sciendo

ECONOMIC THEMES (2023) 61(2): 197-214

DOI 10.2478/ethemes-2023-0010

IMPACT OF INCOME AND ASSETS DIVERSIFICATION ON BANK PERFORMANCE IN SERBIA

Jelena Radojičić

University of Niš, Faculty od Economics, Republic of Serbia

✉ *jelena.radojicic@eknfak.ni.ac.rs*

Srđan Marinković

University of Niš, Faculty od Economics, Republic of Serbia

✉ *srdjan.marinkovic@eknfak.ni.ac.rs*

UDC 336.71 (497.11)

Original scientific paper

Abstract: The paper explores the relationship between the diversification of bank activities and a set of bank performance indicators by running multiple regression on panel data set of 22 operating banks in Serbia in the time period spanning the last 15 reporting years. We have found a positive influence of the degree of diversification, measured both by income composition and earning assets composition indicators, on the levels and stability of the banks' return on equity. For ROA-related performance measures the relationship is not conclusive. We have also tested whether the presence of COVID-19 crisis challenged the observed regularity and confirmed that it has had tendency to reverse the long-term relationship.

Received: 25.01.2023
Accepted: 20.06.2023

Keywords: bank profitability, income diversification, assets diversification, noninterest income, COVID-19

JEL classification: G21.

1. Introduction

Diversification can be understood as a business strategy that involves entering a new business area in order to reduce risk and improve profitability. In banking, diversification is most often defined as functional combining the activities of commercial banking, investment banking, insurance and other financial services (Baele et al., 2007). By diversifying its activities, the bank enriches its sources of

income, so functional diversification is often measured indirectly through income diversification (Mercieca et al., 2007). Income diversification can be analyzed in terms of total operating income (when focusing on the share of interest income and non-interest income) and individual groups of income (usually focusing on the structure of non-interest income) (Sanya & Wolfe, 2011). Non-interest income primarily consists of fees and commissions, as well as trading income. Thus, the bank's income diversification should indicate a shift from traditional lending activities to a variety of non-interest income activities. An increase of non-interest income in banks' income structure is connected with the application of new technologies in banking operations and increasing competition on the financial market. At the same time, lending still remains an important activity in banking operations, and the specific combination of various banking activities shapes the banks' financial performance. The benefits that diversification brings to banks are reflected in economies of scale and economies of diversification, which improve the overall performance. Combining different business activities can result in synergy on both expenses and income side. For example, high profitability may be the result of more efficient use of human resources, technology and information. A theoretical framework for the analysis of the impact of diversification on bank performance is the modern portfolio theory, which represents an analytical approach to the selection and management of the portfolio of securities. Banking activities are viewed as a portfolio (such as a portfolio of securities), and diversification, as a strategy that can reduce the overall portfolio risk. Achieving the desired risk reduction will depend on the correlation of income from different operating activities. In the case of a lower level of correlation of interest and non-interest income, diversification of activities will have a greater impact on risk reduction. Indirect measurement of the diversification of bank activities through the income structure faces certain limitations because banks traditionally earn a relatively stable income from fees and commissions from their traditional banking services. In order to overcome this limitation, the asset structure of banks can be analyzed. Similar to the widely accepted dichotomy of bank income, where it is divided into interest and non-interest income, bank assets are divided into two basic categories, loans and other earning assets. Asset diversification, in terms of these other earning assets, is a reflection of non-traditional banking activities.

This paper investigates how diversification of income and assets affects the bank performance in Serbia, more precisely bank profitability and the risk return trade off. The COVID-19 pandemic declared by the World Health Organization on March 11th, 2020 was a shock to the financial sector globally. The pandemic caused an economic crisis and put pressure on banks' lending activity. Low interest rates, by narrowing the net interest margin and compromised ability to repay loans, may further negatively affect the profitability of traditional bank lending activity (OECD (2021)). Bearing in mind the negative impact of the pandemic on the banking sector, it is justified to investigate whether banks in Serbia benefited from the diversification under the COVID-19 pandemic. The paper is organized as

follows. Section 2 provides an overview of the relevant literature. Section 3 gives the research methodological framework. The results of the empirical research are presented in Section 4. The final part of the paper summarizes the conclusions.

2. Literature review

The empirical literature on the impact of income diversification on bank performance is inconclusive. Although some studies find a positive impact of diversification on bank performance. Baele et al. (2007) confirm the benefits of diversification and find that diversified European banks are characterized by lower idiosyncratic and overall risk. The results of this study also show that income diversification has a positive impact on the long-term value of banks. Analyzing income diversification of Italian banks, Chiorazzo et al. (2008) find a positive relationship between non-interest income and risk-adjusted bank performance. Elsas et al. (2010) find strong evidence that diversification improves bank profitability in different countries (USA, Canada, Australia and some European countries). Edirisuriya et al. (2015) investigate the impact of diversification strategy of Australian banks and find that the expanded range of financial products of Australian banks improves their performance.

Some studies do not confirm the positive impact of diversification on bank performance. Stiroh and Rumble (2006) find evidence of diversification benefits in the US financial holding companies, but these benefits do not offset the costs of increased exposure to volatile activities and call this the "dark side of diversification". Mercieca et al. (2007) examine the benefits of diversification for small banks in European countries and show that an increase in non-interest income is negatively related to bank performance. Lepetit et al. (2008) show that a higher share of fees and commission income is associated with lower margins of European banks and confirm that higher non-interest income is associated with higher risk.

