

MEASURING CONCENTRATION AND EFFICIENCY IN BOSNIA AND HERZEGOVINA BANKING SECTOR USING DYNAMIC PANEL MODEL

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Abstract

This paper seeks to examine the determinants of the profitability of the B&H banking sector, using an empirical framework that incorporates the traditional SCP - structure conduct-performance and ESX efficiency hypothesis. The main goal of this paper is to measure the level of concentration and investigate how concentration and other determinants influence the profitability of the banking sector in Bosnia and Herzegovina for the period from 2008 to 2017. We also tried to determine whether the profitability of the banking sector is more contributed by concentration, i.e. enlargement of the banking market (SCP) rather than increased efficiency of banking organization (ESX). For this purpose, we use a sample of 26 banks from B&H, and our empirical research is based on panel data analysis. The performance of the banking sector is measured by the conventional return on assets (ROA). Besides concentration as a main industry-specific factor, profitability determinants include bank-specific and macroeconomic profitability factors. Obtained results reveal that concentration has positive impacts on B&H banking profitability. But when we talk about competing concentration hypotheses, the paper results here generally support the ESX efficiency hypothesis rather than the traditional SCP approach. It was confirmed that credit risk, deposit risk and cost to income ratio from bank-specific variables, and GDP growth rate from macroeconomic variables have a statistically significant influence on banking performance.

Keywords: Concentration, efficiency, performance, panel data analysis, banking profitability

JEL Classification: C33, G21, L10, L40

1. Introduction

The primary objective of the bank business is to create considerable profit, thereby creating the conditions for growth in dividends, and the reinvestment of the assets of the bank contributes to the growth of credit and financial potential. On the other hand, we have witnessed constant progress in the development

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of information technology, as well as more intensive application of ICT in the banking sector, which has undergone many changes and transformations in the last decade. Banks and banking systems play an essential role in the growth and development of any country in the world. Consequently, it is very important to ensure the stability of the financial system since the efficiency and profitability of the banking sector can have a positive impact on economic development, as confirmed by Levine (1997). The banking sector profitability can successfully “amortize” various damaging effects and provide full support to the stability of the financial system of a country.

In the previous period, numerous analyses and studies on the role and importance of bank profitability were conducted, reaching significant conclusions on the significance of specific determinants having the power to influence the amount of realized profits of banks. One of the determinants attracting the particular attention of economic experts is concentration or market power and its relationship with the banks’ profitability. Bourke (1989), Allen and Gale (2000), and Chirwa (2003), in their papers, come to the conclusion that confirms the existence of a positive relationship between concentration and profitability. Philip Molyneux and John Thornton (1992) also prove the existence of a positive, statistically significant correlation between concentration and profitability which is consistent with the traditional SCP performance hypothesis. It is considered that the banks’ concentration in the market affects the reduction of the competitive game and has a direct impact on the banks’ tendency towards mutual collusion and the creation of secret cartels. Accordingly, it can be concluded that increased market concentration implies higher prices and the realization of the so-called monopoly profits (Bain 1951). While some economists believe that concentration raises profitability, others have a different opinion. Rhoades and Rutz (1981) concluded that there is a significant negative relationship between concentration and stability of the company. Boyd et al. (2006) concluded that the probability of bank failure increases in more concentrated markets. Schaeck et al. (2006) conclude that more competitive banking sectors are more stable than monopolistic.

The main objective of this paper is to contribute to previous research by analysing the determinants of the impact on the profitability of the banking sector with particular emphasis on the SCP hypothesis that links market power, i.e. concentration level and the profitability of banks. According to that, we tried to determine whether the profitability of the banking sector is more contributed by concentration, i.e. enlargement of the banking market (SCP) or increased

efficiency of banking organization (ESX). Therefore the primary hypotheses are: 1. The concentration has a positive effect on the profitability of the banking sector in B&H and 2. The concentration of the banking sector in B&H is the result of severe competition and greater efficiency of the banking management.

The paper is going to investigate three different kinds of determinants affecting B&H banking profitability, namely the bank-specific (credit risk, deposit risk, capital adequacy, cost to income ratio), industry-specific (concentration) and macroeconomic environment variables (GDP growth, inflation). As can be noticed, numerous determinants can affect the daily business activities of the banks and, therefore, to a large degree, determine the level of their profitability (Brissimis et al. 2008; Garcia-Herrero and Vazquez 2009). In most of the earlier studies and analyses, determinants are usually divided into two parts, internal and external ones. Internal determinants are directly related to the internal management of banks (originate from banks), and are therefore called the bank-specific determinants. External determinants are not directly associated with the management of banks carrying out the outside influence on the bank. The macroeconomic environment is usually considered as an exogenous determinant.

This paper is organized in the following manner. Section 2 discusses the existing literature and gives some theoretical background. Section 3 presents a brief overview of Bosnia and Herzegovina banking sector. Section 4 describes selected variables. Section 5 provides information about data, model specification and used methodology. Section 6 presents empirical results and discussion. Section 7 concludes the paper.

2. Literature review

Empirical studies conducted on this subject can be divided into two groups. The first group is focused on the analysis of the determinants of profitability of several countries simultaneously, and the second group is focused on the analysis of the banking sector of a single country. Here are a few authors who have their research on this topic based on the case of several countries: Bourke (1989), Molyneux and Thornton (1992), Chen and Yeh (1998), Demirguc-Kunt and Huizinga (1999), Staikouras and Wood (2004), Goddard et al. (2004), Llewellyn (2005), Micco et al. (2007), Pasiouras and Kosmidou (2007), Casu and Girardon (2008), García-Herrero and Francisco Vázquez (2013), and so on. The studies based on single countries belong to Berger (1995), Neely and Wheelock (1997), Naceur

Goaied (2008), Aysan and Ceyhan (2008), García-Herrero and Vazquez (2009), Fu and Heffernan (2010), Liu and Wilson (2010), Tan and Floros (2012), etc.

