NAVIGATING THE STORM: ASSESSING THE IMPACT OF COVID-19 AND DIGITIZATION ON BANKING PERFORMANCE IN WESTERN BALKAN COUNTRIES

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Abstract

Purpose: The purpose of the study is to assess the impact of both external factors, such as the COVID-19 pandemic, and internal factors, such as digital transformation, on the productivity and sustainability of banks in the Western Balkans.

Methodology: Among the methods used were the analytical method, the statistical method, the functional method, the deduction method, the synthesis method, and the comparison method.

Findings: For a comprehensive assessment of the financial performance of the banking system in six countries in the Western Balkans, three key variables were used – return on assets, return on equity, and non-performing loans. To emphasize the impact of the COVID-19 pandemic on the results of the banking system, the indicator of the number of registered cases of COVID-19 was used. To emphasize the impact of digitization, indicators such as the number of automated teller machines (ATMs) and point of sale (POS) terminals were included and accounts in the electronic banking system.

Originality: The study analysed the combined impact of digitization and the crisis caused by the COVID-19 virus on the performance of the banking system in the Western Balkans using three regression models.

Keywords: digital sustainability, financial productivity, electronic banking services, economic impact, regression models

JEL index: G21, O33, I18.

Introduction

COVID-19 has significantly affected the global economy, including the Western Balkans (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia). The banking industry is being completely transformed by digitalization, which is also having a big impact on it. While this process of changing banks' operating frameworks presents them with new issues in the areas of cybersecurity and information protection, it also opens up a lot of chances for innovation and growth. Banks believe they have a duty to address sustainability at the same time, which includes coordinating their financial objectives with moral and environmental ones (Baula & Liutak, 2023). The banking sector in the Western Balkan countries has recently undergone a number of changes. There are similarities among the banking systems of the Western Balkan nations. First, these systems can be characterized as still young. Second, these systems are still in the early stages of development, even though there are banks offering basic financial services and specialist banks to meet import and export demands (Kholodna & Popova, 2022).

According to Morina and Osmani (2019), most of the banking systems of the Western Balkans countries are under foreign control, even if the share of foreign ownership may vary between these countries. The main trend is that parent banks from the countries of the West and Northern Europe either acquired young or privatized local banks or created new banking institutions from scratch.

Following Tmava et al. (2019), the banking sector of the Western Balkan countries has undergone a process of digital transformation and modernization, introducing new technologies and methods to improve the efficiency and effectiveness of their activities. At the same time, recognition of the importance of sustainable development in the banking sector has increased as financial institutions try to align their activities with the main principles of sustainable growth (Prymostka & Kysil, 2023). Research by Citaku et al. (2023) shows that the global pandemic of COVID-19 had a negative impact on the functioning of banks as well as on other service industries. All banks in the countries of the Western Balkans were forced to limit the provision of financial services. Credit risk is a common rationale for denying financial services in these countries. The COVID-19 situation has led to physical distancing and other government restrictions that have affected operations and services (Sraieb et al., 2022).

In their research, Stakić et al. (2021) emphasize that financial technologies (fintech) are one of the most effective strategies for providing services at a distance. Financial technologies have great potential for creating innovations in this area, which lead to the emergence of new business models, applications, processes, and products that are implemented in financial markets, in financial institutions, and in the provision of financial services (Al-Rubaye, 2020; Kutsevych et al., 2020; Kovalska et al., 2023). Fotova Čiković et al. (2023) emphasize that the global health crisis has highlighted the need for a digital infrastructure so that financial institutions, particularly banks, can quickly provide their products and services. The largest increase in electronic transactions was observed due to mobile

restrictions and government recommendations to reduce the use of cash due to its health hazards.

In general, the development of technologies, in particular digitalization, leads to deep transformations in the banking industry not only in the Western Balkans but also in the whole world. The purpose of this study is to study the significant changes in the banking sector of the Western Balkan countries caused by the process of digitization and the coronavirus. These changes include innovation, opportunities for expansion and changes in the operational framework of banking institutions.

1. Literature Review

The use of digital technologies and internet platforms to offer a variety of banking services to clients is known as "digital banking". It includes all of the exchanges and interactions that formerly happened in real bank branches but are now done online via computers, cell phones, and other electronic devices. Digital banking encompasses a range of services that can be accessed via websites, mobile applications, or online banking portals, including monitoring account balances, moving money, paying bills, applying for loans, managing investments, and more.