Gambacorta et al. (2014) examined almost 100 internationally active banks, and found a non-linear correlation between income diversification and bank profitability, i.e. diversification positively correlates with profitability only to a certain degree. Sanya and Wolfe (2011) examined a sample of more than 200 banks from 11 developing countries and concluded that the diversification of total income, as well as diversification within interest and non-interest income, reduced insolvency risk and increased bank profitability. Meslier et al. (2014) found out that that turning to non-interest activities in developing countries increased bank profits and risk-adjusted profits. Nisar et al. (2018) found out that that the increased diversification into non-interest income sources improved profitability and stability of South Asian banks. Wang and Lin (2021) showed that income diversification could be beneficial for banks in developing countries, while it had no significant effect on bank risk in developed economies.

Certain studies focused on the benefits of diversifying banking activities in crisis conditions. Demirgüç-Kunt and Huizinga (2010) examined the implications of diversification and funding sources of banks from 101 countries in the period before the global financial crisis. They concluded that the diversification of non-interest activities generated benefits for banks in the form of high profitability and slight risk reduction. Kok et al. (2016a) discovered that income diversification in the period before the global financial crisis (2002-2007) was associated with a higher risk of bank failure. With the onset of the crisis, more diversified banks showed better performance and lower bankruptcy risk compared to banks that depended on a single line of business. Pham et al. (2021) suggested that income diversification improved bank performance without increasing risk. However, during the financial crisis, the diversification of assets and sources of funding helped in reducing risk, while the banks with income diversification faced a higher risk. Ochenge (2022) discovered that banks that diversified their sources of income tended to be more profitable and financially stable. It was particularly noted that the reliance on non-interest sources of income acted as an economically important shock absorber in times of declining profits, such as was the case of the COVID-19 pandemic. Lee et al. (2021) found out a positive effect of income diversification on profitability and risk for the US banks during the Covid-19 pandemic.

3. Methodology

The research is based on the annual data in banks' balance sheet and profit and loss statements, which banks regularly submit to the NBS. The analysis covers the time period from 2007-2021. The research includes 22 banks in the Republic of Serbia that operated in the observed period. The banks that were established as a result of mergers and acquisitions were considered as one entity that operated during the observed period. One bank that operated on the market for a relatively short time (less than 5 years) was omitted from the sample. In this way, a data set with 321 observations was created.

3.2. Model specification

The models used in the research are based on the assumption that banks' profitability and risk-adjusted profitability depend on their income diversification and asset diversification. The models used in the regression analysis (Fixed Effect Model, Random Effect Model) are generally given as

$$Y_{i,t} = \alpha_i + \beta_1 DIV_{i,t} + \beta_2 K_{i,t}\mu_i + \sum_{j=1}^{k} \beta_j X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

and

$$Y_{i,t} = \beta_1 DIV_{i,t} + \beta_2 K_{i,t}\mu_i + \sum_{j=1}^{k} \beta_j X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (2)$$

where Y is the dependent variable (measures of profitability and risk), α is regression constant (free term), β is regression coefficient, DIV represents indicators of diversification, K represents indicators of direction of diversification, X represents control variables, *i* represents units of observation and *t* time period, μ_i is deviation value of α_i from the common constant α (individual effects), ε is the error value.

Tables 3 and 4 show the results of the models, the adequacy of which is confirmed by diagnostic tests (F-test, Breusch-Pagan LM test and Hausman test).

3.2. Variable description

3.2.1. Dependent variables

The following profitability indicators are used to measure profitability: return on assets (ROA) and return on equity (ROE). Indicators are calculated on the basis of data taken from banks' balance sheet and profit and loss statements, by dividing annual profit before tax with total assets and equity. These traditional profitability indicators do not take into account the risk level that accompanies returns. For this purpose, risk-adjusted profitability measures are used (Mercieca et al., 2007; Chiorazzo, et al. 2008; Sanya & Wolfe, 2011).

Risk-adjusted return on assets (RAROA) and risk-adjusted return on equity (RAROE) are calculated as

$$\mathrm{RAROA}_{i,t} = \frac{\mathrm{ROA_{i,t}}}{\sigma\mathrm{ROA_i}} \quad (3)$$

$$\mathrm{RAROE}_{i,t} = \frac{\mathrm{ROE_{i,t}}}{\sigma\mathrm{ROE_i}} \quad (4)$$

where $\mathrm{RAROA}_{i,t}$ and $\mathrm{RAROE}_{i,t}$ are risk-adjusted ROA and ROE profitability measures for bank *i* in year *t*, and $\sigma\mathrm{ROA_i}$ and $\sigma\mathrm{ROE_i}$ standard ROA and ROE deviations for the bank *i* over the entire observed period [1...T].

3.2.2. Measures of diversification

Herfindahl-Hirschman Index (HHI) concept indicators are used to measure the degree of functional diversification (Herfindahl Hirschman Index) (HHI) (Stiroh & Rumble, 2006; Mercieca et al., 2007; Chiorazzo et al., 2008; Elsas et al., 2010; Sanya & Wolfe, 2011). Since HHI is a measure of concentration, the lower the

index, the greater the degree of diversification of banking activities. In order to avoid the reverse logic of interpretation, the measures of diversification are used, obtained by subtracting the value of HHI from 1 (Stiroh & Rumble, 2006; Chiorazzo et al., 2008).

The first measure of diversification, DIVincome, is based on the division of banks' net operating income into two components: net interest income and net non-interest income. Net interest income is the difference between interest income and interest expense. Net interest income is the result of performing traditional lending-deposit activities. Net non-interest income is the difference between operating income and net interest income. Net operating income has not been adjusted for net income/expenses based on indirect write-offs of placements and provisions.