Literature review related to this paper can be classified into two categories. The first consists of studies that focus on concentration performance and efficiency. The second consists of studies that focus on the other most important determinants of banks' profitability. The following sections will deal with each one of these categories.

2.1. Studies on the SCP-Market power and ESX-Efficiency hypothesis

In the economic literature, we encounter four hypotheses concerning concentration and its impact on banks profitability. They are traditional SCP (structure-conduct-performance), RMP (relative market power), ESX (efficient structure Hypothesis X-efficiency version), and ESS (efficient structure Hypothesis scale efficiency version).

The basic assumption of the SCP paradigm is that the banking market with a high degree of concentration distorts the competitive battle and provides opportunities for banks with high market share to abuse market power (collusion) and achieve monopoly profits while eliminating competitors from the market. The RMP hypothesis assumes that only companies with a considerable market share and well-differentiated products can carry out market power by determining the high prices and thus achieve monopoly profits. Otherwise, the RMP hypothesis is quite close to the SCP paradigm (Berger 1995).

The previous two hypotheses are based on the theory of market power. However, two additional hypotheses explain the positive relationship between profits and concentration, i.e. market share. ESS hypothesis assumes that all banks have the same quality and efficient management, but some were able to achieve more efficient production volume than others, accordingly to economies of scale have lower costs per unit of output, which implies higher profits per unit of product (Lambson 1987). ESX hypothesis assumes that the bank with efficient management has lower costs, enabling the achievement of greater profits. This paper shall focus on the SCP and ESX hypotheses and their impact on the banks' profitability.

SCP paradigm was designed by Harvard Edward S. Mason (1939), his colleagues and students, as Joe S. Bain (1951). Bain was the first author investigating the concentration-performance relationship. The SCP hypothesis postulates that the degree of market concentration is inversely related to the degree of

competition. SCP hypothesis is primarily descriptive and provides a detailed overview of the structure of the industrial organization. It is based on an investigation of the size of the observed structures of banks (one or more "concentrated" or not), the causes that lead to different sized structures, the effects of the concentration on competition, the effects of concentration on prices, investment, innovation, etc. According to the SCP hypothesis, banking markets with high concentration levels can be termed either monopolistic or oligopolistic market structures. Both of these market structures are characterized by high market power in the hands of one or several banks. According to Gilbert (1984), significant market power in the hands of a few banks usually leads to the achievement of monopoly rents or extra profit. If the banking market is composed of several "big players", they will always turn to "collusion", which means secret negotiating about prices and market division that rarely decide for a competitive battle (price war). SCP paradigm contributes to the weakening of competition and encourages collusive conduct between firms. Accordingly, the highly concentrated banking markets can expect higher interest rates on loans and lower interest rates on savings, as a result of lack of competition in the market. The realization of monopoly rents, due to the higher degree of concentration of the banking market, leads to higher profitability of banks (Short 1979).

On the other hand, the high degree of concentration in the banking market may be the result of the efficient-structure hypothesis (ESX), devised by Peltzman (1977) and Demsetz (1973). ESX hypothesis argues that such high concentration is a result of fierce competition and greater efficiency of the banking management that reduces the cost of doing business, which implies further strengthening of banks market share and higher profits. The degree of market concentration correlates with the number of costs. According to Leibenstein (1966), if the concentration and the costs grow together, this is the result of the market power impact. On the other hand, according to Demsetz (1973), if the bank achieves high efficiency with the help of superior management that will lead to declining costs and rising concentration i.e. concentration and costs are moving in opposite directions. Thus, there is uncertainty over whether the higher profit was a result of the SCP or ESX hypothesis.

In one of his researches, Gilbert (1984) analysed 45 studies and discovered that 32 provided evidence that the SCP paradigm holds. Heggestad and Mingo (1977), and Bourke (1989), Molyneux and Thornton (1992), Khediri and Ben-Khedhiri (2009), Dietrich and Wanzenried (2010), Ahamed (2012), and Karimzadeh

et al. (2013) found in their studies a positive and statistically significant relationship between concentration and banks profitability. There are also disagreeing opinions, which consider that the banking markets are more profitable and safer in more powerful competition, i.e. a large number of participants. Berger (1995) found support for the SCP paradigm and concluded that the concentration was negatively correlated with profitability. Smirlock (1985) found in his paper a positive relationship between market share and profitability, an insignificant relationship between concentration and profits, as well as a negative relationship between the concentration and interaction of market share and profits. Following the results, Smirlock proposes rejecting the SCP hypothesis. Reinforcement for the ESX hypothesis was provided by Brozen (1982), Evanoff and Fortier (1988), Amel and Froeb (1991), and Chortareas et al. (2011).

2.2. Studies on the determinants of profitability

Philip Bourke (1989) analysed the banking sector, the internal and external determination of profitability, in twelve countries in Europe, North America and Australia. He discovered that capital ratios, liquidity ratios, and interest rates have a positive relationship with the profitability of banks. However, he found a weak inverse correlation between the cost of operational management and pre-tax return on assets. Bourke says that in most cases, concentration contributes to profitability. However, this may not be the case consideration includes value-added measures as the dependent variable, because in this case, we get the inverse relationship between concentration and profitability.

In his paper, Allen N. Berger (1995) applied the tests to thirty separate data sets of between 1,300 and 2,000 observations each, covering the ten years of the 1980s. Berger points out that sometimes the concentration and market share do not have a positive effect on the bank's profitability. Berger concludes that market share has a positive effect on profitability, with a partial influence of concentration. While on the other hand, he finds a strong positive relationship between managerial efficiency and profitability.

