AN ANALYSIS OF CONCENTRATION AND COMPETITION IN THE BANKING SECTOR OF THE REPUBLIC OF SERBIA

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Abstract: The degree of the banking sector concentration is a structural variable and refers to the number of banks in the system and the degree of their market power. The importance of measuring concentration in the banking sector stems from the causal relationship between the market structure and the competitive behaviour of market participants. Traditional models measuring the banking sector competition proceed from the market structure and concentration measures. In contrast, modern approaches to measuring competition rely on non-structural models and analysis of the behaviour of market participants. The paper analyzes the degree of concentration and competition in the banking sector of the Republic of Serbia. The traditional and most frequently used indices, the concentration ratio and the Herfindahl-Hirschman index, are used to measure concentration. The values of these indices show low banking sector concentration but a rise in the observed period. The values of the comprehensive industrial concentration index and the entropy coefficient confirm the concentration absence in the banking sector of the Republic of Serbia. In addition to the usual banking sector concentration measures, the authors use the Linda index to assess the banking sector concentration and competitiveness, to show the absence of an oligopolistic structure in terms of total balance sheet assets, lending and deposit activity of banks.

Introduction

Bank mergers and acquisitions have long been restricted by federal and state regulations in the United States. After the financial deregulation of the 1980s, especially the enactment of the 1994 Riegle-Neal Act, which allowed interstate banking, and the Gramm-Leach-Bliley Act of 1999, which allowed banks to associate with non-banking financial institutions, the concentration of the financial sector has taken off. This process was intense in the European area a couple of years earlier, parallel with the European Union creation processes. When it comes to the domestic banking market, Serbia has been reforming the banking and overall financial sector since 2001. The entry of foreign capital into the banking market through mergers/acquisitions of existing banks has significantly reduced the number of banks in the system. Despite the positive effects reflected in a better offer of banking services, rising financial potential and enhanced capital base of the banking sector, the issue of the impact of the concentration trend on the banking sector competitiveness has been raised. The paper evaluates the competitiveness using the Linda index to draw relevant conclusions and investigate the shortcomings of traditional concentration measures. The structure of the paper consists of three parts. The first part of the paper is the conceptual explanation of the banking sector concentration and competitiveness and the interdependence of their influence. The second part presents structural and non-structural models for assessing the banking sector competitiveness. The third part of the paper analyzes the banking sector concentration and competition of the Republic of Serbia. We observe traditional concentration indices (CRk and HHI) for 2009 to 2019, while the comprehensive industrial concentration index and entropy coefficient are based on data from the banks' balance sheets for 2019. In addition to the usual indicators, the research on concentration and competition in the banking sector in the last year is based on the less frequently used Linda index, which enables the identification of the largest companies on the market, the so-called "Oligopolistic core".

1. Concentration and competitiveness in the banking sector: interdependence of influences

In the context of strengthening market competition and globalization on the world market and the introduction of new information technologies in the financial sector, there is a growing tendency to enlarge banking institutions. Financial deregulation and the increasing share of international capital flows in gross domestic product have affected structural changes in the banking sector and encouraged the concentration process. Concentration in banking is a process of reducing the number of banks due to mergers, acquisitions and other forms of business associations of banks. It results in a concentration of power and capital in large banks and financial conglomerates (Bašić, 2012, p. 493). In Europe, mergers and acquisitions in the banking sector have been

supported by introducing the euro as the single currency in the member states of the European Monetary Union, the harmonization of banking regulations and efforts to create a single banking market. Part of the impetus for mergers and acquisitions in the banking sector comes from the banks themselves, strengthening their competitive position in this way. Additional pressure is coming from shareholders who see the growth potential in profit rates and market value of share capital in mergers and acquisitions. In addition, banks diversify their business activity and reduce risk, achieve greater business efficiency through cost savings due to the effect of economies of scale, gain tax benefits when the loss of the acquired bank is used to settle the taxable profit of the acquiring bank. In addition, mergers/acquisitions are often the only options to rescue the bank in the context of banking crises and the collapse of several banks.

The concentration degree of the banking sector is a structural variable and refers to the number of banks in the system and the degree of their market power. The main factors influencing the degree of concentration are: the number of market participants, the dispersion of market share between competitors and the barriers to entry/exit from the branch (Kostić, 2008, p. 90). The general view is that high concentration implies that few banks dominate the market, which adversely affects competitiveness in the sector. In such conditions, dominant participants generally see benefits in tacit agreements with other chief participants, which further jeopardizes the competitiveness of smaller banks (Marinković, 2007, p. 286).

As the most common type of bank agreement, cartels include numerous informal agreements between leading banks on interest rates, exchange rates, market sharing, etc. As the position of dominant market participants is abused in this way, banking theory and practice first relies on market structure indicators in the analysis of competitiveness. However, an increasing number of examples of highly concentrated banking sectors that are at the same time highly competitive diminish the reliability of assessment of the banking sector competitiveness based on concentration measures (Croatian Banking Association, 2007). Therefore, concentration measures play the role of an indirect indicator of competitiveness in the branch, while non-structural measures are there for its direct assessment.