The term "digital sustainability" refers to a relatively new phenomenon in the banking industry that combines sustainable development with digital transformation. There are currently insufficient scientific studies examining the effects of this concept on financial performance, particularly in Western Balkan countries. Nonetheless, there are a few noteworthy studies that provide insight into different facets of this subject. The global COVID-19 pandemic has brought attention to how crucial digital infrastructure is to banks' and other financial institutions' quick service delivery (Kubiczek & Derej, 2021). Digital financial services are now widely used as a result of the pandemic, particularly in underdeveloped nations.

Demirgüç-Kunt et al. (2021) noted that central banks and governments required banks to better absorb economic shocks, which affected their profitability and overall efficiency. In line with these challenges, banks are prioritizing digital transformation to improve productivity and customer engagement. Research that concerns the Western Balkans includes an analysis of the implementation of fintech in Albania in the work of Voka and Ruxho (2022). These studies show the influence of the political consequences of institutional reforms on the adoption of financial technologies in the country and indicate innovations in the Internet banking of Albanian banks, but they also note the need to improve online payment and online shopping processes. Dojçe and Dishnica (2022) explored the impact of digitalization on society and privacy, focusing on a specific bank in Albania, VKT. They found that technological advances have changed lifestyles and services, emphasizing the importance of quality design and service management.

In Kosovo, Sadiku (2019) investigated digitalization and customer satisfaction, pointing

out the need for continuous modernization of bank systems to meet growing expectations for digital services. Veseli-Kurtishi et al. (2020) investigated the impact of digitalization on customer satisfaction in North Macedonia and indicated the need to improve the user experience and offer more favourable prices for electronic banking services. Research by Balla (2020) characterizes the digitalization of financial services in Albania and emphasizes the role of financial technologies in facilitating financial innovation, which leads to new business models and electronic transactions. Research by M.R. Marcu (2021) shows a comparison of banks' strategies during complex crises, drawing parallels between the financial crisis of 2008-2009 and the COVID-19 pandemic, pointing to the acceleration of digital transformation. In Montenegro, Jankovic (2020) emphasized the importance of digital banking and modernization, especially in mobile banking applications. Attention is focused on the importance of the development of modern technologies in the field of banking, in particular mobile applications, which allow customers to perform banking operations quickly and conveniently using their smartphones. A study by Naeem and Ozuem (2021) shows the role of social media in the transition to online banking during the pandemic and reveals an increase in the adoption of online banking, especially for important transactions.

Overall, the studies that have been reviewed show the importance of developing the relationship between digital transformation, sustainability and financial performance in the banking sector, with a particular focus on the countries of the Western Balkans. Together, these studies contribute to the growing body of knowledge on this issue and reveal the challenges and opportunities for financial institutions in the region.

2. Materials and Methods

This study employs a quantitative research methodology, including statistical and analytical methodologies, to evaluate the effects of the COVID-19 pandemic and digitization on the banking industry in Western Balkan nations. This data covers the banking sector of the Western Balkan countries for six years, from 2017 to 2022. It was obtained from publicly available reports, official websites of various countries, and public databases such as the International Monetary Fund (IMF) and the World Bank. To assess the impact of crises caused by the pandemic and the process of digital transformation on the financial activities of banks, a set of variables was selected that effectively reflect the studied phenomena (Table 1).

Table 1. Variables reflecting the situation in the banking sector

Variables	Source
Return on Assets (ROA) (%)	IMF
Return on Equity (ROE) (%)	IMF
Non-Performing Loans (NPL) from the Total Number of Loans (%)	IMF
Automated Teller Machines (ATM)	The World Bank
Point of Sale (POS) Terminals	The World Bank
Number of Credit Cards (CC)	Annual Report of the International Monetary Fund of Each Country
Debit Card (DC) Count	Annual Report of the International Monetary Fund of Each Country
Electronic Banking (Number of Accounts in Electronic Banking)	Annual Report of the International Monetary Fund of Each Country
Total Number of Coronavirus Cases (COV_tc)	Worldometer Database

Source: developed by the author based on International Monetary Fund (2023); World Bank Open Data (2023); Worldometer (2023).

To highlight the impact of the COVID-19 pandemic on banking systems, the number of reported cases was included as a variable in the analysis. A study of the combined impact of digitization and the crisis caused by the COVID-19 virus on the performance of the banking systems of ten countries in Central and Eastern Europe was conducted. In this study, three regression models were used, each of which was based on a specific equation to assess the relationship between the specified factors. The models were developed to highlight the impact of digitalization and the pandemic on the performance of the banking system in the countries of the Western Balkans.

$$Y_{it} = \beta_0 + \beta_1 X_{1t} + \cdots + \beta_i X_{it} + \varepsilon_{it}, \quad (1)$$

where: Y – dependent variable that can be ROA, ROE or NPL and is used to characterize the performance of the banking system; X – independent variable that can be ATM, POS, CC, DC, IB and is used to characterize the digitalization process in the banking system, as well as COV_tc, which is used to characterize the pandemic crisis; $\beta_{0,1..i}$ – associated variable coefficients; t – time period; ε – regression standard error.