To measure operating income diversification, DIVincome is created for bank *i* in year *t* as follows

$$\mathrm{DIVincome}_{\mathrm{i,t}} = 1 - \left[\left(\frac{interest\ income\ _{i,t}}{operating\ income_{i,t}} \right)^2 + \left(\frac{non - interest\ income_{\mathrm{i,t}}}{operating\ income_{i,t}} \right)^2 \right] \quad (5)$$

The higher the DIVincome, the higher the degree of income diversification. DIVincome can go from 0 to 0.5. If the value of net interest income and net non-interest income is equal, there is a complete diversification. In that case, DIVincome equals 0.5. If all income is interest-only or non-interest-only, then the value of DIVincome is 0 and indicates a complete absence of diversification.

The consequence of using the net value of income is to face losses in the balance sheet items of certain income categories. The negative values of non-interest income lead to illogical values of DIVincome, i.e. negative values occur even though the lowest value can be 0. In order to solve this problem without excluding data from the analysis, negative values of DIVincome are transformed to 0. Nguyen, Vo, & Nguyen (2015) apply this adjustment. More specifically, if net non-interest income is negative (when the ratio of net interest income/operating income is greater than 1) then its value in the formula is 0 (that is, the share of interest income is 100%). The economic logic underlying this value adjustment in the case of negative non-interest income is that higher net interest income brought operating income.

Another measure of DIVassets diversification is based on the structure of earning assets, which includes loans, investments of all types, interest earning deposits, etc. The need to use the asset diversification arises due to the shortcomings of income-based measure (Laeven & Levine, 2007): (1) lending operations can also bring income from fees, so income-based measure can overestimate the extent to which banks engage in non-lending activities and (2) accurate measurement of diversification of activities based on income is difficult due to the unavailability of gross data on non-interest income.

The share of loans in earning assets reflects the degree of banks' reliance on traditional lending operations. The second component of DIVassets is the share of other earning assets in total earning assets. Other earning assets are the difference between the value of earning assets and the value of loans. DIVassets as a measure of earning asset diversification for bank *i* in year *t* is obtained as follows:

$$\text{DIVassets}_{i,t} = 1 - \left[\left(\frac{loans_{i,t}}{earning\ assets_{i,t}}\right)^2 + \left(\frac{other\ earning\ assets_{\ i,t}}{earning\ assets_{t,t}}\right)^2\right] \quad (6)$$

DIVincome and DIVassets, as diversification measures, follow the same econometric problem. These indicators show the degree of diversification of banking activities, but do not point to the direction of diversification, that is, the activity the bank focuses on. For example, the two extreme cases (net non-interest income/net operating income) = 0 and (net non-interest income/net operating income) =1 give the same value of DIVincome. With that in mind, it is necessary to include with each DIV variable (as a measure of the degree of diversification) the corresponding indicator that indicates the direction of diversification (and is a component of the DIV indicator) (Sanya & Wolfe, 2011).

In the case of DIVincome, it is the ratio of net non-interest income and net operating income (NII). In the case of DIVassets, it is the ratio of other earning assets and total earning assets (OEA). High values of NII and OEA indicate a greater reliance of banks on non-traditional banking activities that bring non-interest income.

3.2.3. Control variables

The control variables are used to reflect the specific bank characteristics and their strategic choices to ensure that possible independent effects on profitability and risk do not affect the primary relationship under investigation. The following control variables are selected based on the existing literature dealing with the diversification in banking (Stiroh & Rumble, 2006; Mercieca et al., 2007; Chiorazzo et al. 2008; Demirgüç-Kunt & Huizinga, 2010; Sanya & Wolfe, 2011.; Li et al., 2021.; Ochenge, 2022.; Le et al., 2022.):

1. SIZE indicates the bank size. The natural logarithm of total assets is used as a proxy of bank size.
2. GROWTH is the growth rate of total assets. The growth of assets may indicate a high risk appetite of the management.
3. LOANS represent the ratio of loans to total bank assets. LOANS reflect how much the bank is involved in traditional activities, and it serves to control the differences in the structure of asset portfolio. It should be noted that this indicator cannot be interpreted as an alternative indicator of banks' reliance

on interest income, because other parts of assets, in addition to loans, can generate that type of income as well (e.g. bonds) (Sanya & Wolfe 2011).

4. E/A is the ratio of equity to total assets. The level of equity indicates the degree of financial leverage in banks, that is, the level of security of banking operations.
5. LLP represents the ratio of loan loss provisions to total assets (Li et al., 2021). Due to the unavailability of data on gross loans for all observed periods, the value of total assets in the banks' balance sheets is used. LLP is used as an indicator of loan quality.
6. C/I (cost to income ratio) is an indicator obtained by dividing fixed non-interest expenses (overheads) and operating income. C/I ratio measures the banks' operational efficiency.
7. NIM is the net interest margin and is obtained as the ratio of net interest income and earning assets. NIM reflects the bank's interest rate policy.
8. DEPOSITS represent the ratio of deposits to total assets. This variable reflects the bank's funding strategy.

The dummy variable COVID is added to differentiate the year of the COVID-19 pandemic (dummy variable taking a value of 1 in 2020 and 0 otherwise). COVID*DIVincome and COVID*DIVassets are used to examine whether the impact of diversification on bank performance changed during the pandemic, i.e. whether banks benefited from diversification under pandemic conditions (Le et. al, 2022., Ochenge, 2022.)

Table 1 provides a summary of all variables used in the respective regression models.

