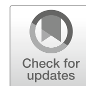
Interactions Between Effectiveness and Consolidation of Commercial Banks in the Polish Banking Sector



Irena Pyka, Aleksandra Nocoń, and Anna Pyka

Abstract Bank consolidation is a process that has been observed in the world economy since the early 1980s. Until the global financial crisis formation of bank capital groups and financial conglomerates was considered as banks' response to the globalization of financial system. After the global financial crisis, a "consolidation window" opened up in the global economy, which did not bypass the Polish banking sector. At the same time, it coincided with the support of the Polish government interested in its repolonization, which in a consequence resulted in an increase of the concentration level of bank capital. The main aim of the paper is the analysis of consolidation processes after the global financial crisis, as well as interactions between concentration of commercial banks in Poland (as a quantitative approach to the consolidation process) and their operational efficiency. The research indicates that concentration of the Polish banking sector affects effectiveness of the sector and individual commercial banks. However, scale and strength of these dependencies varies between the analyzed cases.

Keywords Banking sector · Commercial bank · Consolidation process · Effectiveness

1 Introduction

Bank consolidation is a process that has been observed in the world economy since the early 1980s. Banks are eager to merge and form larger organizational structures, operating on a global scale, due to the following causes: shareholders' striving to maximize profit, managers' striving to increase the privilege of their market position, and the use of all the privileges resulting from consolidation in the banking business

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(Chrabonszczewska 2016). Until the global financial crisis formation of bank capital groups and financial conglomerates, treated as the effect of increasing mergers and/or acquisitions, was considered as banks' response to the globalization of financial system. However, intensification of bank capital concentration processes has increasingly given rise to numerous controversies. The growing number of global banks based on the benefits of cross-border loans—the so-called *cross-border financing*, raised concerns about the disappearance of competition on bank services market and weakening position of a bank client. A new dimension of global banking, called as the financialization, was particularly criticized (Marcinkowska 2015; Szunke 2014). However, strong criticism of large banks' activities followed after the global financial crisis, when they were burdened with the responsibility for escalation of systemic risk in the international economy, and many of them received serious public financial support. The subject of controversy has become not only scale of this support, but also its legitimacy, impact on public budget balance as well as their use by the financial institutions. Based on these circumstances, there is a question what do consolidation processes look like after the global financial crisis? Due to the nature of the study, it was carried out in Poland at a level of the whole banking sector and selected commercial banks setting out the task of multilayered recognition of the undertaken problem.

The main aim of the paper is the analysis of interactions between effectiveness and concentration of commercial banks in Poland. In the postcrisis period, there is observed intensification of capital ownership changes. In 2012, due to the need to return received public aid, the Belgian KBC bank has signed the agreement with Santander bank regarding the merger of Kredyt Bank with BZ WBK bank. The merger was completed in January 2013. This was also the case of the Greek EGF group which was looking for opportunities to improve its financial results. At that time, it was decided to sell the branch in Poland. However, these changes occur constantly. After the global financial crisis, a "consolidation window" opened up in the global economy, which did not bypass the Polish banking sector. At the same time, it coincided with the support of the Polish government interested in its repolonization (Pyka et al. 2018), which in a consequence should result in an increase of the concentration level of bank capital.

The structure of the article includes critical literature studies which present the current state of knowledge about the undertaken problem, methodology with the main indicators used during the research, and the main empirical part of the paper—analysis of the interactions between consolidation and effectiveness in the whole banking sector as well as individual banks. The article ends with a summary which provides the main conclusions from the research.

2 Literature Review

The consolidation process of banking sector is widely studied in the literature (Seo and Hill 2005; Frąckowiak 2009; Antoniadis et al. 2014; Kumar 2013; Ayadi and Pujals 2005; Mikołajczyk 2014; Joash and Njangiru 2015; Tsaurai 2017; Juszczyk et al. 2013). These studies generally focus on the motives and course of consolidation processes, measures of bank concentration level, and mutual effects of an increase or decrease in the banks' capital concentration on selected economic variables.

The research highlights intensification of consolidation processes, which is mainly due to the constantly changing legislative framework and competitiveness environment. According to Ayadi and Pujals (2005), changes in the legal framework, including changing regulations, put pressure on using consolidation processes to remain competitive and fully benefit from the dynamic nature of financial market. However, there is no compliance regarding its positive impact on competitiveness. World Bank (2013) indicated that consolidation may lead to increase in competitiveness, but appropriate supervision and adequate regulations are a necessary condition. On the other hand, Laeven and Claessens (2003) showed almost no relations between an increase in concentration and a level of competition. In turn, Flejterski and Wahl (2010) adopted an increase in competitiveness as a part of set of goals conducive to the progressive banking sectors' consolidation. Among the motives of consolidation process, they also included the possibility of improving operational efficiency through increasing the scale of operations or organizing/changing organizational structures. Kotowicz (2015) believed that in the Polish economy the consolidation process after the global financial crisis was also favored by an increase in the scale of operations of large banks, exceeding the growth in scale of the sector.

In the literature, there is no unanimity on how to examine a level of consolidation processes. When it comes to the measures of concentration, Pawłowska (2014) and Klepacki (1984) refer to the most commonly used consolidation measures. These are concentration ratios (CR) and Herfindahl-Hirschman Index (HHI). While the opponents believe that they only take into account values of the market structure, but no other features, such as regulations, barriers to entry or exit are included. Hence, they propose to use *a new empirical industrial organization* theory, which uses more advanced measurement methods such as the Lerner index, H-statistics or Boon measures (Ramotowski 2013; Mikołajczyk 2014). Tushaj (2010) additionally—in assessing a level of concentration of the sector and selected banks—uses the Hall-Tideman Index (HTI), Rosenbluth Index (RI), Hannah-Kay Index (HKI), Multiplicative Haus Index (Hm), additional Haus index (ha), and entropy measures (E).

Furthermore, in the literature there is also no explicit position regarding an impact of changes in the banking sector concentration on its stability. Kurgan-Van Hentenryk (2001) argued that consolidation contributes to stabilization of banking system. He showed that many of the governments of European countries, including Austria, Belgium, and Germany, promoted bank consolidations when the financial system was exposed to banking crises in the 1920s and 1930s. On the other hand, it

is suggested that bank consolidations do not significantly improve the performance or efficiency of the participating banks (Berger et al. 1999; Financial Service Agency 2002; Shih 2003).