Andreas Dietrich and Gabrielle Wanzenried (2010) analysed the profitability of 372 commercial banks in Switzerland over the period from 1999 to 2009. Due to the impact of the global financial crisis, they separately evaluate the pre-crisis period, from 1999 to 2006, and the crisis years of 2007-2009. For this analysis, they used the GMM dynamic model of the

potential correlation between variables, as well as the sustainability of profits. They conclude that the pre-crisis HHI index had a significant and positive impact on the profitability of banks in Switzerland, while due to the effects of the crisis, its impact decreased. Bank size and taxation have a negative relationship with the profitability of banks in Switzerland.

In their paper, Philip Molyneux and John Thornton (1992) primarily analyse the impact of the determinants of the performance of 4213 banks in eighteen European countries from 1986 to 1989. The study is mainly based on the methodology and the paper published by Bourke in 1989. After analysis of the above banking market, Molyneux confirmed almost all the results of research previously conducted by Bourke - capital ratios and nominal interest rates are positively related to profitability, concentration shows a positive, statistically significant correlation with pre-tax return on assets. The only difference, as compared to the results of Bourke, is manifested in a negative relationship between state ownership and profitability.

Majid Karimzadeh et al. (2013) in their research examine the most important factors that may affect profitability of Indian banking sector. The focus has been pointed to an examination of bank-specific determinants and macro-economic variables that affected profitability in Indian banks over the period from 2003 to 2011. To achieve this, Karimzadeh uses balanced panel data set that is drawn from Indian banking industry. The results confirm the positive relationship between the size of banks, GDP and profitability. In contrast to lending rate, inflation shows negative relationship with profitability. There is also a relationship between market concentration and banks profitability, where greater positive coefficient implies existence of monopoly power, which in the end results with the greater profitability of banks.

Karim Ben Khediri and Hichem Ben-Khedhiri (2009) examined the determinants of Islamic bank profitability in the MENA region during 1999–2006. Khediri uses an unbalanced panel dataset of 40 Islamic banks operating in the MENA region (Bahrain, Egypt, Iran, Jordan, Kuwait, Qatar, Saudi Arabia, Tunisia, United Arab Emirates, and Yemen) from 1999 to 2006. Exploring the above-mentioned banking markets, authors use as a primary determinant of a positive impact on the profitability the specified expenses efficiency of management capitalization, with HHI index, which also showed a significant and positive impact on profitability. They also find a significantly positive relation between inflation, GDP and ROA, and a negative relationship between cost to income ratio and profitability.

Kyriaki Kosmidou (2008) analyses the banking

sector in Greece. In his paper, he tries to examine the determinants of performance of Greek banks during the period from 1990 to 2002. To this purpose, he uses an unbalanced pooled time series dataset of 23 banks in Greece consisting of 154 observations. Kosmidou study confirmed a positive and statistically significant relationship between the equity to assets ratio (high capitalization) and ROAA. On the other hand, he found a high coefficient of cost management that harms the bank profitability. Bank size as a determinant proved to be essential, and has a positive impact on the bank profitability, but only under the condition when the macroeconomic and financial structure variables enter the models. Kosmidou finds that concentration is statistically significant and negatively related to ROAA and concludes that the Greek banking market competition is more profitable than concentration. GDP growth achieved a significant positive impact on the profitability of Greek banks. On the other hand, inflation has a significant negative impact.

Abdelaziz Hakimi et al. (2015) investigate whether the concentration affects the profitability of the Tunisian banking sector from 1980 to 2009 on a sample of 9 Tunisian banks using empirical analysis based on the panel data model. Hakimi emphasizes the positive impact of concentration on the profitability of banks, which was eventually confirmed in his paper. Considering loan to assets ratio, the variable is positively and significantly linked to profitability. As for the size of the bank, he concludes that it affects the performance of banks negatively and significantly. In terms of the macroeconomic environment, GDP growth per capita hurts bank profitability, while inflation has a positive or a low level of significance on the net interest margin.

3. Brief overview of Bosnia and Herzegovina Banking Sector

During the previous years, despite the evident risk, Bosnia and Herzegovina has managed to preserve the stability of the financial system in which the banking sector is the most developed part. For many years, the banking sector in B&H has been operating in very difficult conditions of stagnation of the economy, as a consequence of the financial crisis, bad political environment, limited access to stable sources of funding and the global recession, present in most EU countries for many years. Although the banking sector in B&H faced significant problems, it has managed to maintain stability and successfully amortize all foreign and domestic risks it faced (Bojat and Rebic 2020). The banking sector can alleviate all of the assumed

macroeconomic shocks, confirmed by the results of tests performed by the Central Bank of Bosnia and Herzegovina, or in the case of materialization of the most extreme scenario there was a significant reduction in the level of capitalization (Central Bank of Bosnia and Herzegovina, 2017). The B&H banking market is dominated by banks with a majority share of foreign capital. The intense competition of foreign banks contributed positively to the growth of savings, decline in interest rates, better quality of banking services, and thus the overall confidence in the banking sector.

According to Raiffeisen CEE Banking Sector Report (2017), we can notice that in the last five years, the growth of total bank assets has been recorded, amounting to 13,344 million euros in 2016. Loans to private enterprises and households in recent years, constantly increased. In the last seven years, the banking sector has achieved a satisfactory level of profitability which in 2016 amounted to ROA = 1.1%, and ROE = 7.3%. The capital adequacy ratio of the banking system recorded a slight improvement compared to the previous year and amounted to 15.8%, which is significantly more than the legal minimum (12%) and represents a good capitalization if we take into account the current level of risk exposure in B&H. We expect that the performance of the banking sector in Bosnia and Herzegovina will be strengthened by the EU initiatives for the country under the Stabilization and Association Agreement (SAA).

