DOI: 10.20472/IAC.2017.028.013

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# THE APPLICATION OF MACROPRUDENTIAL POLICY TOOLS TO AFFECT CONCENTRATION IN THE POLISH BANKING SECTOR

## Abstract:

Banking sectors in particular EU Member States are characterized by different profitability and concentration. In the literature there are divergent views on the appropriate concentration level from the perspective of supervisory authorities, consumers or banks themselves. However, the research carried out for Poland shows that there is positive correlation between concentration and profitability. Moreover, since 2009 a wave of mergers and acquisitions has occurred in the Polish banking sector, which is detrimental to consumers. This conclusion has been drawn from the Lerner index values that have been computed owing to the econometric model with transcendental logarithmic function for the total cost. Thus, if concentration is too high, the supervisory authorities could consider preventing further mergers or acquisitions using new macroprudential policy tools, instead of old administrative ones. Especially important here is the capital buffer that is set on other systemically important institutions. It can be accompanied by the systemic risk buffer. Nevertheless, the results of the comparative analysis show that diverse solutions are currently applied across EU Member States.

## Keywords:

concentration, Lerner index, macroprudential policy, capital buffer, bank

**JEL Classification:** D04, G21, G28

## Introduction

The paper analyses the problem of concentration in the Polish banking sector in relation to its profitability. First, a literature review is presented on the relationship between those two phenomena. The papers show different tendencies that are observable both theoretically and empirically. The next chapter is dedicated to comparison of Poland to other EU Member States with respect to concentration and profitability of the banking sector. The main part of the paper is the next chapter where the results of empirical research on Poland are presented. The analysis here is carried out from the perspective of both the firm, and the entire economy as well. The last chapter shows that concentration in the banking sector can be affected by selected tools of the macroprudential policy. Such research is going to gain popularity as that kind of policy is a new one across EU Member States.

## Literature review

There is broad literature on the influence of the structure of the banking sector on its stability and effectiveness. The research is both theoretical end empirical. There is no a single view on how concentration affects profitability in the banking sector.

According to one view excessive concentration in the market for banking services may result in higher systemic risk. When the institution is big, its possible liquidity and solvency problems cause turbulences to a large number of market participants. High concentration also means significant barriers to entry, higher credit risk and lower availability of banking services to both retail clients, and SMEs as well (Rogowski 2001). High concentration may also lead to increase in interest rate on loans and decline in interest rate on deposits.

Concentration in credit supply makes the biggest banks take advantage of their monopoly power to increase the prices (Akhavein et al. 1997). Similar conclusions stem from the research by Verhegyi (2004) on the Hungarian banking sector. Higher concentration results in increased bank profits according to other empirical studies (Demirgüç-Kunt, Huizinga 1999 and Cetorelli 2001). Moreover, according to Cetorelli (2001) high concentration in the banking sector means that enterprises undertake excessively risky projects to address elevated interest rates. Lower credit supply means

slower process of capital formation. Thus, only lower levels of GDP *per capita* are available to the economy.

There are, however, the economists who support the adverse view, i.e. show positive aspects of concentration in the banking sector. A less concentrated banking sector with many small banks is more vulnerable to the financial crisis than a highly concentrated one. Moreover, higher interest rates which are the effect of lower competition among banks, represent a kind of collateral when the economy enters into the bust period. Also, banking supervision is more effective and the risk of the bank crisis is lower when the sector is highly concentrated (Beck et al. 2003). Conversely, when there is a large number of small banks, they have to compete fiercely in order to achieve better financial results and launch complicated financial products. Under such circumstances banks lower their requirements as they are afraid of clients outflow. According to Petersen and Rajan (1995) increasing concentration positively affects the supply of loans to small and medium-sized enterprises. Besides, a highly concentrated sector is less vulnerable to the bank crisis (Beck et al. 2003).

The research on the relationship between concentration and profitability was also done for Poland (Kozak, Pawłowska 2008). The two economists prove that the profitability of the bank is positively correlated with its size. Nevertheless, concentration (measured by Herfindahl index - HHI) negatively affects the overall profitability of the banking sector. The justification is as follows: bigger banks extract their monopoly power, which is detrimental to smaller ones. The negative tendencies have a prevalence over the positive ones, so the total effect is negative for the banking sector.

