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Do mergers and acquisitions improve bank efficiency? Evidence from North Macedonia

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Abstract. This article focuses on the efficiency of commercial banks in North Macedonia in the period from 2007 to 2020. The main goal is to assess the relative efficiency of the banking sector as a whole, and more importantly, to evaluate and analyse the impact of mergers and acquisition (M&A) transactions on banks' efficiency. For this reason, the leading nonparametric methodology Data Envelopment Analysis (DEA) has been employed, i.e., the window DEA model with two input and two output variables on a sample of 13 commercial banks. Based on balanced panel data from the banking sector of North Macedonia, the obtained results show a constant fall of efficiency of the whole banking sector, from 83.33% in 2007 to 70.06% in 2011 and 66.36% in 2020. The results of the M&A transactions case study analysis show that, in general, M&A transactions decrease banks' efficiency, i.e., they do not result in an efficiency increase. The contribution of the study is that it comprises the first study analysing the effects of banks' M&A on bank efficiency in the region of South-Eastern Europe with the application of DEA and thus, it provides valuable information for investors, bank management, M&A analysts, academic members and regulatory bodies.

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1. INTRODUCTION

Banks represent by far the most important players in the financial system and the country's economic development and "are considered a backbone of the country's economy", especially in developing countries with underdeveloped financial systems (Fotova Čiković & Cvetkoska, 2017, p.17-18). Their essential role stems from their inevitable impact on the national financial stability, and thus, the whole economy. Banks' vital intermediary function of transferring the publics' deposits and savings into the business sector once more shows that banks are the main channel for savings and the allocation of credit (Sufian et al., 2016). Thus, bank efficiency is crucial for economic stability and development. It is therefore intensively researched and the Data Envelopment Analysis (hereafter DEA) is one of the main nonparametric methodologies employed for efficiency evaluation.

Bank mergers and acquisitions (M&A), on the other hand, are frequently promoted as enhancers of banking stability, growth and better efficiency of the banking sector, as well as a way in which banks improve their profitability and achieve other advantages (Popovici, 2014). There are several arguments as to why banks decide to engage in mergers and acquisitions, which include the potential realization of synergies, the increase in market power and more efficient operations. The rapid increase of bank M&A has been a global phenomenon and in many developing countries, the bank M&A has often been driven and promoted by authorities and policies for restructuring the banking industry in the hope of improving stability in the financial system (Du & Sim, 2015). Fotova Čiković and Fotov (2015, p. 262) argued that the consolidation of the banking sector, in general, brings a "strong competition among quality competitors, higher quality of bank services, diversification of the assortment of bank services, lower cost of capital, branch optimization, change of the business models, implementation of up-to-date methods for risk management and most importantly, higher profitability and higher efficiency of the banks and the banking system as a whole". Berger et al. (1999, p. 135) found that "mergers and acquisitions may lead to changes in efficiency, market power, economies of scale and scope, availability of services to customers and payment systems efficiency", and finally, to higher cost and profit efficiency, and thus, higher profits. Du & Sim (2015), however, reflected on the common perception of bank M&A leading to better bank performance and better bank efficiency as having strong intuitive appeal but not enough empirical support.

The evidence regarding the impact of M&A on bank efficiency in the developing countries of South-eastern Europe is limited. In this paper, the DEA window approach has been applied to assess the relative efficiency of banks in North Macedonia using balanced panel data in the period of fourteen years (2007-2020). As a second phase of the research, an estimation of the gains in efficiency of certain merged and/or acquiring commercial banks has been provided and the impact of the M&A on their efficiency has been assessed.

The remainder of this paper is structured as follows. Section 2 presents the literature review, Section 3 offers a short background and overview of the Macedonian banking sector. Section 4 describes the DEA methodology, the window DEA model, the selected variables and data. Section 5 presents the findings, Section 6 opens a discussion, while Section 7 concludes the paper.

2. LITERATURE REVIEW

In the last three decades, a large number of studies have been published on the subject of M&As in the banking industry and post-merger performance and efficiency. However, the studies implementing the DEA methodology are the main focus of this section.

Al-Sharkas et al. (2008) have implemented the Stochastic Frontier Approach (SFA) and the DEA methodology to explore the impact of bank M&A on cost and profit efficiency in the US banking industry. Their findings suggest that mergers have indeed improved the cost and profit efficiencies of banks; merged banks note lower costs than non-merged banks because they are using the most efficient technology available (technical efficiency) as well as a cost-minimizing input mix (allocative efficiency). They also suggest there is an economic rationale for future M&A transactions in the banking industry. Gattoufi et al. (2009) have evaluated the efficiency effects of the banking consolidation of commercial banks in Gulf Cooperation Council (GCC) countries in the period from 2003 to 2007. They have applied the output-oriented extended CCR DEA model, with interest expenses, non-interest expenses and loan-loss provision as inputs and interest income and non-interest income as outputs. Their limited findings indicate that there was a positive impact of M&A on the performance of commercial banks. Interestingly, they claim that the majority of banks involved in M&A realized the synergies and improved better than the market itself. Reda (2013) has examined the impact of M&As on the efficiency and profitability of Egyptian banks by using Data Envelopment Analysis (DEA) to measure managerial efficiency. He applied DEA, with variable returns to scale assumption to measure the input-oriented managerial efficiency for the period before consolidation (2000-2003) and the period after the consolidation (2007-2010). The selected variables were non-interest expenses and interest expenses as inputs and net interest income, non-interest income and the total amount of loans and advances as outputs. His findings reveal M&A's positive impact on managerial efficiency and an increased banking efficiency as a result of the consolidation and increased capitalization of banks. Popovici & Turliuc (2014) have focused on three banks from the European banking system that were involved in M&A transaction in the period 2002-2008. They have employed a DEA methodology with the Malmquist total factor productivity index. Total deposits, operating expenses and interest expenses have been selected as inputs, while total loans, net interest income and net profit as outputs. Their results suggest that the M&A transaction impacted all analysed banks with a higher Total Productivity Factor. Halkos et al. (2016) went one step further and researched with a DEA based procedure „to pre-evaluate technical efficiency gains from possible M&As in the Japanese regional banking sector". Their findings clearly show that potential M&As formed by the smaller banks showed greater efficiency than those formed by the larger banks. They even indicate that „small regional banks would gain efficiency if they merge with neighbouring banks, whereas larger banks would gain efficiency when merging with distant banks" (Halkos et al., 2016, p. 47). Aljadani & Toumi (2019) have investigated the causal effect of mergers and acquisitions (M&A) on bank productivity in 23 European Union countries over the period 1990–2013. Their sample consists of 156 commercial banks, of which 60 entities have acquired at least one other entity. They have employed panel cointegration and among others, they analysed the short- and long-term relationship among fixed assets, liquid assets, and labour. Their findings indicate that the focus in bank M&As has to stay on the strategic fit of the banks, due to its potential to create long-term productivity improvement.