The competition contributes to economic efficiency and reduces costs of financial intermediation, thus having a positive effect on the banking sector development. However, on the other hand, greater competition also leads to a reduction of market power and profitability of banks, which can slow down the further development of the bank. So, we encounter several theories of concentration in the banking sector, i.e. theories that support and deny concentration (Tushaj 2010). Adherents supporting a high concentration in the banking market state the following benefits that such market yields: greater efficiency, larger banks manage periods of crisis easier, big banks perform better diversification, improving the stability of the banking market, higher profits, easier monitoring and control of a few large banks. On the other hand, supporters of the theory of competitive banking market highlight the main deficiencies of the highly concentrated banking sector: causing reduced credit supply, leading to an increase in the price of services, lack of competition inevitably leads to slower economic growth and development.

Banks in B&H do business with prevalence private capital with dominant participation of foreign capital.

Table 1. Market shares (% of total assets)

Bank	Market shares
UniCredit Mostar	18.11
Raiffeisen Bank	15.07
Intesa San Paolo	8.05
Nova banka	7.76
UniCredit Banja Luka	5.38
NLB Banja Luka	4.78
Sparkasse	4.56
Sberbank B&H	4.46
NLB Tuzla	3.75
Hypo Mostar	3.25

Source: Author's Calculations

The entry of foreign banks through the privatization of the largest state-owned banks was to provide an increase in competition. In Bosnia and Herzegovina, the asset share of state-owned banks is below 10%, indicating that the privatization process has been quite effective (Bojat and Rebic 2020, p. 230).

As we can see (Table 1), several banks own the largest market share in the banking sector. All of these banks are majority foreign-owned. The largest is UniCredit Bank (Mostar and Banja Luka), with a market share of over 23 per cent, followed by Raiffeisen Bank with 15%, and Intesa San Paolo with 8%.

Table 3 measured the concentration of the banking sector of Bosnia and Herzegovina using CR3 and the Herfindahl-Hirschman index. If CR3 is observed, a continuous decline in concentration levels can be observed from 0.487488 in 2008 to 0.407338 index points in 2014. Then there is a slight increase from 0.415768 in 2015 to 0.424581 in 2016. On the other hand, HHI increased from 0.094547 in 2008 to 0.110567 index points in 2009 and recorded a constant decline in 2015. There was a slight increase from 0.087564 in 2015 to 0.089969 in 2016. As can be seen, B&H showed the highest level of banking concentration at the beginning of the observed period (Bojat and Rebic 2020, p. 230). In the following years, the concentration ratio of banks steadily declined, until the last two years, when there was a slight increase.

Table 3 shows that the value of the CR3 index ranges between 0.4 and 0.5. If we consider that the maximum value of this index is 1, it can be said that the observed banking market achieves low to moderate concentration. If we look at HHI, we notice that its value is around 900 index points on average, which falls within the framework of low concentration. However, the fact that the value is very close to moderate concentration cannot be ignored. In addition to a slight concentration, the general picture of the B&H banking market is that five banks have a higher market share compared to others (individually over 5 per cent, and a total of about 50 per cent), but that it is still not very large (max 18 per cent). Since banks can

Table 2. Descriptive statistics of HHI index

	N	Minimum	Maximum	Mean	Std. Deviation
HHI	100000	0.0623	0.0976	0.0745	0.0122

Source: Author's Calculations

Table 3. Concentration measures of banking sector in B&H

Year	CR(3)	HHI	Number of Banks
2008	0.487488	0.094547	30
2009	0.486520	0.110567	30
2010	0.458133	0.094873	29
2011	0.443025	0.096081	29
2012	0.424939	0.091703	28
2013	0.414816	0.087476	27
2014	0.407338	0.084125	26
2015	0.415768	0.087564	26
2016	0.424581	0.089969	23

Source: Author's Calculations

to some extent control the prices of their products (interest on loans, interest on deposits), as well as barriers to market entry, exist, but are not significantly expressed, and bank products are differentiated, it can be concluded that in the banking market B&H has monopolistic competition as a form of market structure.

Simultaneously with the decrease in the degree of concentration, the number of banks on the banking market decreases. The number of banks on the B&H market decreased from 30 at the beginning of 2008 to 26 at the end of 2014 and 23 at the end of 2016. Although the number of banks declined, this did not lead to a higher concentration level. There are several reasons for such developments in the banking market - the reduction in concentration comes as a result of the closure of smaller or larger insolvent state and private banks, privatization of state banks with foreign investors, and partly due to constant consolidation efforts of the banking sector.

The bearers of most of the changes in the banking market are large and powerful banks, which have participated in takeover and merger activities. The trend of consolidation of the B&H banking sector continues, with a tendency to reduce the number of banks. The most interesting part of this analysis is that despite the steady decline in the number of banks, there was no expected increase in concentration. It can be concluded that the situation in the B&H banking market is characterized by a slight concentration on the market, with differences between market participants in terms of their market power. Taking into account the traditional features that are present between individual market structures, as well as the results of concentration measurements, it is clear that the banking sector in B&H operates in a monopolistic competitive environment (monopolistic competition).

Commercial banks in B&H can, to some extent, independently adjust the price of their products, compete in the field of advertising and cannot effectively apply barriers to the entry of other companies into the market. Banking services are not uniform, and they are the representative tool by which commercial banks tend to differentiate. As concluded earlier, the number of commercial banks has no significant impact on concentration and competition. This points to monopolistic competition as the only sustainable market structure for the B&H banking sector. The improvement in the profitability of B&H banks during the observed period is mainly the result of intense competition, diversification of products and services, as well as the efficient use of new techniques and technologies in the banking.