We estimate models to investigate how income and asset diversity affects bank performance. We test the following hypotheses*:*

H_1: Income diversification has a positive effect on return on assets and risk-adjusted return on assets.

H_2: Income diversification has a positive effect on return on equity and risk-adjusted return on equity.

H_3: Asset diversification has a positive effect on return on assets and risk-adjusted return on assets.

H_4: Asset diversification has a positive effect on return on equity and risk-adjusted return on equity.

H_5: The COVID-19 pandemic influences the relationship between diversification and bank performance (profitability and risk-adjusted profitability).

Table 1 Variable description

	Variable	***Symbol***
Dependent Variables		
Profitability	Return on assets	ROA
	Return on equity	ROE
Risk-adjusted profitability	Risk adjusted-return on assets	RAROA
	Risk adjusted-return on equity	RAROE
Independent Variables		
Diversification	Income diversification	DIVincome
	Net non-interest income/net operating income	NII
	Asset diversification	DIVassets
	Other earning assets/total earning assets	OEA
Control variables		
Bank size	Natural logarithm of total assets	SIZE
Bank growth	Growth rate of total assets	GROWTH
Asset structure	Ratio of loans to total assets	LOANS
Credit quality	Ratio of loan loss provisions to total assets	LLP
Capitalization	Ratio of equity to total assets	E/A
Efficiency	Operational efficiency	C/I
	Net interest margin	NIM
Funding strategy	Ratio of deposits to total assets	DEPOSITS
COVID-19		
COVID Dummy	COVID*DIVincome, COVID*DIVassets	

4. Results and discussion

4.1. Descriptive statistics

The research included 22 banks in the Republic of Serbia that operated in the observed period. Only one bank that operated on the market for a relatively short time (less than 5 years) was omitted. In the case of mergers and acquisitions of banks, it was assumed that the banks were established as a result of these transactions are their continuing business structures. In this way, a data set with 321 observations was created.

Table 2 presents descriptive statistics of the selected dependent and independent variables for banks in Serbia in the period from 2008 to 2021.

Table 2 Descriptive statistics of variables

	Mean	St. Dev.	Minimum	Maksimum	N
ROA	0.00135	0.04006	-0.25264	0.20947	321
ROE	0.00163	0.19071	-1.61715	0.48269	321
RAROA	0.04492	1.33422	-8.41335	6.97565	321
RAROE	0.01176	1.37393	-11.64959	3.47700	321
DIVincome	0.39868	0.10471	0.00000	0.59806	321
NII	0.34477	0.24079	-0.17551	3.11841	321
SIZE	7.77630	0.58034	6.22854	8.87249	321
GROWTH	0.13377	0.27589	-0.99541	2.42322	300
LOANS	0.59682	0.14171	0.11413	0.85248	321
LLP	-0.01573	0.05633	-0.88306	0.22019	321
E/A	0.21308	0.09354	0.07487	0.68018	321
C/I	0.96749	1.82502	-2.81618	26.15560	321
NIM	0.05269	0.02751	0.01240	0.19238	321
DEPOSITS	0.67457	0.16153	0.03425	0.90646	321
DIVassets	0.33932	0.14019	0.00000	0.50000	321
OEA	0.26523	0.15907	0.00000	0.84128	321

Source: Author's calculations

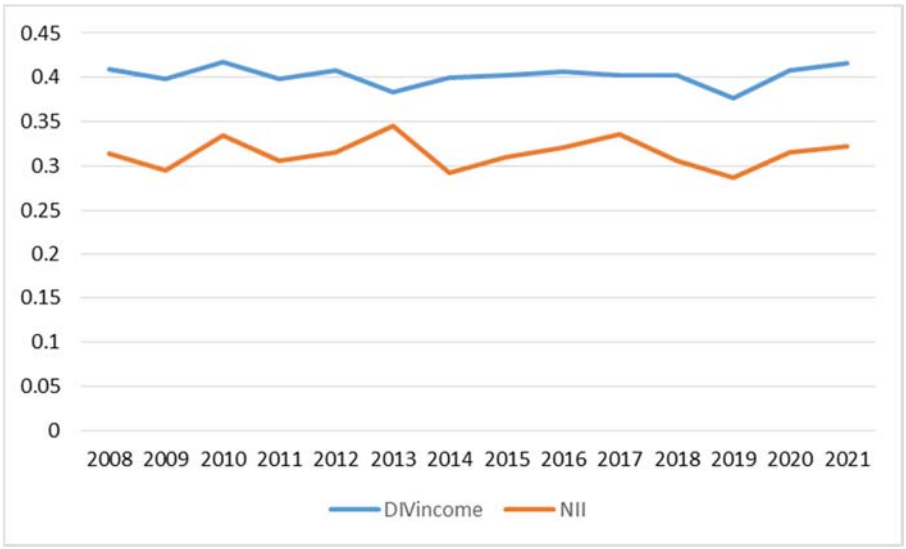
The mean value of income diversification (DIVIncome) is 0.40 (SD=0.10). Given that the maximum value of this indicator is 0.50, the obtained mean value of this variable indicates a relatively high degree of net income diversification. The variation of DIVincome values is slightly smaller at bank level (SD=0.07) than over time (SD=0.08). Standard deviation points to the similarity of the applied income diversification strategies of the banks in the sample. DIVincome does not show whether banks are more focused on interest or non-interest activities. The mean value of net non-interest income/net operating income (NII) is 0.34 (SD=0.24) and shows that the majority of income comes from traditional lending activities (on average, interest income makes up 66% of operating income. The variation of the results is smaller at bank level (SD= 0.12) than in time (SD=0.21).