In contrast to the above-presented literature, there is a solid number of studies that indicate mixed or inconsistent results regarding the benefits of mergers of banks and M&A's impact on banks' performance and efficiency (Le, 2017; Welten, 2017). Namely, Le (2017) has employed the intermediation approach of Data Envelopment Analysis with a variable return to scale (VRS) to investigate the relative efficiency on a sample of 35 Vietnamese banks in the period from 2008 to 2015, with a focus on three merger cases. The selected variables in the DEA model were as follows: operating expenses, physical capital and loanable funds

as inputs, and total loans and non-lending activities (securities) as outputs. His findings do not support the hypothesis that acquiring banks are more efficient than the target banks. However, he did find that the efficiency improved in most of the M&A cases but was not in direct relation with the acquiring bank's advantages since the efficiency level of the Vietnamese banking sector is relatively high and remained constant over the examined years. DeYoung et al. (2009) conducted a bibliometric study reviewing 150 studies on recent financial institutions' mergers and acquisitions in North America and Europe. They report that the studies of the pre-2000 period have found bank mergers to give potential to be efficiency improving, although the event-study literature found little to no evidence of positive stockholder wealth effects. Their analysed post-2000 period gives insights and supports that bank mergers are (or can be) efficiency improving, however, they too could not support the notion that mergers improve stockholders' wealth in North America. Du & Sim (2015) have analysed the banking sectors of six emerging countries and have investigated the effects of banks' M&A on target and acquiring bank efficiency. The observed period is 2002-2009 and the selected variables are fixed assets, non-interest operating expenses and interest expenses as inputs and net interest income and other operating income as outputs. They claim that the „evidence that M&A can lead to better-performing banks is tenuous at best" (Du & Sim 2015, p. 499). Furthermore, they found the effect of M&A to be generally weak except when the regressions for target and acquiring banks have been implemented separately. Interestingly, their findings suggest that target banks show greater efficiency after an M&A but no efficiency improvements were found for acquiring banks. Sindi et al. (2017) have analysed the profit, revenue and cost efficiency of 39 acquirer banks post M&A in the observed period from 2000 to 2012 in the MENA region. Their findings suggest a change in the levels of profit, cost and revenue efficiency, however, they found these changes to be statistically insignificant and the drawn conclusions are that „M&A have no significant effect on profit, revenue and cost efficiency of acquirer banks in the MENA region" (Sindi et al. 2017, p. 1).

Studies dealing with the topic of bank M&As in the area of Southeast Europe and the Western Balkan are scarce. Notwithstanding, the literature regarding the effects of mergers and acquisitions on banks' performances and efficiency are even rarer and these studies rarely cover European developing countries. This is a pioneering study that investigates the impact of M&As on bank efficiency in North Macedonia.

The main research gap regarding the benefits of M&A in banking is whether M&A transactions lead to an increase in efficiency of merged banks. This is a subject that is pivotal in addressing the efficiency gains expected from M&A transactions in banking. The main hypothesis set for this study is as follows: The transactions of M&A in banking lead to a greater efficiency of merged banks. This hypothesis will be tested with the use of the leading non-parametric methodology.

Therefore, this paper is an attempt to fill in this gap and inspire future researchers and academic members to focus their research efforts in this direction as well as to distribute critical information regarding the impact of banks' M&As on banks' efficiency to regulatory bodies, bank management and the public.

3. AN OVERVIEW OF THE MACEDONIAN BANKING SECTOR

North Macedonia is an EU-candidate country (since its application back in 2004) located in the Southeast of Europe and is a typical „bank-based" economy, where „banks play the key role of financing the economic activities and maintaining the financial stability of the system" (Cvetkoska & Fotova Čiković, 2020). The most important source of bank financing is the deposits from households, which hold the highest share in the liabilities of the banking system, namely 49.4% in 2020 (NBRNM, 2021). Furthermore, the financial system is relatively simple and the financial system is still underdeveloped (Fotova Čiković & Cvetkoska, 2017).

The banking sector in North Macedonia is characterized by "a low degree of financial intermediation, high capitalization, high participation of foreign capital in property capital and a high degree of concentration of banking activities" (Naumovska & Cvetkoska, 2016). The North Macedonian banking system takes over 91.6% of the total profit of the whole financial sector in the country. Therefore, it is safe to assume that the banking sector plays a dominant role in the financial system. Moreover, the Macedonian banks take up 81.4% of the total assets of the financial system in 2019 (Financial stability report for the Republic of North Macedonia in 2019, 2020). It is a sector that is in mostly foreign owned (with 75.4% in 2019) and a sector that has maintained its stability, high capitalization and stable solvency and a capital adequacy ratio of 16.3% in 2019 (Financial Stability Report for the Republic of North Macedonia in 2018, 2019). Due to its vital role, the banking sector and its efficiency have been largely researched. There are six studies that employ the DEA methodology investigating the efficiency of the banking sector, as follows: Micajkova and Poposka (2013), Naumovska and Cvetkoska (2014), Naumovska and Cvetkoska (2016), Fotova Čiković and Cvetkoska (2017) and Cvetkoska and Fotova Čiković (2020), Cvetkoska et al. (2021). The most applied DEA model is the output-oriented BCC model (used in Naumovska and Cvetkoska 2016; Fotova Čiković and Cvetkoska 2017; Cvetkoska et al. 2021), whereas the CCR and window DEA models are less popular (used in Naumovska & Cvetkoska 2014 and Cvetkoska & Fotova Čiković 2020, respectively). Micajkova & Poposka (2013) have implemented both BCC and CCR DEA models.

Micajkova and Poposka (2013) have analysed the period from 2008 to 2011, with total deposits received and labor costs as input variables and loans to banks and customers, and investments as output variables. Their findings indicate an increase in the average efficiency of Macedonian banks in 2008-2010 and a decrease in efficiency in 2011. Moreover, they found that the "highest pure efficiency scores and the greatest scale inefficiency" are noted in the large banks' group.

Naumovska and Cvetkoska (2014) and Naumovska and Cvetkoska (2016) observe the period 2007-2013 using deposits and operating costs as inputs and loans and net interest revenue as outputs for their DEA model. The only difference is the used DEA model (CCR output-oriented and BCC output-oriented model, respectively). The results from their empirical studies indicate that the Macedonian banking sector has noted highest efficiency in 2008 (90.35% in the CCR model and 93.66% in the BCC model), whereas lowest efficiency in 2009 according to the BCC model (86.96%), and 2012 according to the CCR model (79.83%).

Fotova Čiković and Cvetkoska (2017) employ three inputs: total deposits (deposits from banks and other clients), interest costs and operating (non-interest) costs (costs for salaries, amortization, administrative costs and other operating costs) and three outputs: total loans (issued to banks and other clients), interest revenue and non-interest revenue (fee and commission revenue and other operating revenue) to their DEA model. The observed period is 2008 – 2015. They found that the banking sector as a whole noted an average efficiency of 88.77% and the most efficient group is the large banks' group.

Cvetkoska and Fotova Čiković (2020) have selected interest and non-interest expenses as inputs, and interest and non-interest revenues as outputs in the period 2007 to 2017. Their findings show that the Global Financial crisis of 2008 impacted the banking efficiency in North Macedonia severely, and they noted highest efficiency score before the crisis (in 2007, 84.04%) and lowest efficiency score in 2011 (65.25%).

Cvetkoska et al. (2021) have conducted an empirical cross-country study including North Macedonia, Serbia and Croatia in the period 2015 to 2019. Their findings show that the Macedonian commercial banking system is the most efficient one with an efficiency score of 91.1% and is followed by the Croatian (90.9%) and the Serbian (81.9%) banking system.