Conducting scientific research on the study of banking activity was carried out using methods that revealed the content of the object. The analytical method was used to examine a large volume of data and information related to the financial performance and activities

of banks in the Western Balkans from 2017 to 2022. This made it possible to thoroughly examine the ways in which banks responded to the crises caused by COVID-19 and digital transformation. The banking system was viewed by the functional method as a framework with certain roles and responsibilities. This approach made it possible to ascertain how the use of digital instruments, such as cards and online banking, affects the productivity and operations of local banks.

The statistical method was used to quantify the relationships between variables and assess the significance of the results. Statistical analysis techniques such as regression modeling, correlation analysis, and hypothesis testing are applied. In order to assess how the pandemic and digitization affected important banking performance metrics, regression models were created.

With the deduction method, reason and logic were used to determine how internal and external forces, such as digitization and COVID-19, have changed the banking sector. The synthesis method helped to merge several analysis facets into a comprehensive picture of the ways in which digital sustainability is influencing the banking industry in the Western Balkans. With the comparative method, it was possible to identify commonalities and contrasts in the ways that Western Balkan countries address contemporary difficulties. A comparison of their banking systems was conducted, which emphasized areas that needed improvement as well as best practices. As a result, these actions were applied to consider the feasibility of increasing banking activity for the successful development of countries (Sliusar & Prikhodko, 2022).

3. Results

3.1 Banking Productivity Dynamics

To obtain a comprehensive understanding of the financial performance of banking systems in six Western Balkan countries, three key variables were analysed – ROA, ROE and NPL. These variables were used to obtain a broad perspective on the overall health and performance of the banking sectors in the Western Balkan countries. Figures 1-3 present the dynamics of the indicated indicators, ROA and ROE, during the period from 2017 to 2021 and NPL until 2022. These figures provide a visual representation of how these important indicators have changed and how they have developed over the specified period.
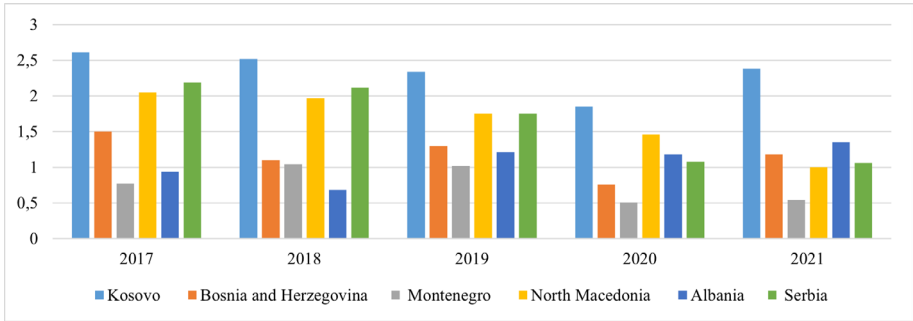
Figure 1. ROA percentage values for the countries of the Western Balkans
Source: developed by the author based on the International Monetary Fund (2023).
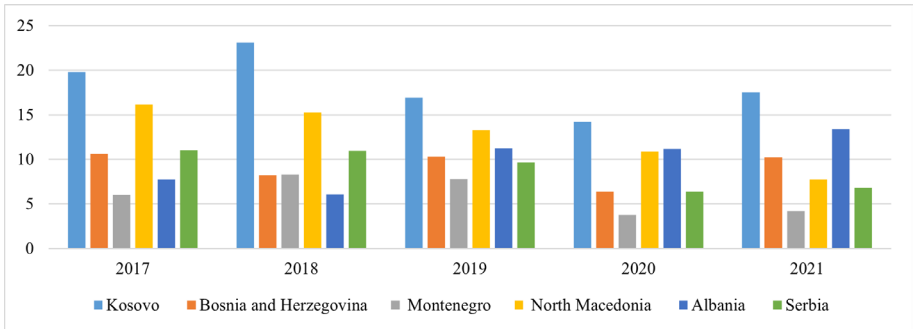
Figure 2. Percentage values of ROE for the countries of the Western Balkans
Source: developed by the author based on the International Monetary Fund (2023).
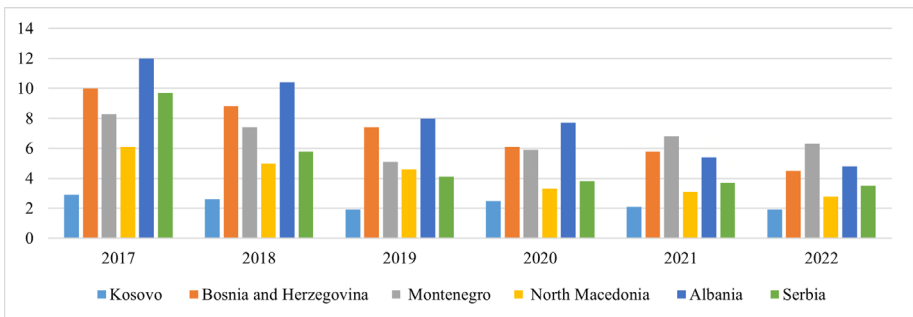
Figure 3. Percentage of NPL in relation to the total amount of gross loans
Source: developed by the author based on the International Monetary Fund (2023).