The mean value of asset diversification (DIVassets) is 0.34 (SD=0.14). This result indicates that banks, to a certain degree, focus on one or two subcategories covered by this indicator (loans and other earning assets). The variation of the results is smaller at bank level (SD=0.09) than over time (SD=0.11). The mean value of the share of other earning assets/total earning assets (OEA) is 0.27 (SD=0.16), and the variation of the results is smaller at bank level (SD=0.10) than over time (SD=0.13). This leads to the conclusion that the largest part of banks'

earning assets is loans. This is in accordance with the results and conclusions obtained when observing banks' income diversification.

The simultaneous presentation of the mean value time series of DIVincome and NII (Figure 1) enables a clearer understanding of the degree and direction of diversification of bank activities in Serbia. When the value of NII is already at a high level, its increase does not lead to a greater diversification of interest activities, but to a decrease in diversification due to the growing concentration of income on only one subcategory (in this case, it is non-interest income). However, it should be noted here that the high values of NII in banks in Serbia mostly are the result of high negative net non-interest income, which lead to a negative net operating income, than the higher positive net non-interest income. Similarly, the decrease in the value of NII, which was at a high level, increases income diversification (in the direction of interest income).

Figure 1 Average degree of net income diversification and average share of net non-interest income in operating income in banks in Serbia

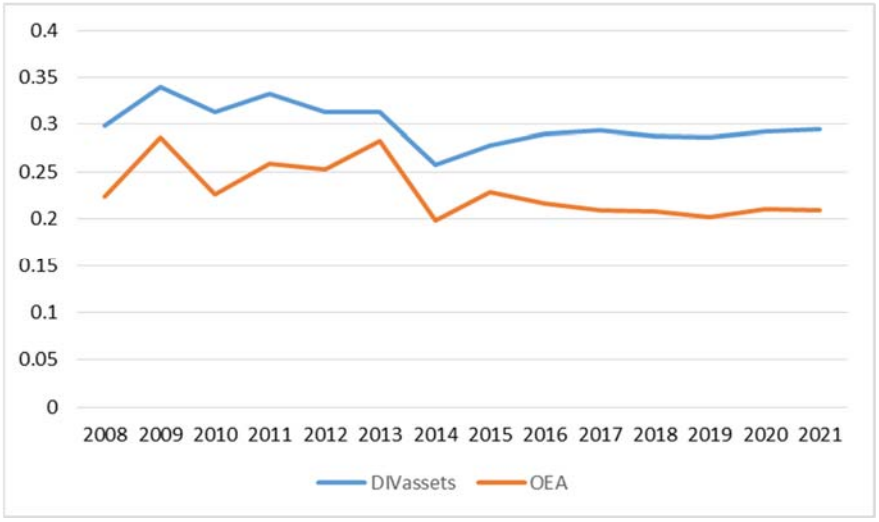


Source: Author's calculations

The mean value trend of OEA in Figure 2 shows that the share of other earning assets in total earning assets is lower than the share of loans in total earning assets during the entire observed period.

Given that loans are the dominant part of earning assets, the increase in the share of other earning assets leads to a greater diversification of earning assets. Rather close alignment of time series patterns of mean DIVassets and mean OEA confirms this. In this case, the greater diversification of earning assets indicates the banks' departure from traditional lending activities.

Figure 2 Average degree of diversification of earning assets and the average share of other earning assets in total earning assets in banks in Serbia



Source: Author's calculations

4.3. Empirical Results

Table 3 presents the panel regression estimation results on the effect of bank income diversification on profitability and risk-adjusted profitability. In order to check the impact of income diversification (DIVincome), the impact of the Covid pandemic, (COVIDDIVincome), net non-interest income/net operating income ratio (NII) on ROA, ROE, RAROA, RAROE, we test a separate model for each dependent variable. To assess the impact of predictor variables on ROA, a fixed-effect model (FE robust) is chosen, with the support of the Breusch-Pagan LM ($\chi2(1)$=38.94; p=0.00) and the Hausman test ($\chi2(11)$ =21.56; p=0.03). To assess the impact of predictor variables on ROE, a fixed-effect model (FE robust) is chosen, with the support of the Breusch-Pagan LM ($\chi2(1)$= 50.47; p=0.00) and the Hausman test ($\chi2(11)$ =19.96; p=0.05). To assess the impact of predictor variables on RAROA, a fixed-effect model (FE robust) is chosen, with the support of the Breusch-Pagan LM ($\chi2(1)$= 38.94; p=0.00) and the Hausman test ($\chi2(11)$=21 .56; p=0.03). To assess the impact of predictor variables on RAROE, a fixed-effect model (FE robust) is chosen, with the support of the Breusch-Pagan LM ($\chi2(1)$= 50.47; p=0.00) and the Hausman test ($\chi2(11)$ =19.96; p=0.05).

The estimated regression coefficients for DIVincome are positive but not statistically significant in models (1) and (3), where the relationship with ROA and RAROA s tested. Thus, hypothesis H1, which assumed a positive relationship between those variables, cannot be confirmed. When other variables are constant (with respect to the control variables), the relationship between income

diversification and ROE and RAROE is positive and statistically significant (at a significance level of 5%). This shows that banks in Serbia benefit from income diversification, thus confirming hypothesis H2. The variable COVID*DIVincome is statistically significant in all models in Table 3 and negatively affects ROA, ROE, RAROA and RAROE (at the 5% significance level), which indicates a negative effect of income diversification on bank profitability and risk during the COVID-19 pandemic. This confirms that the COVID-19 pandemic has affected the ratio of income diversification and bank performance in Serbia.