2. Alternative approaches to measuring the concentration and competitiveness of the banking sector

The economic literature extensively addresses the concept of industrial concentration is. Despite numerous approaches to its measurement, there is a general agreement on the constitutive elements of concentration measures, i.e. number of banks and their market share. Measuring the banking sector competitiveness, on the other hand, is a complex task, bearing in mind that information on the prices of banking services and their marginal costs is often

unavailable (Bukvić, 2017). Therefore, the assessment of competitiveness is performed indirectly, taking into account the measures of banking sector concentration. However, in addition to the market structure, which is often seen as an endogenous factor, competition is determined by many exogenous factors, which are the basis of the so-called modern non-structural models of measuring banking sector competitiveness. Recent approaches to measuring competitiveness rely on the so-called Linda index.

2.1. Structural approach to measuring competition

The traditional structural approach to measuring the banking sector competitiveness has the so-called SCP paradigm (Structure-Conduct-Performance) as its theoretical basis, developed by Mason and Bain. This paradigm relies on the hypothesis that the market structure determines the behaviour of market participants, and the behaviour of market participants then determines their performance. There is a positive correlation between the concentration degree and banks' profitability and a negative correlation between the degree of concentration and the degree of competition. The market structure significantly determines the banking sector competitiveness, so in the conditions of a more concentrated industry, the outcome is the non-competitive behaviour of market participants. As structure, behaviour, and performance stand out as the SCP paradigm components, it seeks to explain aspects of the behaviour and performance of firms in terms of the structural characteristics of the markets in which they operate.

The market structure means the number of firms, their absolute and relative size, regulatory entry/exit thresholds, and the degree of product/service differentiation. In this sense, the market structure moves between two extremes: monopoly, on the one hand, and whole competition, on the other. The market structure is expected to influence the behaviour of firms. Behaviour variables include pricing strategies, secret agreements, and other strategic decisions (such as product quality and advertising costs). Behaviour, under the influence of structure, determines performance. According to the SCP, therefore, there is a positive correlation between concentration and profitability, in the sense that the higher the degree of concentration, the more excellent the opportunity to charge higher prices for banking services. Hence, banks' profitability is higher (Lončar et al., 2016).

Numerous authors criticize the application of the SCP paradigm in the context of analyzing bank behaviour. A serious objection relates to the one-way relationship between the market structure and performance. In this context, the Efficient Structure Hypothesis assumes that the bank's performance stems from its superior efficiency and lower operating costs compared to other banks on the market. Such a bank achieves a significant market share, and the concentration is ultimately the result of the superior efficiency of leading banks (Bikker & Haaf, 2002).

Although competition cannot be equated with concentration, concentration measures provide a good starting point for its assessment. In that sense, the number of banks in the system, the concentration ratio and the Herfindahl-Hirschman index (HHI) determine individual market structures (Marinković, 2007). The general view that high concentration leads to low competition due to the possibility of concluding secret agreements between significant market participants required the caution of regulatory authorities. In this sense, by the procedure of prior approval of the concentration (Law on Protection of Competition, Article 21; Law on Banks, Article 7), the legislator wanted to protect the market structure and existing competition relations. In addition, concentration measures may indicate a low concentration of the banking sector, which, according to the SCP, should result in a competitive market environment and low profitability of banks, but the results show the opposite.

A study conducted by Lončar et al. (2016) examining the link between the concentration and competitiveness of the banking sector in Croatia, Romania, the Czech Republic and Serbia, does not confirm the postulates of the SCP paradigm in all countries. Serbia faces the lowest concentration level, unaccompanied by low bank profitability. Measured by the interest margin, bank profitability in Serbia was at the highest level among the observed countries in some years. This leads us to conclude that the relationship between concentration and profitability does not have to be positive and is determined by the market structure and how market participants are organized. Agreements between market participants on a standard pricing policy mean that bank profitability is formed at a level above that which would be achieved according to the SCP paradigm.

Despite the weaknesses of structural competition models, concentration ratios are often used in the banking sector's competitiveness analysis models. Table 1 shows the measures used to assess the banking sector's market structure. In most studies, it is about applying the Herfindahl-Hirschman index, the *k* concentration ratio of banks or the number of banks on the market. In a small number of studies, the Entropy Index, the Hall-Tideman Index and the Gini coefficient are applied as measures of market structure. In addition, not all studies that base competition analysis on structural models include regulatory barriers to market entry.

Concentration measures are used as exogenous indicators of market structure, while price and profitability measures are used as endogenous indicators of bank performance (Berger et al., 2004, p. 434). The most common concentration measure on the market is the concentration ratio (k-firm concentration ratio), precisely because of its simple application. This ratio represents the sum of the market shares of *k* participants with the largest share. Although there is no rule for choosing the appropriate value of *k*, it usually ranges from three to five participants (Miljković et al., 2013).