## Banking sector in Poland compared to EU

The Polish banking sector is one of the least concentrated in the European Union. 5 largest credit institutions accounted for 48.3% assets of the banking sector in 2014. It is the Herfindahl index that also informs about a relatively low concentration level. In 2014 only Austria, France, Luxembourg, Germany, UK and Italy were characterised by a lower value of that index. It is worth mentioning here that the Polish banking sector is the least concentrated compared to other new EU members, i.e. the ones that entered the EU in 2004, 2007 or 2013. At the same time the Polish banking sector is one of the

most profitable ones. In 2014 the ROA index was higher in the Czech Republic and Estonia only, and in terms of the ROE index Poland proved to be at a worse position than, again, the Czech Republic and Estonia, as well as Latvia and Sweden. A comparative analysis that takes into account the net interest margin, fees and commissions (as a percentage of assets), as well as cost-to-income (C/I) ratio points at a further position of Poland.

**Table 1: Selected concentration and profitability indicators of the banking sector across EU Member States in 2014**

| | ROA (%) | ROE (%) | NIM (%)[a] | C/I (%) | Fees (%)[a] | HHI | CR5 (%) |
|---|---|---|---|---|---|---|---|
| **Austria** | 0.08 | 1.06 | 1.79 | -60.7 | 0.72 | 412 | 36.8 |
| **Belgium** | 0.52 | 7.81 | 1.46 | -61.2 | 0.55 | 982 | 65.8 |
| **Bulgaria** | 0.93 | 7.17 | 3.17 | -48.8 | 1.02 | 836 | 55.0 |
| **Croatia** | 0.54 | 3.89 | 2.73 | -53.2 | 0.95 | 1,364 | 72.3 |
| **Cyprus** | -0.63 | -7.10 | 2.81 | -40.3 | 0.42 | 1,303 | 63.4 |
| **Czech Republic** | 1.18 | 11.42 | 2.45 | -47.7 | 0.76 | 949 | 61.3 |
| **Denmark** | 0.26 | 4.71 | 1.09 | -67.9 | 0.37 | 1,190 | 68.1 |
| **Estonia** | 1.58 | 9.69 | 2.01 | -45.7 | 0.74 | 2,445 | 89.9 |
| **Finland** | 0.40 | 9.13 | 0.60 | -50.6 | 0.25 | 3,310 | 79.8 |
| **France** | 0.23 | 4.39 | 0.98 | -69.6 | 0.64 | 584 | 47.6 |
| **Germany** | 0.13 | 2.49 | 1.11 | -72.6 | 0.49 | 301 | 32.4 |
| **Greece** | -1.05 | -10.58 | 2.40 | -62.4 | 0.43 | 2,195 | 94.1 |
| **Hungary** | -2.04 | -21.89 | 3.97 | -65.7 | 1.73 | 905 | 52.5 |
| **Ireland** | 0.94 | 8.53 | 1.21 | -61.9 | 0.42 | 677 | 47.6 |
| **Italy** | -0.20 | -2.78 | 1.46 | -63.2 | 1.02 | 424 | 40.7 |
| **Latvia** | 0.98 | 10.27 | 1.73 | -51.5 | 1.09 | 1,001 | 63.6 |
| **Lithuania** | 0.88 | 7.73 | 1.56 | -53.5 | 0.80 | 1,818 | 85.7 |
| **Luxembourg** | 0.55 | 7.30 | 0.56 | -114.3 | 0.70 | 329 | 32.0 |
| **Malta** | 0.69 | 4.37 | 2.11 | -36.9 | 0.29 | 1,648 | 81.5 |
| **Netherlands** | 0.19 | 3.33 | 1.28 | -63.1 | 0.31 | 2,131 | 85.0 |
| **Poland** | 1.03 | 9.35 | 2.53 | -52.9 | 0.95 | 656 | 48.3 |
| **Portugal** | -1.21 | -17.16 | 1.34 | -66.5 | 0.74 | 1,164 | 69.2 |
| **Romania** | -1.28 | -15.24 | 3.10 | -54.9 | 1.10 | 797 | 54.2 |
| **Slovakia** | 0.90 | 9.24 | 3.05 | -56.6 | 0.79 | 1,221 | 70.7 |
| **Slovenia** | -0.26 | -2.48 | 2.29 | -58.2 | 0.93 | 1,026 | 55.6 |
| **Spain** | 0.49 | 6.69 | 1.82 | -48.9 | 0.65 | 839 | 58.3 |
| **Sweden** | 0.61 | 11.77 | 1.02 | -56.6 | 0.75 | 880 | 58.5 |
| **United Kingdom** | 0.22 | 3.85 | 0,94[b] | -68.0 | 0.57 | 462 | 38.9 |