The other authors look for a link between a level of consolidation and effectiveness of banking system supervision. Beck et al. (2003) argued that supervision of a highly concentrated sector is more effective. Formation of large banking structures is justified by economies of scale, arising due to mergers and acquisitions, as well as by the belief that larger banks better diversify their operations, which allows them to better adapt to market conditions and at the same time increases their resistance to a potential banking crisis. On the other hand, Mikołajczyk (2014) and Iwanicz-Drozdowska (2002) indicate that excessive concentration may lead to the creation of huge financial institutions and also increase on complexity of capital group's structure.

The subject of research, concerning the ongoing banking sector consolidation, are also changes in financial indicators and the ownership structure of a banking sector. Research conducted by the Polish Financial Supervision Authority (Polish Financial Supervision Authority 2013) indicated that, across the whole European Union, there is no statistically significant relation between concentration in a banking sector and financial indicators. While Weber (2000) studied an effect of bank mergers in the aspect of reduction of operating costs, obtained mainly by limiting employment and noticed the existence of a relation between a consolidation process and size of employment as well as a level of labor costs. He showed that, like Kozak (2015), consolidation contributes to reduction of employment in a banking sector.

The conducted research also concerns links between capital concentration and banking efficiency. Considering consolidation in terms of its impact on efficiency, it should be assessed whether, and if so, how an increase in the concentration of bank assets in the sector will translate into basic effectiveness measures. If a sector's concentration is a result of M&A, the fundamental question is whether this process improves operational effectiveness of an acquiring bank. The relationship between bank market concentration and bank efficiency is complex and sometimes ambiguous: depending on the banking market-specific characteristics, this relationship may be either positive or negative. Roger and Ferguson (2009) studied the potential impact of financial consolidation on financial institutions' effectiveness. Their research concluded with an extensive evaluation of the potential effects of financial consolidation on the efficiency of financial institutions, competition among such firms, and credit flows to households and small businesses. According to Goddard et al. (2008), banks' consolidation in the USA often only slightly improved the efficiency of the combined institution. The study also suggested that the hubris and agency motives for merger may be relevant, or that synergy derived more from enhanced market power than from cost savings. De Young (1993) studied 348 merged banks, of which 43% were intercompany ones. The study estimated pre- and post-merger cost efficiency by applying a thick frontier approach. Prior to merger, the acquiring banks were more cost efficient than the target. However, in the 3 years period after the merger, cost efficiency improved in about 64% of the cases. It is generally confirmed that bank market consolidation and efficiency relationships

are of particular relevance in Europe, but they remain controversial (Goddard et al. 2007; Molyneux 2009; Basílio et al. 2016).

Consolidation processes in Poland in the period after the economic transformation and until 2009, which were banks' reaction to the globalization of the financial system, did not take into account intensification of bank capital concentration processes after the financial crisis of 2008–2012. During this period (i.e., in the years of 2009–2017), the global banking dimension was particularly criticized, in which commercial banks were burdened with the responsibility for escalation of systemic risk in the international economy, and many of them received serious public financial support.[1] The adopted time horizon covering the years of 2005–2018 complements and broadens the research already carried out by others.

3 Controversy Around the Essence and Measurement of Bank's Effectiveness

Effectiveness is an economic concept, which did not find the final scientific consensus for many years. Effectiveness concerns various areas of human activity, including economic activity (Nawrocki 2015). It is widely accepted that economic effectiveness is a quantitative category that describes a degree of achievement of economic objectives (Czyżewski and Smędzik 2010). Therefore, research on economic effectiveness is primarily associated with optimization of resource allocation. This point of view also accompanies the identification of the concept of bank effectiveness. Nowadays, commercial banking sector is constantly undergoing major changes, which cause that banks, in order to meet market and customer requirements, steady monitor effectiveness of their operations (Szelągowska and Posacka 2006; Jonek-Kowalska and Zieliński 2017; Stoła 2011).

Empirical studies presented in the chapter concentrate on the financial effectiveness of a bank. It is well reflected in the set of goals that a bank pursues. It shows an amount of profit, while on the other hand, it allows to assess growth dynamics of bank's market value (increase of added value, increase of benefits for owners). The following indicators for measuring bank's financial effectiveness were adopted in the research:

- Return on assets (ROA)—an indicator reflecting the quotient of net profit and total assets.
- Return on equity (ROE)—an indicator reflecting the quotient of net profit and equity.
- Profit per person (bank net income per full-time equivalents)—reflecting the amount of profit earned by one full-time employee.

[1]The subject of controversy has become not only scale of this support, but also its legitimacy, impact on public budget balance as well as their use by the financial institutions.

- Cost/income ratio (C/I ratio)—an indicator reflecting the quotient of the total costs and revenues of a bank (or a sector).

ROE, ROA, and C/I ratios can be presented as percentages or numerical values, while profit per person ratio is expressed in a currency unit. All the above-mentioned indicators are used in assessing effectiveness of banking sector, a single bank or a bank's capital group. In the first three measures of effectiveness the higher their value against the background of a sector, competition, the better. On the other hand, the lower C/I ratio, the higher operational effectiveness of a bank (sector). The calculated ratios may show a positive proportional relation, when ROA, ROE, and profit per person increase along with a concentration ratio (as a measure of ongoing consolidation) and then this situation will indicate that consolidation has a positive effect on bank's/sector's effectiveness. In such a situation, the C/I ratio should present a downward trend over time. If the ROA, ROE, and profit per person show an inversely proportional relation to a concentration ratio, this may indicate a negative impact of bank consolidation on effectiveness of banks' and/or sector's activity (then the C/I ratio will also increase over time). There is also possible a situation that effectiveness indicators will not show changes in relation to an increase of the CR5/CR10 ratio, which means no interaction between banks' (sector's) concentration and effectiveness.