Kosovo consistently has better ROA values than other regional countries. The country's banking industry has consistently maintained an ROA above 2%. Assets are effectively used for profit. There are many reasons for Kosovo's high ROA. The economy may be strong and growing, which increases the demand for banking services. ROE in Kosovo is one of the highest in the region. The country's banking industry regularly generates returns for shareholders exceeding 14% ROE. A high indicator indicates efficient use of equity capital and profitability relative to shareholders' investments. Bosnia and Herzegovina maintains its ROA at 1.2% despite a slight decline in 2020. This indicates good financial performance and regular a return on assets. The stable ROA in Bosnia and Herzegovina reflects a profitable banking sector. This may be due to prudent lending, asset allocation and cost control by banks. Despite the fluctuations in ROE, Bosnia and Herzegovina has consistently maintained it at over 6%. The decline in 2020 may be related to the economic problems of the banking sector. However, a recovery in 2021 suggests improved profitability and shareholder returns.

Montenegro's ROA in 2021 remained at the level of 0.5, as in 2020. The country's banking industry is resistant to economic downturns. The indicator in Montenegro can be affected by economic cycles and the development of the industry. Economic instability can affect loan repayments and asset quality, which lowers ROA. The connection of the banking sector with tourism and real estate can affect profitability, especially in difficult times. Montenegro's ROE fluctuated, declining in 2020. This suggests that the Montenegrin banking industry has faced particular challenges or risks that have limited shareholder returns. North Macedonia has a moderate ROA of 1% to 2%. Although it is not as stable as Kosovo, the assets support profitability. North Macedonia's stable and growing economy may explain its low ROA. Banks can minimize non-performing loans and maintain asset quality. Stable economic development can be important for the financial industry. North Macedonia's banking industry by ROE is constantly falling. This indicates insufficiently sustainable financial performance, especially in difficult economic times.

Albania has consistently generated returns on its assets, with an ROA level of approximately 1.3%. Albania's stable ROA is linked to prudent banking, economic stability and risk management. Banks can prioritize profitable lending and investments by controlling asset portfolio risks. Albania has a good ROE that regularly exceeds 10%. The country's banks are effectively building equity to generate profits for shareholders, strengthening their finances. Serbia's ROA dropped from 2.2% in 2017 to 1% in 2021, which caused some outrage. The banking sector may need improvements to increase efficiency and profitability. The decline in ROA for Serbia is due to economic or banking problems. Economic downturns or negative phenomena, such as the global financial crisis or local economic problems, harm banks and reduce ROA. Serbia's ROE fell over time but remained close to 6%. This decline may be due to economic or banking problems. To remain competitive, Serbian banks need to improve profitability and efficiency.

These results demonstrate the disparate financial outcomes of the banking sectors in the Western Balkan countries, which are impacted by the state of the economy, obstacles

unique to the business, and cautious banking techniques. Policymakers, banks, and investors can use these insights to better understand the dynamics of the banking sector in the region and to help them make strategic decisions that will affect its future growth.

3.2 Asset Quality Dynamics and Digital Transformation Progress

Albania has had the highest level of NPLs in the region for six years, consistently above 5%. High NPLs in Albania's banking sector may signal problems with credit recovery and asset quality. Policymakers and banks should prioritize this issue and minimize NPLs to improve the financial stability of the sector.