4. Determinants and variables selection

As it has already been pointed out, the banks and the banking sector play a key role in ensuring the economic stability of a single country. The profitability of banks contributes to their strengthening through increased capital position, making them more resilient to unforeseen market shocks. Thus, one of the main goals of each country is to have a profitable banking system. Consequently, the analysis in this paper will attempt to identify the most important factors of influence on the profitability of banks in B&H.

4.1. Dependent variables: Performance measures

There are several key indicators of profitability, all deserving the most attention and including ROA (return on total assets/return on assets), ROE (return on equity), and NIM (net interest margin).

ROA is the ratio between net profit and total assets, i.e. return on assets is the net profit after tax divided by total assets. This indicator essentially shows how effectively banks manage their assets, i.e. represents the profit per unit of assets. Golin (2001) favours ROA and states that ROA is also the most commonly used indicator of profitability in today's literature.

ROE measures the return to shareholders on the unit of invested capital. Although the financial literature commonly uses the ROE to measure profitability, Dietrich and Wanzenried (2010) find that it is not the best indicator of profitability because banks with a lower leverage ratio (higher equity) usually report a higher ROA than a lower ROE. However, an analysis of ROE disregards the higher risk associated with high leverage, and financial leverage is often determined by regulation. All this implies that the ROA is a still better indicator of the profitability of banks. Following the conclusions of Golin (2001), Athanasoglou et al. (2008), Krivačić et al. (2012), we use ROA as the primary indicator of profitability and the main dependent variable.

In the end, NIM is an indicator of profitability, which, in recent years, has been increasingly used in numerous analyses of the performance of the banking sector. While ROA focuses on the profit made per unit of assets, NIM focuses on the profit earned on interest activities. NIM is also defined as net interest income divided by total assets. Considering everything previously written in this paper, ROA will be used as an indicator of profitability.

4.2. Independent variables: determinants of bank profitability

This section describes the independent variables used to analyse bank profitability. They include bank-specific, industry-specific and macroeconomic profitability factors (Table 4).

4.2.1. Bank-specific profitability determinants

The bank-specific variables are selected based on findings from the previous studies (Hakimi et al. 2015; Dietrich and Wanzenried 2010; Goddard et al. 2004; Sufian and Habibullah 2009; Kosmidou et al. 2008; Heffernan and Fu 2010; Athanasoglou et al. 2008, etc.). The selected variables are presented below.

The capital adequacy ratio is calculated as the quotient of capital and assets of the bank. Theoretical arguments and empirical evidence provide different results about the influence of bank capital structure on its profitability. According to the conventional view of the banking capital, a higher ratio of bank assets

leads to lower profitability. Some authors suggest that the higher capital ratio may indicate that banks work cautiously but ignore the potentially profitable business opportunities, which has a negative influence on profitability. On the other hand, some authors point in their papers that the highly capitalized banks face a lower risk of bankruptcy and less risky sources of assets, whereupon achieving higher profitability due to the lower cost of financing of these banks is certainly expected.

Cost to income ratio represents a measure of the efficiency of bank management and is obtained as the difference between the cost of management of the bank salaries account for the largest share therein) and revenues. If the percentage is higher, the bank is less efficient, which in turn harms profit. We expect a negative relationship with the profitability of the bank because it is logical that banks operate more efficiently at a lower cost.

Market share represents a market share of each bank, i.e. the ratio of the total assets of the bank/total bank assets of the sample. Market share as a variable

Table 4. Definition of variables

Variable	Measure	Notation	Expected effect
<i>Dependent variables: Performance measures</i>			
Return on Assets	Net income/Total assets	ROA	
<i>Independent variables: determinants of bank profitability</i>			
<i>Bank-specific profitability determinants</i>			
Capital adequacy ratio	Equity/Total assets	CAP/EA/EQTA	+/-
Cost to Income Ratio	Total (operating) expenses over total generated (operating) revenues	CIR	-
Credit Risk	Net Loans/Total Asset	NLA/NLTA	+
Market Share	Ratio total assets of the bank/total bank assets of the sample	MS	+
Deposit Risk	Deposits/Total Assets	DA	+
<i>Industry-specific profitability determinants</i>			
Concentration	HHI	HHI	+/-
<i>Macroeconomic profitability determinants</i>			
Real Gross Domestic Product Growth	The yearly real GDP growth (%)	RGDP	+
Global Financial Crisis	GFC (dummy variable – that takes a value of 1 for the post global financial crisis period, 0 otherwise)	GFC	+/-
Inflation	The yearly overall percentage increase in the consumer price index for all goods and services	INF	+/-

is used to measure the effect of the impact of market share on bank performance. This variable can have a twofold influence on profitability. The positive connection is realized in the case of economies of scale, a negative when it comes to diseconomies of scale.

Credit Risk can be calculated as net loans/total assets, or the percentage of assets that comprises the loan portfolio. The net loans are equal to gross loans minus loan loss reserves. With the view to the ratio of total credit compared to total assets of the bank, it is expected that bank loans are the largest source of income, and have a positive influence on bank performance. However, if banks may increase this ratio only by accepting a higher level of risk, a decline in profit can be expected.

Deposit Risk is a bank-specific control variable. Deposits are an indicator of liquidity. The deposits are a source of liquid assets and consequently affect banks profitability (Karimzadeh et al. 2013).