4 Consolidation of the Banking Sector in Poland in 2005–2018

The processes of bank consolidation in Poland can basically be analyzed since 1990, when a period of the transformation of the Polish market economy begins. They ran in different ways. Initially, it was a result of the privatization program of the centralized economy, then a targeted consolidation program, and in the end it turned out to be the result of mergers and acquisitions taking place in the developing European Union (Pyka et al. 2018). Research carried out in this study covers the years of 2005–2018. Moreover, after a certain stagnation of ownership transformation in Poland, at the turn of the twentieth and twenty-first centuries, under the strong influence of the negative consequences of the global financial crisis, their next stage begins. It justifies to undertake research, indicating the direction and effects of consolidation processes in the Polish banking sector.

A scale of banking sector consolidation has been adopted to measure a level of its concentration. Concentration, by its nature, means focusing and, unlike consolidation, is a measurable phenomenon. There are many indicators for measuring the concentration of banks. Among them, there are the concentration ratio (CR) and the Herfindahl-Hirschman Index (HHI). The basic concentration indicators CR3, CR5, and CR10 determine a share of, respectively, three, five, and ten largest banks in the selected financial variable, e.g., net assets, gross loans, or banking sector deposits. In turn, the Herfindahl-Hirshman Index (HHI) determines the estimated level of density

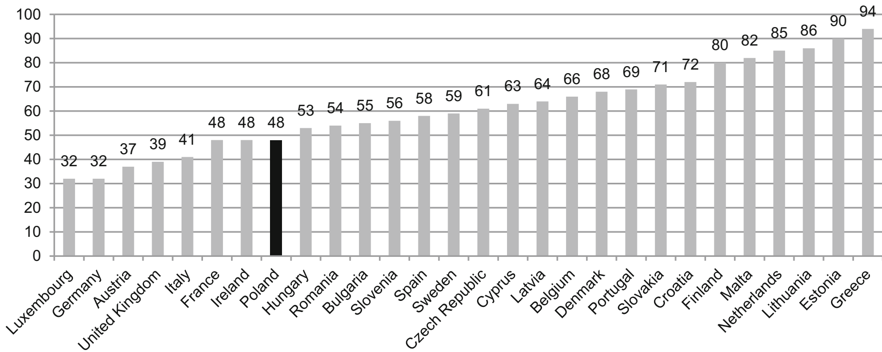

Fig. 1 CR5 concentration ratios in the European Union in 2015 [%]. Source: Based on Kotowicz (2015)

in a given industry and the level of competition in a given market. This index takes values higher than 0 and at most equal to 1 (or 10,000 if percentage instead of fractional values has been used in its calculation). Higher index values correspond to higher market concentration (Olszak 2014; Kil 2015).[2]

The study uses sectoral data and indicators illustrating the share of 5 and 10 banks in the sector's assets (CR5, CR10). Due to the fact that commercial banks are a subject of the analysis, the HHI was rejected. The resignation from the HHI results from the fact that cooperative banks, which were not included in the research, strongly influence on a level of this indicator. The level of concentration of the Polish banking sector compared to EU Member States is low (see Fig. 1). The values of CR5 ratios place the Polish banking sector in the 21st position among EU countries and are clearly lower than the EU average (62%).

The distant position of the CR5 ratio of the Polish sector, compared to other EU countries, indicates that in other EU countries assets are even more concentrated among the top five banks. In six European countries (Finland, Malta, the Netherlands, Lithuania, Estonia, Greece) the five largest banks gather over 80% of the sector's assets (Pyka and Nocoń 2019). In Greece, the CR5 ratio in 2005 was at a level of 65%, while since 2013 it has been amounted to 94%. This means that five credit institutions control almost the whole Greek banking sector (Cichy and Puszer 2016). The similar situation is when it comes to the CR10 ratio—its value is lower than the average of the Central European region countries, which amounts to 76%. It is interesting that in CEE countries concentration is higher than in developed countries of Western Europe.[3] It should be noted that the values for Poland are closer to those for Western Europe.

[2]In the case of the HHI in Poland, its value should be considered as low compared to the European countries. Only the most developed financial markets, such as Germany, Luxembourg, Italy, and the United Kingdom, were characterized by a lower value.

[3]This may be due to the fact that in the aftermath of the global financial crisis, the quality of banks' loan portfolios has significantly deteriorated in most CEE countries. This forced a need to take over

While analyzing a level of concentration in the Polish banking sector, it is noted that in 2005 a share of the five largest banks in Poland (PKO BP, Pekao SA, Santander Bank Polska, mBank, and ING Bank Śląski) accounted for almost 49% of the total assets of the whole sector. In 2008 and 2009 it was over 44%, in 2014—49%, while in 2018 the total balance sheet in the five largest banks exceeded 100 bln PLN, and their share in the sector's total assets fluctuated around 48%. In turn, the 10 largest banks (CR10) in Poland managed over 74% of the assets of the whole sector in 2018, while 8 years ago it was just over 63% (see Table 1).

The indicators of the banking sector concentration in Poland show constant, though small changes (the CR10 ratio is much more susceptible to changes), although their level is still quite low compared to other European Union countries. Situation is different in large European economies (Germany, the UK, France, Italy), where a share in the total assets of a sector of the five largest banks does not exceed 50%, and even ranges from 30 to 40%. Countries with the smallest concentration of the sector (in terms of assets) are Luxembourg and Germany, where the five largest banks account for about 30% of the assets of the whole banking sector (Pyka and Nocoń 2019).

5 Analysis of Relations Between Concentration and Effectiveness of the Polish Banking Sector

The conducted analysis of interactions of the main effectiveness indicators and bank concentration in the Polish banking sector, representing a macroeconomic approach to the analyzed problem, was based on the CR5 and CR10 ratios. The left ordinate axis of Fig. 2 presents the percentage values of ROA, ROE, and C/I ratios in relation to changes in the CR5 and CR10 ratios. The right ordinate axis illustrates how the net income to one full-time equivalent, quantified for the whole banking sector in Poland, has changed in relation to the same concentration indicators (CR5, CR10).

Analyzing the interactions of the banking sector concentration in Poland and a set of analyzed effectiveness indicators, it should be emphasized that:

- CR5 ratio within analyzed 14 years is relatively stable, larger changes are observed in the CR10 ratio.
- Greater correlations of the concentration level and efficiency of the banking sector are noticeable in relation to changes in the CR10 ratio rather than CR5 ratio.
- Until 2015 (with the exception of 2009—time of financial crisis escalation) it is observed a relation (proportional relation) between the change in CR10 and ROE

smaller and weaker institutions on the banking market and thus contributed to an increase of the banking sector concentration ratio.