[a] With reference to assets. [b] Data for 2013.
*Source: European Central Bank.*

Data shown in table 1 prove that there does not exist any strong relationship between the concentration level in the banking sector and profitability. In some cases high profitability is accompanied by high concentration (e.g. Estonia, Slovakia, Lithuania). But at the same time there are countries where the dependence is quite the opposite

(e.g. Greece, Portugal and the Netherlands that are characterised by high concentration and low profitability). The abovementioned divergences show that such a general analysis is not sufficient. That is why a more thorough research on the Polish banking sector has been carried out.

## The market position of banks in Poland

The analysis for the Polish banking sector has been done with a view to verifying possible interdependencies between:

- the size of the banks and their financial results,
- the concentration of the entire banking sector and its market power, i.e. the ability to impose high mark-ups over marginal costs.

The first analysis should be done from the firm's perspective. However, not all banks publish their individual data on profitability. That is why selected results of the research here are based on aggregate data. On the contrary, the objective of the second analysis is to check whether the possible improvement of the bank profitability stems from the fact of imperfect competition in the market. The higher mark-up of the price over the marginal costs (in relative terms) can the firm impose, the stronger its market position. When the price goes up, the quantity traded declines, which is detrimental to consumers. As a drop in consumer surplus exceeds banks' additional profits, a deadweight loss appears and the social welfare (the sum of consumer and producer surplus) decreases. The analysis here is restricted to commercial banks in Poland that represent over 75% of the domestic banking sector.

Analysis from the bank's perspective

The banking sector in Poland has undergone the processes of mergers and acquisitions. They mostly stemmed from changes in ownership between the foreign-owned (mostly EU) parent companies that control around 60% of the Polish banking sector in terms of assets. In years 2008-2015 the number of commercial banks declined from 52 to 38. An interesting question appears here on the influence of that process on the overall profitability of the Polish banking sector. The profitability is measured by the previously mentioned indictors, i.e. C/I, NIM, Fees, ROA and ROE. The results of the analysis are shown in table 2.

**Table 2: ROE, ROA, NIM, Fees and C/I indicators for 5 largest banks in Poland and for the entire Polish banking sector. Data for 2008-2014**

| Bank types | Indicator | | | | |
|---|---|---|---|---|---|
| | ROE | ROA | NIM | Fees | C/I |
| **2008** | | | | | |
| 5 largest | 19.7% | 1.81% | 2.76% | 1.34% | -48.5% |
| Commercial total | 15.1% | 1.32% | 2.60% | 1.09% | -53.7% |
| **2009** | | | | | |
| 5 largest | 12.3% | 1.40% | 2.39% | 1.38% | -48.8% |
| Commercial total | 7.8% | 0.79% | 2.37% | 1.16% | -53.0% |
| **2010** | | | | | |
| 5 largest | 13.3% | 1.60% | 2.81% | 1.47% | -45.2% |
| Commercial total | 9.9% | 1.02% | 2.58% | 1.16% | -50.7% |
| **2011** | | | | | |
| 5 largest | 15.1% | 1.78% | 3.00% | 1.36% | -42.7% |
| Commercial total | 11.8% | 1.20% | 2.64% | 1.07% | -49.2% |
| **2012** | | | | | |
| 5 largest | 13.3% | 1.72% | 3.02% | 1.30% | -41.3% |
| Commercial total | 10.4% | 1.16% | 2.55% | 1.04% | -49.2% |
| **2013** | | | | | |
| 5 largest | 12.0% | 1.50% | 2.69% | 1.21% | -45.9% |
| Commercial total | 9.9% | 1.12% | 2.44% | 0.94% | -51.0% |
| **2014** | | | | | |
| 5 largest | 11.1% | 1.34% | 2.48% | 1.05% | -43.4% |
| Commercial total | 9.6% | 1.07% | 2.39% | 0.89% | -48.8% |

