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Do cyclicality of loan-loss provisions and income smoothing matter for the capital crunch – the case of commercial banks in Poland

Małgorzata Olszak*, Iwona Kowalska#, Patrycja Chodnicka-Jaworska‡, Filip Świtała§

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Abstract

This paper examines the impact of bank capital ratios on bank lending by comparing differences in loan growth to differences in capital ratios at sets of banks that are clustered based on loan-loss provisioning practices. Using a hand-collected unique quarterly dataset (of Polish commercial banks) covering the period of 2000 Q1–2012 Q4, we find that loans growth is particularly capital constrained in poorly--capitalized banks, during both non-recessionary and recessionary periods. Lending of banks with low procyclicality of loan-loss provisions (LLP) is not affected by capital ratio in recessionary periods. Low-procyclicality of LLPs does not make poorly-capitalized banks' lending immune to recessionary capital crunch. In contrast to the common view, profit stabilizing practices achieved through income smoothing do not make banks' lending resilient to capital constraints during recession, as we find that high income smoothing banks seem to suffer from increased capital pressures in their lending. This effect is also present in well-capitalized banks. The implication of our research is that decision--makers implementing new accounting standards for loan-loss allowance (the expected credit loss approach) may not be effective in reducing the procyclicality of capital regulation if they attempt to reduce recessionary capital constraints solely through profit-stabilizing income smoothing.

Keywords: lending, capital crunch, cyclicality of loan-loss-provisions, income smoothing

JEL: G21, G28, G32, M41

* University of Warsaw, Faculty of Management, Department of Banking and Money Markets;
e-mail: molszak@wz.uw.edu.pl.
University of Warsaw, Faculty of Management, Department of Mathematical Methods and Statistics;
e-mail: ikowalska@wz.uw.edu.pl.
‡ University of Warsaw, Faculty of Management, Department of Financial System of Economy;
e-mail: pchodnicka@wz.uw.edu.pl.
§ University of Warsaw, Faculty of Management, Department of Market Economy;
e-mail: fswitala@wz.uw.edu.pl.

1 Introduction

Many contend that accounting rules fuelled the recent global financial crisis (GFC) (for the review refer to ESRB 2014 and Greenberg et al. 2013). While there is broad consensus that accounting rules are an important determinant of bank behaviour, the specific mechanisms and their interaction with capital requirements are less well understood. The timely recognition of, and provision for, credit losses should serve to promote safe and sound banking systems and plays an important role in regulation aiming to reduce the procyclicality of bank lending and procyclical effects of capital ratios (Beatty, Liao 2011).

In response to recommendations by the G20 leaders and the Basel Committee on Banking Supervision, accounting standard setters (both the International Accounting Standards Board, IASB, and the US Financial Accounting Standards Board, FASB) modified provisioning standards to incorporate forward-looking assessments in the estimation of credit losses. Currently, many countries around the world have started the process of implementation of provisioning standards that require the use of expected credit loss (ECL) models rather than fair-value accounting or incurred loss models. In the European Union, and thus in Poland, banks are implementing the provisions of IFRS 9, and thus should have the ECL model for loan-loss provisions fully adopted in several years. IFRS 9 is expected to address some banking prudential concerns (such as the issue of 'too little, too late' in the recognition of credit losses) and thus contribute to financial stability in the EU. In our study we ask about the role of loan-loss provisioning practices for the effect of capital ratio on bank lending. Considering the fact that the ECL model is expected to result in less procyclicality in loan-loss provisions (LLP) and thus in more stable level of banks' profits we ask two questions. The first is whether banks which exhibit lower procyclicality of LLP or countercyclicality of LLP, have their lending affected by capital ratio in an economically significant way compared to banks with high procyclicality of LLP. Our second question is whether banks which engage in more income smoothing exhibit a weaker effect of capital ratio on lending. Of particular interest to our study is the effect of capital ratio on lending in recessionary periods, because capital constraints in such periods are perceived as a source of undesirable procyclicality of bank lending (see e.g. Beatty, Liao 2011; Gambacorta, Marquez-Ibanez 2011; Kim, Sohn 2017).

Beatty and Liao (2011) have also analysed the role of loan-loss accounting in the association between lending and capital ratios, in particular in the recessionary capital crunch. Their research is substantially different from ours in several ways. First, Beatty and Liao look at a measure of delay in recognition of expected loan-losses to identify bank specific approaches to loan loss accounting under the incurred loss model. In contrast, in our study we measure directly the cyclicality of LLPs, the use of LLPs to smooth income, and the use of LLPs in non-discretionary earnings management as the capital management by banks. We also look at the role of loan-loss provisioning practices in the capital crunch effects in banks which differ in the level of capital adequacy constraints. Secondly, Beatty and Liao's results seem to be binding only for large publicly-traded banks, because small- and medium-sized banks' lending is not constrained by regulatory capital. In contrary to this, our study focuses on the sample of all commercial banks. Thirdly, we apply annualized loans growth rate and model the impact of capital ratio on this growth considering the role of the capital allocation process.

Our study adds to a growing body of literature in several ways. Firstly, we look directly at the role of loan-loss provisioning practices in capital crunch by identifying the level of cyclicality of LLPs, income smoothing, non-discretionary earnings management and capital management at the individual

bank level. To do this for each bank with a data set of at least 36 quarters (i.e. nine years, which is the period covering the full business cycle), we estimate the sensitivity of LLPs to the business cycle (to test individual (pro)cyclicality of LLPs), to profits before provisions and taxes (to test income smoothing), to the loans growth rate (to test the non-discretionary earnings management), and to the capital ratio (to test the capital management hypothesis). Secondly, we consider the effect of low-procyclicality of LLPs on the association between lending and the capital adequacy ratio in both poorly--capitalized banks and well-capitalized banks. Previous studies do not focus on this issue. Thirdly, due to the mixed perceptions of the role of income smoothing in banking (some see it as a good device in building buffers in good periods to be drawn down during crises, Borio et al. 2001, 2009; FSB, BIS, IMF 2011; CGFS 2012; whereas others perceive it as a source of increased risk in banking, Bushman, Williams 2012; Illueca, Norden, Udell 2015), it is not obvious whether high income smoothing does really reduce the role of capital constraints in bank lending. We are the first to challenge this problem empirically. In testing the hypothesis about the role of income smoothing in the capital crunch, we also differentiate between poorly- and well-capitalized banks. Fourthly, unlike previous papers looking at the effects of capital ratio on lending (see Beatty, Liao 2011; Kim, Sohn 2017) we also analyse the role of non-discretionary earnings management with LLPs and capital management with LLPs in the association between lending and capital ratio.

Consistent with capital crunch theory (see Van den Heuvel 2009, 2011), we find that lending depends on the level of capital ratio. However, recessionary capital crunch affects lending in the sample of poorly-capitalized banks. Lending of banks whose LLPs are highly procyclical is prone to recessionary capital crunch. Low-procyclicality of LLPs results no effect of capital ratio on lending in recessions. However, low-procyclicality of LLPs does not make the bank's lending immune to insufficient capital ratio. In contrast, it does increase the lending potential of well-capitalized banks. High income smoothing results in enhanced recessionary capital crunch, consistent with the notion of increased risk--taking by banks engaging in discretionary earnings management. High income smoothing also results in a strengthened association between lending and capital ratio in recessions in well-capitalized banks. Non-discretionary earnings management does not affect the association between lending and capital ratio. As for capital management hypothesis, we find that lending of banks which do not apply capital management is prone to recessionary capital crunch.

The rest of the paper is organized as follows. Section 2 provides the regulatory background of our study. Section 3 develops our hypotheses. We describe our sample and research methodology in section 4. We discuss results and robustness checks in section 5. Section 6 concludes our work.

2 Regulatory framework for loan-loss provisions and capital adequacy regulation in Poland

In the banking industry there are two types of loan-loss provisions: specific provisions and general provisions (see e.g. Borio, Furfine, Lowe 2001; Koch, Wall 2000; BCBS 2016). Whereas specific provisions are estimated to cover losses on nonperforming loans, general provisions are applied to cover expected losses on new loans extended during the year. Such a distinction of LLP is also a feature of the Polish banking industry.

In the period of 2000–2012 Polish banks, similar to other banks operating in the European Union, went through changes in the loan-loss provisioning regulatory framework. Basically, in the years

2000–2004 banks were obliged to use local accounting standards (i.e. Polish accounting standards). On 1 January 2005, the IFRS came into effect in the EU, and commercial banks could opt for either IFRS (i.e. IAS 39) or for local accounting standards. In practice, all commercial banks in Poland, due to the huge share of foreign-owned banks and due to more favourable rules for setting LLP (i.e. lower levels of LLP), decided to choose the IAS.

Under both local accounting standards and IFRS 39 banks apply an incurred loss approach to calculate specific provisions related to loan losses that have already occurred in an individual loan (or loan portfolio). Under the IAS 39 these specific provisions may be calculated using two approaches, contingent on whether a given credit exposure is considered as significant or not. For significant exposures the loss is calculated on an individual basis. For insignificant exposures it may be calculated either collectively (for the whole portfolio of insignificant exposures) or individually. Under the collective approach banks are expected to use for each of the homogenous portfolios the credit risk parameters, i.e. PD (probability of default), LGD (i.e. loss-given default) and EAD (exposure at default) in calculating the amount of collective loss. Both, the sum of individually estimated loan-losses as well as the sum of collectively measured loan-losses constitute the total specific loan loss provision, which is accounted as a cost in the income statement of the bank and affects the level of gross profit before tax. Under the IFRS, 39 banks do not calculate general provisions which is included in the Tier 2 capital. Thus, loan-loss provisions calculated under these rules affect bank capital indirectly by influencing the level of net profit, and thus retained earnings. The higher the total provision, the lower the profit, and thus the lower the capital of the bank.

Under Polish accounting standards banks are obliged to calculate both specific provisions (which are regulated in a Ministry of Finance regulation) and general provisions (which are governed in the Polish banking law). Specific provisions are set aside for credit exposures considered as nonperforming. General provisions are calculated for net loans (i.e. gross credit exposure reduced by the level of net specific provisions), as 1.5% of total net loans. Their capital treatment, however, strongly diverges from the capital treatment of general provisions in the Basel Committee Capital Standards (BCBS 2016). Under the standardized approach in Basel II (and Basel III) as well as in Basel I, banks are permitted to include general provisions in Tier 2 capital up to a limit of 1.25% of credit RWA. Within the Polish accounting standards, general provisions are not included in Tier 2 capital. They are retained in long--term reserves on the liabilities side. Increases in general provisions do affect the costs which the bank incurs during the year and thus along with net specific provisions, general provisions reduce the gross profit before taxes. Thus, they do not influence the level of total capital directly. Their effect is indirect, and the same as the effect of net specific provisions, because they influence the capital (and capital ratio) of a bank, through the level of retained earnings. The higher the total loan-loss provision, the lower the amount of retained profits, and thus the lower the capital ratio (in particular Tier 1 capital ratio of a bank).

As is clear from the foregoing considerations, capital adequacy should be regarded not only as a fulfilment of certain measures defined by relevant competent authorities, but rather a process aimed at ensuring that the level of risk that the bank is going to take when conducting its business activities can be covered (with a certain degree of probability) by its capital within a certain time horizon. The process of capital adequacy management should therefore focus on the capital planning process, letting the bank, on the one hand, foresee its capital ratios, and on the other, plan its lending activities bearing in mind the need to have at all times capital at a level adequate to the scale and risk profile of the institution.

In the case of European (EU) banks, the basic requirements have been set at the following levels: total capital ratio (TCR) – not less than 8%, Tier 1 capital ratio – not less than 6%, common equity Tier 1 capital ratio (CET1) – not less than 4.5%. However, the regulatory framework also includes the need to provide additional "cushions" allowing banks to conduct their business activities even in the case of an adverse scenario, i.e. capital conservation buffer, countercyclical capital buffer, buffers for systematically important institutions (G-SII, O-SII) and for macroprudential risk. It is also worth noting that in the case of any institution-based risks, an important role may be played by Pillar 2 requirements imposed on an institution by the relevant competent authority.

3 Literature review and hypotheses development

3.1 Determinants of bank lending

To assess the impact of bank capital ratios on bank lending, it is essential to mention the demand and supply effects of both macroeconomic and bank specific factors on banks' credit behaviour. Therefore it is necessary to answer a question whether the balance sheet channel of transmission of monetary policy impulses is operational and to what extent. As described by Jiménez et al. (2012), to convincingly answer the question, most of all, the supply of credit must be disentangled from its demand. However, if one uses only the quantitative data, it is almost impossible to disentangle the demand and supply effects on bank lending, due to the fact that changes in interest rate and volume may result from shifts of demand and supply curves, which may also be affected by the business cycle, as mentioned by Giovane Del, Eramo and Nobili (2011). They try to assess the potential role of supply and demand factors in banks' lending behaviour, focusing on the period of sharp slowdown in the Italian economy (2008–2009). The analysis is performed using combined quantitative micro-data and qualitative information from the Eurosystem Bank Lending Survey, complementing statistics on loan volumes and lending rates with information on supply and demand conditions. The results show that BLS indicators have a statistically important role in explaining changes in lending to enterprises in Italy.

Hempell and Sørensen (2010) applied a cross-country panel approach using confidential data also from the ECB's Bank Lending Survey, which allowed them to distinguish between the supply and demand effect and to prove that factors related to banks' balance sheet positions play an important role in the growth of loans to non-financial corporations and households in the euro area. They have found that price and volume restrictions negatively affect the growth of both household and corporate loans. Thus, their results suggest that in terms of loan growth implications it matters not only by how much, but also which conditions of credit standards are changed.

Altavilla, Paries and Nicoletti (2015) focused on the macroeconomic impact of credit supply shocks in the euro area using bank-level information from the same source as mentioned above and constructing a so-called loan supply indicator derived from changes in banks' credit standards which cannot be derived from bank-specific demand factors and macro-financial conditions. The results obtained from a Bayessian VAR model identifying credit supply shocks suggests that adverse loan supply shocks lead to a protracted contraction in credit volumes and higher bank lending spreads, which fosters firms' incentives to substitute bank loans for market finance, producing a significant increase in debt securities issuance and higher bond spreads. It is also worth noting that the lower bank

loan supply explains to some extent the recession following the euro area sovereign crisis, the increase in credit spreads and the substitution of loans by bonds issued by non-financial corporations.

Peek, Rosengren and Tootell (2003) have made an effort to identify the macroeconomic effect of loan supply shocks, trying to find evidence of an operative credit channel of monetary policy transmission to the real economy, pointing to the possible the inability to distinguish the effects of shocks to loan supply from those to loan demand. Nevertheless their work brings evidence that shifts of loan supply can be successfully isolated from shifts in loan demand and provides new evidence for the hypothesis that the credit channel is operative in the economy and that banking problems may indeed reduce economic growth, thus making economic recovery dependent on a healthy banking system.