4. VARIABLES, DATA AND METHODOLOGY

DEA (data envelopment analysis) is the leading non-parametric mathematical programming methodology that is used to evaluate the relative efficiency of complex homogeneous entities called decision-making units (DMUs) (Cvetkoska et al., 2021). Its origins date back to Farrell (1957) and his seminal paper, which was a basis for the foundations of the DEA methodology introduced in 1978 by Charnes, Cooper and Rhodes (1978). DEA has gained increasing popularity among academics and researchers and has found extensive use in the evaluation of the efficiency of different industries, such as the pharmaceutical industry (Bezić et al., 2013), tourism (Cvetkoska and Barišić, 2017), health services (Rabar, 2010; Vitezić et al., 2016), the stock market (Gardijan and Škrinjarić, 2015), and education (Aristovnik and Obadić, 2012). However, DEA has been widely applied to assess the efficiency of various national banking sectors (Naumovska and Cvetkoska, 2014; Maletić et al., 2013; Pavković, Cesarec & Stojanović, 2018; Repkova, 2014). The rationale for this is that it „allows a comparison of the relative efficiency of banks by determining the relative efficient banks as benchmarks and by measuring the inefficiencies in input combinations (slack variables) in other banks relative to the selected benchmark" (Jemrić & Vujčić, 2002, p. 4).

In this study, the income-based approach has been employed, therefore assuming that the banks' goal is to maximize the outputs (revenues) with the given level of inputs (expenses). The applied model is conceptually underpinned by the DEA study of Banker et al. (2010) and Cvetkoska et al. (2020). In other words, the output-oriented BCC DEA model has been selected with interest expense and other operating expense as input variables and interest revenue and other operating revenue as output variables (Table 1). The observed period is a bit longer than usual studies and covers 14 years, i.e. from 2007 to 2020, covering the period right after the Great global crisis in 2008-2009, the recovery from it up until the COVID-19 crisis in 2020. The sample contains 13 commercial banks in the Republic of North Macedonia. The Development Bank of North Macedonia and Eurostandard Banka AD Skopje have been excluded from the sample due to objective reasons as follows. The Development Bank of North Macedonia holds a very specific development function and has an untypical nature of its operations, i.e. does not accept deposits (unlike the commercial banks in the sample), whereas Eurostandard Banka AD Skopje has been excluded due to data unavailability and the revoking of the license by the Central Bank and its liquidation in 2020.

Table 1

Input and output variables.

Character of variable	Variables	Elements of the variables
INPUT	Interest expenses (I1)	
	non-interest expenses (I2)	Expenses on fees and commissions
		General administrative expenses and depreciation
		Expenses on value adjustments and provisions
		Other operating expenses
OUTPUT	Interest revenues (O1)	
	non-interest revenues (O2)	Income from fees and commissions
		Other operating income

The data has been extracted from the official and revised financial statements for the selected inputs and outputs for each commercial bank in the period from 2007 to 2020, which are available on their official websites.

The envelopment form of the output-oriented BCC DEA model is given in (1) – (5): (Cooper et al., 2007):

$$(BCC - Oo) \max_{\eta_B, \lambda} \eta_B \quad (1)$$

subject to

$$X\lambda \leq x_0 \quad (2)$$

$$\eta_B y_0 - Y\lambda \leq 0 \quad (3)$$

$$e\lambda = 1 \quad (4)$$

$$\lambda \geq 0 \quad (5)$$

where ηB is a scalar. The input data for DMUj (j = 1, …, n) are (x1j,x2j,…,xmj), and the output data are (y1j,y2j,…,ymj); the data set is given by two matrices X and Y, where X is the input data matrix, and Y is the output data matrix, λ is a column vector and all its elements are non-negative, while e is a row vector and all its elements are equal to 1 (Cooper et al., 2007, p. 22, 91–92); (Cvetkoska & Barišić, 2017, p. 33–34). The efficiency in the BCC model requires the realization of two conditions: „(1) the result of the BCC efficiency to be equal to 1 (100%), and (2) all slacks to have a zero value" (Cvetkoska et al., 2021, p. 8).

In this study, the DEA window analysis approach has been implemented. This approach has first been introduced by Klopp (1985), who developed this approach while working as a chief statistician for the U.S. Army Recruiting Command (Cooper et al., 2007, p.323). The main goal of the window analysis is to „capture the variations of efficiency over time" (Al-Delaimi et al., 2006). Its specific role is to add a dynamic perspective to the DEA methodology, assessing the efficiency of a DMU over a period of time, „treating it as a different entity in each time period", which enables allows for marking the performance of each DMU in the sample (Al-Delaimi et al., 2006, p. 142). In this article, the practical application of DEA window analysis has been explored in the investigation of relative efficiencies of the banks operating in North Macedonia as well as the change in efficiencies before and after the M&A transactions.

The DEA window analysis applies additional symbols and formulas as laid out in Cooper et al., (2007, p. 326-327) and Cvetkoska & Savić (2017, p.322): n – the number of decision-making units, k - the number of periods, p - length of the window ($p \leq k$), $p=k+1/2$, w – the number of windows ($w = k – p + 1$), the number of decision-making units in each window is calculated according to this formula: np, while the number of "different" decision-making units is calculated through the formula: npw (Cvetkoska & Fotova Čiković, 2020).

As a second phase of this study, a case study approach will be implemented following Le (2017). Namely, he claims that even though previous studies have implemented cross-section analysis of bank mergers, and included a large number of M&A transactions with the implementation of a statistical model, this would lead to „statistically valid generalisations". Furthermore, it is almost impossible to conduct a cross-section analysis in the region of Southeastern Europe, due to the relatively small number of mergers and acquisitions that occur in the banking sectors of these countries.

In this article, quantative and qualitative analysis of the transactions of M&A that occurred in the observed period have been conducted. Namely, in 2008 the Steiermärkische Sparkasse has acquired Invest banka AD Skopje and CCB AD Sofija has acquired CKB Banka AD Skopje. Furthermore, the period from 2011-2014 has been analysed, when Stater Bank AD Kumanovo merged with CKB AD Skopje, Halk Bank AD Skopje has bought the control package in IK Banka AD Skopje, and thereafter Ziraat Banka AD Skopje.

5. EMPIRICAL RESULTS

The sample consists of 13 commercial banks (n=13), which are Alfa Banka AD Skopje (rebranded into Silk Road Bank AD Skopje in May 2016), Centralna Kooperativna Banka AD Skopje, Halk Banka AD

Skopje, Kapital Banka AD Skopje, Komercijalna Banka AD Skopje, NLB Banka AD Skopje, Ohridska Banka AD Skopje, ProCredit Banka AD Skopje, Sparkasse Banka AD Skopje, Stopanska Banka AD Bitola, Stopanska Banka AD Skopje, TTK Banka AD Skopje and Uni Banka AD Skopje. The Development Bank of North Macedonia JSC Skopje and Eurostandard Banka AD Skopje have been intentionally left out from the empirical analysis due to the specific support role in the sector and the cancelation of its national license to operate (due to its significant exposure to risk), respectively.

For this analysis, fourteen years are considered (k=14), the length of the window is 5 years (p=5), and the number of windows is 10 (w=k-p+1=14-5+1=10). In each window, there are 65 banks (n x p), and the number of "different" banks is 650 (65 banks x 10 windows). Charnes, Cooper & Thrall (1991) give an alternative formula to obtain the total number of „different" DMUs, which follows: n(k-p+1)p. Every window covers 5 years (for example, window 1 covers 5 years: 2007, 2008, 2009, 2010 and 2011; window 2 covers data for 2008, 2009, 2010, 2011 and 2012, and so on), as presented in table 2 below:

Table 2

Windows in the DEA window analysis model.

window 1	2007	2008	2009	2010	2011									
window 2		2008	2009	2010	2011	2012								
window 3			2009	2010	2011	2012	2013							
window 4				2010	2011	2012	2013	2014						
window 5					2011	2012	2013	2014	2015					
window 6						2012	2013	2014	2015	2016				
window 7							2013	2014	2015	2016	2017			
window 8								2014	2015	2016	2017	2018		
window 9									2015	2016	2017	2018	2019	
window10										2016	2017	2018	2019	2020

The specified DEA model (Window-O-V) has been solved with the application of the DEA-Solver-LV software, and additional details for this software can be found in Cooper et al. (2007). The efficiency results from DEA will identify which banks are relative efficient and which are, relative inefficient. Efficient banks will be assigned a score of 1, i.e. 100%, while inefficient ones will be assigned an efficiency score lower than 1.