4.2.2. Macroeconomic profitability determinants

Macroeconomic determinants of profitability play an essential role in the banking sector analysis because the analysis based only on bank-specific indicators would not be complete. In that case, it would not consider certain developments on the market that can eventually lead to fundamental changes in production technology and related production functions (Sufian and Habibullo 2009). According to Apergis (2009), the most common macroeconomic indicators were GDP growth and Inflation.

GDP is the most commonly used macroeconomic indicator for measuring the total economic activity of a country. The growth of real GDP, according to most previous studies, exerts a positive effect on the profitability of the banking sector (Sufian and Habibullo 2009; Afanasieff et al. 2002; Demirguc-Kunt and Huizinga 1999; Karimzadeh et al. 2013; Khedira and Ben-Khedhiri 2009). Also, it is necessary to note that some studies confirmed the negative relationship between GDP growth and the banking sector profitability. One such is a study by Tan and Floros (2012) conducted in China for 2003-2009, and Hakimi et al. (2015), who researched the banking market in Tunisia during 1980-2009. The growth of GDP is usually followed by the growth of demand for loans. Thus, we expect the positive impact of growth in real GDP on bank profitability in B&H.

Another very significant macroeconomic indicator, which greatly concerns the income and expenses of banks, is the rate of inflation. Staikouras and Wood

(2004) emphasize the importance of the impact of inflation in their paper and stress that inflation can directly or indirectly affect the profitability of banks. The direct effect is represented by the growth of labour costs, while the indirect impact manifests through changing interest rates and asset prices. Revell (1979) also emphasizes that the variation in the profitability of banks can be explained by movements in the inflation rate in a given period. Namely, the impact of inflation on bank profitability depends on the fact that the operating costs rise at a faster rate than inflation.

Perry (1992) also concluded that the impact of inflation on the profitability of banks depends on whether the bank management did not foresee or predict the trend of the inflation rate. If the banking management predicted the movement of the inflation rate, the bank will be ready for change and will set the interest rate so that the income effects are more significant than the cost, which eventually leads to greater profitability. As for the second scenario, the management responds slowly and does not come on time to adjust the level of interest rates, which implies faster growth of costs in relation to income and a negative impact on bank profitability. Analysing the banking market in Tunisia, Hakimi et al. (2015) found the negative effect of inflation bank performance; banks in Tunisia are profitable in a non-inflationary environment. The obtained result can be the consequence of poor anticipation of developments in the inflation rate by the bank management in Tunisia. Hence, we expect a positive association between inflation and bank profitability.

GFC presents the dummy variable, which is included in the model as a control variable, to determine the existence or non-existence of the impact of the global financial crisis on the profitability of banks in Bosnia and Herzegovina.

4.2.3. Industry-specific profitability determinants

Concentration, which represents one of the most significant industry-specific profitability determinants, plays a crucial role regarding the impact on profitability. Index of n -firms, marked with CR_n , is commonly used for calculating the level of concentration as a measure of market share in the largest firms in the market (in our case 3). The formula of the index of n -companies is (Ljubaj 2005):

$$CR_n = \frac{\sum_{i=1}^n S_i}{S_t}$$

where S_i represents the individual participation of large banks, while S_t represents the total market share. The ratio tells how much production in this branch belongs to the three biggest banks in the sector. If the ratio is closer to 1, the concentration in the industry is higher, and when it is closer to 0, concentration is lower. *Low concentration* represents a situation where the level in one market ranges from 0 to 50%. These markets are usually called monopolistic competition. *Medium (moderate) concentration* represents a level of concentration in the banking market of 50 to 80%. It is usually a case of oligopoly. *High concentration* is the level of concentration in a market of 80 to 100%. In such cases, those are monopolies. However, the HHI index can be stated as the most important measure of market concentration. As the name suggests, this index is the result of the individual works of Herfindahl and Hirschman. Specifically, these economists concluded, based on their detailed research and analysis, that concentration measures should be based on the sum of the squares of market shares of all companies within one branch. Thus, the Herfindahl-Hirschman Index is a convex function of market share, which is also the result of its sensitivity to inequality. So HH - index can be formally expressed as follows:

$$HHI = \sum_{i=1}^N S_i^2$$

where S_i is the market share of the company, while N denotes the total number of firms in a given industry. Unlike the CR_n concentration ratio, HHI shows the

distribution of the market share of the selected limited number of leading companies but also includes all the companies in the sector. Because of the squaring procedure, proportionately greater importance is given to banks with the most extensive market shares (Calkins 1983). HHI theoretically cannot be less than zero. Therefore, the index value ranging from 0 to 1000 shall be interpreted as low concentrated market value, from 1000 to 1800 shall be construed as a medium concentrated market, while all index values above 1800 are marked as highly concentrated markets. In the banking market, the market share is usually calculated by using the total assets of banks and deposits, with a note that larger industrial developed countries, as a rule, have powerful banking systems (greater volume of assets), i.e. greater number of banks and naturally more competitive banking sector compared to small or developing countries.

5. Data, model specification and methodology

The data used in the analysis are the annual financial statements of 26 banks of B&H for the period from 2008 to 2017. The primary data sources for variables specific to the banking sector are shortened audit reports of the Banking Agencies of the Republic of Srpska and the Federation of B&H, available on their websites. The necessary macroeconomic data are obtained from the website of the Central Bank of Bosnia and Herzegovina. Correlation between the independent variables is reported in Table 5.