The identification and separation of the credit supply shock effect is also important if investigating the roles that banks play in business cycle fluctuations. Economic disturbances affecting credit supply are also likely to influence real variables – following the example of Basset et al. (2014), an unanticipated change in monetary policy may change the cost or volume of bank loans, but in parallel, it may also affect production and spending through its influence on interest rates and expectations (as would be in the case of the existing bank lending channel of monetary policy transmission). The authors develop a measure of changes in the supply of bank-intermediated credit, constructed using bank-level responses on changes in lending standards for enterprises and households – based on the Federal Reserve Board's Senior Loan Officer Opinion Survey on Bank Lending Practices (a similar approach to the one aforementioned). As the results show, fluctuations in this measure appear to be accounted for by reassessments of the riskiness of certain types of loans, changes in banks' business models, or (what is of utmost importance) banks' response to changes in the structure or intensity of bank supervision and regulation.

As mentioned above, disentangling demand and supply factors affecting banks' credit behaviour may be done using qualitative information from bank lending surveys performed by various central banks across the world. Interesting research in this field was conducted by Muller Kurul (2013), showing that survey answers are useful in assessing the changes in the loan supply and loan demand. The author also shows that banks are more successful in forecasting the change in the loan supply rather that in loan demand.

Nevertheless, disentangling demand from supply factors in banks' lending behaviour still remains a part of the desired solution. An important issue that should be considered in the analysis is what drives banks to change their lending behaviour – whether these are constraints resulting from their assets/liabilities structure, liquidity or capital position or whether it is their perception of risk related to market participants – both effects occur on the supply side.

3.2 Determinants of the cyclical impact of capital ratio on bank lending

The cyclical effects of capital adequacy regulation on bank lending have been thoroughly investigated in wide theoretical and empirical research that has flourished since the early 1990s following the introduction of the first Basel Capital Accord in 1988 (see Laeven, Majnoni 2003). As Laeven and Majnoni (2003) suggest, risk-based capital regulation by increasing capital requirements might increase the likelihood of capital shortages during recessions, potentially reducing the supply of credit to the economy. To describe this phenomenon, the "capital crunch" was coined in the early nineties, just after

the implementation of the Basel I capital accord. The capital crunch characterizes the simultaneous shortage of capital and the contraction in the supply of new loans that affected banks in New England during the early 1990s recession in the United States. Bernanke and Lown (1991) and Peek and Rosengren (1995) provide evidence in favour of the presence of a capital crunch during the 1990–1991 recession in the United States. In contrast, Berger and Udell (1994), do not find evidence for the capital crunch.

From the theoretical perspective, an explicit treatment of the effects of capital requirements on the level of economic activity is provided by Holmström and Tirole (1997). They find that, in a world where agents both in the real and in the financial sector may be capital constrained, market-determined solvency ratios are pro-cyclical, i.e., they are higher during expansions and lower during recessions. In particular, they show that a negative shock to banks' capital negatively affects the level of economic activity and that the lower level of investment generated by the capital crunch requires a reduction of market determined solvency ratios. This theoretical model is developed by Van den Heuvel (2009), who provides a distinct model of reduced lending arising from recessionary decreases in bank capital. His model explicitly shows that such a reduction in lending may occur not only with insufficient equity in recessions, but also even when the capital requirements are not currently binding, e.g. in expansions, because low capital banks may forgo profitable lending opportunities now to lower the risk of future capital inadequacy.

Many empirical studies have examined the effect of bank capital on lending, with most indicating a positive effect, albeit to various degrees. In an early study, Bernanke and Lown (1991) estimate that the effect of a 1-percentage-point increase in bank capital results in approximately 2–3 percentage point increases annually in loan growth. Hancock and Wilcox (1994), Peek and Rosengren (1995) also suggest a positive effect of bank capital on lending. In a recent study, Berrospide and Edge (2010) estimate an increase of approximately 0.7–1.2 percentage points in loan growth in response to a 1 percentage-point increase in bank capital ratio annually. The effect of an increase in capital ratio on loan growth was estimated by Beatty and Liao (2011) and Carlson, Shan and Warusawitharana (2013) for the US banks. Based on quarterly data Beatty and Liao (2011) find that the effect of capital ratio on lending of US banks is stronger for large banks and particularly significant in recessions. This effect is definitely strengthened in banks with delays in expected loan-loss recognition. Carlson, Shan and Warusawitharana (2013) show that this effect is also positive and differs between contractions and expansions. They also provide evidence of non-linear effects of capital ratio on bank lending, showing that lending of low capital banks is definitely more sensitive to capital ratio (i.e. the coefficient on capital is positive and stronger in low-capital banks than in medium and high capital banks). In a cross-country study using data on publicly-traded banks, Gambacorta and Marquez-Ibanez (2011) find that capital ratio exerts a positive effect on lending and that this effect is strengthened during the last financial crisis. The recent paper by Kim and Sohn (2017) seems to contradict the results of Beatty and Liao (2011), because the lending of large banks is not significantly and positively affected by capital ratios. In contrast, they find that is it small banks that adjust lending in response to changes in capital ratios during both non-crisis and crisis periods.

To sum up, previous research on the effect of capital ratio on bank lending suggests diversity of this effect, which can be attributed to bank size, capital ratio level and the business cycle or crisis events (Berrospide, Edge 2012; Mora, Logan 2012; Beatty, Liao 2011; Gambacorta, Marques-Ibanez 2011; Carlson, Shan, Warusawitharana 2013; Kim, Sohn 2017). However, the general conclusion of this

research is that the effect of capital ratios on lending is positive. We therefore expect that in our sample the association between bank lending and regulatory capital ratio is positive.

In a theoretical model, Van den Heuvel (2009) shows that capital-constrained banks tend to reduce their lending. Previous empirical research also shows that the lending of poorly capitalized banks tends to be definitely more sensitive to capital ratio (Carlson, Shan, Warusawitharana 2013) than the lending of well-capitalized banks, we therefore expect that the relative impact of capital ratio on lending is stronger in poorly-capitalized banks than in well-capitalized banks.

Banks facing external financing frictions[1] have difficulties in immediately restoring equity capital reductions occurring in recessionary periods. Following the capital crunch effect, which shows that banks' lending is more sensitive to capital ratios in economic downturns, in particular in capital--constrained banks (Van den Heuvel 2009; Beatty, Liao 2011; Carlson, Shan, Warusawitharana 2013), we expect to find that the lending of poorly-capitalized banks is definitely more prone to capital ratios in recessions relatively to well-capitalized banks.

3.3 The role of loan loss-provisioning practices for the effect of capital ratio on bank lending – procyclicality of LLP, income smoothing, risk management and capital management

Many papers have dealt with the role of LLP in the procyclicality of bank lending as well as with bank managers' incentives to use LLPs as a management tool. In this section we focus on four loan--loss provisioning practices: cyclicality of LLP, discretionary earnings management with LLP, non-discretionary earnings management and capital management.

Cyclicality of LLP and the effects of capital ratio on lending

The literature focusing on the procyclicality of LLP (see e.g. Borio, Furfine, Lowe 2001; Laeven, Majnoni 2003; Bikker, Metzemakers 2005; Olszak et al. 2017) as well as literature looking at the sensitivity of LLP to the business cycle, shows diversity of this phenomenon across countries and across banks. In this literature procyclicality of LLP is defined as increased (decreased) provisioning for incurred--losses due to increases (decreases) in nonperforming loans in recessionary (expansionary) periods. As a result of procyclicality, loan charge-offs related to loan-defaults reduce bank profits and the potential of the bank to retain earnings important in building capital buffers (see e.g. Van den Heuvel 2009). In a theoretical paper, Borio, Furfine and Lowe (2001) suggest that procyclicality of LLP is deeply related to imprudent risk management, in particular credit risk management, and thus delayed recognition of loan-losses and not-timely accumulation of loan-loss provisions, in particular general provisions. Laeven and Majnoni (2003) and Bikker and Metzemakers (2005) analyse the determinants of LLP, of which one is the business cycle measured with GDP growth. Their research shows that the sensitivity of LLP to business cycle differs from country to country (USA, Japan, France, Italy, Luxembourg, Spain, UK in Bikker and Metzemakers 2005) as well as from region to region (Europe, USA, Japan, Latin America, Asia, in Laeven and Majnoni 2003). In a recent paper, Olszak et al. (2017) find that the cyclicality of LLP is heterogeneous in the European Union, and differs from one country to another.

[1] Such frictions include e.g. the Myers and Majluf's (1984) adverse selection problem.

Some countries seem to have countercyclical LLP (i.e. LLP are positively related with GDP growth), whereas others exhibit procyclicality of LLP (i.e. LLP are negatively related with GDP growth), but this procyclicality is also strongly diversified. They find that the diversity of cyclicality of LLP may be explained by the restrictiveness of bank regulations, bank supervision, investor protection and financial development of a country. They also show that the procyclicality of LLP depends on bank size, bank type and the consolidation of financial statements and is also diversified across individual banks.

The procyclicality of LLP results in increased loan charge-offs in recessionary periods, when loan--defaults tend to be higher, and loan-quality deteriorates (Laeven, Majnoni 2003; Bikker, Metzemakers 2005; Bouvatier, Lepetit 2008; Foos, Norden, Weber 2011; Olszak et al. 2017). Van den Heuvel (2009, 2011) models the effects of loan default shocks on new lending, in both capital-unconstrained and capital-constrained banks. He shows that lending of well-capitalized banks is unaffected by loan charge-offs. However, lending by constrained banks (i.e. poorly-capitalized banks) declines and stays lower for several periods in response to increased provisioning. Another implication of his study is that, "bank capital affects lending even when the regulatory constraint is not momentarily binding, and that shocks to bank profits, such as loan defaults, can have a persistent impact on lending". One way of testing the impact of shocks to bank profits resulting from loan defaults is to analyse delays in expected loan-loss recognition. As Beatty and Liao (2011) suggest, such delayed recognition of loan-losses will lead to an increase in the required provision during economic downturns, because it will decrease reported profit of banks and thus reduce the chances to build up buffers in Tier 1 capital. Exploiting variation in the delay in the expected loss recognition under the incurred loss model, Beatty and Liao (2011) find evidence that reductions in the lending of large banks during recessionary periods relative to expansionary periods are lower for banks that delay less. They also find that smaller delays reduce the recessionary capital crunch effect. In a related study, Bushman and Williams (2013) show that delayed expected loss recognition is associated with significantly higher risk of severe balance sheet contraction during recessions. Such a delayed expected loss recognition is also found to increase the sensitivity of a bank's contraction risk to distress of the banking system, and that banks with high delayed expected loss recognition contribute more to systemic risk during downturns. In another paper, Bushman and Williams (2012) find that forward-looking provisioning reflecting timely recognition of expected future loan losses is associated with enhanced risk-taking discipline. In our study we look at another type of timely recognition of loan-losses, which is associated with cyclicality of LLP. We expect that lending of banks with low procyclicality of LLP (or even countercyclicality of LLP) will be definitely less affected by recessionary capital crunch effect. We therefore hypothesize that:

H1. The capital crunch is weaker for low-procyclicality of LLP banks than for high-procyclicality of LLP banks.

In addition to this potential effect of capital on lending activity, Van den Heuvel (2009, 2011) argues that the impact of loan-losses is stronger for poorly-capitalized banks due to the fact that such banks will be faced with binding regulatory, supervisory or financial market constraints. In our study we are interested in whether low-procyclicality of LLP affects the association between lending and the capital ratio in banks which differ in capitalization. In other words, we ask whether low-procyclicality of LLP makes banks' lending immune to capital constraints, in particular to recessionary capital crunch. We put the following hypothesis in this respect:

H1a. The effect of capital ratio on bank lending in recessionary periods is weaker for low--procyclicality of LLP banks and well-capitalized banks than for low-procyclicality of LLP banks and poorly-capitalized banks.

Income smoothing (discretionary earnings management) and the effects of capital ratio on bank lending

In the literature, earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers (Healy, Wahlen 1999, p. 368; Liu, Ryan 2006). Nelson, Elliott and Tarpley (2003) suggest that the earnings management actions are usually achieved by the manipulation of specific costs, such as cost capitalisation, estimation of provisions for risks and charges, impairment of assets and amortisation and depreciation expenses. In the banking industry, such discretionary earnings management is achieved through income smoothing, a practice aimed at reducing the variability of net profits over time (Ghosh 2007; Fonseca, Gonzalez 2008; Leventis, Dimitropoulos, Anandarajan 2011; Curcio, Hasan 2015). In order to stabilize net income, bank managers will increase (decrease) LLPs when profits before provisioning charge-offs and taxes are high (low). Income smoothing incentives can derive from a bank manager's desire to alter the risk perception of the bank to the regulator and supervision authority (Greenawalt, Sinkey 1988; Bhat 1996; Koch, Wall 2000; Liu, Ryan 2006; Curcio, Hasan 2015), and thus to deal with regulatory constraints. Furthermore, as to the reasons why managers smooth income, Greeawalt and Sinkey (1988) suggest that it helps handle agency or compensation problems. In this vein, Bhat (1994) underscores that income smoothing helps to stabilize, over time, managers' compensation and allows managers to grant a steady flow of dividends to bank stockholders, and additionally, leads to a greater stock-price stability.

As for the role and reasons behind income smoothing in the banking industry, the concepts are twofold. On the one side, specifically to the banking industry, this issue should be analysed from the regulator's and supervisor's point-of-view. Regulatory constraints on capital and expectations as to the level of capital ratio from the supervision authority would give the bank manager the incentive to smooth earnings over time. Therefore, there is the preoccupation that income smoothing is related with risk inherent in the loans and lending portfolio, and thus reflects the manager's decisions about this risk and its coverage. In this view, banks smooth their earnings by drawing from loan loss reserves if actual losses exceed expected losses and by contributing additional loan loss provisions to loan loss reserves if actual losses are lower than expected losses. The advantage of income smoothing is that it reduces the volatility of reported bank profits and reduces the possibility that the bank may have to eat into its capital (Laeven, Majnoni 2003). Thus, banks with smooth income also achieve sounder capital management, since expected loan losses exert no impact on bank capital. As a consequence, increased income smoothing should be associated with a reduced capital crunch effect. A second concept is that income smoothing is related to the extent to which banks record loss provisions based solely on the level of earnings without reference to information about the loan portfolio (Bushman, Williams 2012). If such a notion is true, discretion in earnings management will result in increased risk-taking behaviour by banks. Given that bank capital should be sensitive to bank risk-taking and that this risk--taking is reflected in the risk-weighted capital requirements defined by the Basel Committee capital accords, income smoothing will result in a greater procyclical impact of capital ratio on bank lending (i.e. in increased capital crunch).

From the perspective of this paper, the different concepts may be important for the final outcome, i.e. it may matter whether banks pursue a policy of income smoothing, either to achieve regulatory

goals (i.e. to stabilize capital ratios) taking into consideration future loan-losses, or to obtain short--term benefits, unrelated to information about the loan portfolio (and thus unintentionally destabilize capital ratios).

There is a huge collection of significant literature examining the use of loan-loss provisions to smooth earnings that can be described as "determinants" studies (see the collection in, e.g. Bushman, Williams 2012; for a review see Curcio, Hasan 2015; Skała 2015). Basically, this literature shows that income smoothing in banking is heterogenous across countries (Fonseca, Gonzalez 2008; Bushman, Williams 2012) as well as across banks (Liu, Ryan 2006; Olszak et al. 2017). In our study, of huge interest is the context of EU accounting regulations, in particular the potential effect of the introduction of IAS 39 on income smoothing by European banks. In particular, Gebhardt and Novotny-Farkas (2011) argue that the introduction of IAS 39 in the EU represents a switch from partial expected loss approaches under local GAAP to an incurred loss approach and as such could have affected the level of income smoothing by European banks.