Table 1 Share of the largest 5 (CR5) and 10 (CR10) banks in the total assets of the whole sector in 2005–2018

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CR5	49%	47%	47%	49%	47%	47%	49%	47%	47%	49%	47%	47%	49%	48%
CR10	69%	66%	64%	62%	64%	63%	63%	65%	67%	70%	71%	71%	70%	74%

Source: Polish Financial Supervision Authority (2016, 2017, 2018)

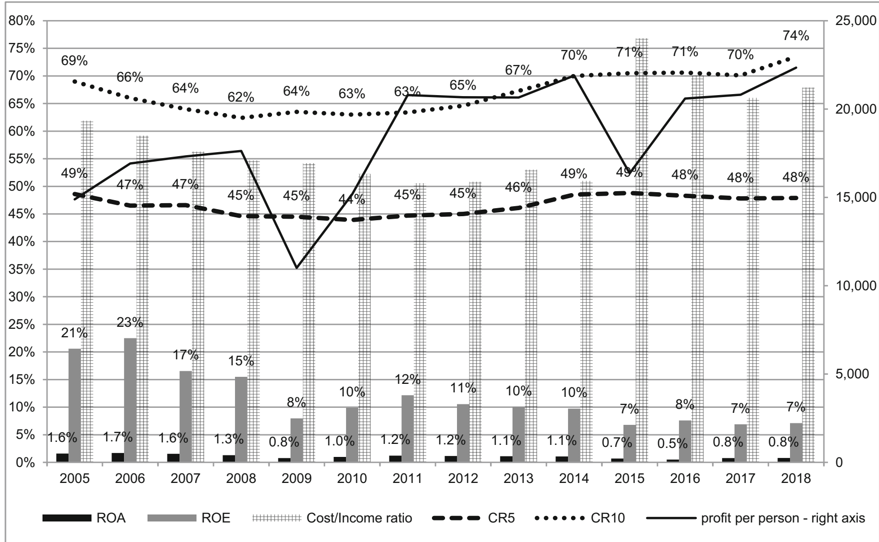

Fig. 2 ROA, ROE, C/I, and profit per person versus concentration of the banking sector in Poland (CR5 and CR10 ratios) in 2005–2018. Source: Own work based on the National Bank of Poland and the Polish Financial Supervision Authority data. * NOTE: currency conversions were made assuming that 1 EUR = 4 PLN

as well as ROA; however after 2016—after the banking tax implementation and other charges for banks, such relations are difficult to determine.[4]

- Correlation of profit per person ratio versus concentration level is similar to correlations with ROA and ROE, but with a less clear trend; similar to ROA and ROE in 2009 (financial crisis), the indicator deteriorates and in the following years it increases again to values not recorded historically; another very significant deterioration of the indicator occurs in 2015 and is not related to the consolidation process but to the macroeconomic and fiscal circumstances.
- In 2005–2008 with a decrease in the CR10 ratio, there is a decrease in the C/I ratio, while in the years of 2009–2014, along with an increase of the CR10 ratio, the C/I ratio decreased, between 2015 and 2018 again as the concentration level

[4]The deterioration of main effectiveness indicators in 2015 and 2016, including an increase of cost/income ratio, lowering ROA and ROE indicators resulted from an increase of operating costs, which were related, among others, from the implemented tax on certain financial institutions (the so-called *banking tax*). This tax included commercial banks. In addition to the banking tax, the financial results of the banking sector in Poland were also affected by liabilities to the Bank Guarantee Fund and contributions to the Borrowers Support Fund (FWK), which value was determined by the amount of unsupported housing loans in a bank's portfolio (capital from the Fund is used as repayable aid for people having problems with mortgage loans). FWK contributions were paid in February 2016; however, most banks recorded the related expenses in December 2015. The one-off event, which was the sale of Visa Europe shares, had a positive impact on the financial result of the banking sector in 2016, when Polish banks earned about 2 bln PLN (Pyka 2017).

increases, the C/I ratio increases; therefore, it can be observed that the C/I ratio in the analyzed period (except the years of 2005–2008) indicates an inverse relation as compared to CR10 ratio; thus, it can be assumed that an increase of concentration is conducive to the improvement of the C/I ratio.

6 Analysis of Relations Between Concentration and Effectiveness of the Selected Commercial Banks in Poland

The interactions between concentration and effectiveness of a given bank in the Polish banking sector are difficult to examine, based on the concentration ratios for the whole banking sector. In order to objectively assess whether (and if so how) service of a major part of the banking market by a given bank affects effectiveness of its operations, in the research a share of assets of the analyzed bank in the total assets of the whole sector was adopted as the concentration indicator. The research covered banks included in the CR5 ratio, i.e., PKO BP SA 2005-2017, PeKaO, Santander, mBank, and ING SA 2005-2017 Śląski in the period of 2005–2017.[5]

Analyzing the above-mentioned effectiveness and concentration indicators for PKO BP, the largest commercial bank in Poland, the following conclusions can be drawn (see Fig. 3):

- Since 2008 a share of assets of the biggest commercial bank in Poland (PKO BP SA) has been systematically increasing, while the largest increase was recorded after 2013 as a result of the Nordea Bank Polska SA acquisition.[6]
- ROA and concentration ratio show inverse relations, which means that ROA indicators deteriorate with an increase of the concentration ratio in the analyzed period; this may confirm the thesis that an increase of concentration affects complexity of banking group structures and favors a decrease of effectiveness indicators (at least in the first years after M&A—after the acquisition of Nordea Bank Polska, a share in the sector was growing, but did not impact on an increase of asset profitability).
- In 2005–2008, ROE increased while a share of bank assets in the sector decreased; in subsequent years, ROE decreased despite an increase in the concentration ratio; this indicates an inverse relation between ROE and a level of concentration of PKO BP bank in the sector; however, it should be noted that this may also result from macroeconomic conditions (financial crisis, the banking tax) and the merger process with Nordea Bank Polska.

[5]At the moment of the research, there is no access to the commercial banks' results for 2018, as it was possible in the sectoral analysis.

[6]PKO BP assets increased from 199.2 bln PLN in 2013 to 248.7 bln PLN in 2014.