Table 3 Effects of income diversification on profitability and risk-adjusted profitability

	ROA	ROE	RAROA	RAROE
	(1)	(2)	(3)	(4)
(C)	-0,547 [0,314] (0,096)	-2,919 [-3,19] (0,001)***	18,208 [10,454] (0,096)	-21,027 [9,100] (0,031)**
DIVincome	0,339 [0,205] (0,114)	1,075 [0,507] (0,046)**	11,290 [6,843] (0,114)	7,748 [3,650] (0,046)**
COVID* DIVincome	-0,068 [0,025] (0,014)**	-0,179 [0,064] (0,011)**	-2,253 [0,843] (0,014)**	-1,288 [0,462] (0,011)**
NII	-0,048 [0,114] (0,678)	0,177 [0,314] (0,578)	-1,592 [3,785] (0,678)	1,274 [2,255] (0,578)
SIZE	0,047 [0,038] (0,232)	0,280 [0,139] (0,058)*	1,575 [1,280] (0,232)	2,016 [1,003] (0,058)*
GROWTH	0,026 [0,030] (0,405)	0,041 [0,084] (0,630)	0,853 [1,003] (0,405)	0,298 [0,609] (0,630)
LOANS	0,226 [0,127] (0,090)	0,724 [0,308] (0,029)**	7,526 [4,233] (0,090)	5,217 [2,222] (0,029)**
LLP	-1,391 [0,178] (0,000)***	-6,881 [0,960] (0,000)***	-46,333 [5,934] (0,000)***	-49,067 [6,918] (0,000)***
E/A	0,008 [0,105] (0,940)	0,439 [0,306] (0,167)	0,267 [3,487] (0,940)	3,162 [2,208] (0,167)
C/I	0,002 [0,006] (0,772)	-0,049 [0,035] (0,174)	0,059 [0,201] (0,772)	-0,351 [0,250] (0,174)
NIM	-0,474 [0,804] (0,562)	-0,069 [1,984] (0,973)	-15,785 [26,791] (0,562)	-0,496 [14,291] (0,973)
DEPOSIT	-0,065[0,046] (0,170)	-0,236 [0,151] (0,133)	-2,170 [1,526] (0,170)	-1,701 [1,087] (0,133)
R^2	0,586	0,806	0,586	0,884
Test	F(11, 21)=66,56	F(11, 21)=74.58	F(11, 21)=66,56	F(11, 21)= 74.58
p	0,000	0,000	0,000	0,000
Wooldridge	F(1, 21)=13,73, p=0,001	F(1, 21)=19,51, p=0,000	F(1, 21)=13,73, p=0,001	F(1, 21)=19,51, p=0,000
Wald	$\chi^2(22)$= 12148.67; p=0,000	$\chi^2(22)$= 8803.17; p=0,000	$\chi^2(22)$= 12148.67; p=0,000	$\chi^2(22)$= 8803.17; p=0,000
F test	F(21, 267)=4.75; p=0,000	F(21, 267)=5.46; p=0,000	F(21, 267)=4,75; p=0,000	F(21, 267)=5.46; p=0,000

Notes: The statistical significance is at 1%, 5%, and 10% and is denoted by ***, **, and * respectively.
Source: Author's calculations

The relationship between LLP and measures of profitability and risk in estimated models is negative and statistically significant (at the 1% level), which indicates that high ratio of loan loss provisions to total assets, i.e. lower loan quality, worsens bank performance. There is also a positive influence of the share of loans in total assets (LOANS) on return on equity and risk adjusted-return on equity.

Table 4 presents the panel regression estimation results on the effect of bank asset diversification on profitability and risk-adjusted profitability. Due to the high correlation between LOANS and OEA, the control variable LOANS was omitted from the analysis, in order to avoid the problem of multicollinearity. The existence of serial autocorrelation is tested using the Wooldridge test for autocorrelation in panel data.

To assess the influence of predictor variables on ROA, a random effect model was used (Cross-sectional time-series FGLS regression), with the support of the Breusch-Pagan LM ($\chi2(1)=61.95$; p=0,00) and the Hausman test ($\chi2(11)=16.88$; p=0,077). To assess the influence of predictor variables on ROE, a random effect model (Cross-sectional time-series FGLS regression), with the support of the Breusch-Pagan LM ($\chi2(1)=113.60$; p=0,00) and the Hausman test was used ($\chi2(11)=9.88$; p=0,451).). To assess the impact of predictor variables on RAROA, a random effect model (Cross-sectional time-series FGLS regression) is chosen, with the support of the Breusch-Pagan LM ($\chi2$ (1) = 40.79; p=0.00) and the Hausman test ($\chi2(11)= 16.88$; p=0,077). To assess the impact of predictor variables on RAROE, a random effect model (Cross-sectional time-series FGLS regression) is chosen, with the support of the Breusch-Pagan LM ($\chi2(1)= 113.60$; p=0,00) and the Hausman test ($\chi2(11)= 9.88$; p=0,451).