Two potential effects of IFRS on income smoothing could be expected. On the one hand, implementation of the incurred loss approach as defined in the IAS 39 impairment rules, relative to local GAAP requirements, may lead to less discretion, and thus to less income smoothing. At a theoretical level, this is consistent with the findings of Ewert and Wagenhofer (2005), who argue that tighter accounting rules increase the disutility of managers engaging in earnings management, as a result of higher individual regulatory and litigation risks (see Gebhardt, Novotny-Farkas 2011). On the other hand, the stricter IAS 39 impairment standards still leave some scope for discretion in setting up the loan loss provision depending on the firms' underlying reporting incentives. In this vein, several studies attribute a limited role to accounting standards in determining income smoothing (Leuz, Nanda, Wysocki; Ball, Shivakumar 2005; Burgstagler et al. 2006; Novotny-Farkas 2011), and argue that the use of discretion provided by accounting standards may result from the firm's underlying incentives. What's more, compliance with accounting standards depends on the effectiveness of enforcement (Hotlhausen 2009), and thus if the enforcement of IFRS is not proper, we are not likely to find improved quality of accounting, and the income smoothing will not be reduced. At a cross-country level, Daske et al. (2008) using a world-wide sample of IFRS adopting countries find that the capital market benefits of mandatory IFRS adoption accrue only to firms in countries where firms have incentives to be transparent and legal enforcement is strong. Similarly, Li (2010) examines 18 EU countries and finds that the cost of capital decreases in countries with strong enforcement. In a recent paper, Liu and Sun (2015) examine whether the mandatory adoption of IFRS affected the earnings quality of Canadian public firms and find that there has been no significant change in earnings quality for public Canadian firms after the adoption of IFRS. As for the empirical evidence for the banking industry, there are two papers focusing directly on the effect of the introduction of IFRS on income smoothing (Leventis, Dimitropoulos and Anandarajan 2011; Gebhardt, Novotny-Farkas 2011). Both these papers find that the implementation of IAS 39 impairment rules reduced, but did not eliminate, income smoothing. Leventis, Dimitropoulos and Anandarajan (2011) show that the scope of reduction in the level of income smoothing depends on the riskiness of banks. Generally, they provide evidence that for risky banks, discretionary earnings behaviour is more pronounced when compared to the less risky banks. These results seems to be consistent with the Buhman and Williams' (2012) finding that income smoothing is related to increased risk-taking behaviour by banks. Gebhardt and Novotny--Farkas (2011) show that the reduced income smoothing is less pronounced in countries with stricter bank supervision, widely dispersed bank ownership and for EU banks cross-listed in the US.

Following the literature, we start from the assumption that the income smoothing across banks in our sample is diversified. But the expected effect of income smoothing on the link between capital ratio and lending depends strongly on the underlying incentives behind discretionary use of loan loss provisions by the bank's manager to smooth income. On the one hand, if the use is to achieve capital stabilization desirable from the regulator's point-of-view, we hypothesize that:

H2: The effect of capital ratio on bank lending in recessions is lower for high income-smoothing banks than for low income-smoothing banks.

If banks smooth income to achieve the goal of forward-looking LLPs practices, then to a certain extent they may find that the effects of capital ratio on lending are reduced, in particular in poorly capitalized banks. However, the literature does not give precise guidance in this respect. Therefore we hypothesize that:

H2a: The effect of capital ratio on bank lending in recessions differs between high income--smoothing and well-capitalized banks relatively to high income-smoothing and poorly-capitalized banks.

In contrast, if banks apply LLP to stabilize earnings without reference to the risk intrinsic in their loan portfolio, following Van den Heuvel's (2009) theoretical approach, we expect greater shocks to capital ratio, and thus hypothesize that:

H2.1: The effect of capital ratio on bank lending in recessions is stronger and economically significant for high income-smoothing banks than for low income-smoothing banks.

Given that a lower level of the capital adequacy ratio is typical of high risk-taking banks, one may expect that additional risk related with income smoothing will not result in a change in the range of impact of capital ratio on lending. Contrary to this, well-capitalized banks may be more sensitive to such additional risks, to avoid supervisory authority actions. Thus, the effect of capital ratios on lending in well-capitalized banks may be strengthened if bank managers use discretionary earnings management. We thus hypothesize that:

H2.1a: The effect of capital ratio on bank lending in recessions is stronger and economically significant for high income-smoothing and well-capitalized banks than for high income-smoothing and poorly-capitalized banks.

Control of non-discretionary earnings management and capital management

Non-discretionary earnings management and the effects of capital ratio on bank lending. The literature identifies that earnings management may also be non-discretionary (Laeven, Majnoni 2003; Bikker, Metzemakers 2005; Fonseca, Gonzalez 2008; Gebhardt, Novotny-Farkas 2011; Bushman, Williams 2012; Curcio, Hasan 2015; Olszak et al. 2017), and thus may be an effect of a prudent approach to risk management. Such an approach results from the fact that there is a mechanical accounting relationship between total net loan loss provisions (included in the profit-and-loss account) and non--performing loans (related to the value of past-due-loans) and loan loss allowance (related to the value of net loans) (Gebhardt, Novotny-Farkas 2011). Non-performing loans determine the level of incurred loan-losses and thus the amount of specific loan loss provision. Loan loss allowance is directly related to the general provision, perceived as a buffer against expected loan losses (Koch, Wall 2000; Novotny--Farkas 2011; Olszak et al. 2017). Prior research proxied the non-discretionary component through at least one of these variables (Laeven, Majnoni 2003; Bikker, Metzemakers 2005; Fonseca, Gonzalez

2008; Gebhardt, Novotny-Farkas 2011; Bushman, Williams 2012; Curcio, Hasan 2015; Olszak et al. 2017). The research in this field provides ambiguous results. On the one hand, banks seem to apply non--discretionary earnings management (Bikker, Metzemakers 2005; Ghosh 2007; Fonseca, Gonzalez 2008; Curcio, Hasan 2015), which is however diversified across countries. On the other, Laeven and Majnoni (2003), Gebhardt and Novotny-Farkas (2011) and Olszak et al. (2017) provide evidence which contradicts non-discretionary earnings management.

From the perspective of this paper, an issue of huge interest is whether some part of net LLP affects the level of loan loss allowance, and thus the amount of Tier 2 capital. As has been mentioned in section 2, impairment and loan loss allowance accounting rules applied by commercial banks in Poland (i.e. both local GAAP as well as IAS 39) do not allow for inclusion of loan loss allowance in Tier 2 capital. Therefore, even if we find that there is some diversity of the relationship between LLP and non-discretionary component of LLP (e.g. general provision under the local GAAP or collective provision under the IAS 39), this diversity will be of no importance from the point of view of capital ratio stabilization. Therefore, we put forward following hypothesis:

H3: Non-discretionary earnings-management with LLP does not affect the association between lending and capital ratios.

Capital management and the role of the capital adequacy ratio in bank lending. Capital management, similarly to income smoothing, is an example of the discretionary use of LLPs. The traditional capital management hypothesis states that bank managers use LLP to reduce expected regulatory costs associated with violating capital requirements, a negative relationship being predicted between capital ratios and loan-loss provisions. The use of LLP to manipulate the capital adequacy ratios has been documented by prior research; however, the results are ambiguous. Evidence of such capital management is found for the US (Beatty et al. 1995; Ahmed, Takeda, Thomas 1999; Galai, Sulganik, Wiener 2003; El Sood 2011). In contrast, Collins, Shackelford and Wahlen (1995) found no evidence of capital management in the US. In studies using banks from other countries, Anadarajan et al. (2007) find some evidence that supports the capital management hypothesis. Ghosh (2007) finds evidence of capital management for Indian banks. Bouvatier and Lepetit (2008), analysing banks' pro--cyclical behaviour for a sample of 186 European banks, show that poorly capitalized banks use LLPs to manage regulatory capital. In a study applying cross-country data covering 91 listed European banks, Leventis, Dimitropoulos and Anandarajan (2011) show that capital management behaviour by bank managers is not significant in both the pre-IFRS and post-IFRS period. Looking at Spanish banks, Pérez, Salas and Saurina (2008) find no capital management. In the same vein, applying almost 500 European banks, Curcio and Hasan (2015) show that LLP are not used for managing capital ratios. In a recent study, Olszak et al. (2017) identify diversity of capital management across individual banks and find that LLP are negatively associated with capital ratios, thus suggesting capital management.

Loan-loss accounting standards applied in Poland (both those in use up to 2004, as well as IAS 39 since 2005) do not allow for inclusion of loan-loss provisions into Tier 2 capital. Therefore LLPs will only affect Tier 1 capital. As a result, we expect that the association between LLPs and current capital ratio (CAP) will be negative for those banks that to some extent reduce (increase) LLPs (i.e. net specific provision or current net charge-offs = gross charge-offs net of recoveries plus collective provision) to increase (decrease) profits and thus increase (decrease) Tier 1 capital. We posit that banks prefer to have a steadily increasing amount of capital, as it is a nominator of the capital adequacy ratio, and

with the expansion of their credit activity it helps them keep a stable level of the capital adequacy ratio. We expect that banks which do not apply LLPs to manage capital ratios may suffer from reduced lending due to capital constraints in recessionary periods. We thus put the following hypothesis:

H4. Banks which do not apply capital management with LLPs will have their lending more sensitive to the capital crunch effect in recessionary periods.

4 Empirical model and data

4.1 Estimation methods

The most problematic issue in the measurement of the impact of bank capital on loan extension is the identification of supply and demand factors, which affect lending activity, both during favourable and unfavourable economic conditions. In particular, during recessionary periods, not only loan supply (due to bank capital and liquidity problems) may decrease, but also loan demand of households and firms may decline. This makes any identification of bank capital effects on lending in recessionary or crisis periods difficult. Following the results obtained by Giovane Del, Eramo and Nobili (2011), it may be stated that in times of crisis the most important factor influencing the tightening of credit standards (both margins and credit availability) is the banks' perception of credit risk, while banks' balance sheet positions and financing abilities could be considered as less important. From the demand point of view, its weakness results from a lesser need of fixed investment financing and lesser willingness of conducting mergers and acquisition operations. Similar effects from the supply side can be observed in the case of household mortgage loans. From the demand point of view, the prospects of the housing market perceived by market participants remains the most important.

Several approaches have been used in the literature to take account of both supply side and demand side determinants of bank lending. The empirical models that addressed the question of whether a bank-capital induced credit crunch was hindering the recovery were developed in the early- and mid-1990s in the US (see e.g. Bernanke, Lown 1991; Hancock, Wilcox 1994; Peek, Rosengren 1995). In our study we apply contemporary adoptions of those models available in several studies (Beatty, Liao 2011; Carlson, Shan, Warusawitharana 2013). We use a reduced form model (equation (1)), including both the supply and demand side of the lending market. In particular, we follow Kishan and Opiela (2006), who note that for individual bank level analyses, loan supply can be identified by separating banks by differential features tied to their ability to supply loans, but not to loan demand. Such features include bank size, bank liquidity (Kim, Sohn 2017) and capital ratio level (Carlson, Shan, Warusawitharana 2013). Following Carlson, Shan and Warusawitharana (2013), we apply the level of bank capital ratio as the main variable of diversification. We divide our banks by the level of the capital adequacy ratio for two reasons. First, in our study we refer to the Van den Heuvel's (2009) model, showing that negative shocks to bank capital (e.g. changes in monetary policy interest rates or increases in loan-losses charge--offs) reduce lending, and the effect of these shocks is particularly significant for capital-constrained banks. Second, in the Polish supervisory framework, the capital ratio and its level are the most salient variables in supervisory policy decision making. Under the Supervisory Review and Evaluation Process (the so called BION, Badanie i Ocena Nadzorcza) in the period of our study, the desired level of the capital adequacy ratio of 12.00% was quite restrictive and exceeded the Basel Committee

(i.e. Basel I and Basel II) minimum of 8.00%. Thus banks with a capital ratio falling below this 12.00% boundary usually went under greater scrutiny of the supervisory authority and therefore their lending activity may have been reduced to meet the capital adequacy levels. In such banks, any increase in capital ratio may have resulted in a definitely stronger increase in new lending.

The baseline model reads as follows, and will be run in subsamples of banks:

$$\begin{aligned}\Delta Loan_{i,t} = {} & \alpha_o + \alpha_1 \cdot \Delta Loan_{i,t-1} + \alpha_2 \cdot CAR_{i,t-2} + \alpha_3 \cdot NIM_{i,t-1} + \alpha_4 \cdot DEP_{i,t-1} + \alpha_5 \cdot UNEMPL_{i,t} \\ & + \alpha_6 \cdot recession + \alpha_7 \cdot recession \cdot CAR_{i,t-2} + \varepsilon_t + \vartheta_{i,t}\end{aligned} \tag{1}$$

where:

i – the number of the bank;

j – the number of country;

t – the number of observation for the i-th bank;

$\Delta Loan$ – real annual loans growth rate, calculated at a quarterly frequency; to deflate the nominal loans growth rate, we apply the Fisherian formula, i.e.:

$$\Delta Loan = \frac{N\_Loan\,growth\,rate_t - CPI_t}{1 + CPI_t}$$

where *N_Loan growth rate* is the nominal annual loans growth rate (computed at a quarterly frequency), *CPI* is the annual consumer price index in Poland (also computed at a quarterly frequency to correspond with the loans growth rate);

CAR – the lagged capital adequacy ratio, i.e. total bank capital divided by risk-weighted assets, lagged by two quarters;

NIM – net interest margin on loans lagged by one quarter, i.e. net interest margin divided by average loans (this interest margin is annualized and computed at a quarterly frequency);

DEP – one-quarter lagged deposits from non-financial customers divided by total assets;

UNEMPL – an annual unemployment rate, calculated at quarterly frequency;

recession – a dummy variable equal to one during recessionary periods 0 otherwise; we identify four recessionary periods (in 2001 Q2–2002 Q2, 2005 Q1–Q4, 2009 Q1–Q3, 2012 Q2–Q4);

recession · *CAR* – an interaction between the crisis and capital ratio (CAR) was added to the model in order to investigate the effect of CAP depending on the recession (the presence or not of the period of recession);

$\vartheta_{i,t}$ – unobservable bank-specific effects that are not constant over time but vary across banks;

ε_t – a white-noise error term.