The percentage of NPLs in Serbia decreased but remained high compared to other countries in the region. This suggests that the banking system is managing non-performing loans, but more needs to be done to reduce NPLs and improve asset quality. The percentage of NPLs in Bosnia and Herzegovina is decreasing, indicating a recovery of credit and an improvement in asset quality. The percentage of NPLs remained above 4% in 2022, indicating the possibility of continued work on their management and reduction. The percentage of NPLs in Montenegro has changed over time but remained below 8%. The percentage of NPLs in North Macedonia is decreasing, indicating an improvement in asset quality and credit recovery. The banking industry has reduced NPLs, enhancing financial stability. Kosovo has the lowest NPL percentages in the region, always below 3%. The banking system is robust and well managed, with few non-performing loans.

The financial industry has been affected in several places by the COVID-19 pandemic. Kosovo's ROA and ROE showed stability and efficiency. Albania and Serbia had problems with NPL management, although they improved during the monitoring period. Some countries' banking industries have responded well to the epidemic, while others have struggled with financial performance and risk management. In the period of rapid digitalization, the banking industry has seen a significant transformation, caused by the increased demand for online services amid the COVID-19 pandemic (Borio, 2020; Maziy, 2023). However, despite the apparent movement towards digital banking, a significant segment of the population remains dubious about making these digital decisions. This disagreement can be caused by two key factors.

First, user skills determine the acceptability of digital banking. Some individuals may be sceptical about digital banking due to their lack of Information Technology (IT) skills. Second, outrage over the security of digital services is slowing the adoption of online banking. ATMs, credit cards and online banking are often open to bank fraud, which has increased customer outrage. By finding a balance between embracing digital innovation and ensuring robust security measures, the banking sector can pave the way for a more inclusive and efficient banking experience for all customers (Erkes et al., 2021). Figure 4 presents an analysis of Internet usage in relation to Internet banking. The relationship between the level of Internet use and the adoption of Internet banking services, taking into account the number of accounts, is investigated.
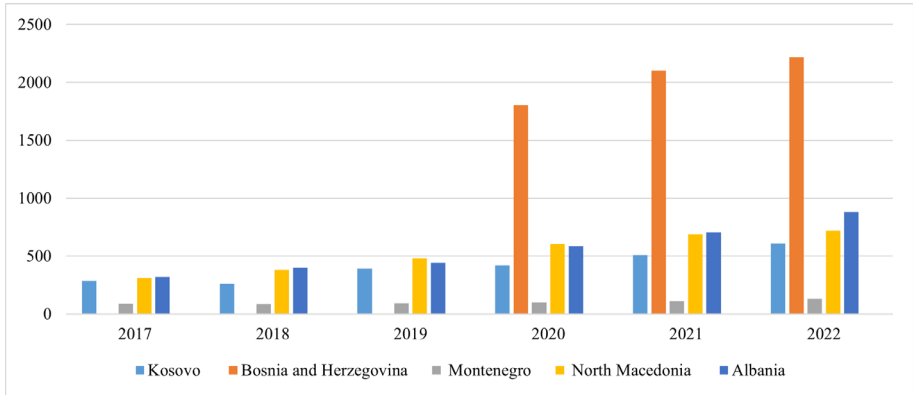
Figure 4. The number of electronic banking accounts, thousands of units
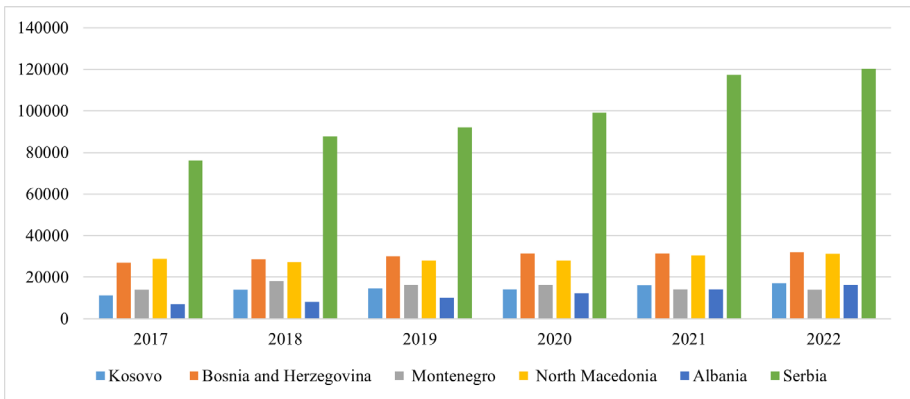*Source: developed by the author based on the International Monetary Fund (2023).*

The number of Internet banking accounts in Bosnia and Herzegovina increased significantly from 2020 to 2022. This indicates a change in customer behaviour in favour of digital banking, mainly influenced by online convenience and security. The use of internet banking has also grown significantly in Kosovo over the years. The sharp growth shows that this country prefers Internet banking. North Macedonia also saw steady growth in the number of Internet banking accounts. This growing trend shows that more and more customers are adopting digital methods. The number of accounts in Albania increased significantly during the period studied, reflecting the transition to digital banking in the country. Montenegro also saw growth in the number of Internet banking accounts, although this happened more slowly than in other countries. The number of accounts has increased with the popularity of digital banking options. Data for Serbia on Internet banking accounts for the years provided is not available.