The results in Table 4 do confirm the assumed positive impact of asset diversification on ROE and RAROE. The estimated regression coefficients for DIVassets are positive and statistically significant in models (6) and (8), which shows that banks that diversify earning assets achieve benefits in terms of profitability and risk (at a significance level of 1%), which confirms hypothesis H5. At the 10% significance level, DIVassets positively affects both ROA and RAROA. OEA is statistically significant in all models and has a negative effect on the observed dependent variables. This shows that, by itself, the reduction of the share of loans in total earning assets (i.e. the increase in the share of other earning assets) is not favorable for bank performance in Serbia. However, if this leads to a greater degree of diversification of earning assets (which depends on the existing level of diversification), then it can be beneficial for the level and stability of the return on equity of banks. Variable COVID*DIVassets is not statistically significant in all 4 models; therefore, the impact of the COVID-19 pandemic on the relationship between diversification and bank performance has not been proven.

Table 4 Effects of diversification of earning assets on profitability and risk-adjusted profitability

	ROA	ROE	RAROA	RAROE
	(5)	(6)	(7)	(8)
DIVassets	0.005 [0.003] (0.078)*	0.123 [0.030] (0.000)***	0.177 [0.100] (0.078)*	0.884 [0.213] (0.000)***
COVID*DIVassets	-0.002 [0.001] (0.126)	-0.004 [0.010] (0.695)	-0.051 [0.033] (0.126)	-0.028 [0.072] (0.695)
OEA	-0.008 [0.004] (0.035)**	-0.115 [0.034] (0.001)***	-0.259 [0.123] (0.035)**	-0.832 [0.244] (0.001)**
SIZE	0.001 [0.000] (0.280)	0.006 [0.005] (0.160)	0.018 [0.016] (0.280)	0.047 [0.033] (0.160)
GROWTH	0.001 [0.001] (0.168)	0.015 [0.007] (0.033)**	0.034 [0.024] (0.168)	0.107 [0.05] (0.033)**
LLP	-0.978 [0.01] (0.000)***	-4.496 [0.089] (0.000)***	-32.566 [0.325] (0.000)***	-32.389 [0.639] (0.000)***
E/A	0.01 [0.004] (0.004)***	-0.078 [0.037] (0.033)**	0.345 [0.120] (0.004)***	-0.563 [0.263] (0.033)**
CII	-0.059 [0.001] (0.000)***	-0.269 [0.009] (0.000)***	-1.965 [0.034] (0.000)***	-1.935 [0.066] (0.000)***
NIM	0.275 [0.011] (0.000)***	1.269 [0.114] (0.000)***	9.161 [0.368] (0.000)***	9.141 [0.818] (0.000)***
DEPOSITS	-0.002 [0.001] (0.118)	0.014 [0.010] (0.159)	-0.061 [0.039] (0.118)	0.103 [0.073] (0.159)
_cons	0.041 [0.004] (0.000)***	0.149 [0.039] (0.000)***	1.36 [0.132] (0.000)***	1.073 [0.283] (0.000)***
Test	$\chi^2(10)$=15360.02	$\chi^2(10)$=4883.62	$\chi^2(10)$=15360.02	$\chi^2(10)$=4883.62
p	0,000	0,000	0,000	0,000
Wooldridge	F(1,21)=26.379; p=0,000	F(1,21)=16.667; p=0,000	F(1,21)=26.379; p=0,000	F(1,21)=16.667; p=0,000
BP/CW	$\chi^2(1)$=4344.29; p=0,000	$\chi^2(1)$=1998.46; p=0,000	$\chi^2(1)$=4344.29; p=0,000	$\chi^2(1)$=1998.46; p=0,000
F test	F(21,267)=5.10; p=0,000	F(21,267)=6.39; p=0,000	F(21,267)=5.10; p=0,000	F(21,267)=6.39; p=0,000

Notes: The statistical significance is at 1%, 5%, and 10% and is denoted by ***, **, and * respectively.
Source: Author's calculations

When all other variables in the models are constant, the GROWTH variable is statistically significant in a models (6) and (8) in Table 4 (at the 5% significance level), which means that a higher growth rate of the bank's total assets is associated with higher ROE and RAROE. Net interest margin (NIM) has a positive impact on all observed bank performance measures (at the 1% significance level). Poorer loan quality (LLP) and lower operational efficiency (C/I) have a negative impact on profitability and risk measures in all estimated models (at a significance level of 1%). When all other variables in the model are constant, the variable E/A (higher share of equity in assets) is positively related to ROA and RAROE, while it has a negative effect on ROE and RAROE.

5. Conclusion

This paper examines the relationship between the diversification of bank activities and bank performance looking at a sample of 22 operating banks in Serbia in the period from 2007 to 2021. The impact of income diversification and earning assets on the rate and stability of return on assets has not been confirmed; however, the research results have shown that the greater degree of diversification, both in terms of income and earning assets, leads to higher and more stable return on equity. It can be concluded that banks in Serbia that diversify their activities to a greater extent benefit from diversification. However, it turns out that what in normal conditions gives an advantage to diversified banks, in crisis conditions, caused by the COVID-19 pandemic, has the opposite effect. Income diversification during the COVID-19 pandemic has had a negative impact on bank performance, i.e. on all observed and risk-adjusted profitability measures. It could be that already weak credit demand in the ambience of low credit rates in the crisis period further worsened, which forced banks to search for non-interest income sources (largely by increase of fees and commissions) in order to compensate. It increased a share of NII (Figure 1) together with a decrease in performance, making income diversification inversely related to the performance in the crisis year.

References

Baele, L., De Jonghe, O., & Vander Vennet, R. (2007). Does the stock market value bank diversification? *Journal of Banking & Finance*, 31(7), 1999–2023.

Chiorazzo, V., Milani, C., & Salvini, F. (2008). Income Diversification and Bank Performance: Evidence from Italian Banks. *Journal of Financial Services Research*, 33(3), 181–203.