Following the convention adopted in many studies (e.g. Kashyap, Stein 1995; Gambacorta, Mistrulli 2004; Berrospide, Edge 2010; Beatty, Liao 2011; Gambacorta, Marques-Ibanez 2011; Carlson, Shan, Warusawitharana 2013; Kim, Sohn 2017), we use the growth rate of the dependent variable instead of levels of the variable to mitigate spurious correlation problems. In contrast to previous research applying quarterly data, instead of using quarterly loan growth rates, we use annual loan growth rates for several reasons. Firstly, macroeconomic variables are published at a quarterly frequency and

presented as a yearly change in the variable (e.g. the unemployment rate). Secondly, quarterly the loan growth rate is prone to seasonality problems, and therefore some changes in loan growth may not be included in the capital allocation process. Thirdly, capital adequacy and capital allocation is implemented at an annual frequency (and continuously adjusted and corrected) and refers to the whole balance sheet structure and total lending portfolio, not to only ¼ of the balance sheet or lending portfolio. It is worth noting that capital ratios are targeted at the whole amount of risk-weighted assets (influencing the bank's ability of new loans production) and therefore cannot be perceived as point--in-time measures. They, thus, have to be thoroughly monitored and planned by banks. It should also be kept in mind that retained net earnings of the previous periods can be included in the own funds only after being reviewed by the auditor and accepted (e.g. under the CRD/CRR provisions in the EU) by the competent authority. This creates a difference between the actual and expected capital position of the bank influencing its lending behaviour. As in the previous studies (Beatty, Liao 2011; Gambacorta, Marques-Ibanez 2011; Carlson, Shan, Warusawitharana 2013; Kim, Sohn 2017), we also apply one quarter lag of the loan growth rate as a dependent variable to capture adjustment costs that constrain complete adjustment to an equilibrium level.

CAR. In our study we apply basically the total risk-adjusted capital ratio. In the robustness checks we will also use the Tier 1 capital adequacy ratio. According to the literature, the coefficients on the capital ratio are expected to be positive, implying that well capitalized banks extend more loans, because they can more effectively absorb the negative effects of risk shocks on bank lending (see, e.g. Bernanke, Lown 1991; Hancock, Wilcox 1994; Peek, Rosengren 1995, 2003; Gambacorta, Mistrulli 2004; Berrospide, Edge 2010; Beatty, Liao 2011; Gambacorta, Marques-Ibanez 2011; Carlson, Shan, Warusawitharana 2013; Kim, Sohn 2017). The α_2 coefficient measures the sensitivity of bank lending to capital ratio during non-recessionary periods (see Beatty, Liao 2011; Carlson, Shan, Warusawitharana 2013). In contrast to previous research (e.g. Kim, Sohn 2017), we apply a two quarters lagged capital ratio due to several reasons. Firstly, banks in Poland are obliged to report capital adequacy data to the supervisory authority as well as for internal reporting purposes at a quarterly frequency. So the information from the last quarter is reported to the management board of a bank with a lag, e.g. this may be one or two months' lag (the data has to be collected, analysed and included in a financial report, and then published in the case of stock-market traded banks). Secondly, our main dependent variable is the annual loan growth rate, measured at a quarterly frequency. So the actually realized loans growth during the year depends on the level of the expected capital ratio as well as the actually realized capital ratio. The best way to resolve such problems is to choose the level of capital in the middle of the period of the estimation of the loan growth rate (i.e. in our case we need four quarters to calculate the annual loans growth rate, so we need a capital ratio which is expected within the next two quarters and is realized and affects the business strategies of banks in the last two quarters of loans growth extension). Thirdly, the use of a two-quarters lag of capital adequacy is also justified from the perspective of capital allocation strategies applied by banks (see Resti, Sironi 2007) and the potential for supervisory pressures from the side of supervisory authorities in response to the actual level of capital ratio. Usually, in allocating bank capital to business activity (e.g. nonfinancial sector lending), banks take into account the expected level of the capital adequacy ratio in the next two quarters (i.e. for the semi-annual period), which is a side effect of the aforementioned need for an auditor review and regulatory approval process.

The capital ratio lagged by two quarters not only refers to strategic decisions related to capital allocation, but also to decisions which are a response to the actual level of capital ratio (which is related to the capital absorption process and pressures from the side of supervisory authorities if the capital ratio falls below a certain level). The strategic decisions about the level of bank lending in response to the information about the actual level of capital ratio will be implemented into the lending process to some extent at the end of the next quarter and in the quarter that follows the next quarter. So basically, the level of capital ratio lagged by two quarters is the ratio which the bank keeps in the middle of loans growth extension during the year. Therefore it affects the capital allocation process (as the two-quarter lagged capital ratio may be deemed as forecasted capital ratio in the middle of the year) and also gives fuel to the lending in the last two quarters of the lending extension during the year (as it is the actual level of capital ratio after the lending is extended, it may result in changes in capital allocation strategies for the next two quarters of lending in the year). The process of capital allocation and absorption is continuously repeated from one quarter to another.

NIM. It proxies profitability of bank lending as well as cost of bank lending. Banks with high profitability are be eager to extend more loans, thus the relationship between the loan growth rate and net interest margin is expected to be positive; however, high profitability may also imply higher costs on bank loans, thus diminishing the loan demand; in effect, a negative coefficient on net interest margin may also be expected; as suggested by Kim and Sohn (2017), higher profitability may imply greater risk on assets; thus, from the perspective of a bank, it may be related to lower lending growth to improve the quality of loans; under this scenario, the association between profitability and lending may be negative.

DEP. A positive coefficient on this variable suggests that those banks with better stable financing (i.e. lower liquidity pressures) extend more loans; we generally expect a positive coefficient on this variable, if banks need access to deposits to extend new lending; the association between loan growth and deposits may also be negative or statistically insignificant if banks do not suffer from lack of stable funding.

UNEMPL. This rate is included to account for the effects of macroeconomic conditions and loan demand. It proxies the demand for loans. We expect a negative coefficient on this variable because increases in unemployment rate are associated with decreased demand for bank lending (and vice-versa).

recession. We predict a negative coefficient on recession if loan supply declines during a crisis for reasons other than capital and liquidity constraints (as do Beatty and Liao 2011, p. 7).

recession · CAR. Banks which exhibit capital pressures during recessions will only increase their lending if their capital ratio is sufficiently high; from the perspective of the procyclicality of the impact of capital ratio on bank lending (the so-called capital crunch effect, see Peek, Rosengren 1995 and Beatty, Liao 2011), our main coefficient of interest is 7 on the interaction term between recession and the capital adequacy ratio; we expect this coefficient to be positive and statistically significant for banks which suffer from capital shortages (or risk shocks), which affect capital absorption potential; in contrast, banks which have large enough capital buffers and do not suffer from risk shocks will exhibit negative and/or statistically insignificant effects of capital ratio on lending in economic downturns.

This study employs the fixed effects panel method, although Gambacorta and Marquez-Ibanez (2011) and Brei, Gambacorta and von Peter (2013) employ a dynamic system generalized method of moments (GMM) panel methodology developed by Blundell and Bond (1998) to ensure efficiency

and consistency. Brei, Gambacorta and von Peter (2013) and Gambacorta and Marquez-Ibanez (2011) argue that this methodology ensures efficiency and consistency as long as the models do not suffer from serial correlation of order two and valid instruments are used. However, Roodman (2006, 2009) recommends fixed effects estimators as superior alternatives to GMM for the case of a large time dimension T because in such cases the dynamic panel bias becomes insignificant, and the number of instruments tends to increase considerably as T increases. Furthermore, Judson and Owen (1999) suggest that fixed effects estimators perform well or better when the time dimension of panel data T is greater than 30. Because the time dimension of our datasets is 52 quarters, we adopt the bank fixed effects panel model. The fixed effects method has been extensively used in the literature (see, e.g. Berrospide, Edge 2010; Francis, Osborne 2012; Cornett, McNutt, Strahan 2011; Kim, Sohn 2017). As argued by Brei, Gambacorta and von Peter (2013), non-randomly selecting a sample from the population of banks is also consistent with the choice of fixed effects estimations, which is true of our sample. An alternative approach is to use an ordinary least squares estimator, following, for example, Beatty and Liao (2011) and Carlson, Shan and Warusawitharana (2013). However, in our study it could give biased results due to the application of the lagged dependent variable. Therefore, the OLS estimation is shown for informative and control purposes.

Strategy for testing the impact of procyclicality LLP, income smoothing, risk management and capital management on the effect of capital ratio on bank lending

To identify loan loss provisioning practices (cyclicality of LLP, income smoothing, prudent risk management and capital management) applied by banks in our sample, we use the model described by equation (2), in which we include several measures. These measure have been used in previous research and are expected to affect loan-loss provisions of banks significantly (see Laeven, Majnoni 2003; Bikker, Metzemakers 2005; Ghosh 2007; Fonseca, Gonzalez 2008; Leventis, Dimitropoulos, Anandarajan 2011; Gebhardt, Novotny-Farkas 2011; Curcio, Hasan 2015; Olszak et al. 2017). The variables included in this model cover both discretionary characteristics of loan loss provisioning regimes as well as non-discretionary fundamentals (see e.g. Bushman, Williams 2012). This model reads as below:

$$LLP_{i,t} = \alpha_0 + \alpha_1 LLP_{i,t-1} + \alpha_2 GDPgrowth_t + \alpha_3 PROFITBPT_{i,t} + \alpha_4 \Delta L_{i,t} + \alpha_5 CAP_{i,t} \quad (2)$$

where:

LLP is loan loss provision (normalized by average assets),
GDP growth is the Gross Domestic Product growth rate in real terms,
PROFITBPT equals profit before provisions and taxes normalized by average assets,
ΔL equals the real loan growth rate,
CAP equals bank capital normalized by total assets.

In equation (2) we include one lag of dependent variable (i.e. LLP) to capture adjustment costs that constrain complete adjustment to an equilibrium level (as in Fonseca, Gonzales 2008).

Due to the fact that we apply GDP growth, which is an annual growth published at quarterly frequency, most of the variables (i.e. LLP, PROFITBPT, ΔL) in the study are annualized.[2] Such an approach allows us to minimize potential problems with seasonality.

As for equation (2), the variables included in the model are expected to affect LLP as follows. The annual growth of GDP (GDP growth) is included to control for the documented procyclical effect of provisioning (Laeven, Majnoni 2003; Bikker, Metzemakers 2005; Curcio, Hasan 2015; Olszak et al. 2017). We expect that the association between LLP and GDP growth to be negative – thus indicating procyclicality of LLP. If this association is positive, it denotes counter-cyclicality of LLP (see Olszak et al. 2017).

The link between PROFITBPT and LLP measures income smoothing; the higher its positive coefficient, the more income smoothing there will be. In our study we follow an approach used by Bushman and Williams (2012) in an international sample of banks to test the role of income smoothing. In particular, they differentiate between countries using the income smoothing approach by applying the regression coefficient describing the association between LLP and PROFITBT. The same approach is used by Fonseca and Gonzalez (2008), who identify diversity in income smoothing in a cross-country context by looking at the sensitivity of LLP to PROFITBPT. As Bushman and Williams (2012) suggest, the coefficient on earnings before provisions and taxes picks up the extent to which banks record loss provisions based solely on the level of earnings without reference to information about the loan portfolio. In other words, they record large provisions because earnings are high and low provisions because earnings are low.

The loan growth rate is used to control for non-discretionary components of LLP, since this variable is related to changes in default risk. Following Greenawalt and Sinkey (1988), Laeven and Majnoni (2003), Bikker and Metzemakers (2005), Olszak et al. (2017) we expect positive coefficients for this variable. We do not apply non-performing loans as a proxy for non-discretionary earnings management because they are strongly correlated with the business cycle, and thus the estimated coefficient in (2) could have suffered from correlation bias.

We include the bank capital normalized by total assets (CAP) to control for the potential use of capital management. We use total equity capital because banks in Poland applying both Polish Accounting Standards (in the period before 2005) and IFRS (in period beginning in 2005) are not allowed to include general provisions into Tier 2 capital. Net specific LLP affect the level of Tier 1 capital, because increases in LLP are related with decreased net profits and thus with lower retained earnings. In effect the capital ratio is lowered. In contrast, decreases in net specific LLP are related with increases in the total capital of a bank. We expect banks applying capital management with LLP to exhibit a negative coefficient of CAP. The more negative coefficient, the more capital management there will be (see Ghosh 2007; Leventis, Dimitropoulos, Anandarajan 2011; Curcio, Hasan 2015; Olszak et al. 2017). A positive coefficient implies no capital management.

In the model presented with equation (2) our measure of:

– procyclicality of LLP is α_2 (i.e. the sensitivity of LLP to the business cycle); the more negative the coefficient, the stronger the procyclicality of LLP; the positive or more positive this coefficient, the lower the procyclicality of LLP; this coefficient is henceforth called PROCI;

[2] We do not annualize CAP because it is computed using the full balance sheet data (and thus always covers full information about bank risk) and is published at a quarterly frequency.

– income smoothing is α_3 (i.e. the sensitivity of LLP to current period earnings before provisions and taxes); the higher the positive coefficient, the more income smoothing the bank applies; this coefficient is henceforth called ISI;

– non-discretionary earnings management is α_4 (i.e. the sensitivity of LLP to loans growth); the positive coefficient implies a prudent approach to credit risk management (see Laeven, Majnoni 2003 and Fonseca, Gonzalez 2008) and controls for more non-discretionary components of LLP, since this variable is related to changes in default risk; the higher the value of this coefficient, the more loan loss provisions the bank sets aside to cover expected loan-losses in the current period; the negative coefficient implies imprudent risk management with LLPs; this coefficient is henceforth called RMI;

– capital management is α_5; the negative coefficient implies capital management; the higher the absolute value of this coefficient, the more capital management is applied; this coefficient is henceforth called CMI.

To identify the relative procyclicality of LLP, we divide our banks into two subsamples: banks with "low procyclicality" (i.e. banks with the value of PROCI over the median), and banks with "high procyclicality" (i.e. banks with the value of PROCI below median). To differentiate between banks applying income smoothing, we divide the sample also applying the median value of ISI. Low income-smoothing banks are those with ISI below the median, whereas high income-smoothing banks are those with ISI over the median. As for non-discretionary earnings management, we use the median value of RMI to differentiate between banks applying a more non-discretionary earnings management (i.e. those with RMI positive and over the median value), and a less non-discretionary earnings management approach (i.e. those with RMI below the median value). To differentiate between banks applying capital management, we use the CMI index. No-capital management banks are those with positive values of CMI and over the median, whereas capital management banks are banks with negative values of CMI < median.

The indices of PROCI and ISI, i.e. the coefficients on GDP growth and profits before provisions and taxes, are of particular interest in our study. These two coefficients maybe be interpreted as indicative of the important question whether bank provisioning is countercyclical (or forward-looking) or not (see also Borio, Furfine, Lowe 2001; Laeven, Majnoni 2003; Packer, Zhu 2012; Olszak et al. 2017). In particular, the two coefficients could reflect two different forms of forward-looking or countercyclical provisioning practices. One form of countercyclical provisioning is contingent on the state of macroeconomic conditions. A positive coefficient (α_2) implies that banks accumulate provisions during economic upturns, which will be used in economic downturns. In practice, such an approach to provisioning is adopted in several countries (e.g. Spain, Chile, Peru), and is known as the statistical (or dynamic) provisioning method (Burroni et al. 2009; Saurina 2009; Fernandez de Lis, Garcia-Herrero 2010; Wezel 2010; Fillat, Montoriol-Garriga 2010). However, it is imposed by the regulatory authority rather than self-motivated by banks. In Poland in the period under analysis banks were not obliged to apply such a countercyclical tool. So if they used a countercyclical approach to LLPs – they did it voluntary. The other form of countercyclical provisioning is related to bank-specific accounting results, in particular bank earnings. A positive coefficient (α_3) implies that banks put aside more provisions when profits are high. Throughout this paper, we will distinguish between these two possible sources of countercyclical (or procyclical) provisioning behaviour, one micro-oriented and the other macro-oriented.