Table 1. Measures of banking sector concentration in structural models

Market structure	Concentration	❖ Herfindahl-Hirschman Index ❖ *k* bank concentration ratio ❖ Number of banks ❖ Other concentration ratios or Gini coefficient
	Market share	❖ Defined for a specific market, i.e. share in a certain balance sheet item (assets, loans, deposits, income, etc.)
	Entry barriers	❖ Regulatory barriers: banking license and establishment conditions (capital census and other conditions) ❖ Non-regulatory barriers: minimum level of differentiation efficiency of products, technology, know-how, economies of scale and diversity,
	Branch number	❖ Branches operating on the relevant market
Performance	Pricing measures	❖ Price of a competitive banking service or the average price of a group of banking products
	Profitability measures	❖ Profit/loss in the bank's operations

Source: Bikker & Haaf (2002, p. 25)

The formula for calculating the concentration ratio has the following form:

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

where:

k - number of banks whose market share we calculate

s_i - market share of the i-th bank

The bank's market share is obtained according to the following formula:

$$S = \frac{q}{Q} * 100\% \quad (2)$$

where:

q – balance sheet value of i-th bank

Q – balance sheet value of the total banking sector

The value of the concentration ratio ranges from 0 to 1. If the value of the coefficient is closer to zero, it means that a large number of banks operate on the market with an evenly distributed share (a larger number of smaller banks). In other words, there is high competitiveness on such a banking market, because the share of k largest banks is of relatively little importance.

Conversely, if the value of the concentration ratio is closer to one, a high degree of concentration is present on the market (dominated by a smaller number of larger banks). The limits for market classification according to the value of the concentration ratio are determined arbitrarily and may vary from market to market.

Although often used to measure market concentration in regulatory reports, a severe objection to concentration ratio is the coverage of only a specific group of banks on the market (the first k banks according to a particular balance sheet criterion). As a result of which it is classified as a partial indicator. As such, it can lead to erroneous conclusions when it comes to assessing the degree of market concentration, as a result of which it is often combined with the Herfindahl-Hirschman concentration index.

The Herfindahl-Hirschman Index (HHI) is the most commonly used cumulative concentration measure and often serves as a measure for evaluating other concentration indices. The index was named after the two economists, Oris Herfindahl and Albert Hirschman. It is the sum of squares of the market participants' market shares in the observed industry, obtained by the following formula:

$$HHI = \sum_{i=1}^{n} s_i^2 \quad (3)$$

where s_i are market shares of n firms on the market.

Given the HHI values, markets can be divided into: non-concentrated (HHI below 1000), moderately concentrated (HHI between 1000 and 1800), highly concentrated (HHI between 1800 and 2600), very highly concentrated (HHI between 2600 and 10000) and fully concentrated, i.e. monopoly markets (HHI = 10000). HHI, as a concentration measure, shows a certain advantage over CR_k since it is a cumulative indicator and takes into account the market share of all participants. However, due to the squaring of market shares, a relatively higher weight is given to participants with higher market share, while the share of those with lower market share is practically neglected.

The Comprehensive Concentration Index (CCI) or Horvath's Index reflects the relative dispersion and absolute size of banks. The CCI index is the sum of the largest bank's share and the sum of squares of all other banks' shares weighted by a factor that reflects the proportional size of the rest of the sector. This way, the shortcomings of dispersion concentration measures (which undermine the importance of large banks) and discrete concentration measures (which are based on the assumption that the dominance of several largest banks determines market behaviour) are avoided (Bikker & Haaf, 2002, str. 11). The CCI index is calculated as follows:

$$CCI = s_1 + \sum_{i=2}^{n} s_i^2 (1 + (1 - s_i)) \quad (4)$$

The value of the index ranges from 0<CCI≤1, where 1 represents a monopoly.

The Entropy index measures the ex-ante distribution of market share and is calculated by the following formula (Bikker & Haaf, 2002):

$$E = -\sum_{i=1}^{n} s_i \log_2 s_i \quad (5)$$

The values of the index range between 0 and $\log_2 n$ and vary inversely with the degree of concentration. The highest value, $E = \log_2 n$, is reached when the market shares of all banks are equal, i.e. when the market concentration is the lowest. The higher the concentration, the closer the value of the index to zero. Equalizing the market share of banks increases entropy, i.e. reduces concentration and vice versa.

Recent theoretical and practical advances have not confirmed the enduring link between concentration and competition, arguing that even highly concentrated banking systems can be competitive. In this regard, by assessing the degree of competitiveness and through concentration measures, it is necessary to consider other factors, such as regulatory barriers to enter the banking services market; ownership structures of the banking sector in terms of competition between state and private banks; origin of capital in terms of competition of domestic and foreign banks; the size of banks, in the sense that banks of different sizes exhibit different comparative advantages and ultimately create a distinct competitive environment (Berger et al., 2004). Keeping in mind numerous factors affecting the banking sector competitiveness, the so-called non-structural approach to measuring competition appears.