The obtained results show that the relative efficiency of the Macedonian banking sector in 2007 was 83.33% and started to decline, presumably as a result of the global financial crisis in 2008/2009, until reaching its low point in 2011 (70.06%). This decrease could be elaborated with the time-lag effect that the global crisis had on small developing economies such as the Macedonian. Since 2012, the relative efficiency started rising again until 2016 (77.15%) and thereafter slowly decreasing its efficiency to 66.36% in 2020. The decrease of bank efficiency should always be interpreted by using a wider economic and political perspective. Namely, the period from 2015 to 2019 has been quite difficult for North Macedonia. The political instability constantly rose, due to the „clouding of the domestic political situation and the outburst of the Greek debt crisis" leading to „escalation of the political situation" in April 2016 (Cvetkoska et al., 2021, p.13). And even though the political situation has ultimately calmed down, it has left consequences on the Macedonian economy, and thus on its banking sector.

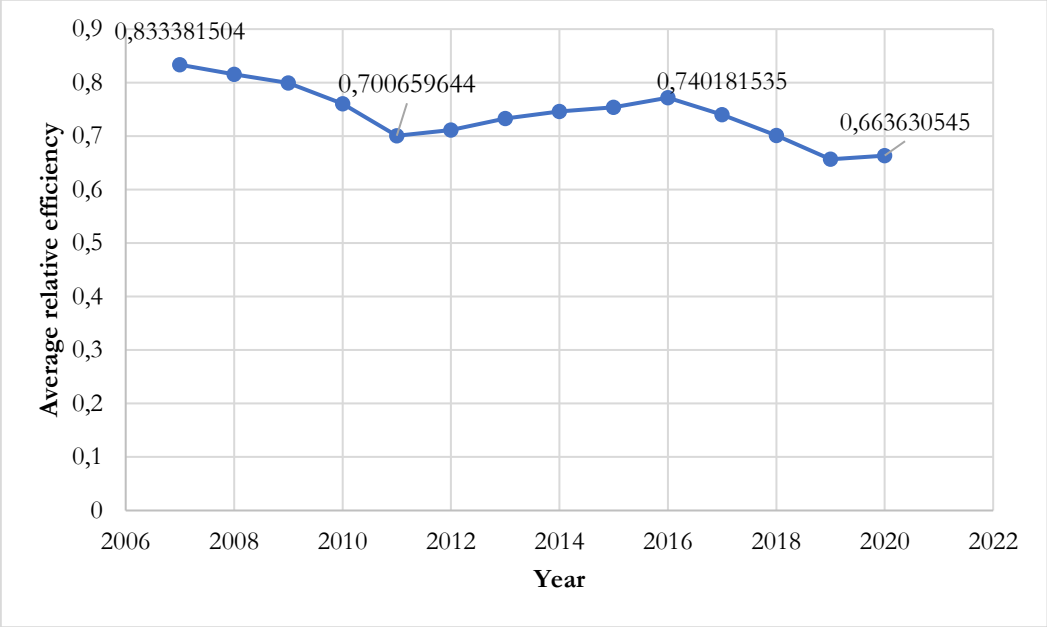

Figure 1. Average relative efficiency of the North Macedonian banking sector (2007-2020)
Source: Authors.

Table 3 presents the overall efficiency by windows and by term for each bank in the analysed sample. The average efficiency scores in all ten windows have been taken into consideration in order to estimate the overall efficiency by windows, while the overall efficiency by year have been estimated using the annual efficiency of each bank.

Table 3

Overall efficiency for commercial banks in North Macedonia

Bank	**Overall efficiency**	
	by windows	**by term**
NLB Banka AD Skopje	0.928214886	0.907878319
Stopanska Banka AD Skopje	0.990802601	0.993200724
Komercijalna Banka AD Skopje	0.96555114	0.966556493
HalkBank AD Skopje	0.588952192	0.586456914
Uni Banka AD Skopje	0.616356512	0.617862161
ProCredit Banka AD Skopje	0.671565615	0.670003975
TTK Banka AD Skopje	0.847552327	0.833047674
Capital Banka AD Skopje	0.797807206	0.828429913
Stopanska Banka AD Bitola	0.655664706	0.649328015
Sparkasse Banka Makedonija AD Skopje	0.714077649	0.709149073
Ohridska Banka AD Skopje	0.606227694	0.608076752
Centralna Kooperativna Banka AD Skopje	0.620224577	0.62822559
Silk Road Banka AD Skopje	0.623502668	0.646010231

Source: Authors' construction, based on the results from the DEA Solver-LV.

According to the obtained results for overall efficiency by years, the most efficient banks are Stopanska Banka AD Skopje (99.32%), Komercijalna Banka AD Skopje (99.70%) and NLB Banka AD Skopje (98.79%), which are part of the large banks' group. Namely, according to the classification of banks by the National Bank, large banks are those which hold assets higher than 37.95 bln. MKD (Cvetkoska et al. 2021). These findings are consistent with the findings of Pavković et al. (2018), Cvetkoska et al. (2021) and Micajkova and Poposka (2013). The results of the overall efficiency by windows in Table 3 represents the main advantage of the WDEA (window DEA) approach as "a useful and effective method that describes the dynamic changes of the efficiency of each DMU, comprehensively and the horizontal and vertical changes in the efficiency of DMUs" (Peykani et al., 2021).

The case study approach has been conducted in order to analyse the specific M&A transactions (as shown in Table 4) and their impact on target banks' efficiency in the Macedonian banking sector as follows.

Table 4

The analysed bank M&A case studies.

Analysed case studies		
Acquiring bank	***Target bank***	***Year***
Steiermärkische Sparkasse Group	Invest Bank AD Skopje	2008
	Ohridska Banka AD Skopje	2019
CCB AD Sofija / CKB AD Skopje	Sileks Banka AD Skopje	2008
	Stater Banka AD Kumanovo	2011
HalkBank Turkey	IK Banka AD Skopje	2011
	Ziraat Banka AD Skopje	2012
Silk Road Capital	Alpha Banka AD Skopje	2016

Source: Authors' construction.