Table 5. Correlation of independent variables

	Capital adequacy	GDP	Inflation	Credit risk	HHI	Market share	Cost to income ratio	Deposit risk
Capital adequacy	1							
GDP	-0.0115	1						
Inflation	0.0902	0.3563**	1					
Credit risk	-0.1693	-0.0951	-0.0102	1				
HHI	0.0481	-0.1366	0.6810***	-0.0224	1			
Market share	-0.2225**	0.1608	0.2160**	0.0996	0.1899*	1		
Cost to income ratio	0.1622	-0.1241	0.0790	-0.1155	0.2399**	-0.1812	1	
Deposit risk	-0.3863**	0.1027	-0.1331	0.0753	-0.2069**	0.2149**	-0.2446**	1

Source: Authors' calculations

a***, **, * indicate significance at the 1, 5 and 10 percent levels respectively

Table 5 shows the correlation matrix between the independent variables used in the model. Based on this matrix, it can be seen among which variables multicollinearity can appear. The correlation among variables is not strong, and in most cases, it is less than 0.5, which suggests that there is no problem with multicollinearity (Table 5).

In this paper, we use the SCP and ESX hypotheses as a basis for analysing the relationship between concentration and competition in the banking market in B&H. According to Smirnock (1985), as the base measure of the ESX hypothesis, we use variable MS (market share), due to omissions of direct measures from the equation X-Efficiency, with the assumption that MS will be positively associated with effective management. On the other hand, we use concentration as a base measure of the SCP hypothesis, which we can count using the HHI index. In testing this hypothesis, we try to determine the structure of the B&H banking market and the nature of profitability. Since transition countries banking markets are usually more concentrated than in developed countries, it is expected that concentration positively affects the profitability of banks in B&H. According to Weiss (1974), Smirnock (1985), and Molyneux (1995), SCP and ESX hypotheses can be tested based on their impact on banks' profit.

The banking business performance can be measured in two ways. The first method involves the use of prices of banking services and products, while the other way uses specific measures of profitability such as return on assets or return on equity. Because of the complexity of applying the first method for measuring profitability in the banking sector, this paper used another approach of measurement, i.e. ROA. Measuring the profitability of banks based on return on assets is more appropriate for the banking sector because, in this way, the problem of cross-subsidization is solved. We use the HHI index as a measure of concentration and a firm-specific market share measure (MS) for firm efficiency. We include several control variables to account for other risk and cost characteristics such as capital adequacy, the cost to income ratio, deposit risk, credit risk, etc.

To analyse the stated hypothesis, we used a dynamic panel model rated by Arellano-Bond (AB) valuator in two steps on the entire sample of the banking sector in Bosnia and Herzegovina. Since the static panel model does not include the assumption of autocorrelation of random error, the dynamic panel model represents the optimal choice. We chose Dynamic panel analysis because economic relations are dynamic in nature. Therefore, it is necessary to include the lagged dependent variable in the study. Unlike the static panel data models, dynamic panel

data ones include lagged levels of the dependent variable as regressors. Including a lagged dependent variable as a regressor violates strict exogeneity because the lagged dependent variable is likely to be correlated with the random effects and/or the general errors. Even when the coefficients of the lagged variable are significant for the analysis, their introduction can influence the consistent evaluation of other parameters in the model (Bond 2002). The dynamic model is defined as follows:

$$y_{it} = \mu + \gamma y_{i,t-1} + \beta_i x'_{itK} + \alpha_i + \varepsilon_{it}, \quad (1)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

where N denotes the number of units of observation, T the number of periods, μ is an intercept, y_{it} denotes the value of dependent variable, x_{itK} denotes the value of K independent variables in period t , γ is a parameter of lagged dependent variable, α_i is a random or fixed effect, β_i are parameters with exogenous variables to be estimated in the model and $\varepsilon_{it} : N(0, \sigma_\varepsilon^2)$ are error terms that are assumed to be identically and independently distributed with mean 0 and variance σ_ε^2 .

Using the ordinary least squares method for evaluating the dynamic model leads to many complications in the meaning of bias, inefficiency and inconsistency of gained grades, especially when the number of observations per observation unit is not significant. Regardless of the choice of models with fixed or random effects, the problem arises because the lagged dependent variable is correlated with individual-specific effects. Arellano and Bond (1991) propose all regressors transformation by differentiation and employing the GMM - generalized method of moments for evaluating the model parameters. In the Arellano-Bond method, the first difference of the regression equation are taken to eliminate the particular effects. Then, deeper lags of the dependent variable are used as instruments for differenced lags of the dependent variable (which are endogenous).

Dynamic panel models with Arellano-Bond estimators are usually calculated in one or two steps. AB estimator in two steps reduces the assumption of independence and homoscedasticity using residuals obtained by using AB GMM estimator in one step to construct a consistent matrix of variance and covariance (Visic et al. 2011). Also, dynamic panels represent optimal choice in the case of shorter time series with a more extensive number of units of observation, and consequently, two steps AB estimator was used in this

paper.

The Sargan test tests the validity of the instruments selected for the dynamic panel model evaluation. Acceptance of the null hypothesis of the test, i.e. that the selected instrumental variables are uncorrelated with residuals, indicates that all conditions are satisfied at times and that all the listed instruments are accepted. It confirms the dynamic panel model's adequate specifications. Arellano and Bond (1991) developed two additional diagnostic tests on autocorrelation among the first residual deviation differences. The existence of second or higher-order autocorrelation suggests problems in model specification. It shows that some of the conditions are not met at times and that the parameter estimates are inconsistent.

6. Results and discussion

The results of applying dynamic panel model are shown in Table 6.

The Sargan test of the over identifying restriction and test of serial correlations in the differenced residuals were used to determine the model validity. The null hypothesis of the Sargan test is that the instruments are valid, i.e. there is no correlation between the instruments and the error term. If the null hypothesis is not rejected, all conditions on moments are fulfilled, and all stated instruments are valid. Since the p-value of the Sargan test in the evaluated model is greater than 0.05, we accept the null hypothesis and confirm that the instruments are well selected. Hence, an autocorrelation test of the first and second-order of the first differentiation was carried out. The Arellano-Bond test for autocorrelation has a null hypothesis of no autocorrelation and applies to the differenced residuals, while the far more significant test for AR (2) is first differences because it will detect autocorrelation in levels. Based on the p values of m1 and m2 tests, the non-existence of autocorrelation of the first and second-order is proven (Table 6).