2.2. Non-structural approach to measuring competition

The non-structural approach does not draw its conclusions on market competitiveness by analyzing the market structure but by observing the behaviour of market participants on a particular market. The basis of non-structural approaches is the so-called Contestable Markets Theory (CMT), which assumes that participants can behave competitively in concentrated sectors, considering that there are no barriers to entry and exit or barriers are very low (Baumol, 1982). The following variables are taken as the basic measure of market contestability: census policy, presence of foreign capital, formal and informal entry barriers and other restrictions. Traditional barriers include a pre-defined procedure for establishing domestic and foreign banks in terms of the capital census and regulations governing the performance of banking activities. In addition to formal barriers, there are also informal barriers related to technology and information barriers.

The contestability theory indicates that the degree of market concentration is not a clear indicator of the degree of competition. Entry i.e. exit barriers policy) plays a key role in determining the degree of the banking sector's competitiveness, so low thresholds to entry and exit suit a higher degree of market competition. However, this position should also be taken with caution, given that potential mergers of large market participants or the conclusion of informal agreements between them can significantly restrict market competition. For these reasons, non-structural models assess competition by observing the behaviour of market participants. Table 2 shows the most commonly used non-structural models for measuring competition in the banking sector.

Table 2. Non-structural models of competition measurement

The first model generation	Lerner index Conjectural variation models (Iwata, Bresnahan, Lau) Panzar and Rosse model
The second model generation	Mueller - The Persistence of profits The Boone indicator

Source: Leon (2015)

The Panzar-Rosse Index (PR) is the most commonly used model for measuring competition in the banking sector. It monitors the price elasticity of demand and the ratio of marginal revenues and marginal costs, regardless of the market structure itself. High values of this index show highly competitive market conditions, where: a) if the test value is 1, there is perfect competition on the market, b) if the test value is between 0 and 1, there is limited competition and c) if the test value is less than 0, the market is monopolistic. The application of the PR test in assessing the degree of the banking sector competitiveness in European countries has shown, in most cases, limited competition (Bikker & Haaf, 2002). The analysis of the banking sector competitiveness of the countries of Southeast Europe, including Serbia, shows the same (Mamatzakis et al., 2005).

In addition to the usual measures of the banking sector concentration that are used in structural and non-structural models to assess the banking sector competitiveness, in recent times the so-called Linda index is often used to assess the banking sector competitiveness.

2.3. Application of the Linda index in measuring concentration and competition in the banking sector

The Linda index (L-index, IL) identifies the largest companies on the market, the so-called "Oligopolistic core" and is widely used in the EU in market concentration and competition research (Stazhkova et al., 2017). This index is

increasingly used in the analysis of banking sectors concentration of countries in transition, including Serbia (Bukvić, 2017).

The Linda index is calculated step by step, first for the two largest banks, then for the three and so on. It shows how many and which participants occupy dominant positions on the market. The Linda index does not have a predetermined minimum and maximum value, but the value of the index itself shows whether a given market is oligopolistic. If the market is competitive, then the value of the index falls for each newly added bank. If the stated continuity is disturbed, the observed market is oligopolistic. If the value of the index increases with the addition of a new market participant, then the previous participants form the market core. Increasing market concentration replaces the decrease by the rise in the value of the index, and in the case of the dominance of one bank, the index increases from the very beginning (Stazhkova et al., 2017).

The general formula for calculating the Linda index is (Bukvić, 2017):

$$IL_m = \frac{1}{m(m-1)} \sum_{i=1}^{m-1} \frac{m-i}{i} * \frac{CR_i}{CR_m - CR_i} \qquad (6)$$

where m is the number of largest banks for which the index is calculated.

For the case m = 2 the Linda index is calculated as half of the market share ratio of the two largest banks:

$$IL_2 = \frac{1}{2} * \frac{s_1}{s_2} \qquad (7)$$

In the case when m = 3, the following is multiplied with 1/m: a) the ratio between the share of the largest bank and the arithmetic mean of the share of the second and third bank by size and b) the ratio between the arithmetic mean of the share of the first and second bank and the share of the third bank by size:

$$IL_3 = \frac{1}{3} * \frac{1}{2} \left[\frac{s_1}{\frac{s_2 + s_3}{2}} + \frac{\frac{s_1 + s_2}{2}}{s_3} \right] \qquad (8)$$

For each subsequent value of m (m = 5.6 ...), the previous expression develops into a formula that becomes more complicated as m increases.

We will test the previously mentioned indicators, both traditional structural measures and the Linda index, in measuring the competition and concentration of the banking sector of the Republic of Serbia.

3. Analysis of the concentration and competitiveness of the banking sector of the Republic of Serbia

In empirical research on concentration and competition in the banking sector of the Republic of Serbia, the authors focus on the problem of concentration. Concentration analyses predominantly rely on two traditional indicators, CRk and HHI, while a small number of papers apply other indicators such as CCI and Entropy index. A small number of papers analyze competitiveness using the Panzar-Rosse model, which is the most widely used assessment of competition in the banking literature (L´eon, 2014, p. 24). The National Bank of Serbia, in its analysis of concentration and competition in quarterly reports, uses CRn and HHI indicators.