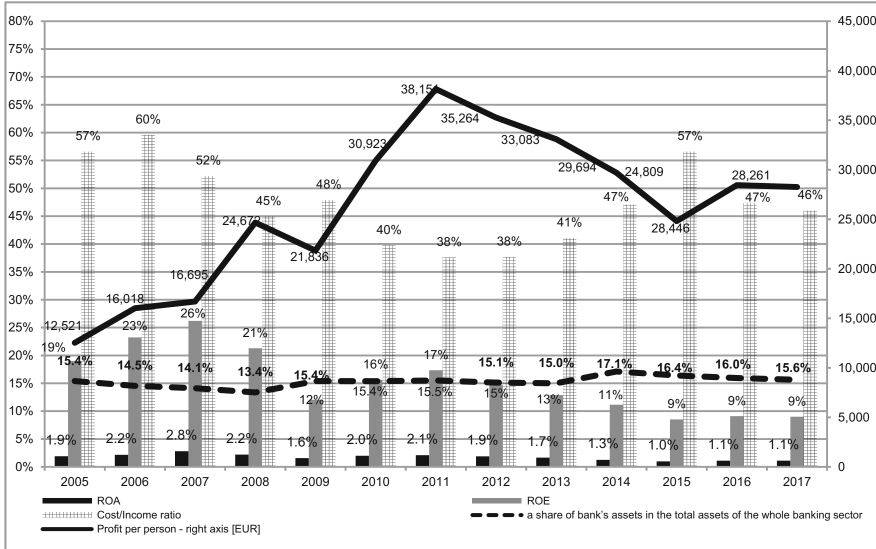

Fig. 3 ROA, ROE, C/I, and profit per person of PKO BP SA bank versus a share of bank's assets in the total assets of the whole banking sector in Poland in 2005–2017. Source: Own work based on the annual unconsolidated reports of PKO BP SA in the years of 2005–2017. * NOTE: currency conversions were made assuming that 1 EUR = 4 PLN

- An increase of the share of PKO BP assets in the sector's total assets is conducive to an improvement in the C/I ratio as well as an increase of net income related to the scale of employment (except for the years 2009 and 2015—respectively the period of the financial crisis and fiscal changes in banking industry).

Analyzing interactions between effectiveness and changes in the share of PeKaO bank (the second largest commercial bank in Poland) in total assets of the whole banking sector in 2005–2017, presented in Fig. 4, it can be noticed that a share of the bank's assets has been increasing since 2008. ROE and ROA ratios were inversely proportional to an increase of the concentration of bank's assets in the sector's assets. There are no interactions of changes in concentration ratio of bank's assets in sector's assets and changes in net income per employee. An increase in the share of PeKaO assets in the sector's assets has a positive impact on the C/I ratio.

Furthermore, in the next stage of the research, there was conducted the analysis of interactions between effectiveness and changes in the share of mBank in the total assets of the banking sector in 2005–2017 (Fig. 5). Throughout the whole analyzed period, there is no spectacular changes in a share of mBank's assets in the sector's assets (no new acquisitions of the analyzed bank), accompanied by a simultaneous decline of ROE since the financial crisis, i.e., since 2008. ROA ratio was stable in the whole analyzed period (just like the concentration ratio) except a period of the financial crisis (2008–2012) when the rate of return on bank assets decreased. Despite a stable share of the assets of the analyzed bank in sector's assets, there is

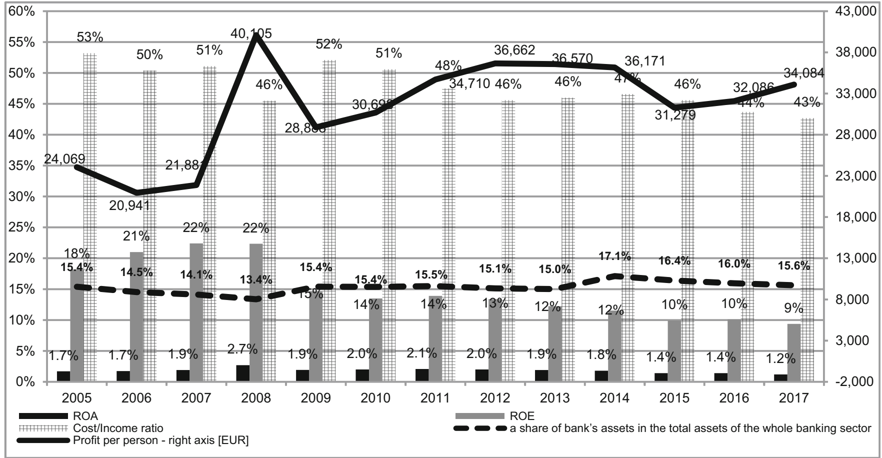

Fig. 4 ROA, ROE, C/I, and profit per person of PeKaO SA bank versus a share of bank's assets in the total assets of the whole banking sector in Poland in 2005–2017. Source: Own work based on the annual unconsolidated reports of PeKaO SA in the years of 2005–2017. * NOTE: currency conversions were made assuming that 1 EUR = 4 PLN

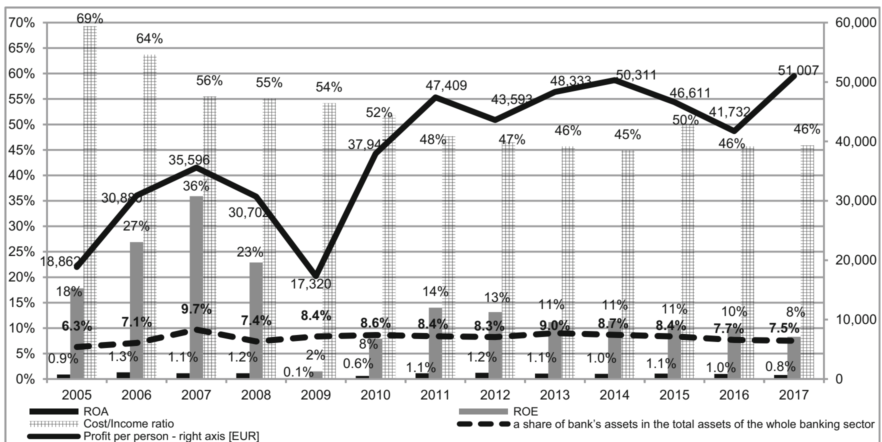

Fig. 5 ROA, ROE, C/I, and profit per person of mBank bank versus a share of bank's assets in the total assets of the whole banking sector in Poland in 2005–2017. Source: Own work based on the annual unconsolidated reports of mBank in the years of 2005–2017. * NOTE: currency conversions were made assuming that 1 EUR = 4 PLN

observed a systematic decline in the C/I ratio. In 2008–2009 there was a drastic drop of profit per person ratio, and its increase later on; there is no visible interaction of the net income/full-time equivalents in relation to changes in concentration ratio.