5.1. The Acquisitions of Invest Bank AD Skopje (2008) and Ohridska Banka AD Skopje (2019) by Steiermärkische Sparkasse Group

In 2008, the Austrian Steiermärkische Sparkasse Group entered the Macedonian banking market by acquiring Invest Banka AD Skopje. Its efficiency score in 2008 was 73.88% and thereafter decreased to its lowest 58% in 2011, and thereafter it slowly restored its efficiency to 85.37% in 2017. On November 4, 2019, the Sparkasse Group (Steiermerkische Bank and Sparkasse AG) officially became the new owner of Ohridska Banka AD Skopje, buying 91.57 per cent of the shares for 48 million euros. With this transaction, Steiermerkische Sparkasse has become the fourth largest banking group in Macedonia with a market share of about 14 percent (Sparkasse Macedonia, 2021). This acquisition of Ohridska Banka AD Skopje has drastically decreased its efficiency, resulting in efficiency scores of 71.71% and 61.62% in 2019 and 2020, respectively. Ohridska Banka AD Skopje has been one of the least efficient banks in the whole analysed period, with an average efficiency score of 60% for the period 2007-2020. However, it can be concluded that the acquisition by the Sparkasse Group has brought an increase in efficiency up until the second M&A transaction in 2019 (as shown in Figure 2). It is still very early for the 2019 M&A transaction to jump into conclusions. Notwithstanding, these inefficiency scores could be matched with the fact that in 2019, the banking system as a whole „noted slightly lower profits, and consequently, a lower return on assets and equity indicators" (Cvetkoska et al., 2021).

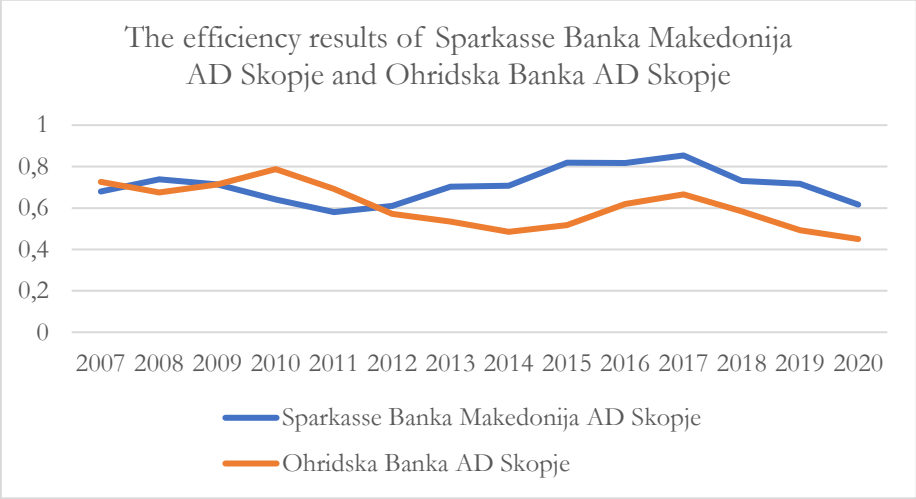

Figure 2. Average relative efficiency of Sparkasse Banka Makedonija AD Skopje and Ohridska Banka AD Skopje (2007-2020).
Source: Authors.

5.2. The acquisition of Sileks Banka AD Skopje by CCB AD Sofija in 2008 and the acquisition of Stater Banka AD Kumanovo by CKB AD Skopje in 2011

Sileks Banka AD Skopje has been acquired in 2008 when the majority share package was purchased by Central Cooperative Bank AD Sofia, and the bank changed its name to Centralna Kooperativna Banka (CKB) AD Skopje. At the beginning of 2011, the Stater Banka AD Kumanovo (which was acquired a year earlier) merged into the Bank (BCRA, 2017).

In this case, what is evident in Figure 3 is that rapid growth in efficiency has occurred right after the acquisition in 2008, resulting in relative efficiency scores of 100% in both 2008 and 2009, a rise from 69.5% in 2007. However, after these two consecutive years (i.e. 2008 and 2009), a dramatic fall in efficiency followed, especially after the acquisition of Stater Banka AD Kumanovo in 2011. Namely, its efficiency resulted in 53.93% in 2011, a slightly improved 62.14% in 2014 and sunken 40.64% in 2020. As shown in Figure 3, Centralna Kooperativna Banka AD Skopje did not restore its efficiency after the second M&A transaction in 2011.

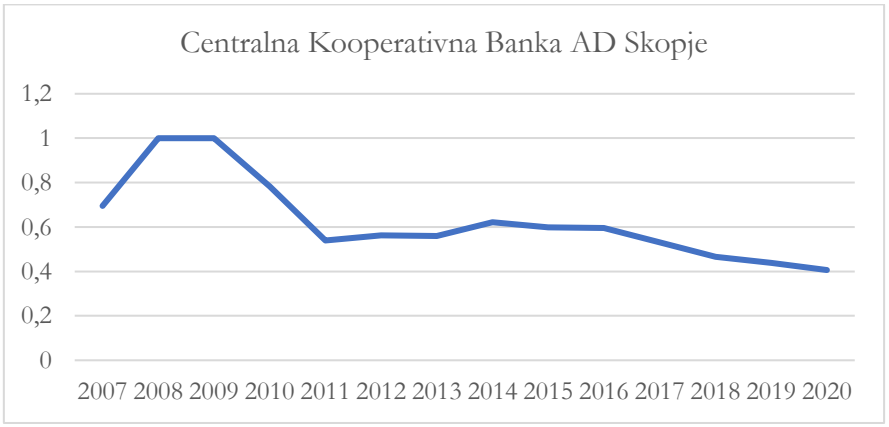

Figure 3. Average relative efficiency of Centralna Kooperativna Banka AD Skopje (2007-2020)
Source: Authors.

5.3. The acquisition of IK Banka AD Skopje (2011) and Ziraat Banka AD Skopje (2012) by HalkBank Turkey in 2011

The Turkish HalkBank entered the Macedonian banking market in 2011, when it acquired then-so-called IK Banka AD Skopje. The bank noted its lowest efficiency score in 2010, a year before the acquisition. In 2012, its efficiency has risen to 63.8%, but after the acquisition of Ziraat Bank AD Skopje that same year, the efficiency constantly sank and reached 54.6% in 2020. In the case of HalkBank AD Skopje, the analysis shows that the M&A transactions did not bring the expected gains and improvement in efficiency. Moreover, as shown in Figure 4, HalkBank has shown rather inconsistent and volatile efficiency results in the observed period. Even though this could be the only logical conclusion, when analysing bank efficiency, the big picture should be considered. In the case of HalkBank AD Skopje, its volatile efficiency could be a result of the large investment policy it introduced for investment in new technologies (such as introducing a new platform for e-banking in 2015; mobile applications for e-banking services for individuals and legal entities in 2017) and its commitment to long-term growth, which resulted in becoming the fifth largest bank on the market by assets and by profit.

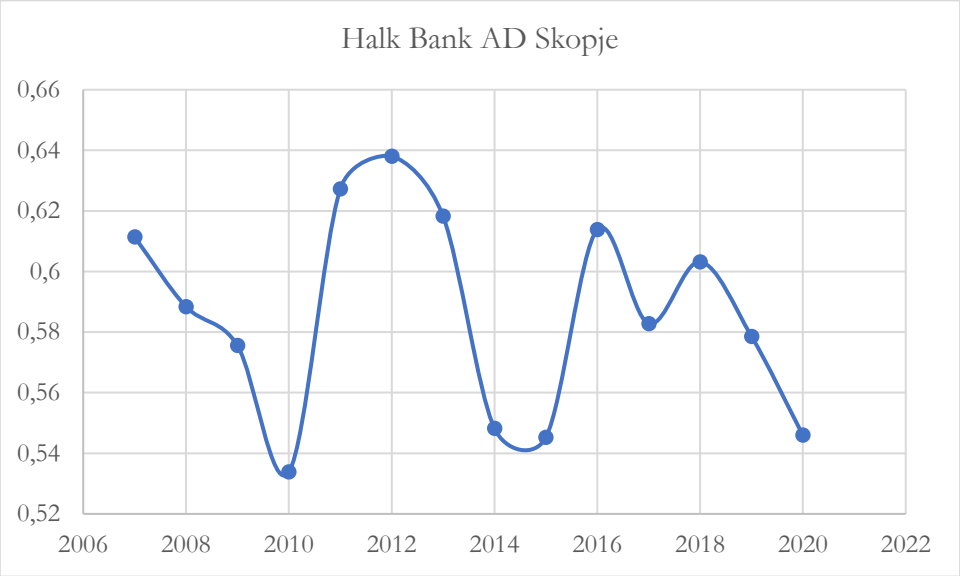

Figure 4. Average relative efficiency of HalkBank AD Skopje (2007-2020)

Source: Authors.