*Source: own calculations based on KNF (Polish Financial Supervision Authority) and selected banks data.*

The abovementioned results show that larger banks in Poland are in general more profitable compared to the average profitability of commercial banks. This relationship is prevalent in case of all indicators used. Nevertheless, when time series are taken into consideration with respect to each particular indicator, one cannot say that an increase in the concentration due to mergers and acquisitions was accompanied by higher profitability. For example, ROE and ROA indices fluctuated over the analysed period and no clear tendency was visible here. That is why further research is needed from the point of view of the social welfare. Another interesting topic is the verification whether higher profitability of bigger banks stems from their cost effectiveness or extracting higher monopolistic power compared to smaller banks. However, such an analysis should be carried out on the basis of individual data that are not available for some banks.

Analysis from the social point of view

To analyse a relationship between the size of the bank and social welfare, the Lerner index has been computed. Its definition is as follows:

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

where *P* stands for the price and *MC* denotes the marginal cost. The index takes the values between 0 and 1, where „0" denotes a perfectly competitive market where a firm is a price-taker. The higher the value of the index, the higher the monopoly power of a certain firm. Marginal cost is defined as follows: $MC = \frac{dTC}{dq}$, where *TC* denotes the total cost and *q* stands for the output. In order to estimate a total cost function, a transcendental logarithmic function has been chosen. Thus:

$$lnTC = \alpha_0 + \alpha_1 \cdot lnq + \frac{1}{2}\alpha_2 \cdot (lnq)^2 + \sum_{i=1}^{3} \beta_i \cdot lnw_i + \sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{jk} \cdot lnw_j \cdot lnw_k +$$

$$\sum_{m=1}^{3} \gamma_m \cdot lnq \cdot lnw_m + \varepsilon \qquad (1)$$

This function has been applied in the research carried out by Řepková (2012), Pruteanu-Podpiera et al. (2007), Efthyvoulou and Yildirim (2013), as well as Weill (2011). The first and second works refer to concentration problem in the Czech Republic, the third contains a comparison of concentration measures between Central and Eastern European countries. The last work is dedicated to EU-27 countries.

In the model there are the following notations:

*q* – output; in case of a bank that category is approximated by the sum of the following items: "loans and receivables", "available-for-sale financial assets", "financial assets designated at fair value through profit and loss", "financial assets held for trading" and "cash, cash balances at central banks and other demand deposits"

$w_1$ – labour price, i.e. a ratio of staff expenses to "q",

$w_2$ – price of physical capital, i.e. a ratio of depreciation to the sum of tangible and intangible assets,

$w_3$ – price of financial capital, i.e. a ratio of interest together with fee and commission expenses to the sum of the following categories: "financial liabilities measured at amortised cost" (mostly deposits), "financial liabilities designated at fair value through profit and loss" and "financial liabilities held for trading".

Once all there parameters of the model have been properly estimated, the marginal cost (*MC*) can be computed. The appropriate mathematical rearrangements of equation (1) lead to the following:

$$MC = \frac{TC}{q} \cdot (\alpha_1 + \alpha_2 \cdot lnq + \sum_{m=1}^{3} \gamma_m \cdot lnw_m) \qquad (2)$$

The price (*P*) is defined as the sum of interest together with fee and commission income divided by *q*.

The model has been estimated for the group of commercial banks in Poland. The theoretical values of the model parameters serve to calculate the marginal cost and eventually to find the value for the Lerner index. The model has been estimated on the basis of monthly data from January 2009 until June 2004 (66 observations).