Figure 6 illustrates mutual dependencies between Santander Bank's effectiveness and its assets share in the whole banking sector's assets in the years of 2005–2017.

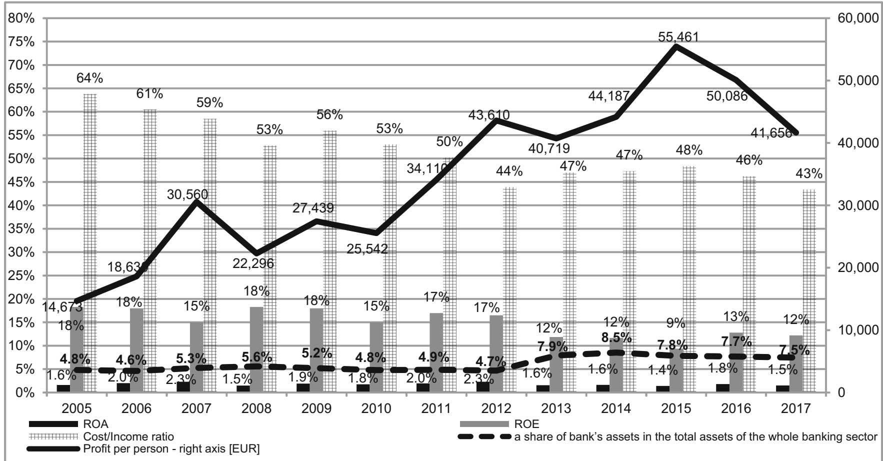

Fig. 6 ROA, ROE, C/I, and profit per person of Santander Bank SA bank versus a share of bank's assets in the total assets of the whole banking sector in Poland in 2005–2017. Source: Own work based on the annual unconsolidated reports of Santander Bank SA in the years of 2005–2017

Since 2013, a share of the bank's assets has increased disproportionately more than in the years of 2005–2012. Since 2013, along with an increase of the concentration of bank's assets in relation to the sector's assets, ROA and ROE ratios have decreased slightly. Regardless of the degree of concentration, there was a decline in the C/I ratio in the analyzed period, which indicates good bank's effectiveness. Along with an increase in concentration of bank's assets in the sector's assets in the years of 2013–2015, the profit per person ratio also increased; however, in 2016–2017 the indicator deteriorated significantly.

Figure 7 shows the mutual dependencies between ING's effectiveness and its asset share in the banking sector's assets in the years of 2005–2017. Since the beginning of the financial crisis (i.e., since 2008), there was a significant increase in a share of ING's assets in the sector's assets (organic growth, no M&A), while there was also observed stable level of ROA ratio and deterioration of ROE ratio in this period. The bank recorded a decrease (and then its maintenance) of the C/I ratio, along with an increase of a share of the bank's assets in 2008 and later maintaining this share at a similar level. Since 2008, there has been a gradual improvement in profit per person ratio with no significant changes in a level of concentration of bank's assets in the sector's assets.

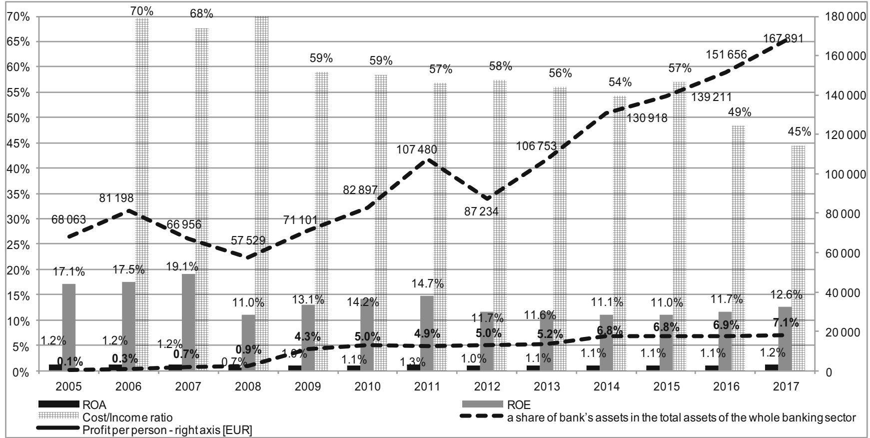

Fig. 7 ROA, ROE, C/I, and profit per person of ING Bank Śląski SA bank versus a share of bank's assets in the total assets of the whole banking sector in Poland in 2005–2017. Source: Own work based on the annual unconsolidated reports of ING Bank Śląski SA in the years of 2005–2017

7 Conclusion

The conducted research concerning interactions between a concentration level and selected effectiveness indicators of commercial banks and the banking sector in Poland in the years of 2005–2018 indicates that concentration of the Polish banking sector affects effectiveness of the sector and individual commercial banks. Concentration of the sector, measured by the CR10 ratio, indicates greater interactions with effectiveness indicators of the banking sector than concentration, measured by the CR5 ratio.

The interactions between concentration and effectiveness of banks allow to draw the conclusion that in the years of 2005–2018 four subperiods can be distinguished, covering the years of:

- 2005–2007—a period before the global financial crisis, where there is observed an increase in banking sector's assets along with high operational effectiveness and decreasing concentration of the sector
- 2008–2011—identified as a period of escalation of the crisis, when there was observed a slowdown in the growth of banking sector's assets, lowering its profitability and stabilizing a level of concentration
- 2012–2014—characterized by an increase of the sector, expressed in the size of assets and combined with a decrease of its profitability due to increased operating costs of commercial banks and an increase in a level of concentration in the banking sector
- 2015–2018—when there was a further gradual increase of assets and an increase of concentration ratios of the banking sector combined with "rebuilding" of its profitability.