Table 3: Overview of selected literature dealing with concentration and competition in the banking sector of the Republic of Serbia

Author/s	Method	Period
Mešić (2018)	CR_k, HHI	2014-2017
Bukvić (2017)	CR_k HHI IL	2016 2010-2016 2016
Mirković (2016)	CR_k, HHI	2010-2015
Miljković et al. (2013)	CR_k, HHI, Gini, Reciprocity index	2008-2012
Lončar et al. (2012)	CRk, HHI, Gini, CCI, E,	2012
Bulajić et al. (2011)	Panzar-Rosse	2005-2009
Babić et al. (2015)	Panzar-Rosse	2004-2012

The concentration ratio for k banks takes into account large banks in descending order (according to the chosen market share measure). There is no rule for choosing the value of k, so the choice of the number of banks whose market share we calculate is an arbitrary decision (Stazhkova et al., 2017, p. 459). In quarterly reports, the National Bank of Serbia analyzes the concentration ratio of the five and ten largest banks, respectively.

The values of the concentration ratio for the five largest banks show that from 2013 until the end of the observed period, the five largest banks account for more than half of the banking sector in all experimental segments. The concentration ratio of the ten largest banks in all observed segments has been growing in the last decade. At the beginning of the observed period, the number of banks present on the market was 34. The first ten banks (less than a third) in 2009 participated with almost 70% in total balance sheet assets. At the end of the observed period, in 2019, the first 10 out of a total of 26 banks have a share of about 80%. If we observe these values, it can be noticed that the average percentage of the remaining banks in the balance sheet total is lower in 2009 compared to 2019. This is where the shortcoming of this index for measuring market concentration comes into play. Calculating the

concentration ratio with a larger number of participants reduces its analytical significance because it increases the index's value.

Table 4: Share of banks in the balance sheet total, loans and deposits of the banking sector (CR5 and CR10) for the period 2009-2019

Year	Number of banks	Share in balance sheet total (in %)		Share in total loans (in %)		Share in total deposits (in %)	
		The first five banks	The first ten banks	The first five banks	The first ten banks	The first five banks	The first ten banks
2009.	34	46,0	69,4	46,9	69,4	50,9	72,4
2010.	33	45,1	69,3	45,4	70,4	49,6	72,0
2011.	33	47,2	70,9	50,3	71,9	48,4	72,0
2012.	32	48,1	72,3	50,9	73,3	48,5	73,2
2013.	30	51,6	74,3	53,2	75,2	50,4	75,4
2014.	29	53,5	76,3	53,9	75,4	52,5	77,5
2015.	30	54,2	76,8	52,7	75,7	53,6	78,3
2016.	30	54,7	77,4	51,2	74,7	54,3	77,9
2017.	29	54,9	78,4	53,6	77,7	55,6	79,5
2018.	27	53,5	78,2	53,3	77,7	54,1	79,0
2019	26	53,4	79,7	52,0	78,8	54,9	81,2

Source: Based on: NBS (2019a).
Note: The NBS fourth-quarter reports for the banking sector in Serbia for the period from 2009 to 2019 are used

Some authors believe that for a small market, with a small number of participants, CR3 or CR4 concentration ratios are more adequate (Bukvić, 2017; Stazhkova et al., 2017).

Table 5: Share of banks in the balance sheet total, loans and deposits of the banking sector (CR3 and CR4) as at 31 December 2019

	Total assets	Total loans	Total deposits
CR3	37,4	36,13	37,58
CR4	45,59	44,04	45,89

Source: Calculation based on NBS data (2019b), Balance sheet/income statement of banks, https://www.nbs.rs/internet/cirilica/50/50_5.html
*Note*: Data from the balance sheet of banks as at 31 December 2019 is used

Having in mind the values of the concentration ratio for the four largest banks, the markets can be divided into (Kostić, 2008): non-concentrated (CRk below 25%), moderately concentrated (CRk between 25 and 50%), highly concentrated (CRk above 50%). Based on the obtained CR4 values given in

Table 5, the banking market of the Republic of Serbia can be assessed as moderately concentrated. A different demarcation of market structures is used in the literature. For example, if the four largest banks control 40% - 90% of the market, it can be concluded that the market is oligopolistic (Lončar & Rajić, 2012). The values of all CR4 indicators exceed the lower limit, but remain close to it, which could indicate a mild oligopolistic market structure.

The values of the concentration ratio for the three largest banks can be interpreted in accordance with the following market classification (Stazhkova et al., 2017, p. 461): low concentrated (CR3 <45%), moderately concentrated (45% <CR3 <70%) and highly concentrated (CR3> 70%). In accordance with such defined margins, the banking market belongs to the low-concentrated markets for all observed balance sheet items.

The HH concentration index takes into account the total number of banks on the market. The movement of HHI values for the period from 2009 to 2019 is shown in the following chart. The values of HHI for the balance sheet total, total loans and total deposits are less than 1000 in the entire observed period, which means that the market of the Republic of Serbia is low concentrated. The highest values of HHI are present on the deposit market.