ATMs and service points were analysed (Figures 5, 6). They provide important insights into the shift towards digitization in the banking industry and society's growing preference for digital transactions over traditional physical visits to bank branches. This trend highlights the growing importance of digital banking solutions to meet the needs and preferences of today's consumers, contributing to greater efficiency, accessibility, and convenience of financial transactions.
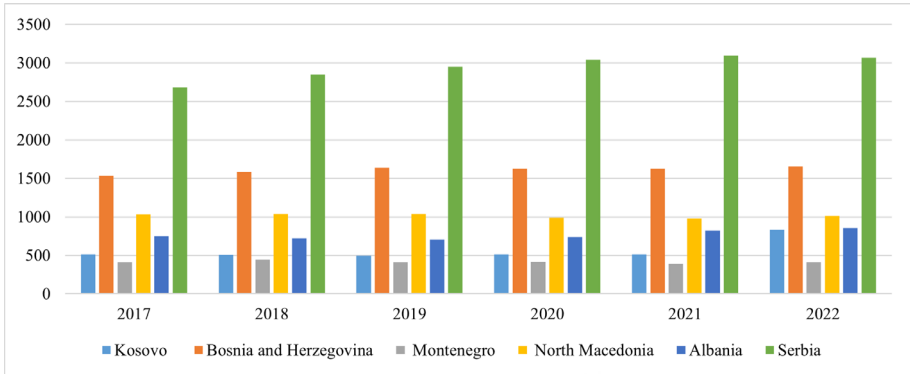
Figure 5. Number of ATMs

Source: developed by the author based on World Bank Open Data (2023).

Figure 6. Number of POS terminals

Source: developed by the author based on World Bank Open Data (2023).

Over the past six years, the number of ATMs in Bosnia and Herzegovina has remained constant with little change. A stable number of ATMs indicates that banks provide adequate cash withdrawal and digital banking services for the country's population. Six years of data show steady growth of POS in Bosnia and Herzegovina. This growth shows a good adaptation to cashless purchases and card payments, reflecting the digital payment infrastructure in the country. The number of ATMs gradually increased in Kosovo. The number of POS terminals also grew steadily. Electronic payments are becoming more popular and modernizing the country's payment network. The number of ATMs in Montenegro peaked in 2018 and decreased to 413 in 2022. Changes may be related to banking tactics, customer choice or digital payment methods. During the studied period, there were changes in POS

terminals in Montenegro. Fluctuations could be caused by market dynamics, economic conditions or consumer choices. In North Macedonia, the number of ATMs has changed little over the past six years. This stability means that banks provide cash withdrawal services consistently and that cash and digital transactions are balanced across the country. The number of POS terminals in North Macedonia also changed little from 2017 to 2022. The well-developed infrastructure of digital payments in the country and the stable demand for electronic payment systems testify to this. The number of ATMs in Serbia has gradually increased over time. Despite the popularity of digital payments, increased customer demand, the expansion of banking services and the need for cash in some locations may explain this trend of growth. POS terminals in Serbia also grew significantly during the observed period. Technology, financial literacy and consumer behaviour are driving cashless transactions, as evidenced by this significant growth. The number of ATMs has increased in Albania. This shows the banks' attempts to improve cash withdrawal and digital banking services for the country's population. Albania has been steadily adding POS terminals. The payment ecosystem in the country is improving every year as companies and consumers adopt electronic payment options.

In general, some countries have had steady growth in the number of ATMs, while others have increased or fluctuated. Observed patterns can be driven by customer choices, digital infrastructure, regulation, and economic conditions. The data indicate a trend toward cashless payments in the Western Balkans region. The popularity and ease of electronic transactions are driving an increase in the number of POS terminals, reducing the use of cash and improving financial efficiency. Tables 2-4 show the relationship between the impact of the COVID-19 pandemic and digitalization on the efficiency of the banking system.