These periods have different characteristics, which cause big problems with drawing coherent and unambiguous conclusions from the conducted research and often not corresponding to the theories, described in the literature. This encourages the authors to conduct further in-depth research, in particular those based on modeling interactions between concentration in the banking sector and effectiveness of individual banks. Moreover, the authors are aware of a further research gap, concerning an impact of banking sector's concentration on its stability, which might be a subject of their next studies.

References

Antoniadis, I., Alexandridis, A., & Sariannidis, N. (2014). Mergers and acquisitions in the Greek banking sector: an event study of a proposal. *Procedia Economics and Finance, 14*, 13–22.

Ayadi, R., & Pujals, G. (2005). Banking mergers and acquisition in the EU: Overview, assessment, and prospects. *SUERF – The European Money and Finance Forum*. Vienna, Austria, 2005.

Basílio, M. S., Pires, M. C. P., & Reis, J. F. P. (2016). Portuguese banks' performance: comparing efficiency with their Spanish counterparts. *Eurasian Economic Review, 6*, 27–44.

Beck, T., Demirguc-Kunt, A., & Levine, R. (2003). Bank Concentration and Crises. In *Working Paper, 9921*. National Bureau of Economic: Research.

Berger, A. N., Demsetz, R. S., & Strahan, P. E. (1999). The consolidation of the financial services industry: causes, consequences, and implications for the future. *Journal of Banking and Finance, 23*, 94–135.

Chrabonszczewska, E. (2016). *Ryzyko globalizacji banków [Risk of banks' globalization]*. Warsaw: Warsaw School of Economics Publishing House.

Cichy, J., & Puszer, B. (2016). *Sektory bankowe w Unii Europejskiej [Banking sectors in the European Union]*. Katowice: University of Economics in Katowice Publishing House.

Czyżewski, A., and Smędzik, K., (2010). Efektywność techniczna i środowiskowa gospodarstw rolnych w Polsce według ich typów i klas wielkości w latach 2006–2008 [Technical and Environmental Efficiency of Farms in Poland in 2006–2008, According to their Types and Sizes]. *Annals of Agricultural Sciences – Series G,* 97(3), Warsaw: Warsaw University of Life Sciences Publishing House, pp. 61–71.

De Young, R. (1993). Determinants of cost efficiencies in banks' mergers, Office of the Comptroller of the Currency, *Economic and Policy Analysis*. *Working paper, 93-01*, 93–111.

Financial Service Agency. (2002). *Koho Kona (The Public-Relation Press)* (p. 23). Japan: Financial Service Agency.

Flejterski S., and Wahl, P., (2010). Globalizacja – stare i nowe dylematy u progu drugiej dekady XXI wieku [Globalization – old and new dilemmas at the beginning of the second decade of the 21st century]. *Contemporary Economic Issues. Globalization. Liberalization. Ethics,* 607, Szczecin: University of Szczecin Publishing House, pp. 9–16.

Frąckowiak, W. (2009). *Fuzje i przejęcia [Mergers and Acquisitions]*. Warsaw: Polish Economic Publishers.

Goddard, J. A., Molyneux, P., & Wilson, J. O. S. (2007). European banking: an overview. *Bank Finance, 31*, 1911–1935.

Goddard, J., McKillop, D., & Wilson, J. O. S. (2008). The diversification and financial performance of US credit unions. Journal of Banking & Finance, 32, 1836–1849.

ING SA. (2005-2017). *Annual Report*. Warsaw: ING SA.

Iwanicz-Drozdowska, M. (2002). *Kryzysy bankowe. Przyczyny i rozwiązania [Banking crises. Causes and solutions]*. Warsaw: Polish Economic Publishers.

Joash, G. O., & Njangiru, M. J. (2015). The effect of mergers and acquisitions on financial performance of banks. A survey of commercial banks in Kenya. *International Journal of Innovative Research & Development, 4*(8), 101–113.

Jonek-Kowalska, I., & Zieliński, M. (2017). CSR activities in the banking sector in Poland. In K. S. Soliman (Ed.), *Education Excellence and Innovation Management through Vision 2020: From Regional Development Sustainability to Global Economic Growth. Proceedings of the 29th International Business Information Management Association Conference, Vienna* (pp. 1294–1304).

Juszczyk, S., Balina, R., Różyński, J., & Pochopień, J. (2013). Zmienność funduszy własnych a efektywność banków spółdzielczych [Variability of Equity versus Efficiency of Cooperative Banks]. *The Journal of Management and Finance, 11*(2), 230–242.

Kil, K. (2015). *Poziom koncentracji a stabilność finansowa sektorów bankowych krajów Europy Środkowo-Wschodniej [Concentration level, and financial stability of banking sectors of the Central and Eastern European countries]*. Cracow: Cracow University of Economics Publishing House.

Klepacki, B. (1984). *Wybór próby w badaniach ekonomiczno-rolniczych [Selection of the sample in economic and agricultural research]*. Warsaw: Warsaw University of Life Sciences Publishing House.

Kotowicz, A. (2015). *Koncentracja sektora bankowego [Banking sector concentration]. Department of Commercial and Specialized Banking and Payment Institutions*. Warsaw: Polish Financial Supervision Authority.

Kozak, S. (2015). Wpływ koncentracji sektora bankowego na poziom kosztów pracy w bankach w Polsce w latach 1997-2014 [The Impact of the Banking Sector Concentration on the Labour Cost in Polish Banks in the Years 1997-2014]. *Scientific Papers of the Siedlce University of Natural Sciences and Humanities, Administration and Management, 107*, 69–78.

Kumar, S. (2013). Impact of bank mergers on the efficiency of banks: A study of merger of Bharat Overseas Bank with Indian Overseas Bank. *International Journal of Academic Research in Business and Social Sciences, 3*(12), 221–242.

Kurgan-Van Hentenryk, G. (2001). Supervision and regulation of bank merger: a historical survey. In M. Pohl, T. Tortella, & H. Van der Wee (Eds.), *A Century of Banking Consolidation in Europe: the History and Archives of Mergers and Acquisitions*. London: Taylor & Francis Group.