**Figure 1: Degree of concentration of the banking sector
of the Republic of Serbia measured by the HH index for the period 2009-2019**
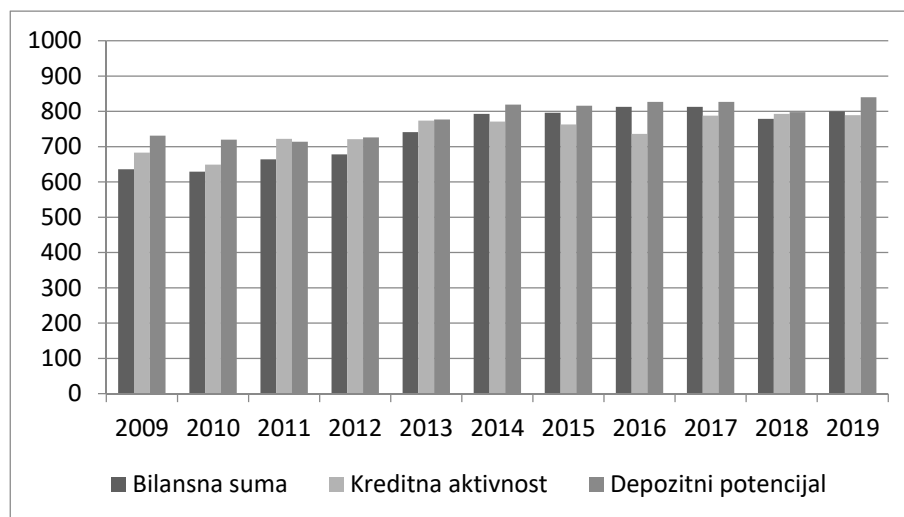
Source: Based on: NBS (2019a).
Note: NBS fourth-quarter reports for the banking sector in Serbia for the period from 2009 to 2019 are used

The HH index shows the absence of high concentration in the banking sector, though with a slight increase in concentration over the past decade. The values of the comprehensive industrial concentration index and the entropy coefficient confirm the concentration absence in the banking sector of the

Republic of Serbia. Based on data on balance sheet assets of banks as oat 31 December 2019, CCI is 0.2644. Given that the index value ranges from 0 to 1, where the value of 1 indicates a monopoly, it can be concluded that the banking sector is not concentrated. The entropy coefficient (E) for total balance sheet assets as of 31 December 2019 is 3.9696. The upper limit, which means an equal share of banks in the balance sheet total for 26 banks, is 4.70043, while the lower limit, which means monopoly, is 0. The obtained value of the entropy coefficient is closer to the upper limit, which indicates a weakly concentrated market.

Concentration ratios are often used in structural models that explain competitiveness in the banking sector as a consequence of market structure. However, the measure of concentration does not guarantee the correctness of the conclusion about the level of competitiveness on a particular market because even on a highly concentrated market, the competitive behaviour of market participants is possible. The CRk does not reflect the share distribution within the group of the largest banks and among other smaller banks. When interpreting the CRk and HH index values, the influence of arbitrarily determined limits for market classification should be taken into account. The advantage of HHI as a measure of concentration in relation to CRk is in the fact that it takes into account the market share of all banks on the observed market. On the other hand, in addition to variations in setting market classification limits, the disadvantage of this method is the neglect of the share of banks with lower market shares due to the squaring of market shares before aggregation.

These shortcomings of previously used indicators can be circumvented by applying the Linda index in the analysis of concentration and competition. Similar to the concentration index, the Linda index calculates values for several of the largest banks, but in contrast to the concentration ratio, it takes into account the structure of the market core itself, i.e. the relative development of market share among the largest banks.

Table 6: Values of the Linda index for total balance sheet assets, total loans and total deposits in the banking sector of the Republic of Serbia as at 31 December 2019

|	Total assets	Total loans	Total deposits	PE
IL2	0.73898	0.79480	0.77616	0.50000
IL3	0.45981	0.50880	0.47809	0.33333
IL4	0.38000	0.40198	0.38703	0.25000
IL5	0.31165	0.33281	0.31593	0.20000
IL6	0.29380	0.29018	0.29005	0.16667

Source: Calculation based on NBS data (2019b), Balance sheet/income statement of banks, https://www.nbs.rs/internet/cirilica/50/50_5.html
Note: Data from the balance sheet of banks as at 31 December 2019 is used

The obtained values of Linda index in all segments show a constant decline, which shows that there is no oligopolistic structure on the market of the Republic of Serbia. This confirms the results obtained on the basis of other indicators (CR3, HHI, E, CCI) and supports the conclusion that the banking sector is low-concentrated. The results are in line with the previous research on the concentration of the banking sector based on the application of the Linda index in the domain of total balance sheet assets, loans and deposits (Bukvić, 2017).

The PE column in the table represents the "perfect equilibrium", i.e. a situation when there is equality of market share of observed participants (1/m). A graphical representation of the curve based on the Linda index value, which shows the real market situation, and the perfect equilibrium curve, shows how far the specific market is from perfect competition. The difference between the curve showing the values of the Linda index and the perfect equilibrium curve defines the so-called "Oligopolistic arena" (Bukvić, 2017).