Table 2. Analysis of descriptive statistics

Changeable	Description	Value	Standard
LnNPL	Non-performing loans in a logarithmic scale	-2.98	0.54
ROA	Return on assets	0.02	0.01
ROE	Return on capital	0.12	0.04
LnATM	Number of ATMs in a logarithmic scale	6.65	0.41
LnPOP	Population size in a logarithmic scale	0.54	0.6
LnCC	Number of credit cards in logarithmic scale	11.79	0.85
COVID	Number of cases of COVID-19	$6.4*10^4$	$9.1*10^4$
LnDC	Number of debit cards in logarithmic scale	13.8	0.51
LnIB	The number of electronic banking services in a logarithmic scale	12.73	0.94
LnPOS	Number of POS in logarithmic scale	9.7	0.44

Source: developed by the author.

Table 3. Analysis of the correlation matrix

	LnNLP	ROA	ROE	LnATM	LnPOP	LnCC	COVID	LnDC	LnIB	LnPOS
LnNLP	1									
ROA	-0.62*	1								
ROE	-0.51**	0.97*	1							
LnATM	0.16	-0.24	-0.16	1						
LnPOP	0.01	0.22	0.34	0.7*	1					
LnCC	-0.44**	0.4**	0.46**	0.68*	0.72*	1				
COVID	-0.14	-0.12	-0.18	0.39**	0.21	0.13	1			
LnDC	-0.33	0.27	0.33	0.77*	0.86*	0.94*	0.34	1		
LnIB	-0.16	0.11	0.15	0.8*	0.9*	0.73*	0.53**	0.91*	1	
LnPOS	-0.27	-0.2	-0.23	0.7*	0.14	0.6*	0.37**	0.54*	0.41**	1

*Note: * – statistical significance level p<1%; ** – statistical significance level p<5%.*
Source: developed by the author.

Table 4. Parametric estimates of the model

	ROA model		ROE model		Ln NPL model	
	Coefficient	Probability (significance)	Coefficient	Probability (significance)	Coefficient	Probability (significance)
Constant – β0	0.2648	0.0140**	2.0721	0.0135**	-5.7942	0.3360
LnATMit	-0.0126	0.0634***	-0.0901	0.0852***	2.0816	0.0001*
LnPOPit	0.0042	0.5895	0.0692	0.2634	0.4361	0.3702
LnCCit	0.0184	0.0006*	0.1322	0.0010*	-1.0008	0.0015*
COVIDit	$2.45*10^{-8}$	0.0630***	$2.18*10^{-7}$	0.0366**	$-2.24*10^{-7}$	0.7684
LnDCit	-0.0302	0.0222**	-0.2034	0.0428**	1.3745	0.0782***

*Note: * – statistical significance level p<1%; ** – statistical significance level p<5%; *** – statistical significance level p<10%.*
Source: developed by the author.

The deployment of online and mobile banking, point-of-sale terminals, and payment cards is all on the rise, which is indicative of an acceleration of the digital transformation. By doing this, banks are able to adapt to changing customer demands. In certain voucher areas, expanding digital and card-based services carries a greater risk of defaults and debt, necessitating close risk management and monitoring. Banks in the Western Balkans must take a proactive stance toward responsible lending and cautious digital innovation in order to promote sustainable growth and preserve financial stability. Tailored legislative measures will be required to tackle the unique digital banking obstacles in every nation.

3.3 Insights from ROA, ROE, and NPL Models

The form of the equation of the ROA model:

$$ROA_{it} = 0.2648 - 0.0126 LnPOP_{it} + 0.0184 LnCC_{it} + 2.45 * 10^{-8} COVID_{it} - 0.0302 LnDC_{it} + $$
$$+0.0049 LnIB_{it} - 0.0035 LnPOS_{it} + u_{it}. \quad (2)$$

This model is statistically significant (with a significance level of $p<1\%$) according to Fisher's test and has a good level of coefficient of determination, accounting for approximately 74% of the variation in ROA. ROA has a negative and statistically significant relationship (with a significance level of $p<10\%$) with the number of ATMs. If the number of ATMs increases by 1%, this will lead to an expected decrease in the ROA of the banking system in the region of 0.01%. The negative relationship between ROA and the number of ATMs means that, on average, as the number of ATMs increases, the profitability of the banking system in the Western Balkans decreases. In other words, the more ATMs there are, the less profitable banks in the region become. For every 1% increase in the number of ATMs, the ROA of the banking system in the Western Balkan region is expected to decrease by 0.01%.

ROA has a positive and statistically significant relationship (with a significance level of $p<1\%$) with the number of credit cards. If the number of credit cards increases by 1%, this leads to an expected average increase in the ROA of the banking system in the region of 0.02%. The positive relationship between ROA and the number of credit cards means that, on average, as the number of credit cards increases, the profitability of the banking system in the Western Balkans should also increase. Credit cards typically generate interest income for banks through the interest rates charged on the outstanding balance. With the increase in the number of credit cards, banks have a larger customer base with debt, which leads to increased interest income and helps to increase profitability.