5.4. The acquisition of Alpha Banka AD Skopje by Silk Road Capital in 2016

In May 2016, Silk Road Capital (the corporation owned by Swiss private investors) bought out Alpha Bank AD Skopje and changed its name to Silk Road Bank AD Skopje. This is a bank that belongs to small-sized banks and has shown rather untypical efficiency results (Figure 5). Namely, it has started this analysis with a relative efficiency score of 100% in 2007, noting quite a volatile efficiency ever since. The efficiency score in 2015 was 77.68%, and after the acquisition in 2016, the efficiency scores have been further decreased to 47.39% in 2017 and then rose slightly to 54.11% in 2020. In this case, it can also be concluded that the M&A transaction in 2016 did not result in any efficiency improvement.

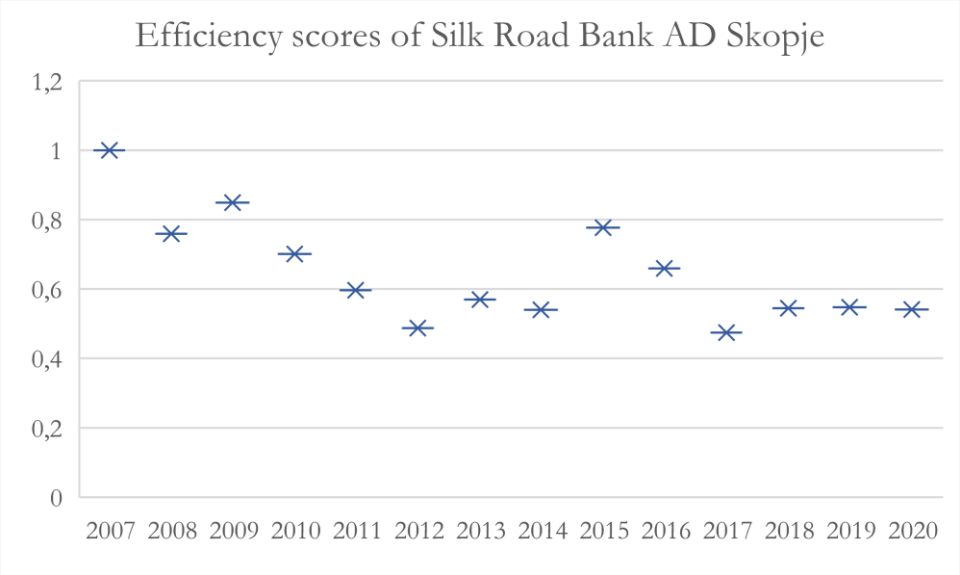

Figure 5. Average relative efficiency of Silk Road Bank AD Skopje (2007-2020)

Source: Authors.

6. DISCUSSION

The results of the empirical research show that the large bank Stopanska Banka AD Skopje has been relative efficient in 8 out of 14 analysed years, NLB Banka AD Skopje has been relative efficient in one analysed year (2017), whereas Komercijalna Banka AD Skopje has been relative efficient in 4 analysed years. However, no bank has been relative efficient in the whole observed period. The least efficient banks according to the obtained results for overall efficiency by years are HalkBank AD Skopje (58.64%), Ohridska Banka AD Skopje (60.80%) and Uni Banka AD Skopje (61.78%), which are part of the large (HalkBank AD Skopje) and the middle-sized banks' group (Ohridska Banka AD Skopje and Uni Banka AD Skopje). These results are not completely in line with the findings of Naumovska and Cvetkoska (2014); Naumovska and Cvetkoska (2016) and Fotova Čiković & Cvetkoska (2017), who conclude that "the group of large banks has the highest efficiency, and the group of small banks the lowest efficiency in the Macedonian banking sector". Namely, in this study, the middle-sized banks (i.e. Uni Banka AD Skopje and Ohridska Banka AD Skopje) are the least efficient banks and they share these efficiency results with the small-sized banks.

In order to validate and verify the used model, we have run the BCC output-oriented DEA model with the same input and output variables in the period 2007 to 2020 and the results shown in Figure 6 indicate that the large banks (Stopanska Banka AD Skopje, NLB Banka AD Skopje and Komercijalna Banka AD Skopje) have noted highest efficiency scores (0.986, 0.859 and 0.929, respectively). Moreover, the results indicate that HalkBank AD Skopje (0.475), Ohridska Banka AD Skopje (0.461) and Uni Banka AD Skopje (0.459) have yet again showed lowest efficiency results in this model as well. Once again, this study has proven that the group of middle-sized and small-sized banks are the least efficient banks' group in the Macedonian banking sector.

These results provide new insights and valuable information for bank management, regulatory bodies, investors, the government and the interested public and could lead to an increased focus of banks on the efficient use of resources and thus, a higher efficiency of Macedonian banks in the future.

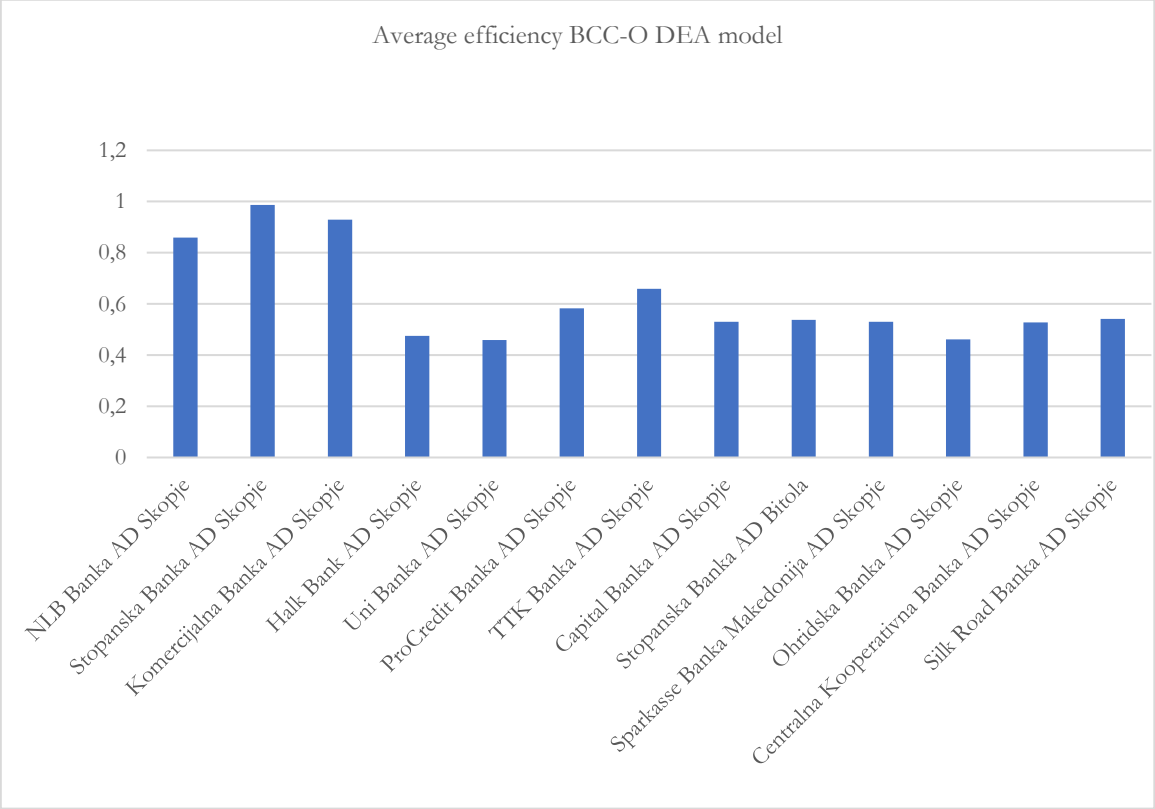

Figure 6. Average relative efficiency of the banks in North Macedonia (2007-2020) with BCC-O DEA model