Figure 2: Perfect equilibrium curve and Linda indices for the observed balance sheet values in the banking sector of the Republic of Serbia on 31 December 2020
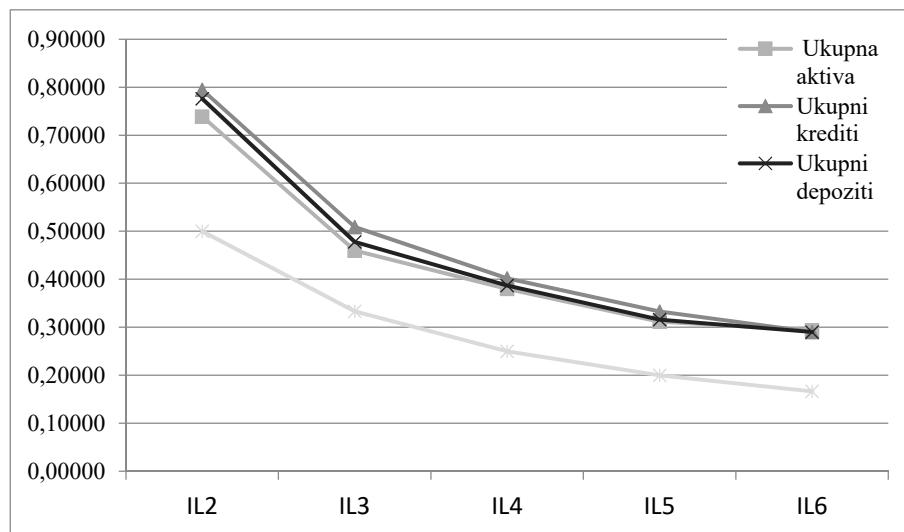
Source: Calculation based on NBS data (2019b), Balance sheet/income statement of banks, https://www.nbs.rs/internet/cirilica/50/50_5.html
Note: Data from the balance sheet of banks as at 31 December 2019 is used

In all observed segments, the continuity of decline in the value of the Linda index is not disturbed, i.e. the market is low-concentrated and competitive. However, the position of the curves on the chart shows that the real market situation is furthest from the "perfect competition" in the area of lending, while this distance is the smallest when looking at total balance sheet assets.

Conclusion

The change in the degree of the banking sector competitiveness may occur as a consequence of changes in the market structure of the banking sector due to more intensive bank mergers/acquisitions or as a consequence of the adoption of appropriate regulations. While the first group of measures affects changes in the banking sector concentration, the second works by reducing or increasing regulatory entry barriers to the banking market. If, on the other hand, the regulatory barriers to entering the banking market are relaxed, even in the conditions of a concentrated banking market, it will result in a competitive banking environment. For these reasons, traditional structural measures of banking sector concentration are not sufficiently precise in assessing the banking sector's competitiveness. The values of the concentration ratio show that the five largest banks make up more than half of the banking sector in all observed segments with a tendency to increase the value of the ratio in the observed period, which requires the attention of competent competition authorities in the future. If we consider the values of the concentration coefficient for the four largest banks, the banking market of the Republic of Serbia could be assessed as moderately concentrated. The values of the concentration ratio for the three largest banks (which is considered an adequate indicator of concentration) show that the banking market of Serbia belongs to the low-concentrated markets for all observed balance sheet values. The low degree of concentration in the banking sector of the Republic of Serbia is also confirmed by the values of the comprehensive industrial concentration index and the entropy coefficient. Some shortcomings of traditional indices justify the application of the Linda index in the analysis of concentration and competition in the banking sector. The obtained values of the Linda index in all segments show no oligopolistic structure on the market of the Republic of Serbia, which confirms the results obtained based on other indicators used (CR3, HHI, E, CCI). However, the most significant deviation from the "perfect balance" is observed in the deposit market. This is in line with the highest values of the HH index in this segment of the banking market. However, the application of the Linda index is accompanied by certain shortcomings. The Linda index indicates market leaders and possible monopolists but does not deal with competition from smaller banks outside the market core. The Linda index and traditional concentration indices provide the basis for an indirect assessment of the competition in the banking sector. A low degree of concentration does not necessarily mean high competition. Still, it represents a sound basis for developing competitiveness and a lower probability of cartel behaviour of banks.

References

Bašić, D. (2012). *Savremeno bankarstvo.* Banja Luka: Ekonomski fakultet.

Babic, A., Zildzovic, E. & Loncar, D., 2015, Testing for Competition in Serbian Banking Industry: the Panzar-Rosse Approach. *Industrija*, 43 (3), 7-26

Baumol, W. (1982). Contestable markets: an uprising in the theory of industry structure. *American Economic Review*, 72 (1), 1-15.

Berger, A., Demirguc-Kunt, A., Levine, R., & Haubrich, J. (2004). Bank concetration and competition: An evolution in the making. *Journal of Money, Credit and Banking*, 36 (3), 433-451.

Bikker, J., & Haaf, K. (2002). Measures of competition and concentration in the banking industry: a review of the literature. *Economics&Financial Modelling.*

Bikker, J., & Haaf, K. (2002). Measures of competition and concentration in the banking industry: a review of the literature. *Economic and Financial Modelling*, 9, 53-98.

