-3.761**	-0.130
	(-2.365)	(-0.101)
$IFRS_t$	1.525***	0.169
	(3.707)	(1.167)
$FOREIGN_t$	-0.526	0.057
	(-1.186)	(0.365)
Year FE	YES	YES
Country FE	NO	NO
Adj. R-squared	0.295	0.081
N	994	994

This table reports results for the valuation model in the one-step approach advocated by Chen et al. (2018) and Christodoulou et al. (2018). The dependent variable is given by: (1) the natural log of bank equity market value three months after financial statements release date (*MV*). (2) price-to-book (*P/B* ratio), calculated as the equity market value three months after financial statements release date divided by book value of equity (*PB*). *UELLP* and *ELLP* are, respectively, the unexpected and non-unexpected component of *LLP*, as estimated by the residuals and fitted values in Table 4. All explanatory variables are defined in Table 1. Standard errors are clustered at the bank level. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Table 10: The effect of market competition on future non-performing loans (NPL) and net charge-offs (NCO) – single regression approach

Panel A: Market competition and future NPL

$$NPL_{it+1/t+2/t+3} = \delta_0 + \delta_1 COMP_{it} + \delta_2 LLP_{it} + \delta_3 LLP_{it} \times COMP_{it} + \delta_4 GDP_t + \delta_5 UNEMP_t + \delta_6 Z_{it} + \delta_7 ROE_{it} + \delta_8 INEF_{it} + \\ + \delta_9 NII_{it} + \delta_{10} LR_{it} + \delta_{11} IMP_{it} + \delta_{12} IFRS_{it} + \delta_{13} FOREIGN_{it} + fixed\ effects + \varepsilon_{it}$$

Dependent variable	NPL_{t+1}	NPL_{t+2}	NPL_{t+3}
	(1)	**(2)**	**(3)**
Intercept	0.213***	0.195***	0.168***
	(9.378)	(6.410)	(4.922)
LI_t	0.001	-0.004	-0.013
	(0.119)	(-0.334)	(-1.045)
HHI_t	-0.038**	-0.059**	-0.053*
	(-2.148)	(-2.408)	(-1.809)
LLP_t	-0.800**	-1.091**	-1.374***
	(-2.402)	(-2.399)	(-2.587)
LLP_t*LI_t	-2.291***	-3.941***	-4.868***
	(-3.966)	(-5.102)	(-5.527)
LLP_t*HHI_t	-8.516***	-4.475**	-2.867
	(-5.153)	(-2.051)	(-1.169)
ΔGDP_t	-0.332***	-0.445***	-0.413***
	(-5.126)	(-5.190)	(-4.304)
$\Delta UNEMP_t$	-0.829***	-0.437**	0.386*
	(-5.511)	(-2.236)	(1.719)
Z_t	-0.000***	-0.000***	-0.000*
	(-3.446)	(-2.811)	(-1.709)
ROE_t	0.103***	0.090***	0.045***
	(10.568)	(7.362)	(3.074)
$INEF_t$	0.005	0.011	0.021**
	(0.662)	(1.184)	(1.990)
NII_t	-0.002***	-0.002***	-0.002**
	(-3.725)	(-3.004)	(-2.194)
LR_t	-0.248***	-0.231***	-0.211***
	(-10.640)	(-7.292)	(-5.866)
IMP_t	0.059***	0.056***	0.055***
	(36.281)	(26.119)	(20.621)
$IFRS_t$	0.009***	0.008**	0.005
	(3.699)	(2.238)	(1.143)
$FOREIGN_t$	0.000	-0.000	0.000
	(0.070)	(-0.111)	(0.074)
Year FE	YES	YES	YES
Country FE	NO	NO	NO
Adj. R-squared	0.840	0.772	0.763
N	941	775	611

This table reports results for the forward-looking model in the one-step approach advocated by Chen et al. (2018) and Christodoulou et al. (2018). The dependent variable (*NPL*) is the non-performing loans, scaled by beginning total assets. *UELLP* and *ELLP* are, respectively, the unexpected and non-unexpected component of *LLP*, as estimated by the residuals and fitted values of the equation in Table 4. All explanatory variables are defined in Table 1. Standard errors are clustered at the bank level. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.

Panel B: Market competition and future NCO

$$NCO_{it+1/t+2/t+3} = \delta_0 + \delta_1 COMP_{it} + \delta_2 LLP_{it} + \delta_3 LLP_{it} \times COMP_{it} + \delta_4 GDP_t + \delta_5 UNEMP_t + \delta_6 Z_{it} + \delta_7 ROE_{it} + \delta_8 INEF_{it} + \\ + \delta_9 NII_{it} + \delta_{10} LR_{it} + \delta_{11} IMP_{it} + \delta_{12} IFRS_{it} + \delta_{13} FOREIGN_{it} + fixed\ effects + \varepsilon_{it}$$

Dependent variable	NCO_{t+1}	NCO_{t+2}	NCO_{t+3}
	(1)	**(2)**	**(3)**
Intercept	0.019***	0.011*	0.001
	(3.569)	(1.903)	(0.113)
LI_t	-0.000	-0.001	-0.001
	(-0.100)	(-0.256)	(-0.546)
HHI_t	-0.002	0.002	-0.001
	(-0.475)	(0.398)	(-0.095)
LLP_t	-0.842***	-0.882***	-0.256**
	(-6.405)	(-5.547)	(-1.994)
LLP_t*LI_t	-1.347***	-1.429***	-0.553***
	(-6.841)	(-6.049)	(-2.826)
LLP_t*HHI_t	-0.933**	-1.766***	-1.422***
	(-2.535)	(-4.022)	(-2.876)
ΔGDP_t	-0.024*	-0.041***	-0.011
	(-1.721)	(-2.748)	(-0.631)
$\Delta UNEMP_t$	-0.272***	-0.248***	-0.129***
	(-8.609)	(-7.223)	(-3.215)
Z_t	0.000	0.000*	0.000***
	(1.291)	(1.859)	(2.677)
ROE_t	-0.007***	-0.001	0.002
	(-3.222)	(-0.577)	(0.728)
$INEF_t$	0.001	0.005***	0.006***
	(0.525)	(2.584)	(2.747)
NII_t	-0.000	-0.000	-0.000
	(-1.493)	(-1.405)	(-0.715)
LR_t	-0.019***	-0.014**	-0.007
	(-3.465)	(-2.231)	(-1.021)
IMP_t	-0.001*	-0.002***	-0.002***
	(-1.696)	(-4.565)	(-3.866)
$IFRS_t$	-0.000	-0.000	0.001
	(-0.780)	(-0.058)	(0.963)
$FOREIGN_t$	-0.001	-0.000	0.000
	(-0.755)	(-0.378)	(0.256)
Year FE	YES	YES	YES
Country FE	NO	NO	NO
Adj. R-squared	0.171	0.204	0.141
N	845	697	555

This table reports results for the forward-looking model in the one-step approach advocated by Chen et al. (2018) and Christodoulou et al. (2018). The dependent variable (*NCO*) is the net charge-offs, scaled by beginning total assets. *UELLP* and *ELLP* are, respectively, the unexpected and non-unexpected component of *LLP*, as estimated by the residuals and fitted values of the equation in Table 4. All explanatory variables are defined in Table 1. Standard errors are clustered at the bank level. All *t*-statistics values are reported in parentheses. *, ** and *** denote significance at 10%, 5% and 1% level, respectively.