7. CONCLUSION

By applying the leading nonparametric frontier approach, i.e. the Data Envelopment Analysis (DEA), this study attempts to determine and assess the impact of mergers and acquisitions on the efficiency of commercial banks in North Macedonia, with a special emphasis on specific case-study mergers and acquisitions that occurred in the analysed period. The sample in this DEA model consists of 13 commercial banks which were operating in the whole observed period from 2007 to 2020 and the model used two inputs (the interest and the non-interest expenses) and two outputs (the interest and the non-interest revenue) as variables. This empirical study has addressed the main research gap, which is unveiling whether M&A transactions lead to an increase in efficiency of merged banks. The main hypothesis set for this study, i.e. that the transactions of M&A in banking lead to a greater efficiency of merged banks could not be supported with the findings of this empirical research. These findings are intriguing and request for further future research on this subject.

Namely, the obtained results show a constant fall in efficiency of the whole banking sector, from 83.33% in 2007 to 70.06% in 2011 and 66.36% in 2020. The most efficient banks belong to the group of large banks. However, no bank has noted a relative efficiency score of 100 % in the whole observed period. Stopanska Banka AD Skopje has been the most efficient bank and was relative efficient in 8 out of 14 analysed years. On the other hand, the least efficient bank is HalkBank AD Skopje, with a mean relative efficiency score of 58.64%, followed by Ohridska Banka AD Skopje (60.80%) and Uni Banka AD Skopje (61.78%), which are both part of the middle-sized banks' group. What is intriguing is that HalkBank AD Skopje is since 2017 part of the large banks' group, and still shows relative inefficiency results. When looking

at the bigger picture, it can be concluded that this is due to investment in its rapid growth (from being a small-sized bank in 2011, to being a middle-sized bank from 2012 to 2016, to eventually becoming a large bank in 2017). The obtained results show that small-sized and middle-sized banks are least efficient in the Macedonian banking sector. These results and the window DEA model have been verified with an application of another BCC-O DEA model that has proven the findings.

The case study approach regarding the impact of M&A transactions on bank efficiency offers a more detailed perspective and shows rather inconsistent results. In the case of small-sized banks (i.e. the Silk Road Bank AD Skopje), M&A transactions did not result in an efficiency increase. In the case of middle-sized banks (CKB Bank AD Skopje and Sparkasse Bank Makedonija AD Skopje), the results show that the first M&A transaction achieved the potential efficiency gains. However, the second M&A transactions in both cases resulted in lower efficiency. And lastly, in the case of large banks (HalkBank AD Skopje), the analysis shows that the M&A transactions did not bring an increase in efficiency.

This study and the window DEA model have some limitations. Namely, Cooper et al. (2007) state that the fact that the first and the last year in the analysis „are not tested as frequently" as the other analysed years is its main disadvantage. Simar & Wilson (2000) suggest using a bootstrap in DEA to obtain efficiency scores of DMUs in the sample. Moreover, the biggest limitation of this study is that, as the study of Le (2017), it focuses solely on the effect of bank mergers on the relative efficiency, without taking into consideration the different aspects of M&A that impact the efficiency, profitability and sustainability of the merged banks. However, the findings regarding the efficiency of the whole banking sector are invaluable since no previously published study incorporates such a long time period (2007 – 2020) in the Macedonian banking sector. This article's main scientific contribution derives from the focus on the whole banking sector, each bank and the efficiency gains and impact from the M&A transactions in the sector in the analyzed period. The findings from this study provide new insights to bank management, M&A consultants and analysts, potential investors as well as regulatory bodies. In the future research, the authors plan to include contextual variables in the model and to focus on and explore the profit efficiency of Macedonian banks.

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REFERENCES

Al-Delaimi, K.S.K. & Al-Ani, A.H.B. (2006). Using Data Envelopment Analysis to measure cost efficiency with an application on Islamic banks. *Scientific Journal of Administrative Development, 4*, I.A.D., 134-156

Aljadani, A. & Toumi, H. (2019). Causal effect of mergers and acquisitions on EU bank productivity. *Economic Structures 8* (44). https, //doi.org/10.1186/s40008-019-0176-9

Al-Sharkas, A.A., Kabir, H.M. & Shari, L. (2008). The Impact of Mergers and Acquisitions on the Efficiency of the U.S. Banking Industry, Further Evidence (2007-03). *Journal of Business Finance & Accounting, 35* (1-2), 50-70, http, //dx.doi.org/10.1111/j.1468-5957.2007.02059.x

Aristovnik, A. & Obadić, A. (2012). Measuring the technical efficiency of secondary education in Slovenia and Croatia, a DEA approach. In, *6th International Conference – An Enterprise Odyssey, Corporate governance and public policy – path to sustainable future*, edited by, Galetić, L. & Šimurina, J., 354-367.

Banker, R.D., Chang, H. & Lee, S. (2010). Differential impact of Korean banking system reforms on bank productivity. *Journal of Banking and Finance, 34* (7), 1450-1460, https, //doi.org/10.1016/j.jbankfin.2010.02.023

BCRA, (2017). Central Cooperative Bank AD Skopje Report.

Berger, A. N., Demsetz, R. & Strahan, P. (1999). The consolidation of the financial services industry, Causes, consequences and implications for the future. *Journal of Banking and Finance 23*(2-4) (February), 135–194

Bezić, H., Galović, T. & Mišević, P. (2013). Efficiency of the Pharmaceutical Industry of the Selected European Countries through Implementation of the DEA Analysis. In, *Proceedings of the 1st International Conference on Management, Marketing, Tourism, Retail, Finance and Computer Applications (MATREFC13)*, edited by Vrdoljak Raguž, I., Roushdy, M. & Salem, A-B., 271-276.

Charnes, A., Cooper, W., & Rhodes, E. (1978). Measuring the efficiency of decision-making units. *Eur. J. Oper. Res, 2*, 429–444.

Charnes, A., Cooper, W.W. & Thrall, R.M. (1991). A Structure for Classifying and Characterizing Efficiency and Inefficiency in Data Envelopment Analysis. *Journal of Productivity Analysis 2*(3), 197–237. http, //www.jstor.org/stable/41769834 (Accessed November 23, 2021).

Cooper, W., Seiford, L. & Tone, K. (2007). *Data Envelopment Analysis, A Comprehensive Text with Models, Applications, References and DEA-Solver Software*, 2nd ed.; Springer Science-i-Business Media, LLC, New York, NY, USA.