Demirgüç-Kunt, A., & Huizinga, H. (2010). Bank activity and funding strategies: The impact on risk and returns. *Journal of Financial Economics, 98* (3), 625-650.

Edirisuriya, P., Gunasekarage, A., & Dempsey, M. (2015). Australian Specific Bank Features and the Impact of Income Diversification on Bank Performance and Risk. *Australian Economic Papers , 54* (2), 63-87.

Elsas, R., Hackethal, A., & Holzhäuser, M. (2010). The Anatomy of Bank Diversification. *Journal of Banking and Finance*, 34, 1274–1287.

Gambacorta, L., Scatigna, M., & Yang, J. (2014). Diversification and bank profitability: a nonlinear approach. *Applied Economics Letters, 21* (6), 438-441.

Laeven, L., & Levine, R. (2007). Is There a Diversification Discount in Financial Conglomerates? *Journal of Financial Economics*, 85, 331–367.

Le, T.T., Nguyen, Q.A., Vu, T.M.N., Do M.P. & Tran, M.D. (2022). Impact of income diversification on the default risk of Vietnamese commercial banks in the context of the COVID-19 pandemic, *Cogent Business & Management*, 9:1, DOI: 10.1080/23311975.2022.2119679

Lepetit, L., E. Nys, P. Rous, & A. Tarazi. (2008). The expansion of services in European banking: Implications for loan pricing and interest margins. *Journal of Banking & Finance*, *32*, 2325–2335.

Li, X., Feng, H., Zhao, S., & Carter, D. A. (2021). The effect of revenue diversification on bank profitability and risk during the COVID-19 pandemic. *Finance Research Letters*, 43, 101957. DOI: 10.1016/j.frl.2021.101957

Mercieca, S., Schaeck, K., & Wolfe, S. (2007). Small European banks: Benefits from diversification? *Journal of Banking & Finance*, 31(7), 1975–1998.

Meslier, C., Tacneng, R., & Tarazi, A. (2014). Is bank income diversification beneficial? Evidence from an emerging economy. *Journal of International Financial Markets, Institutions and Money*, 31, 97–126.

Nguyen, T. C., Vo, D. V., & Nguyen, V. C. (2015). Risk and Income Diversification in the Vietnamese Banking System. *Journal of Applied Finance & Banking*, 5(1), 99-115.

Nisar, S., Peng, K., Wang, S., & Ashraf, B. N. (2018). The impact of revenue diversification on bank profitability and stability: Empirical evidence from south Asian countries. International Journal of Financial Studies, 6(2), 40

Ochenge, Rogers (2022). The effect of revenue diversification on bank profitability and stability during the COVID-19 Pandemic: Evidence from Kenya, *KBA Centre for Research on Financial Markets and Policy Working Paper Series, No. 59*, Kenya Bankers Association (KBA), Nairobi.

OECD (2021). The COVID19 crisis and banking system resilience: Simulation of losses on nonperforming loans and policy implications. OECD Paris.

Pham, D. K., Ngo, V. M., Nguyen, H. H., & Le, T. L. V. (2021). Financial crisis and diversification strategies: the impact on bank risk and performance. *Economics and Business Letters*, 10(3), 249–261.

Sanya, S. and S. Wolfe, 2011. Can banks in emerging economies benefit from revenue diversification? *Journal of Financial Services Research*, 40(1): 79-101

Sanya, S., & Wolfe, S. (2011). Can Banks in Emerging Economies Benefit from Revenue Diversification? *Journal of Financial Services Research*, 40(1-2), 79–101.

Stiroh, K. J., & Rumble, A. (2006). The dark side of diversification: The case of US financial holding companies. *Journal of Banking & Finance*, 30(8), 2131–2161

Wang, C. & Lin, Y. (2021). Income Diversification and Bank Risk in Asia Pacific. *The North American Journal of Economics and Finance*, 57 (2): 101448. DOI: 10.1016/j.najef.2021.101448.

UTICAJ DIVERZIFIKACIJE PRIHODA I AKTIVE NA PERFORMANSE BANAKA U SRBIJI

Apstrakt: U radu se istražuje odnos između diverzifikacije bankarskih aktivnosti i seta indikatora performansi banaka, primenom višestruke regresije na skup panel podataka 22 banke koje su poslovale u Srbiji u vremenskom periodu koji obuhvata poslednjih 15 izveštajnih godina. Utvrdili smo pozitivan uticaj stepena diverzifikacije, merenog indikatorima strukture prihoda i prinosne aktive, na nivoe i stabilnost prinosa na kapital. Za mere učinka koje se odnose na prinos na aktivu banaka, zaključak nije konačan. Takođe smo testirali da li je prisustvo COVID-19 krize uticalo na uočenu regularnost i potvrdili da ona ima tendenciju da preokrene dugoročne relacije.

Ključne reči: profitabilnost banke, diverzifikacija prihoda, diverzifikacija aktive, nekamatni prihod, COVID-19

Authors' biographies

Jelena Radojičić is an Assistant Professor at the Faculty of Economics, University of Niš, where she teaches Financial system and financial institutions, Financial markets, Banking management, Banking and Global banking. She is the author or co-author of numerous papers published in scientific journals and conference proceedings. Her main research interests include bank efficiency, financial regulation and financial stability.

Srđan Marinković is a Full Professor at Faculty of Economics, University of Niš, Serbia. He has been employed at the Faculty of Economics since 1995. His main fields of research interests are finance, financial markets and banking. He teaches courses at the Undergraduate level – Bank management and Financial markets, and the Master level – Microstructure of financial markets.