To test the role of procyclicality of loan loss provisions, income smoothing, risk management and capital management for the impact of capital ratio on bank lending, we estimate equation (1)

in subsamples of banks identified using the median values of PROCI, ISI, RMI and CMI. Such an analysis will provide us with information about the role of low (high) procyclicality (and countercyclicality) of LLP, high (low) income smoothing, prudent (imprudent) risk management with LLP as well as capital management with LLP on the effects of capital ratio on bank lending during both non-recessionary periods as well as recessionary periods.

As we are particularly interested in the role of low procyclicality of LLP as well as high income smoothing (both of which are perceived as a measure of forward-lookingness, see Laeven, Majnoni 2003; Bushman, Williams 2012 or countercyclicality of LLP), we run regression expressed with equation (1) in poorly-capitalized banks and well-capitalized banks. In contrast to the previous work of Carlson, Shan and Warusawitharana (2013), which applies the relative capital ratio size identified with percentile values of capital ratios to differentiate between high versus medium and versus low capital ratio banks, in our study we refer to actual pressures put by official supervisory authorities on banks. In Poland, in the supervisory practices in the period of our analysis, well capitalized banks were those with a capital ratio of at least 12% (even it was not a supervisory expectation) in some of the periods. We define such banks as well-capitalized banks and denoted as CAR > 12. In contrast, banks whose capital adequacy ratio was below 12% for at least some of the period of our analysis are defined as poorly--capitalized banks and denoted as CAR < 12. Poorly-capitalized banks are expected to be prone to risk shocks due to insufficiently high capital buffers. Such an approach yields a number of banks exceeding the total volume of the sample, because in some periods some bank-subsamples overlap.

In the subsamples of well- and poorly-capitalized banks we run additional regressions, which are a modified version of equation 1, with the inclusion of double interaction term between CAR*low procyclicality (to test the impact of capital ratio in non-recessionary periods in banks with low procyclicality of LLP) and a triple interaction term between CAR*recession*low procyclicality (to test the impact of low procyclicality of LLP on the association between lending and capital ratio during recessionary periods). The model is given by equation (3) and reads as:

$$\begin{aligned}\Delta Loan_{i,t} = {} & \alpha_0 + \alpha_1 \cdot \Delta Loan_{i,t-1} + \alpha_2 \cdot CAR_{i,t-2} + \alpha_3 \cdot NIM_{i,t-1} \\ & + \alpha_4 \cdot DEP_{i,t-1} + \alpha_5 \cdot UNEMPL_{i,t} + \alpha_6 \cdot lowprocyclicality + \alpha_7 \cdot recession \\ & + \alpha_8 \cdot recession \cdot lowprocyclicality + \alpha_9 \cdot CAR_{i,t-2} \cdot lowprocyclicality \\ & + \alpha_{10} \cdot CAR_{i,t-2} \cdot recession + \alpha_{11} \cdot CAR_{i,t-2} \cdot recession \cdot lowprocyclicality + \varepsilon_t + \vartheta_{i,t}\end{aligned} \tag{3}$$

In separate models, these additional regressions also cover the role of high income smoothing. In particular, by the inclusion of a double interaction term between CAR*high income smoothing, we test the role of high income smoothing on the effect of capital ratio on bank lending in non--recessionary periods. The triple interaction term between CAR*recession*high income smoothing is included to test effect of capital ratio on lending in recessions in banks which apply income smoothing to a huge extent. The model is given by equation (4) and reads as:

$$\begin{aligned}\Delta Loan_{i,t} = {} & \alpha_0 + \alpha_1 \cdot \Delta Loan_{i,t-1} + \alpha_2 \cdot CAR_{i,t-2} + \alpha_3 \cdot NIM_{i,t-1} \\ & + \alpha_4 \cdot DEP_{i,t-1} + \alpha_5 \cdot UNEMPL_{i,t} + \alpha_6 \cdot highincomesmoothing + \alpha_7 \cdot recession \\ & + \alpha_8 \cdot recession \cdot highincomesmoothing + \alpha_9 \cdot CAR_{i,t-2} \cdot highincomesmoothing \\ & + \alpha_{10} \cdot CAR_{i,t-2} \cdot recession + \alpha_{11} \cdot CAR_{i,t-2} \cdot recession \cdot highincomesmoothing + \varepsilon_t + \vartheta_{i,t}\end{aligned} \tag{4}$$

3.2 Data used for analysis

We use pooled cross-section and time-series quarterly data of individual commercial banks' balance sheet items and profit-and-loss accounts from Poland over a period from 1999 to 2012. The balance--sheet and profit-and-loss account data are taken directly from the prudential reporting of all banks operating in Poland in the period under analysis. This is a unique set of data, which is gathered by Narodowy Bank Polski[3] and used in the Polish Financial Supervisory Authority, and covers the financial statements reporting information ("FINREP") and capital adequacy information (bank capital and own funds composition and capital requirements composition) ("COREP"). In collecting the data set applied in our study, we had to hand-merge three databases, because the range of information reported by banks went through regulatory changes in the period of analysis. We additionally used the data available in the Monitor B (official journal including financial statements reported, among others, by all commercial banks) as well as on the web pages of banks, to complement any data shortages as well as to eliminate potential errors in the base data set.

The macroeconomic data were accessed from Statistics Poland (GUS). We conduct our study for unconsolidated data to include the effects of capital ratio on bank lending in traditional banking business (i.e. taking deposits and extending loans). We exclude outlier banks from our sample by eliminating the extreme bank-specific observations. Based on this selection strategy, the number of banks included in our sample is 65 and the number of observations for the dependent variable is 2833.

In order to capture both economic upswings (non-recessionary periods) and downturns (recessionary periods) we need to use bank data for a sufficiently long period, which is particularly important in the identification of procyclicality of LLP. Thus our period covers 1999 Q4–2012 Q4 and for most banks includes 52 quarters. In this period we are able to identify four recessionary periods (in 2001 Q1–2002 Q1, 2005 Q1–Q4, 2009 Q1–Q3, 2012 Q2–Q4). To identify these periods we refer to Olszak et al. (2014), where these periods are identified using the methodology by Lenart and Pipień (2013).

In Table 1 in Panel A we present descriptive statistics of the key regression variables in the full sample as well as in well-capitalized and poorly-capitalized banks. In Panel B we include baseline statistics for indices measuring procyclicality of LLP (PROCI), income smoothing (ISI), capital management (CMI) and non-discretionary earnings management (RMI). We find that in well-capitalized banks mean the total capital ratio (CAR) is 25.93%, with a median value of 17.17%. As for poorly-capitalized banks, the average CAR is 10.92% with a median value of 9.61%. Well-capitalized banks exhibit lower median loan growth of 2.23% relative to poorly-capitalized banks with median loan growth of 5.19%. There is also visible discrepancy between well-capitalized and poorly-capitalized banks in terms of profitability (NIM). Generally, well capitalized banks' average NIM is around 7.89% with a median value of 5.97%. In contrast, in poorly-capitalized banks these values are 6.11% and 4.70%, respectively.

Looking at descriptive statistics for PROCI, ISI, CMI and RMI, we find that in average commercial banks LLP are procyclical (as the mean PROCI is negative equal to -0.04) and that LLPs are applied to smooth income (as the mean ISI is definitely positive). Close to 0 values of CMI and RMI suggest that the average commercial bank in Poland does not apply LLPs for capital management and for non--discretionary earnings management.

[3] This data is collected because in accordance with Resolution No. 53/2011 of the Management Board of Narodowy Bank Polski of 22 September 2011 as amended (NBP Official Journal of 2011 No. 14, 2013 No. 6, No. 47, 2014 No. 40, 2015 No. 38, 2016 No. 2) and pursuant to Regulation of the European Parliament and Council (EU) No. 575/2013 of June 26, 2013, (L 176, 06.27.2013 p. 1) credit institutions are obliged to provide NBP with prudential reporting on an individual and consolidated basis.

Table 2 presents correlation coefficients between all variables applied in this study. As can be seen from the Table, there is a positive and statistically significant correlation between loan growth and capital ratio, in the full sample, and in well- and poorly-capitalized banks. This correlation of 0.53 is definitely stronger in well-capitalized relative to poorly-capitalized banks, in which this correlation is 0.18.

5 Regression results

5.1 Main results

Before discussing the main regression results, we present the baseline regressions, which examine the relationship between bank lending and bank-specific characteristic variables without including the interaction terms of the capital ratio and measure of cyclicality of LLP as well as of income smoothing. Table 3 reports these results.

First, looking at the full sample results estimated with OLS and FE, we find that the coefficients of the capital ratio are positive and statistically significant at the 1% level. The effect of capital ratio on lending varies between 0.255 and 0.396 (see columns 1–4 in Table 3) in general (see column 1 and 3) or in non-recessionary periods (see column 2 and 4). The capital ratio in recessionary periods does not seem to induce procyclicality of lending in the full sample, because the coefficient on CAR*recession is negative and statistically significant (see columns 1–4). However, the relative level of the capital ratio of a bank matters for the effect of capital ratio on lending in both non-recessionary and recessionary periods (see columns 5–8 in Table 3). Poorly-capitalized banks' lending is definitely more affected by the capital ratio, because the regression coefficients on CAR and on CAR*recession are positive and statistically significant. Based on regression 7, we infer that a 1% decrease (increase) in the capital ratio causes the poorly-capitalized bank to decrease (increase) its lending by 1.724% (as 0.862 + 0.862 = 1.724). In contrast, well-capitalized banks' loan growth is definitely less sensitive to the capital ratio, because the whole effect of CAR is 0.036 (as 0.383 – 0.287 = 0.036).

In all regressions, the coefficients of all the other control variables are generally significant, with expected signs. Concerning the coefficients of the net interest margin on loans (NIM), the estimated coefficients are positive in the full sample and in well-capitalized banks, but their effect is not always significant. The stable funding effect (proxied by DEP) is positive and significant in the poorly--capitalized banks, suggesting that in such banks' lending is also dependent of funding constraints (consistent with Kim and Sohn 2017). Finally, the macroeconomic environment proxied with the unemployment rate (UNEMPL) and recession dummies also exerts the expected effect. Looking at the full sample estimates, we infer that the increases in unemployment are associated with decreases in the bank's loan growth, thus confirming the notion that bank lending is procyclical. This procyclicality is particularly strong in poorly-capitalized banks, in which a 1% increase in the unemployment rate is associated with a 0.466 decrease in lending. As for the recession dummy, we find that only poorly-capitalized banks reduce their lending in a recession (see regression 7). On the contrary, well-capitalized banks' lending does not seem to be diminished in recessions (see column 8 in Table 3).

5.2 The role of cyclicality of LLP as well as income-smoothing in the association between lending and capital ratio

In this subsection we present the tests of our hypotheses referring to the procyclicality of LLP and income smoothing with LLP by banks. In Tables 4 and 5 we present estimates testing hypotheses H1, H2 and H2.1. Table 6 covers empirical tests of hypotheses H1a, H2a and H2.1a.

As can be seen from Table 4, high-procyclicality of LLP banks' lending is definitely more affected by the capital ratio in recessionary periods than the lending of low-procyclicality of LLP banks. Such a result confirms the notion expressed in hypothesis H1, that the capital crunch is weaker for low--procyclicality of LLP banks than for high-procyclicality of LLP banks. In particular, in low-procyclicality of LLP banks, the decrease of capital ratio by 1% seems to increase lending by 0.309%.

The regression coefficient on the interaction term between CAR*recession is positive (equal to 0.365) and statistically significant in high-income smoothing banks, and negative (equal to -0.237) in low income-smoothing banks (see columns 3 and 4 in Table 5). We therefore find empirical support for the view expressed in hypothesis H2.1, that the effect of capital ratio on bank lending in recessions is stronger and economically significant for high income-smoothing banks than for low income--smoothing banks. Thus the results imply that commercial banks in Poland may apply LLP to stabilize earnings without reference to risk intrinsic in their loan portfolio. Consequently, following Van den Heuvel's (2009) theoretical approach, we experience greater shocks to capital ratio, which significantly affect banks' lending in recessionary periods. With our results we are not able to confirm the view that income smoothing is beneficial for the stability of the capital ratio and bank lending, as expressed in hypothesis H2. Generally, our results seem to contradict the view that the effect of capital ratio on bank lending in recessions is lower for high income-smoothing banks than for low income-smoothing banks (see hypothesis 2).

Table 6 includes the empirical results of our tests of hypothesis H1a (regressions 1, 2, 5 and 6), H2a (regressions 3, 4, 7 and 8) and H2.1a (regressions 3, 4, 7 and 8). To build more robustness into our analysis we estimate these regressions applying both OLS (columns 1–4 in Table 6) and FE (columns 5–8 in Table 6). The triple interaction variable describing the effect of low-procyclicality of LLP on the association between capital ratio and lending in banks which differ in the level of capital ratio (i.e. poorly-capitalized versus well-capitalized banks) is negative and statistically significant at the level of 1% for well-capitalized banks (see regressions 2 and 6) and positive, but not significant for poorly--capitalized banks (see regressions 1 and 5). Based on regressions 2 and 6, we infer that a 1% decrease in the capital ratio in well-capitalized and low-procyclicality of LLP banks in recessionary periods results in an increase of loans-growth by 0.422% (as 0.18 – 0.602 = -0.422) or by 0.397% (as 0.204 – 0.601 = -0.397), respectively, in regressions 2 and 6. In contrast, poorly-capitalized banks' lending does not seem to benefit from decreased procyclicality of LLP in recessions, as the effect of capital ratio on lending in recessions is still positive (but not significant) (see regressions 1 and 5). Therefore, we find support for the view expressed in hypothesis H1a, that the effect of capital ratio on bank lending in recessionary periods is weaker for low-procyclicality of LLP banks and well-capitalized banks than for low-procyclicality of LLP banks and poorly-capitalized banks.

Furthermore, the coefficients on the triple interaction term of CAR*recession*high income--smoothing, describing the impact of income smoothing on the association between CAR and lending, differ between poorly-capitalized and well-capitalized banks, consistent with hypothesis H2a.

This coefficient is positive and statistically significant in well-capitalized banks, suggesting that lending of banks which apply more income smoothing is more affected by the capital ratio in recessions (see regressions 4 and 8 in Table 6). Explicitly, we find that low income smoothing and well-capitalized banks' lending in recessions is not economically affected by the capital ratio, because independently of the estimation method (i.e. both OLS and FE estimators), the effect of CAR is negative and statistically significant at 1%, and equals -0.54 (see regression 4) or -0.362 (see regression 8). In contrast, the impact of the capital ratio on lending in recessions becomes economically and statistically significant in high-income smoothing banks, because the coefficient on triple interaction of CAR*recession*high income smoothing is positive and equals 0.827 (in OLS estimation, regression 4 in Table 6) and 0.64 (in FE estimation, regression 8 in Table 8). Based on regression 4, we infer that a 1% decrease in CAR in a recession causes high-income smoothing banks to decrease their lending by 0.287% (as 0.827 – 0.54 = 0.287, in regression 4) or by 0.278% (as 0.64 – 0.362 = 0.278, in regression 8). In contrast, poorly--capitalized banks' lending does not seem to benefit significantly from increased income smoothing, because the negative coefficient on triple interaction of CAR*recession*high-income smoothing is not statistically significant (see regressions 3 and 7 in Table 6). Such an effect seems to give empirical support to the view expressed in hypothesis H2.1a that the effect of the capital ratio on bank lending in recessions is stronger and economically significant for high income smoothing and well-capitalized banks than for high income smoothing and poorly-capitalized banks. To sum up, our results seem to be in line with the notion that well-capitalized banks may be more sensitive to additional risks typical of increased discretionary income smoothing (see e.g. Bushman, Williams 2012), in order to, for example, avoid supervisory authority actions. Therefore, the effect of capital ratios on lending in well-capitalized banks, may be strengthened if bank managers use discretionary earnings management.