Cvetkoska, V. & Barišić, P. (2017). The efficiency of the tourism industry in the Balkans. In *Proc. of the Faculty of Economics in East Sarajevo*, 14, 31-41. https, //doi.org/10.7251/ZREFIS1714031C

Cvetkoska, V. & Fotova Čiković, K. (2020). Assessing the relative efficiency of commercial banks in the Republic of North Macedonia, DEA window analysis. *Croat. Oper. Res. Rev. CRORR*, 11, 217–227.

Cvetkoska, V. & Savić, G., (2017). Efficiency of bank branches, empirical evidence from a two-phase research approach. *Economic Research-Ekonomska Istraživanja, 30* (1), 318-333 https, //doi.org/10.1080/1331677X.2017.1305775

Cvetkoska, V., Fotova Čiković, K. & Tasheva, M. (2021). Efficiency of Commercial Banking in Developing Countries. *Mathematics; 9*(14), 1597. https, //doi.org/10.3390/math9141597

DeYoung, R., Evanoff, D.D. & Molyneux, P. (2009). Mergers and acquisitions of financial institutions, a review of the post-2000 literature. *J Financ Serv Res 36*, 87–110.

Du, K. & Sim, N. (2015). Mergers, acquisitions, and bank efficiency, Cross-country evidence from emerging markets. *Research in International Business and Finance, 36*, 499-510, https, //doi.org/10.1016/j.ribaf.2015.10.005

Farrell, M., (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society,* Series A, 120, 253–281.

Financial stability report for the Republic of North Macedonia in 2018. (2019). National Bank of the Republic of North Macedonia. Available at, https, //www.nbrm.mk/content/Regulativa/%D0%A4%D0%A1%D0%A0_2018.pdf

Financial stability report for the Republic of North Macedonia in 2019. (July 2020). National Bank of the Republic of North Macedonia. Available at, https, //www.nbrm.mk/content/%D0%A4%D0%A1%D0%A0_2019.pdf

Fotova Čiković, K. & Cvetkoska, V. (2017). Efficiency of the Macedonian banking sector, A non-parametric approach. *CEA J. Econ*., 12, 17–26.

Fotova Čiković, K. & Fotov, R. (2015). Consolidation of the banking sector in Macedonia, effects and benefits. In, *Economic Recovery in The Post-Crisis Period -Proceedings from International Conference*, Skopje, Ss. Cyril and Methodius University in Skopje, Faculty of Economics - Skopje, edited by Filipovski, V., 262-277.

Gardijan, M. & Škrinjarić, T. (2015). Equity portfolio optimization, A DEA based methodology applied to the Zagreb Stock Exchange. *Croatian Operational Research Review, 6* (2), 405-417. https, //doi.org/10.17535/crorr.2015.0031

Gattoufi, S., Al-Muharrami, S. & Al-Kiyumi, A. (2009). The impact of mergers and acquisitions on the efficiency of GCC banks. *Banks and Bank Systems, 4* (4).

Halkos, G.E., Matousek, R. & Tzeremes, N.G. (2016). Pre-evaluating technical efficiency gains from possible mergers and acquisitions, evidence from Japanese regional banks. *Rev Quant Finan Acc, 46*, 47–77. https, //doi.org/10.1007/s11156-014-0461-5

Jemrić, I. & Vujčić, B. (2002). Efficiency of Banks in Croatia, A DEA Approach, *Comparative Economic Studies, 44* (2-3), 169-193, https, //doi.org/10.1057/ces.2002.13

Klopp, G., (1985). *The analysis of the efficiency of production system with multiple inputs and outputs*. Ph.D. Thesis, (Chicago, University of Illinois at Chicago, Industrial and Systems Engineering College).

Le, T. (2017). The efficiency effects of bank mergers, An analysis of case studies in Vietnam. Risk governance & control, *Financial markets & institutions, 7*(1), 61-70. https, //doi.org/10.22495/rgcv7i1art8

Maletić, R., Kreća, M. & Maletić, P. (2013). Application of DEA methodology in measuring efficiency in the banking sector. *Economics of Agriculture 60* (4), 843-855

Micajkova, V. & Poposka, K. (2013). Efficiency of Macedonian banks, A DEA approach. *Res. J. Financ. Account* 4, 141–149.

Naumovska, E. & Cvetkoska, V. (2014). Measuring the efficiency of the banking sector in the Republic of Macedonia. *Annu. Collect. Fac. Econ. Skopje*, 49, 221–238.

Naumovska, E. & Cvetkoska, V. (2016). Efficiency of the Macedonian banking sector. *Yugosl. J. Oper. Res., 26*, 317–329.

NBRNM - National Bank of The Republic of North Macedonia 2021. Report on Risks in The Banking System of The Republic of North Macedonia in 2020. Available at, https, //www.nbrm.mk/content/Regulativa/Godisen_BS_31_12_2020_ENG.pdf (accessed November 21, 2021)

Pavković, A., Cesarec, A. & Stojanović, A. (2018). Profitability and efficiency of the Croatian banking sector, impact of bank size. *Int. J. Trade and Global Markets, 11*(4), 243–258.

Peykani, P., Saen, R.F., Esmaeili, F.S.S. & Gheidar-Kheljani, J. (2021). Window data envelopment analysis approach, A review and bibliometric analysis. *Expert Systems. 38*, e12721, 1-25. https, //doi.org/10.1111/exsy.12721

Popovici, A. & Turliuc, D. (2014). The effects of cross-border bank mergers and acquisitions on the productivity of credit institutions. *CrossCultural Management Journal, 16* (1), 157-167.

Popovici, A., (2014). The impact of mergers and acqusitions on the market value of shares of Erste Bank Group. *Timisoara Journal of Economics & Business, 7*(1), 102–112.

Rabar, D. (2010). Ocjenjivanje efikasnosti poslovanja hrvatskih bolnica metodom analize omeđivanja podataka. *Ekonomski pregled, 61* (9-10), 511-533

Reda, M. (2013). The effect of mergers and acquisitions on bank efficiency, Evidence from bank consolidation in Egypt. *Working Paper 770. The Economic Research Forum*.

Repkova, I. (2014). Efficiency of the Czech Banking Sector Employing the DEA Window Analysis Approach. *Procedia Economics and Finance, 12*, 587-596

Simar, L. & Wilson, P. (2000). A general methodology for bootstrapping in non-parametric frontier models. *Journal of Applied Statistics 27*(6), 779-802. https, //doi.org/10.1080/02664760050081951

Sindi, S.M., Noordin, B.A., Hisyam, N. & Kamarudin, F. (2017). Assessing the effect of mergers and acquisitions on banks price efficiency, Evidence from banking sectors in Middle East & North Africa (MENA) region. *International Journal of Economic Research 14,* 1-17.

Sparkasse Macedonia (2021). Official Website Notification. https://sparkasse.mk/PrisoedinuvanjeEN.aspx (Accessed November 11, 2021)

Sufian, F. & Kamarudin, F. (2016). Determinants of efficiency in the Malaysian banking sector, Does bank origins matter? *Intellectual Economics, 10*(1), 38-54.

Vitezić, N., Šegota, A. & Setnikar Cankar, S. (2016). Measuring the efficiency of public health services by DEA. *International Public Administration Review, 14* (4), 27-48. https://doi.org/10.17573/ipar.2016.4.02

Welten, M. (2017). *The performance effects of mergers and acquisitions on U.S. banks*. Master thesis. Tilburg University.