**Table 3: Lerner index values for the sector of commercial banks in Poland**

| Date | Lerner index - weighted average |
|---|---|
| 2009 Jan | 0.530 |
| 2009 Dec | 0.575 |
| 2010 Dec | 0.580 |
| 2011 Dec | 0.579 |
| 2012 Dec | 0.543 |
| 2013 Dec | 0.658 |
| 2014 Jun | 0.660 |

*Source: own calculations based on KNF (Polish Financial Supervision Authority) data.*

The obtained results show that in the analysed period the Lerner index gradually increased in the Polish banking sector. As it was specified before, that period was characterised by a wave of mergers and acquisitions. Hence, an increase in concentration was accompanied by declining social welfare. The data show vividly that more monopoly power was extracted by the banks in times where the banking sector was more concentrated. Further mergers and acquisitions could thus result in gradual deterioration of the consumer surplus, as well as social welfare.

## Macroprudential policy

The latest financial and economic crisis led to the discussion on the necessity of detailed monitoring of the entire financial sector. It means that not only should the various analyses refer to the financial institutions themselves, but to the interconnectedness between them as well. Equally important are the possible interactions between the financial institutions and the real sector of the economy. In time such ideas evolved towards the macroprudential policy, which is now run in all EU Member States. Its implementation is based on the following legislative acts:

- CRD, i.e. Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013,
- CRR, i.e. Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013.

Macroprudential policy in Poland has been pursued since the beginning of 2016. Its objective is to strengthen the resilience of the financial system in case of materialisation of the systemic risk and to support long-term sustainable economic growth. One of the tools of macroprudential policy are capital buffers, which represent additional portions of capital above the regulatory (CRR) minima. The CRD introduces the following capital buffers:

- conservation,
- countercyclical capital - CCB,
- global systemically important institutions - G-SIIs,
- other systemically important institutions - O-SIIs,
- systemic risk- SRB.

The macroprudential policy tools are precisely described in the CRD and are uniform across all EU Member States[1]. However, it is the arbitrary decision of a particular country regarding the scope of their application. In this paper the O-SII buffer is going to be described due to the role of this tool in affecting the level of concentration.

O-SII buffer – EU countries

The procedure regarding setting O-SII buffers on banks consists of 2 stages. First, the competent authority or a designated authority of each Member State should decide which banks are to be considered other systemically important institutions. The decisions here are based on the appropriate guidelines issued by the European Banking Authority (EBA/GL/2014/10)[2] on 16th December 2014. The document, which is uniform across all Member States, introduces the following indicators that are used to assess a systemic importance of particular banks (see: table 4).

**Table 4: Obligatory indicators specified in the EBA guidelines to identify O-SIIs**

| Criterion | Indicators | Weight |
|---|---|---|
| Size | Total assets | 25% |
| | Value of domestic payment transactions | 8.33% |

[1] They are also present in Norway, Iceland and Liechtenstein which belong to the European Economic Area.
[2] See: EBA(2014).

| | | |
|---|---|---|
| Importance (including substitutability / financial system infrastructure) | Private sector deposits from depositors in the EU | 8.33% |
| | Private sector loans to recipients in the EU | 8.33% |
| Complexity / cross-border activity | Value of OTC derivatives (notional) | 8.33% |
| | Cross-jurisdictional liabilities | 8.33% |
| | Cross-jurisdictional claims | 8.33% |
| Interconnectedness | Intra-financial system liabilities | 8.33% |
| | Intra-financial system assets | 8.33% |
| | Debt securities outstanding | 8.33% |

*Source: European Banking Authority.*

Banks are automatically designated as other systemically important institutions when their score at least equals 350 bps (out of 10,000)[3]. It indicates a minimum market share of 3.5% (a weighted average with reference to the indicators and their weights in table 4). It is also possible to add other banks to that list on the basis of optional indicators.

The second stage of the procedure is to set the O-SII buffer, which cannot exceed 2% of the total risk exposure (art. 131(5) CRD). Nevertheless, it is not the only restriction. For banks that are subsidiaries of EU parent institutions the O-SII buffer rate cannot exceed the higher of:

- 1%,
- respective G-SII or O-SII buffer rate of the EU parent company.

The abovementioned cap is material especially for Central and Eastern European countries (including Poland) where many subsidiaries or branches of banks from Western European countries operate. Selected data on O-SIIs in all Member States are presented in table 5.