5.3 Results of control of non-discretionary earnings management and capital management

In Table 7 we present control tests of the role of non-discretionary earnings management on the effect of CAR on lending. As we can see from the table, differentiating between banks applying more non--discretionary earnings management (the "prudent risk management" banks, see columns 1 and 3) and less non-discretionary earnings management (the "imprudent risk management banks", see columns 2 and 4) does not result in changes in the sensitivity of lending to capital ratio, in both non-recessionary and recessionary periods, because the coefficients on CAR are positive, statistically significant and of almost the same magnitude – ranging between 0.129 and 0.157 – in all four estimations in Table 7. What's more, the effect of CAR on lending in recession is weakly positive and statistically insignificant. We therefore infer that non-discretionary earnings management does not matter for the effect of CAR on loan growth of banks, which is consistent with hypothesis H3.

Our results presented in Table 8 seem to be in line with the expectation that banks prefer to have a steadily increasing amount of capital to keep buffers for stable lending in recessions. The third column in this table gives empirical support to our prediction, expressed in hypothesis H4, that the lending of banks which do not apply capital management with LLPs will be lending more sensitive to the capital crunch effect in recessionary periods. In particular, the coefficient on the double interaction term of CAR*recession is positive and statistically significant at 1% in no-capital management banks.

The recessionary impact of CAR on loan growth is economically important, because for no-capital management banks the lending-capital ratio sensitivity is 0.369 and increases by 0.201 relative to non--recessionary periods (as 0.369 – 0.168 = 0.0201). Looking at the coefficient in regression 4, testing the impact of the use of capital management on lending-capital ratio sensitivity, we find evidence that some application of capital management reduces the capital crunch effect. In particular, the association between CAR and lending is negative (of low magnitude equal to -0.046) and statistically insignificant.

5.4 Robustness checks

In this section, we conduct several robustness checks to determine whether our results remain unchanged. First, we investigate the robustness of our results by employing an alternative measure of the capital ratio into the baseline model and to subgroups of banks differing in the level of capital ratio. To this end, instead of using the total capital adequacy ratio, we include Tier 1 capital adequacy ratio. Specifications of regressions presented in Table 9 show that the regression results (in particular in the non-recessionary period) remain unchanged.

Second, we run baseline regressions in banks which differ in size, because size is perceived as a potential factor behind the diversity of the effect of capital ratio on loans growth (see e.g. Beatty, Liao 2011; Kim, Sohn 2017). To do this, we divide banks into three subsamples, i.e. large – denoting 30% banks with largest assets, medium – denoting 40% of banks with medium assets, and finally small – denoting 30% of banks with smallest assets. The results are shown in Table 10. They are consistent with the view that large banks' lending is definitely more affected by the level of capital ratio in non--recessionary periods. However, we do not find support for the previous result by Beatty and Liao (2011) that lending of large banks is definitely more sensitive to capital ratio in recessionary periods. All regressions coefficients on CAR*recession are negative (and statistically significant at 1% in medium and large banks), suggesting the lack of heterogeneity in the sensitivity of loans growth to capital ratio in recessions in banks differing in size.

Third, we perform regressions with an alternate measure for the capital ratio to test the role of cyclicality of LLP and income smoothing in the link between lending and capital ratio. Table 11 reports the results for the change in capital ratio. Regressions include the baseline model in banks exhibiting low procyclicality of LLP (see columns 1 and 3 in Table 11), high procyclicality of LLP (see columns 2 and 4 in Table 11), as well as high income-smoothing banks (columns 5 and 7) and low income-smoothing banks (columns 6 and 8). Comparing these specifications with the models presented in Tables 4 and 5, we can see that the conclusions remain unchanged.

6 Conclusions

Using the 2000 Q1–2012 Q4 unbalanced quarterly observations of Polish commercial banks, this study examines whether the effect of bank capital on lending differs depending upon the cyclicality of LLP and income smoothing. There are two novel contributions of our study relative to the literature.

First, we show that the effect of capital ratio on loans growth is significantly sensitive to two loan-loss provisioning practices, i.e. co-movement of LLP with business cycle and income smoothing.

Banks with more procyclical loan-loss provisions exhibit greater sensitivity of lending to capital ratio, relative to less procyclical banks. Lending of banks with low procyclicality of loan-loss provisions (LLP) is not affected by capital ratio in recessionary periods. In contrast to the widely accepted belief, banks engaging in more income smoothing exhibit greater sensitivity of lending to capital ratio.

Second, we provide evidence that the impact of LLP practices depends on the banks' capital ratio size. Low-procyclicality of LLPs does not make poorly-capitalized banks' lending immune to recessionary capital crunch. The effect that profit stabilizing practices achieved through income smoothing do not make banks' lending resilient to capital constraints during recession is also present in well-capitalized banks. Thus our results suggest that capital-buffers do not reduce the negative effects of discretionary income smoothing, including, for example, increased risk-taking and decreased transparency.

The implication of our research is that decision-makers implementing new accounting standards for loan-loss allowance as included in the IAS 9 (the Expected Credit Loss approach) may not be effective in reducing procyclicality of capital regulation if they attempt to reduce recessionary capital constraints through profit-stabilizing income smoothing. There seems to be great need for increased market discipline, reducing the undesirable effects of potentially higher risk-taking related to income smoothing, as suggested in other studies (e.g. Bushman, Williams 2012).

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Appendix

Table 1
Descriptive statistics

Panel A. descriptive statistics for bank specific variables and measures of procyclicality, income smoothing, risk management and capital management

	Mean	Median	Std. dev.	Min	Max	# Banks	# Obs.
Full sample							
ΔLoans	6.57	3.10	24.57	-65.83	331.95	65	2833
CAR	21.62	14.32	38.30	-158.86	533.85	57	2566
CAR1	21.77	14.36	39.14	0.34	552.93	57	2548
NIM	7.09	5.57	6.90	-24.34	84.30	65	2788
DEP	63.21	73.19	26.04	0.00	99.97	65	2873
UNEMPL	15.26	15.55	3.54	9.10	20.60	65	3380
Capital ratio above 12							
ΔLoans	6.08	2.23	25.34	-52.85	331.95	57	1793
CAR	25.93	17.17	42.59	-5.49	533.85	57	1776
CAR1	26.09	17.43	43.74	0.43	552.93	57	1772
NIM	7.89	5.97	7.87	-24.34	84.30	57	1757
DEP	61.73	71.48	23.95	0.00	92.55	57	1819
UNEMPL	15.75	15.90	3.41	9.10	20.60	57	1828
Capital ratio below 12							
ΔLoans	6.25	5.19	16.44	-65.83	297.65	46	777
CAR	10.92	10.50	3.91	-8.62	52.44	46	763
CAR1	10.62	9.61	3.98	0.34	52.44	46	751
NIM	6.11	4.70	4.22	-2.15	27.53	46	763
DEP	72.29	77.45	17.78	0.00	93.27	46	779
UNEMPL	14.39	13.00	3.72	9.10	20.60	46	780

Notes:
ΔLoans – real loans growth rate; CAR – total capital adequacy ratio; CAR1 – Tier 1 CAR; NIM – net interest margin; DEP – nonfinancial sector deposits as a share of total assets; UNEMPL – unemployment rate. Capital ratio above 12 denotes banks which during the period of analysis always exhibited a capital adequacy ratio over 12%. Capital ratio below 12 denotes banks which during the period of analysis exhibited a capital adequacy ratio below 12% at least for some of the time period. # denotes number of.

Table 1
Descriptive statistics

Panel B. Descriptive statistics for procyclicality of LLP, income smoothing, non-discretionary earnings management and capital management

	Mean	**Median**	**Std. dev.**	**Min**	**Max**	**# Banks**
PROCI	-0.040	-0.032	0.080	-0.299	0.212	40
ISI	0.203	0.140	0.279	-0.260	1.374	40
CMI	0.001	0.003	0.057	-0.174	0.198	40
RMI	0.010	0.006	0.037	-0.103	0.113	40

Notes:
PROCI – procyclicality measure of a bank, i.e. regression coefficient between loan-loss provisions (LLP) and GDP growth rate; ISI – income smoothing measure of a bank, i.e. regression coefficient between loan-loss provisions and profit before provisions and taxes; RMI – non-discretionary earnings management measure, i.e. regression coefficient between loan-loss provisions and loans growth rate; CMI – capital management measure of a bank, i.e. regression coefficient between loan--loss provisions and capital ratio (total capital divided by total assets).
# denotes number of.

Table 2
Correlations

	ΔLoans	p-val.	CAR	p-val.	CAR1	p-val.	NIM	p-val.	DEP	p-val.	UNEMPL
Full sample											
ΔLoans	1.00										
CAR	0.47	***	1.00								
CAR1	0.50	***	0.99	***	1.00						
NIM	0.21	***	0.45	***	0.49	***	1.00				
DEP	-0.06	***	-0.33	***	-0.32	***	-0.04	**	1.00		
UNEMPL	0.01		0.09	***	0.10	***	0.23	***	0.18	0.00	1.00
Capital ratio above 12											
ΔLoans	1.00										
CAR	0.53	***	1.00								
CAR1	0.56	***	0.99	***	1.00						
NIM	0.29	***	0.47	***	0.51	***	1.00				
DEP	-0.15	***	-0.32	***	-0.32	***	-0.05	**	1.00		
UNEMPL	0.05	**	0.09	***	0.09	***	0.16	***	0.20	***	1.00
Capital ratio below 12											
ΔLoans	1.00										
CAR	0.18	***	1.00								
CAR1	0.18	***	0.82	***	1.00						
NIM	-0.05	0	-0.08	**	0.04		1.00				
DEP	0.03	0.43	-0.13	***	-0.01		0.04		1.00		
UNEMPL	-0.11	***	-0.05		0.08	**	0.40	***	0.16	***	1.00

Notes:
ΔLoans – real loans growth rate; CAR – capital adequacy ratio; CAR1 – Tier 1 CAR; NIM – net interest margin; DEP – nonfinancial sector deposits as a share of total assets; UNEMPL – unemployment rate. Capital ratio above 12 denotes banks which during the period of analysis always exhibited a capital adequacy ratio over 12%. Capital ratio below 12 denotes banks which during the period of analysis exhibited a capital adequacy ratio below 12% at least for some of the time period.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 3
Baseline results in full sample and subsamples categorized following the capital adequacy ratio level

	Full sample	**Full sample**	**Full sample**	**Full sample**	**CAR < 12**	**CAR > 12**	**CAR < 12**	**CAR > 12**
	OLS p-val	**OLS p-val**	**FE p-val**	**FE p-val**	**FE p-val**	**FE p-val**	**FE p-val**	**FE p-val**
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
ΔLoans(-1)	0.227***	0.229 ***	0.172 ***	0.175 ***	0.033	0.177 ***	0.022	0.183 ***
	(13.10)	(13.28)	(9.58)	(9.78)	(0.86)	(8.52)	(0.58)	(8.87)
CAR(-2)	0.255 ***	0.314 ***	0.347 ***	0.396 ***	1.061 ***	0.326 ***	0.862 ***	0.383 ***
	(10.88)	(12.37)	(12.91)	(14.01)	(5.15)	(11.11)	(3.91)	(12.53)
NIM(-1)	0.195 ***	0.228 ***	0.069	0.120	-0.287	0.055	-0.362	0.144
	(3.25)	(3.80)	(0.92)	(1.57)	(-1.26)	(0.64)	(-1.58)	(1.66)
DEP(-1)	0.035 *	0.029 *	0.021	0.021	0.127 **	-0.009	0.107 **	-0.006
	(2.01)	(1.71)	(0.90)	(0.88)	(2.39)	(-0.33)	(2.02)	(-0.21)
UNEMPL	-0.276**	-0.220**	-0.234**	-0.191 *	-0.466**	-0.027	-0.412**	0.010
	(-2.64)	(-2.11)	(-2.14)	(-1.75)	(-2.30)	(-0.19)	(-2.03)	(0.07)
recession		1.950 *		1.518			-13.27***	4.079 ***
		(1.72)		(1.33)			(-2.93)	(2.86)
CAR*recession		-0.256***		-0.235***			0.862 **	-0.287***
		(-5.82)		(-5.24)			(2.13)	(-5.88)
Cons	0.014	-1.026	-0.205	-1.306	-6.180	-2.276	-1.719	-4.443*
	(0.01)	(-0.56)	(-0.10)	(-0.63)	(-1.31)	(-0.89)	(-0.36)	(-1.73)

Table 3, cont'd

	Full sample		Full sample		Full sample		Full sample		CAR < 12		CAR > 12		CAR < 12		CAR > 12	
	OLS	p-val	OLS	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val
	1		2		3		4		5		6		7		8	
# obs.	2499		2499		2499		2499		760		1737		760		1737	
# groups	57		57		57		57		46		57		46		57	
F	119.72	***	93.69	***												
R-squared	0.194		0.208													
Adj R-squared	0.192		0.206													
R-sq within					0.187		0.201		0.062		0.215		0.080		0.233	
R-sq between					0.224		0.272		0.025		0.568		0.027		0.651	
R-sq overall					0.186		0.202		0.048		0.239		0.063		0.262	
F					112.22	***	87.28	***	9.38	***	91.6	***	8.74	***	72.6	***
F that all u_i = 0					2.07	***	1.98	***	0.94	0.59	1.97	***	0.95	0.56	1.82	***

Notes:
This table presents the results of the estimation of regression 1 obtained with the OLS and FE estimators; the dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate; the explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – nonfinancial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods; CAR > 12 denotes banks which during the period of analysis always exhibited a capital adequacy ratio over 12%. CAR < 12 denotes banks which during the period of analysis exhibited a capital adequacy ratio below 12% at least for some of the time period.
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 4
Determinants of bank lending, the effect of capital ratio in recessions and cyclicality of loan-loss provisions

XTREG FE	**Low procyclicality (PROCI > median)**		**High procyclicality (PROCI < median)**		**Low procyclicality (PROCI > median)**		**High procyclicality (PROCI < median)**	
	FE	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**
	1		**2**		**3**		**4**	
ΔLoans(-1)	0.120	***	0.191	***	0.096	**	0.187	***
	(3.34)		(6.93)		(2.63)		(6.77)	
CAR(-2)	0.456	***	0.032		0.518	***	0.010	
	(8.74)		(0.83)		(9.33)		(0.25)	
NIM(-1)	0.304	***	0.423	***	0.302	***	0.370	**
	(3.10)		(3.27)		(3.09)		(2.83)	
DEP(-1)	0.018		0.058		0.009		0.063	
	(0.45)		(1.56)		(0.23)		(1.67)	
UNEMPL	-0.378	**	-0.220		-0.351	**	-0.223	
	(-2.73)		(-1.44)		(-2.53)		(-1.44)	
recession					3.655	**	-4.322	**
					(2.03)		(-2.51)	
CAR*recession					-0.309	***	0.188	**
					(-3.17)		(2.37)	
Cons	-0.075		-0.617		-0.291		0.237	
	(-0.02)		(-0.22)		(-0.08)		(0.08)	
# obs.	857		852		857		852	