Laeven, L., & Claessens, S. (2003). What drives bank competition? Some International Evidence. *World Bank Policy Research Working Paper*, 3113.

Marcinkowska, M. (2015). Bank jutra..., czyli rozważania o przyszłości sektora bankowego [Bank of tomorrow..., reflections on the future of banking sector]. In J. Nowakowski (Ed.), *W kierunku nowego ładu świata finansów [Towards a new order of the world of finance]* (pp. 30–40). Warsaw: Warsaw School of Economics Publishing House.

mBank SA. (2005-2017). *Annual Report*. Warsaw: mBank SA.

Mikołajczyk, M. (2014). Konsolidacja sektora bankowego w Polsce – szansa czy zagrożenie? [Consolidation of the Banking Sector in Poland: Threat or Opportunity?]. *Cracow Review of Economy and Management, 10*(934), 123–134.

Molyneux, P. (2009). Do mergers improve bank productivity and performance? In M. Balling, E. Gnan, F. Lierman, & J. P. Schoder (Eds.), *Productivity in the financial services* (pp. 23–43). Vienna: SUERF Studies.

Nawrocki, T. L. (2015). The use of fuzzy logic in the enterprises business efficiency assessment. In T. Dudycz, G. Osbert-Pociecha, & B. Brycz (Eds.), *The essence and measurement of organizational efficiency* (pp. 229–234). Springer Proceedings in Business and Economics.

Olszak, M. (2014). Zależność między konkurencją w sektorze bankowym i stabilnością finansową banków – przegląd badań teoretycznych i empirycznych [Competition in the banking sector and financial stability – a review of theoretical and empirical evidence]. *Internet Quarterly on Antitrust and Regulation, 5*, 8–33.

Pawłowska M. (2014). *W poszukiwaniu optymalnego poziomu konkurencji w sektorze bankowym [In search of the optimal level of competition in a banking sector]*. Accessed Feb 2, 2019, from

https://www.obserwatorfinansowy.pl/tematyka/bankowosc/w-poszukiwaniu-optymalnego-poziomu-konkurencji-w-sektorze-bankowym/

PeKaO, S. A. (2005-2017). *Annual Report*. Warsaw: PeKaO SA.

PKO BP SA. (2005-2017). *Annual Report*. Warsaw: PKO BP SA.

Polish Financial Supervision Authority. (2005-2014). *Raporty o sytuacji finansowej banków w latach 2005–2017 [Reports on the financial condition of banks in 2005–2017]*. Warsaw.

Polish Financial Supervision Authority (2013). *Koncentracja w sektorze bankowym w Polsce [Concentration in a banking sector in Poland]*. Warsaw.

Polish Financial Supervision Authority. (2016). *Raport o sytuacji banków w 2015 roku [Report on the financial condition of banks in 2015]*. Warsaw.

Polish Financial Supervision Authority. (2017). *Raport o sytuacji banków w 2016 roku [Report on the financial condition of banks in 2016]*. Warsaw.

Polish Financial Supervision Authority. (2018). *Sytuacja sektora bankowego w 2017 [Situation of a banking sector in 2017]*. Warsaw.

Pyka, A. (2017). Determinanty wyników finansowych i siły kapitałowej sektora bankowego [Determinants of financial results and capital strength of the banking sector]. *The Enterprise Sciences Quarterly, 2*(43), 83–85.

Pyka, I., Cichy, J., Nocoń, A., and Pyka, A. (2018). *Repolonizacja banków w Polsce. Przesłanki, założenia i dylematy zmian własnościowych [Repolonization of banks in Poland. Premises, assumptions and dilemmas of ownership changes]*. Warsaw: Difin.

Pyka, A., & Nocoń, A. (2019). *Polish versus European Banking Sector – Characteristics, Consolidation, Ownership Changes. International Scientific Conference: Contemporary Issues in Business, Management and Economics Engineering'2019; Vilnius Gediminas Technical University Press* (pp. 319–320). Vilnius: Lithuania.

Ramotowski, J. (2013). *W polskim sektorze bankowym jest sporo miejsca na fuzje [There is a lot of place for mergers in the Polish banking sector]*. Accessed Dec 22, 2013, from http://www.obserwatorfinansowy.pl/tematyka/bankowosc/w-polskim-sektorze-bankowymjest-sporo-miejsca-na-fuzje

Roger, A., & Ferguson, S. (2009). *Understanding financial consolidation*, A paper presented at the conference of Federal Reserve Bank of New York.

Santander SA. (2005-2017). *Annual Report*. Warsaw: Santander SA.

Seo, M., & Hill, N. S. (2005). Understanding the human side of merger and acquisition: An integrative framework. *The Journal of Applied Behavioral Science, 41*(4), 422–443.

Shih, S. H. M. (2003). An investigation into the use of mergers as a solution for the Asian banking sector crisis. *The Quarterly Review of Economics and Finance, 43*, 31–49.

Stoła, E. (2011). Efektywność techniczna a efektywność finansowa banków komercyjnych [The Technical Effectiveness vs. the Financial Effectiveness of Commercial Banks]. *Scientific Papers of University of Szczecin. Finance, financial markets, insurance, 37*, 141–152.

Szelągowska, A., & Posacka, K. (2006). Zastosowanie analizy regresji w ocenie konkurencyjności wybranych banków komercyjnych w Polsce w latach 1996-2004 [Application of regression analysis in evaluation of competitiveness of chosen commercial banks in Poland from 1996 to 2004]. *Scientific Paper of University of Computer Sciences and Skills in Lódź, Theory and Application of Computer Science*, 5(1). *Lodz*, 137–146.

Szunke, A. (2014). The role of financialization in banking sector instability. *Journal of Economics and Management, 16*, 97–111.

Tsaurai, K. (2017). Financial market performance: An influence of personal remittances. *Corporate Ownership & Control, 14*(2–1), 268–273.

Tushaj, A. (2010). Market concentration in the banking sector: Evidence from Albania. *BERG Working paper series on government and growth*, 73.

Weber, T. (2000). *The impact of mergers and acquisitions on employees in the financial services sector. The Impact of Mergers and Acquisitions in the Banking and Insurance Sector*. UNI-Europa: Brussels.

World Bank. (2013). *Rethinking the Role of the State in Finance*. World Bank: Washington D.C.