**Table 5: Other systemically important institutions in EU Member States. Selected data**

| Country | O-SIIs - No. | Buffer rate (%) | | Country | O-SIIs - No. | Buffer rate (%) | |
|---|---|---|---|---|---|---|---|
| | | min | max | | | min | max |
| **Austria** | 7 | 1.00 | 2.00 | **Italy** | 3 | 0.25 | 1.00 |
| **Belgium** | 8 | 0.75 | 1.50 | **Latvia** | 6 | 1.50 | 2.00 |
| **Bulgaria** | 10 | 0.50 | 1.00 | **Lithuania** | 4 | 0.50 | 2.00 |
| **Croatia** | 9 | 0.20 | 2.00 | **Luxembourg** | 6 | 0.50 | 1.00 |
| **Cyprus** | 6 | 0.50 | 2.00 | **Malta** | 3 | 0.50 | 2.00 |
| **Czech Rep.** | 7 | 0.00 | 0.00 | **Netherlands** | 5 | 1.00 | 2.00 |

[3] Each Member State has an option to adjust a cut-off score within an interval between 275 and 425 bps. However, a majority of countries applies a threshold of 350 bps.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Denmark** | 6 | 0.00 | 0.00 | **Poland** | 12 | 0.00 | 0.75 |
| **Estonia** | 2 | 2.00 | 2.00 | **Portugal** | 6 | 0.25 | 1.00 |
| **Finland** | 4 | 0.50 | 2.00 | **Romania** | 11 | 1.00 | 1.00 |
| **France** | 6 | 0.25 | 1.50 | **Slovakia** | 5 | 1.00 | 2.00 |
| **Germany** | 14 | 0.50 | 2.00 | **Slovenia** | 8 | 0.25 | 1.00 |
| **Greece** | 4 | 1.00 | 1.00 | **Spain** | 6 | 0.25 | 1.00 |
| **Hungary** | 9 | 0.50 | 2.00 | **Sweden** | 4 | 2.00 | 2.00 |
| **Ireland** | 7 | 0.00 | 1.50 | **UK** | 16 | 0.00 | 0.00 |

*Source: own elaboration on ESRB information.*

Polish solutions[4] with respect to the O-SIIs

In Poland the O-SII identification process is in line with the abovementioned EBA guidelines. In case of the buffer calibration, a proportional method has been applied, according to the following formula:

$$r_{OSII} = \begin{cases} \left[\frac{w}{350}\right] \cdot 0.25\% \; if \; w < 1\,750 \\ 2\% \; if \; w \geq 1\,750 \end{cases} \qquad (3)$$

where:

$r_{OSII}$ denotes the O-SII buffer, and $w$ is the score of the particular bank in basis points (for all institutions the basis points sum up to 10,000), and the square bracket denotes a mathematical operation of rounding down to the nearest whole number.

Such a methodology of buffer calibrating means that the banks have been divided into several groups (buckets) according to their score. The buffer rate increases proportionally until the score reaches 1,750 bps. Then, the rate grows more than proportionally from 1% to 2%, rather than from 1% to 1.25%. The reasoning here is the following: when an institution exceeds certain size, the risk that it generates grows non-linearly. Such a phenomenon is described in detail in the literature (Tarashev et al. 2010, Moore and Zhou 2014, Black et al. 2016)

When clear definitions of the intervals for basis points and respective O-SII buffer rates are disclosed, banks can evaluate possible costs and benefits of mergers and acquisitions. The cost here would stem from higher capital requirements for a larger bank, which adversely affects the supply of loans and profits from that activity. Setting the O-SII buffer automatically creates a kind of the opportunity cost for the bank.

[4] On the basis of KNF (2016).

## Conclusion

- The Polish banking sector is one of the least concentrated and one of the most profitable ones across EU Member States. There is no strong relationship between concentration and profitability, both theoretically and empirically.
- The analysis carried out for Poland shows that bigger banks are characterised by higher profitability. At the same time the Lerner index (LI) for a group of commercial banks grows once the sector becomes more concentrated.
- Further mergers and acquisitions in the Polish banking sector could adversely affect the consumer surplus and social welfare.
- Selected macroprudential policy tools can influence the level of concentration in the banking sector. That policy is now pursued by all EU Member States. Owing to appropriate calibration of the other-systemically-important-institution buffer, the opportunity cost arises. Banks have to take it into consideration when deciding on possible mergers and acquisitions.

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