Bukvić, R. (2017). Concentration and competition in Serbian banking sector. *Economic and Engineering Studies, 2*(2), 4-12.

Bulajić, M., Savić, S., & Savić, G. (2011). Analysis of Competition in Banking Sector of Serbia. U V. Kostoglou, G. Arabatzis, & L. Karamitopoulos (Ur.), *1st International Symposium and 10th Balkan Conference on Operational Research BALCOR 2011. 2*, str. 12-19. Thessaloniki: University of Macedonia, Economic and Social Sciences

Hrvatska udruga banaka. (2007). Okrupnjavanja u bankarstvu: o složenosti veze između koncentracije i konkurencije u Europskom okviru. *HUB Analize*, 2.

Kostić, M. (2008). Merenje koncentracije ponude grane. *Ekonomski horizonti*, 10 (1), 89-108.

Leon, F. (2015). Measuring competition in banking: A critical review of methods. HAL archives-ouvert. Preuzeto sa: https://halshs.archives-ouvertes.fr/halshs-01015794v2/document, pristupljeno: 20. jun 2020.

Lončar, D. & Rajić, V. (2012) Concentration and competitiveness of the banking market in Serbia: current situation and possible future changes under the influence of market consolidation. *Ekonomika preduzeća*, 7-8,372-385

Lončar, D., Đorđević, A., Lazić, M., Milošević, S., & Rajić, V. (2016). Interplay between market concentration and competitive dynamics in the banking sector: evidence from Serbia, Croatia, Romania and the Czech Republic. *Finance*, 332-346.

Mamatzakis, E., Staikouras, C., & Koutsomanoli-Fillipaki, N. (2005). Competition and concentration in the banking sector of the South Eastern European region. *Emerging Markets Review,* 6, 192-209.

Marinković, S. (2007). Stanje i dinamika stepena koncentracije u bankarskom sektoru Srbije. *Teme*, 2, 283-299.

Mešić, D. (2018). *Transformacija bankarskih sistema u zemljama zapadnog balkana* Bankarstvo, 2018, 47 (4).

Miljković, M., Filipović, S., & Tanasković, S. (2013). Market Concentration In The Banking Sector - Evidence From Serbia . *Industrija,* 41(2).

NBS (2019a). Bankarski sektor - analize izveštaji. Preuzeto sa: https://www.nbs.rs/internet/cirilica/55/55_4/index.html, pristupljeno 05. jul 2020.

NBS (2019b). Bilans stanja/uspeha banaka. Preuzeto sa: https://www.nbs.rs/internet/cirilica/50/50_5.html, pristupljeno: 05. jul 2020.

Stazhkova, P., Kotcofana, T., & Protasov, A. (2017). Concentration Indices In Analysis Of Competitive Environment: Case Of Russian Banking Sector. *CBU International Conference Proceedings. 5*, str. 458-464. ISE Research Institute.

Zakon o bankama. "Sl.glasnik RS", br. 107/2005, 91/2010 i 14/2015.

Zakon o zaštiti konkurencije. "Sl.glasnik RS", br. 51/2009 i 95/2013.

ANALIZA KONCENTRACIJE I KONKURENCIJE U BANKARSKOM SEKTORU REPUBLIKE SRBIJE

Apstrakt: Stepen koncentracije bankarskog sektora predstavlja strukturnu varijablu, a odnosi se na broj banaka u sistemu i stepen njihove tržišne moći. Značaj merenja koncentracije u bankarskom sektoru proizilazi iz kauzalnog odnosa između tržišne strukture i konkurentskog ponašanja tržišnih učesnika. Tradicionalni modeli merenja konkurencije bankarskog sektora polaze od tržišne strukture i mera koncentracije, dok se savremeni pristupi merenja konkurencije oslanjaju na nestrukturne modele i analizu ponašanja tržišnih učesnika. Rad se bavi analizom stepena koncentracije i konkurencije u bankarskom sektoru Republike Srbije. Za merenje koncentracije korišćeni su najpre tradicionalni i najčešće korišćeni indeksi, koeficijent koncentracije i Herfindal-Hiršmanov indeks.Vrednosti ovih indeksa pokazale su nizak stepen koncentracije u bankarskom sektoru, ali prisutan rast koncentracije u posmatranom periodu. Odsustvo koncentracije u bankarskom sektoru Republike Srbije potvrđuju i vrednosti sveobuhvatnog indeksa industrijske koncentracije i koeficijenta entropije. Pored uobičajenih mera koncentracije bankarskog sektora za ocenu koncentracije i konkurentnosti bankarskog korišćen je Linda indeks koji je pokazao odsustvo oligopolističke strukture posmatrano sa aspekta ukupne bilansne aktive, kreditne i depozitne aktivnosti banaka.

Ključne reči: koncentracija, konkurencija, bankarski sektor, koeficijent koncentracije, Herfindal-Hiršmanov indeks, Linda indeks

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