Table 4, cont'd

XTREG FE	Low procyclicality (PROCI > median)		High procyclicality (PROCI < median)		Low procyclicality (PROCI > median)		High procyclicality (PROCI < median)	
	FE	p-val	FE	p-val	FE	p-val	FE	p-val
	1		2		3		4	
# groups	19		19		19		19	
R-sq within	0.228		0.086		0.238		0.093	
R-sq between	0.460		0.495		0.485		0.489	
R-sq overall	0.242		0.103		0.253		0.109	
F	49.16	***	15.51	***	37.14	***	12.1	***
F that all u_i = 0	2.23	***	1.46		2.15	***	1.48	*

Notes:
This table presents the results of the estimation of regression 1 obtained with the FE estimator. The dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate. The explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – non-financial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods; low procyclicality – a dummy variable taking the value of 1 for banks with PROCI measure over the median PROCI (i.e. PROCI > median); high procyclicality – a dummy variable taking the value of 1 for banks with PROCI measure below the median PROCI (i.e. PROCI < median).
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 5
Determinants of bank lending, the effect of capital ratio in recessions and income smoothing

XTREG FE	**High income smoothing (ISI > median)**		**Low income smoothing (ISI < median)**		**High income smoothing (ISI > median)**		**Low income smoothing (ISI < median)**	
	FE	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**
	1		**2**		**3**		**4**	
ΔLoans(-1)	0.033		0.182	***	-0.011		0.171	***
	(0.94)		(6.16)		(-0.30)		(5.75)	
CAR(-2)	0.017		0.357	***	-0.043		0.383	***
	(0.49)		(7.00)		(-1.18)		(7.28)	
NIM(-1)	0.325	***	0.547	***	0.244	**	0.529	***
	(2.94)		(5.13)		(2.23)		(4.95)	
DEP(-1)	0.083	**	-0.007		0.096	**	-0.014	
	(2.32)		(-0.18)		(2.72)		(-0.38)	
UNEMPL	-0.403	***	-0.149		-0.427	***	-0.092	
	(-2.88)		(-1.04)		(-3.08)		(-0.63)	
recession					-6.572	***	2.327	
					(-4.35)		(1.14)	
CAR*recession					0.365	***	-0.237	**
					(5.23)		(-2.12)	
Cons	2.046		-3.051		3.338		-3.235	
	(0.61)		(-1.02)		(1.01)		(-1.08)	
# obs.	780		929		780		929	

Table 5, cont'd

XTREG FE	High income smoothing (ISI > median)		Low income smoothing (ISI < median)		High income smoothing (ISI > median)		Low income smoothing (ISI < median)	
	FE	p-val	FE	p-val	FE	p-val	FE	p-val
	1		2		3		4	
# groups	18		20		18		20	
R-sq within	0.023		0.245		0.058		0.250	
R-sq between	0.179		0.082		0.316		0.107	
R-sq overall	0.027		0.220		0.066		0.229	
F	3.58	***	58.63	***	6.58	***	42.97	***
F that all u_i = 0	2.58	***	3.41	***	2.38	***	3.12	***

Notes:
This table presents the results of the estimation of regression 1 obtained with the FE estimator. The dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate. The explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – nonfinancial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods; high income smoothing – a dummy variable taking the value of 1 for banks with ISI measure over the median ISI (i.e. ISI > median); low income smoothing – a dummy variable taking the value of 1 for banks with ISI measure below the median ISI (i.e. ISI < median).
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 6
Determinants of bank lending, the effect of capital ratio in recessions and the impact of cyclicality of LLP and income smoothing in banks categorized following CAR size

	CAR < 12		**CAR > 12**		**CAR < 12**		**CAR > 12**		**CAR < 12**		**CAR > 12**		**CAR < 12**		**CAR > 12**	
	OLS	**p-val**	**OLS**	**p-val**	**OLS**	**p-val**	**OLS**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**
	1		**2**		**3**		**4**		**5**		**6**		**7**		**8**	
ΔLoans(-1)	0.168	***	0.164	***	0.203	***	0.149	***	0.087	*	0.117	***	0.133	***	0.068	**
	(3.79)		(6.39)		(4.67)		(5.51)		(1.87)		(4.46)		(2.93)		(2.43)	
CAR(-2)	1.639	***	-0.035		0.774	***	0.422	***	1.815	***	-0.007		0.862	***	0.547	***
	(6.33)		(-0.92)		(4.66)		(8.25)		(6.55)		(-0.18)		(4.90)		(9.50)	
NIM(-1)	0.137		0.387	***	0.095		0.404	***	0.302	**	0.407	***	0.219		0.454	***
	(1.45)		(5.31)		(0.98)		(5.52)		(2.13)		(4.15)		(1.53)		(4.63)	
DEP(-1)	0.068	**	0.026		0.074	**	0.044	*	0.111	***	0.011		0.088	**	0.006	
	(2.51)		(1.04)		(2.80)		(1.74)		(2.99)		(0.32)		(2.37)		(0.18)	
UNEMPL	-0.208	*	-0.085		-0.195	*	-0.051		-0.308	**	-0.145		-0.259	**	-0.174	
	(-1.92)		(-0.59)		(-1.81)		(-0.35)		(-2.53)		(-0.95)		(-2.11)		(-1.14)	
Low procyclicality	14.01	***	-10.34	***												
	(3.86)		(-6.24)													
High income smoothing					-9.77	*	8.07	***								
					(-1.96)		(4.79)									
recession	1.640		-4.294	*	-2.831		9.285	***	3.641	0.57	-4.871	**	-3.259		6.067	**
	(0.26)		(-1.94)		(-0.75)		(3.40)		(0.57)		(-2.17)		(-0.85)		(2.21)	
Recession * Low procyclicality	-6.222		12.176	***					-8.876	0.24	12.244	***				
	(-0.82)		(3.56)						(-1.17)		(3.51)					
Recession * High income smoothing					11.782		-14.283	***					9.740		-10.943	***
					(1.23)		(-4.00)						(1.01)		(-3.06)	

Table 6, cont'd

	CAR < 12	CAR > 12	CAR < 12	CAR > 12	CAR < 12	CAR > 12	CAR < 12	CAR > 12
	OLS p-val	OLS p-val	OLS p-val	OLS p-val	FE p-val	FE p-val	FE p-val	FE p-val
	1	2	3	4	5	6	7	8
CAR * Low procyclicality	-1.182***	0.556***			-1.338***	0.562***		
	(-3.73)	(8.59)			(-3.92)	(8.00)		
CAR* High income smoothing			0.796*	-0.473***			0.652	-0.627***
			(1.81)	(-7.14)			(1.37)	(-8.74)
CAR* recession	-0.359	0.180**	0.008	-0.540***	-0.409	0.204**	0.042	-0.362**
	(-0.63)	(2.06)	(0.02)	(-4.16)	(-0.72)	(2.28)	(0.13)	(-2.75)
CAR* recession * Low procyclicality	0.472	-0.602***			0.576	-0.601***		
	(0.70)	(-4.06)			(0.85)	(-3.92)		
CAR* recession * High income smoothing			-1.085	0.827***			-0.782	0.640***
			(-1.26)	(5.21)			(-0.90)	(4.00)
Cons	-15.722***	0.858	-5.848*	-9.490***	-11.733***	-2.672 0.40	-10.842***	-2.210
	(-4.12)	(0.32)	(-1.81)	(-3.45)	(-3.32)	(-0.85)	(-2.85)	(-0.71)
# obs.	593	1114	593	1114	593	1114	593	1114.000
F	11.7***	28.08***	10.49***	26.23***	2.22***	2.71 ***	1.66**	3.08***
R-squared	0.18	0.22	0.17	0.21				
Adj R-squared	0.17	0.21	0.15	0.20				
within					0.16	0.18	0.14	0.19
between					0.04	0.29	0.11	0.19
overall					0.02	0.16	0.06	0.13

Notes:
This table presents the results of the estimation of regression 1 obtained with the OLS and FE estimators. The dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate. The explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – nonfinancial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods; low procyclicality – a dummy variable taking the value of 1 for banks with PROCI measure over the median PROCI; high income smoothing – a dummy variable taking the value of 1 for banks with ISI measure over the median ISI; CAR > 12 denotes banks which during the period of analysis always exhibited a capital adequacy ratio over 12%; CAR < 12 denotes banks which during the period of analysis exhibited a capital adequacy ratio below 12% at least for some of the time period.
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 7
Determinants of bank lending, the effect of capital ratio in recessions and non-discretionary earnings management

XTREG FE	**Prudent risk management (RMI > median)**		**Imprudent risk management (RMI < median)**		**Prudent risk management (RMI > median)**		**Imprudent risk management (RMI < median)**	
	FE	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**
	1		**2**		**3**		**4**	
ΔLoans(-1)	0.187	***	0.221	***	0.186	***	0.220	***
	(7.34)		(6.75)		(7.14)		(6.73)	
CAR(-2)	0.135	***	0.157	***	0.129	**	0.154	***
	(3.23)		(3.54)		(2.57)		(3.45)	
NIM(-1)	0.291	***	0.659	***	0.283	***	0.637	***
	(4.42)		(3.82)		(4.30)		(3.64)	
DEP(-1)	0.037	*	0.065		0.033		0.064	
	(1.71)		(1.02)		(1.51)		(0.99)	
UNEMPL	-0.160		-0.272		-0.136		-0.256	
	(-1.60)		(-1.49)		(-1.34)		(-1.38)	
recession					-1.566		-2.162	
					(-1.26)		(-0.90)	
CAR*recession					0.018		0.074	
					(0.31)		(0.56)	
Cons	-1.088		-3.654		-0.647		-3.275	
	(-0.58)		(-0.66)		(-0.33)		(-0.59)	

Table 7, cont'd

XTREG FE	Prudent risk management (RMI > median)		Imprudent risk management (RMI < median)		Prudent risk management (RMI > median)		Imprudent risk management (RMI < median)	
	FE	p-val	FE	p-val	FE	p-val	FE	p-val
	1		2		3		4	
# obs	872		837		872		837	
# groups	19		19		19		19	
R-sq within	0.161		0.126		0.165		0.127	
R-sq between	0.385		0.409		0.380		0.411	
R-sq overall	0.169		0.139		0.172		0.141	
F	32.64	***	23.43	***	23.8	***	16.85	***
F that all u_i = 0	2.62	***	1.71	**	2.58	***	1.7	**

Notes:
This table presents the results of the estimation of regression 1 obtained with the FE estimator. The dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate. The explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – non-financial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods; prudent risk management – a dummy variable taking the value of 1 for banks with RMI measure over the median RMI (i.e. RMI > median); imprudent risk management – a dummy variable taking the value of 1 for banks with RMI measure below the median RMI (i.e. RMI < median).
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 8
Determinants of bank lending, the effect of capital ratio in recessions and capital management

XTREG FE	**No capital management (CMI > median)**		**Capital management in use (CMI < median)**		**No capital management (CMI > median)**		**Capital management in use (CMI < median)**	
	FE	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**
	1		**2**		**3**		**4**	
ΔLoans(-1)	0.057		0.324	***	0.056		0.321	***
	(1.55)		(14.08)		(1.53)		(13.94)	
CAR(-2)	0.120		0.130	***	-0.168		0.131	***
	(1.39)		(4.80)		(-1.25)		(4.78)	
NIM(-1)	0.500	***	0.318	***	0.514	***	0.291	**
	(4.26)		(3.04)		(4.39)		(2.76)	
DEP(-1)	0.114	**	0.003		0.117	**	-0.004	
	(2.33)		(0.12)		(2.39)		(-0.14)	
UNEMPL	-0.288		-0.133		-0.271		-0.091	
	(-1.62)		(-1.21)		(-1.52)		(-0.81)	
recession					-5.993	**	-1.045	
					(-2.49)		(-0.65)	
CAR*recession					0.369	**	-0.046	
					(2.81)		(-0.52)	
Cons	-4.446		0.041		-0.604		0.548	
	(-1.00)		(0.02)		(-0.13)		(0.24)	

Table 8, cont'd

XTREG FE	No capital management (CMI > median)		Capital management in use (CMI < median)		No capital management (CMI > median)		Capital management in use (CMI < median)	
	FE	p-val	FE	p-val	FE	p-val	FE	p-val
	1		2		3		4	
#obs	803		906		803		906	
# groups	18		20		18		20	
R-sq within	0.042		0.310		0.051		0.314	
R-sq between	0.181		0.557		0.187		0.583	
R-sq overall	0.043		0.325		0.053		0.330	
F	6.79	***	79.09	***	6.02	***	57.41	***
F that all u_i = 0	2.08	**	2.09	***	2	**	1.95	**

Notes:
This table presents the results of the estimation of regression 1 obtained with the FE estimator. The dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate. The explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – nonfinancial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods; no capital management – a dummy variable taking the value of 1 for banks with CMI measure over the median CMI (i.e. CMI > median); capital management in use – a dummy variable taking the value of 1 for banks with CMI measure below the median CMI (i.e. CMI < median).
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 9
Robustness of results to change in the main explanatory variable – the role of Tier 1 capital ratio in the baseline regression

	Full sample		**Full sample**		**CAR < 12**		**CAR > 12**		**CAR < 12**		**CAR > 12**	
XTREG FE	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**
	1		**2**		**3**		**4**		**5**		**6**	
ΔLoans(-1)	0.153	***	0.156	***	0.034		0.154	***	0.032		0.160	***
	(8.59)		(8.83)		(0.88)		(7.45)		(0.83)		(7.82)	
CAR tier1(-2)	0.353	***	0.389	***	1.062	***	0.337	***	1.057	***	0.379	***
	(14.70)		(15.65)		(5.72)		(12.65)		(5.22)		(13.79)	
NIM(-1)	-0.001		0.049		0.032		-0.007		-0.056		0.074	
	(-0.01)		(0.66)		(0.14)		(-0.09)		(-0.25)		(0.86)	
DEP(-1)	0.023		0.022		0.130	**	-0.006		0.109	**	-0.003	
	(1.02)		(1.00)		(2.71)		(-0.23)		(2.27)		(-0.13)	
UNEMPL	-0.211	**	-0.168		-0.589	***	-0.031		-0.509	**	0.001	
	(-2.05)		(-1.63)		(-3.17)		(-0.23)		(-2.72)		(0.01)	
recession			1.201						-2.545		3.335	**
			(1.15)						(-0.64)		(2.50)	
CAR1*recession			-0.210	***					-0.099		-0.245	***
			(-5.17)						(-0.27)		(-5.47)	
Cons	-0.154		-1.060		-6.010		-2.176		-4.106		-3.864	
	(-0.08)		(-0.55)		(-1.48)		(-0.89)		(-0.97)		(-1.58)	
# obs	2,484		2,484		749		1,733		749		1,733	
# groups	57		57		46		57		46		57	
R-sq within	0.211		0.224		0.067		0.231		0.078		0.247	
R-sq between	0.318		0.375		0.064		0.718		0.106		0.770	
R-sq overall	0.214		0.230		0.054		0.267		0.068		0.288	
F	129.23	***	99.49	***	9.94	***	100.4	***	8.36	***	78.08	***
F that all u_i = 0	2.51	***	2.37	***	1.23	0.15	2.03	***	1.15	0.24	1.84	***