The significance of the coefficient, along with lagged variable, shows the dynamic nature of the model. The coefficient of the lagged variable demonstrates the speed of adjustment to an equilibrium state. The value of this coefficient between 0 and 1 indicates the persistence of profitability (the constant presence of profit), and because in the evaluated model, the value is closer to null, it is concluded that there is a low degree of competition in the banking sector of Bosnia and Herzegovina.

According to our results, the concentration ratio variable (HHI) is negative and statistically significant. The market share variable (MS) also yields a negative

Table 6. Estimation results

Dependent variable return to assets - ROA	
Explanatory variables	Coefficients Standard errors ^a
Constant	0.093267***
	(0.007487)
ROA _(t-1)	0.0152561**
	(0.0537665)
CAP	-0.0002607
	(0.002198)
CIR	-0.0492433***
	(0.0008442)
DA	-0.006322
	(0.0079375)
NLA	-0.0070352**
	(0.0034734)
MS	-0.3285395***
	(0.120673)
HHI	-0.0144354
	(0.0117273)
RGDP	0.0001776
	(0.0004001)
INF	0.0006795*
	(0.0003495)
GFC	0.0092693***
	(0.007487)
Sargan test	17.76533
p-value	0.09932
First order correlation (m1)	-0.76107
p-value	0.4466
Second order correlation (m2)	0.4158
p-value	0.6776

Source: Authors' calculations

a***, **, indicate significance at the 1 and 5 percent levels respectively

and statistically significant coefficient. These findings, therefore, support the ESX efficiency hypothesis and reject the competing traditional SCP hypothesis in the banking sector of Bosnia and Herzegovina. It can be explained by the fact that the structure of the bank income has experienced severe changes in recent years. These changes are evident in the fact that interest income, such as the primary income of banks, has

been declining for years. Consequently, banks found a solution, so they focus their attention on operating income, which tends to increase as much to compensate declining trend of interest income.

A variable cost to income ratio and credit risk have a statistically significant influence on the movement of the banking sector of profitability of B&H. Cost to income ratio harms the profitability movement as was expected. Lower costs definitely lead to higher profitability. Variables credit risk also has a negative influence on the profitability movement. A great ratio of high-risk credit loans can explain the negative impact of credit risk variables on profitability. Variable capital adequacy does not have a statistically significant impact on profitability.

When it comes to macroeconomic factors of banks' profitability, the influence on inflation and GDP growth rates have been evaluated. GDP growth has a positive and statistically significant impact on the profitability movement. In the period comprised by the analysis, there are statistically recorded effects of the crisis and the recovery from it. Inflation has a positive impact on the profitability of banks but is not statistically significant. The observed period was characterized by stable inflation and deflation, which contributed to the positive expectations of consumers and higher credit activity.

The global Financial Crisis dummy variable has a statistically significant influence on the movement of the banking sector of the profitability of B&H. It can be explained by the fact that the bank has experienced severe issues with changes in recent years. The financial crisis inevitably leads to a decrease in bank liquidity. Reducing the liquidity of banks limits the business activities of banks and their ability to function successfully in the banking market, which directly affects the profitability of banks, with the possibility of their bankruptcy (Smolo and Mirakhor, 2010).

7. Conclusion

This paper analyses the impact of key determinants of profitability of 26 B&H banks from 2008 to 2017. Under the key determinants, we imply bank-specific, industry-specific characteristics and macroeconomic factors that affect profitability. Also, we test the SCP and EFX hypothesis in the context of the B&H banking market and their impact on banks profitability. The paper particularly emphasizes the importance of profitability as an indicator of performance. The

neoclassical theory implies that achieving high profits is a result of the high market power (high concentration) of certain companies. However, "Chicago School" presented its opinion on this subject. Supporters of this school believe that the achievement of high profits is a consequence of lower costs benefits or efficiency by certain firms, in our case, the banks. It is evident that superior management of resources is consistently associated with higher profits.

If obtained results prove the SCP hypothesis in the B&H case, regulatory bodies would be recommended to pay special attention to the banking sector market to improve competitiveness, i.e. prevent anti-competitive behaviour. However, the obtained results confirm the ESX hypothesis, which implies that concentration in the banking market does not distort competition and should not be the subject of intensive analysis of regulatory bodies in B&H. According to that, we can conclude that the initial ESX hypothesis is confirmed.

After 2000, there has been a significant increase in the number of foreign banks in the banking market of Bosnia and Herzegovina, which primarily leads to increased competition in the relevant market. In response to the pressure of competitive new banks, many banks have decided to consolidate in mergers and acquisitions or use a strategy for diversification and financial innovations, such as mobile banking etc. These activities of banks in B&H have opened the gate to their more efficient operation. We can conclude that the improvement in profitability of B&H banks over the observed period is mainly the result of intense competition, diversification of products and services, as well as the efficient use of new techniques and technologies in banking. It is considered that additional consolidation of banks is necessary as a driving force of further development and keeping up with the actual trends in European and World banking. The final goals are more effective intermedial cooperation and better banks performances.

During the research, we faced several problems, such as lack of a single banking market, unique banking agencies for the entire B&H, and insufficient data and information availability related to this issue. Due to the limitations, future research on this topic should include specific information about bank management, as well as several other variables, i.e. the ownership structure of banks, total taxes over pre-tax profit etc.

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