Notes:
This table presents the results of the estimation of regression 1 obtained with the FE estimator. The dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate. The explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – nonfinancial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods.
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 10
Determinants of bank lending, the effect of capital ratio in recessions on bank size

	Small		Medium		Large		Small		Medium		Large	
	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val
	1		2		3		4		5		6	
ΔLoans(-1)	0.167	***	0.202	***	0.090	***	0.146	***	0.215	***	0.093	***
	(3.85)		(8.19)		(3.20)		(2.92)		(8.72)		(3.31)	
CAR(-2)	0.174	*	0.272	***	0.674	***	0.211	*	0.311	***	0.738	***
	(1.84)		(8.72)		(10.73)		(1.91)		(9.63)		(11.18)	
NIM(-1)	1.046	**	0.169	*	-0.176		1.059	**	0.262	**	-0.231	*
	(2.88)		(1.68)		(-1.50)		(2.81)		(2.56)		(-1.96)	
DEP(-1)	0.047		-0.004		0.057		0.046		-0.006		0.051	
	(1.54)		(-0.13)		(1.43)		(1.51)		(-0.17)		(1.28)	
UNEMPL	0.179		-0.069		-0.533	***	0.240		-0.010		-0.464	***
	(0.65)		(-0.42)		(-3.38)		(0.86)		(-0.06)		(-2.92)	
recession							-2.103		1.279		3.599	*
							(-0.66)		(0.80)		(1.76)	
CAR*recession							-0.035		-0.217	***	-0.379	***
							(-0.26)		(-4.33)		(-3.16)	
cons	-16.199	***	-1.474		0.820		-17.033	***	-2.897		0.088	
	(-3.27)		(-0.50)		(0.26)		(-3.24)		(-0.97)		(0.03)	
# obs.	158		1280		1198		158		1280		1198	

Table 10, cont'd

	Small		Medium		Large		Small		Medium		Large	
	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val
	1		2		3		4		5		6	
# groups	6		33		28		6		33		28	
R-sq within	0.50		0.22		0.15		0.51		0.24		0.16	
R-sq between	0.104		0.051		0.498		0.149		0.072		0.493	
R-sq overall	0.461		0.217		0.162		0.472		0.239		0.169	
F	29.92	***	71.86	***	42.44	***	21.95	***	56.59	***	32.4	***
F that all u_i = 0	5.16	***	2.53	***	1.81	0.01	4.71	***	2.38	***	1.86	***

Notes:
This table presents the results of the estimation of regression 1 obtained with the FE estimator. The dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate. The explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – nonfinancial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods; small – denotes banks with small size of assets (i.e. 30% of banks with the smallest assets); large – denotes 30% of banks with the largest assets; medium – denotes 40% of banks with medium assets.
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Table 11
Robustness check of the effect of cyclicality of LLP and income smoothing and the impact of Tier 1 capital adequacy ratio

XTREG FE	Low procyclicality (PROCI > median)		High procyclicality (PROCI < median)		Low procyclicality (PROCI > median)		High procyclicality (PROCI > median)		High income smoothing (ISI > median)		Low income smoothing (ISI < median)		High income smoothing (ISI > median)		Low income smoothing (ISI < median)	
	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val	FE	p-val
	1		2		3		4		5		6		7		8	
ΔLoans(-1)	0.159	***	0.197	***	0.135	***	0.191	***	0.032		0.194	***	-0.013		0.181	***
	(4.52)		(7.51)		(3.79)		(7.31)		(0.91)		(6.86)		(-0.36)		(6.30)	
CAR tier1(-2)	0.364	***	0.095	**	0.424	***	0.066	*	0.041		0.350	***	-0.022		0.381	***
	(7.58)		(2.81)		(8.23)		(1.91)		(1.18)		(8.00)		(-0.60)		(8.30)	
NIM(-1)	0.308	***	0.161		0.316	***	0.107		0.295	**	0.397	***	0.210	*	0.385	***
	(3.09)		(1.40)		(3.18)		(0.93)		(2.67)		(4.11)		(1.92)		(3.98)	
DEP(-1)	-0.001		0.076	**	-0.006		0.083	**	0.088	**	-0.025		0.100	**	-0.028	
	(-0.02)		(2.30)		(-0.14)		(2.50)		(2.46)		(-0.75)		(2.83)		(-0.86)	
UNEMPL	-0.333	**	-0.283	**	-0.319	**	-0.304	**	-0.404	***	-0.158		-0.439	***	-0.121	
	(-2.39)		(-2.09)		(-2.28)		(-2.22)		(-2.89)		(-1.23)		(-3.18)		(-0.94)	
recession					3.315	*	-4.504	***					-6.400	***	2.116	
					(1.94)		(-3.10)						(-4.37)		(1.26)	
CAR tier1*recession					-0.278	***	0.224	***					0.363	***	-0.209	**
					(-3.14)		(3.30)						(5.37)		(-2.31)	
Cons	1.704		-0.101		1.253		0.880		1.549		-0.598		3.150		-0.897	
	(0.44)		(-0.04)		(0.33)		(0.36)		(0.47)		(-0.23)		(0.96)		(-0.34)	

Table 11, cont'd

XTREG FE	**Low procyclicality (PROCI > median)**		**High procyclicality (PROCI < median)**		**Low procyclicality (PROCI > median)**		**High procyclicality (PROCI > median)**		**High income smoothing (ISI > median)**		**Low income smoothing (ISI < median)**		**High income smoothing (ISI > median)**		**Low income smoothing (ISI < median)**	
	FE	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**	**FE**	**p-val**
	1		**2**		**3**		**4**		**5**		**6**		**7**		**8**	
# obs	857		849		857		849		780		926		780		926	
# groups	19		19		19		19		18		20		18		20	
R-sq within	0.21		0.10		0.22		0.11		0.02		0.28		0.06		0.28	
R-sq between	0.440		0.383		0.453		0.284		0.197		0.053		0.330		0.070	
R-sq overall	0.225		0.105		0.235		0.114		0.030		0.242		0.070		0.251	
F	44.67	***	17.69	***	33.84	***	14.45	***	3.82	***	69.16	***	6.98	***	50.63	***
F that all u_i = 0	2.09	***	1.54	0.07	2.07	0.01	1.64	0.05	2.53	***	3.58	***	2.38	***	3.34	***

Notes:
This table presents the results of the estimation of regression 1 obtained with the FE estimator. The dataset applied is quarterly for 2000–2012. The dependent variable is ΔLoans – real loans growth rate. The explanatory variables include: up to one lag of the dependent variable; CAR – capital adequacy ratio; NIM – net interest margin; DEP – non-financial sector deposits as a share of total assets; UNEMPL – unemployment rate; recession – a dummy taking the value of 1 for recessionary periods and 0 otherwise; CAR*recession – interaction term between the capital adequacy ratio and recession, which measures the effect of capital ratio on lending in recessionary periods; low procyclicality – a dummy variable taking the value of 1 for banks with PROCI measure over the median PROCI (i.e. PROCI > median); high procyclicality – a dummy variable taking the value of 1 for banks with PROCI measure below the median PROCI (i.e. PROCI < median); high income smoothing – a dummy variable taking the value of 1 for banks with ISI measure over the median ISI (i.e. ISI > median); low income smoothing – a dummy variable taking the value of 1 for banks with ISI measure below the median ISI (i.e. ISI < median); all PROCI and ISI measures included in the table were estimated using the regression type 2 model;
# denotes number of; t-statistics are given in brackets.
*** – significant at 1%, ** – significant at 5%, * – significant at 10%.

Czy cykliczność rezerw na straty kredytowe oraz wygładzanie dochodów wpływają na kryzys kapitałowy – analiza banków komercyjnych w Polsce

Streszczenie

Wielu przedstawicieli zarówno środowiska naukowego, jak i praktyki uznaje, że reguły księgowości stanowiły jedno ze źródeł światowego kryzysu finansowego (ang. *global financial crisis*, GFC). O ile jednak panuje ogólne przekonanie, że standardy rachunkowości wpływają na zachowania banków (tj. na decyzje osób zatrudnionych w bankach), o tyle nie został szczegółowo poznany mechanizm ich oddziaływania i ich interakcje ze standardami kapitałowymi. Odpowiednio skoordynowane w czasie zidentyfikowanie strat na kredytach oraz tworzenie rezerw pokrywających te straty powinno stanowić fundament bezpiecznego i zdrowego system bankowego. Adekwatne regulacje w tym zakresie są istotnym warunkiem ograniczenia procykliczności działalności kredytowej banków oraz procyklicznych efektów wskaźników kapitałowych.

W odpowiedzi na rekomendacje przywódców grupy G20 oraz Bazylejskiego Komitetu ds. Nadzoru Bankowego twórcy standardów rachunkowości i księgowości (zarówno International Accounting Standards Board, IASB, jak i amerykańska Financial Accounting Standards Board, FASB) zmodyfikowali standardy tworzenia rezerw na straty kredytowe, tak by były one oceniane i uznawane wyprzedzająco (tzw. *forward-looking assessment*). Obecnie w wielu krajach na świecie wdrażane są zatem nowe standardy tworzenia rezerw, które zakładają stosowanie modeli oczekiwanych strat na kredytach (ang. *expected credit loss* (ECL) models) zamiast stosowanych do 2017 r. modeli wyceny według wartości godziwej. Ma to miejsce również w krajach Unii Europejskiej, a zatem i w Polsce, gdzie banki wdrażają zalecenia standardu IFRS 9. Standard ten, wedle założeń opracowujących go podmiotów, powinien rozwiązać niektóre problemy regulacji ostrożnościowych (tj. problem „zbyt mało i zbyt późno" w identyfikacji strat kredytowych) i w efekcie powinien przyczynić się do stymulowania stabilności finansowej w UE. Biorąc pod uwagę fakt, że model ECL ma ograniczyć procykliczność rezerw na ryzyko kredytowe i zapewnić bankom stabilny (w ujęciu czasowym) poziom zysków, w artykule zostały postawione dwa pytania. Po pierwsze, czy banki, których model rezerw na ryzyko kredytowe cechuje się relatywnie niską procyklicznością, doświadczają łagodniejszego wpływu wskaźnika kapitałowego na działalność kredytową w porównaniu z bankami, w których proces tworzenia rezerw jest wysoce procykliczny? Po drugie, czy banki angażujące się w wygładzanie zysków przy użyciu rezerw doświadczają łagodniejszego wpływu wskaźnika kapitałowego na aktywność kredytową? W badaniu tym szczególnie interesuje nas wpływ wskaźnika kapitałowego na aktywność kredytową w okresie recesji, ponieważ to właśnie w tych okresach ograniczenie ze względu na kapitał własny jest uznawane za główne źródło procykliczności aktywności kredytowej banków.

Artykuł poszerza wiedzę dostępną w literaturze przedmiotu w kilku obszarach. Po pierwsze, analizowany jest w nim bezpośrednio wpływ rezerw na ryzyko kredytowe na kryzys kapitałowy, poprzez identyfikację specyfiki cykliczności rezerw na straty kredytowe, wygładzania dochodów, niedyskrecjonalnego zarządzania zyskami oraz kapitałami w indywidualnych bankach. Aby to wykonać, w przypadku każdego banku, dla którego mamy obserwacje obejmujące minimum 36 kwartałów (tj. 9 lat, które jest okresem obejmującym pełen cykl koniunkturalny), oszacowujemy wrażliwość rezerw na: (1) cykl

koniunkturalny (co identyfikuje procykliczność rezerw indywidualnego banku); (2) zyski przed opodatkowaniem i obciążeniem stratami kredytowymi (co określa wygładzanie zysków); (3) stopę wzrostu kredytów (co określa tzw. niedyskrecjonalne zarządzanie zyskami); (4) wskaźnik kapitałowy (co identyfikuje zarządzanie kapitałem własnym za pomocą rezerw). Po drugie, uwzględniamy wpływ niskiej procykliczności LLP na związek między aktywnością kapitałową i wskaźnikiem kapitałowym, odrębnie w próbie banków cechujących się bardzo dobrym dokapitalizowaniem (tj. wysokim wskaźnikiem kapitałowym) oraz w próbie banków niedokapitalizowanych. Po trzecie, biorąc pod uwagę fakt, że w literaturze przedmiotu różnie ocenia się rolę wygładzania zysków w praktyce działania banków (niektórzy uznają je za pożądane narzędzie budowania buforów w dobrej koniunkturze, które będą „skonsumowane" w okresie kryzysów, inni natomiast uważają, że są one źródłem podwyższonego ryzyka w działalności banków), nie jest zatem oczywiste, czy wysoki stopień wygładzania dochodów faktycznie ogranicza rolę wskaźnika kapitałowego w działalności kredytowej. Zaprezentowane badanie jest pierwszym w literaturze przedmiotu opracowaniem podejmującym ten problem z perspektywy empirycznej. Po czwarte, w odróżnieniu od dotychczas prowadzonych badań dotyczących roli wskaźnika kapitałowego w akcji kredytowej banków w tym artykule analizowana jest rola niedyskrecjonalnego zarządzania zyskami i zarządzania kapitałami przy użyciu rezerw w kształtowaniu się związku między aktywnością kredytową i wskaźnikiem kapitałowym.

Na podstawie badania przeprowadzonego z zastosowaniem panelowego estymatora z ustalonymi efektami stałymi (tzw. *estymator fixed-effects*) na danych indywidualnych banków komercyjnych w Polsce z okresu I kwartał 2000 – IV kwartał 2012 r. stwierdzono, że aktywność kredytowa tych banków zależy istotnie ekonomicznie i statystycznie od poziomu wskaźnika kapitałowego. Wpływ tego wskaźnika jest jednak bardzo istotny w bankach słabo dokapitalizowanych w okresie recesji. Aktywność kredytowa banków, których rezerwy są mocno procykliczne, jest bardzo wrażliwa na poziom wskaźnika kapitałowego. Niski stopień procykliczności rezerw wiąże się z brakiem wpływu wskaźnika kapitałowego na aktywność kredytową w okresie recesji. Nie dotyczy to jednak banków słabo dokapitalizowanych. Dobrze dokapitalizowane banki o niskiej procykliczności rezerw cechują się natomiast większym potencjałem do udzielania kredytów. Wysoki stopień wygładzania dochodów powoduje wyższą wrażliwość aktywności kredytowej na wskaźnik kapitałowy, również w bankach bardzo dobrze dokapitalizowanych. Niedyskrecjonalne zarządzanie zyskami nie ma istotnego wpływu na związek między działalnością kredytową i wskaźnikiem kapitałowym. Zarządzanie kapitałami ma istotne ekonomicznie znaczenie dla wpływu wskaźnika kapitałowego na kredytowanie przez banki, ponieważ banki zaangażowane w ten proces cechuje niższa wrażliwość na wskaźnik w okresie recesji.

Słowa kluczowe: działalność kredytowa, kryzys kapitałowy, cykliczność rezerw, wygładzanie dochodów