ROA has a positive and statistically significant relationship (with a significance level of $p<10\%$) with the number of cases of infection with COVID-19. Despite the positive relationship, the degree of influence is practically zero. The positive relationship between ROA and the number of cases of COVID-19 suggests that, on average, as the number of cases increases, the profitability of the banking system in the Western Balkans region should also increase. ROA has a negative and statistically significant relationship (with a significance level of $p<5\%$) with the number of debit cards. If the number of debit cards increases by 1%, it will reduce the ROA of the banking system in the region by 0.03%. The negative relationship indicates that the increase in the number of debit cards is associated with a decrease in the profitability of the banking system in the region. Also, the model shows that in this region there is no statistically significant relationship between ROA and such variables as the population of the states of the region, the number of electronic banking accounts and the number of Value Added Tax (VAT) terminals.

The form of the equation of the ROE model:

$$ROE_{it} = 2.0721 - 0.0901LnATM_{it} + 0.0692LnPOP_{it} + 0.1322LnCC_{it} + 2.18 * 10^{-7}COVID_{it} - \\ -0.2034LnDC_{it} + 0.0062LnIB_{it} - 0.0248LnPOS_{it} + u \quad . \quad (3)$$

This model is statistically significant (with a significance level of p<1%) by Fisher's test and has a good level of coefficient of determination, accounting for approximately 77% of the variation in ROE. ROE has a negative and statistically significant relationship (with a significance level of p<10%) with the number of ATMs. If the number of ATMs increases by 1%, it is expected to reduce the ROE of the banking system in the region by 0.09%. The negative relationship between ROE and the number of ATMs indicates that with an increase in the number of ATMs, the profitability of the banking system, represented by ROE, tends to decrease.

ROE has a positive and statistically significant relationship (with a significance level of p<1%) with the number of credit cards. If the number of credit cards increases by 1%, it is expected to lead to the same increase in the ROE of the banking system in the region by 0.13%. The positive relationship between ROE and the number of credit cards indicates that with an increase in the number of credit cards, the profitability of the banking system, represented by ROE, tends to increase. ROE has a positive and statistically significant relationship (with a significance level of p<5%) with the number of cases of infection with COVID-19. Despite the positive relationship, the degree of influence is practically zero. The positive relationship between ROE and the number of cases of COVID-19 suggests that, on average, as the number of cases of COVID-19 increases, the profitability of the banking system in the Western Balkans region also tends to increase.

ROE has a negative and statistically significant relationship (with a significance level of p<5%) with the number of debit cards. If the number of debit cards increases by 1%, it is expected to reduce the ROE of the banking system in the region by 0.2%. The negative relationship between ROE and the number of debit cards indicates that as the number of debit cards increases, the profitability of the banking system, represented by ROE, tends to decrease. This model shows that in this region there is no statistically significant relationship between ROE and such variables as the population of the states of the region, the number of electronic banking accounts and the number of VAT terminals.

The form of the equation of the NPL model:

$$LnNPL_{it} = -5.7942 + 2.0816LnATM_{it} + 0.4361LnPOP_{it} - 1.0008LnCC_{it} + (-2.24) * \\ * 10^{-7}COVID_{it} + 1.3745LnDC_{it} - 0.9692LnIB_{it} - 0.6077LnPOS_{it} + u \quad . \quad (4)$$

This model is statistically significant (with a significance level of p<1%) according to Fisher's test and has a very high level of coefficient of determination, accounting for approximately 91% of the variation in NPL. NPL has a positive and statistically significant relationship (with a significance level of p<1%) with the number of terminals. If the number of terminals increases by 1%, it is expected to lead to an average growth of the NPL of

the banking system in the region of 2.08%. The positive relationship between NPL and the number of terminals indicates that with an increase in the number of terminals, the level of non-performing loans in the banking system, as represented by NPL, tends to increase. An increase in the number of terminals may be a reflection of an expanding economy, leading to increased borrowing and consumption. However, an expanding economy may also lead to riskier lending practices and possibly higher levels of NPLs.

NPL has a negative and statistically significant relationship (with a significance level of p<1%) with the number of credit cards. If the number of credit cards increases by 1%, it is expected to reduce the NPL of the banking system in the region by 1%. The negative relationship between NPL and the number of credit cards indicates that as the number of credit cards increases, the level of non-performing loans in the banking system, as represented by NPL, tends to decrease. NPL has a positive and statistically significant relationship (with a significance level of p<10%) with the number of debit cards. If the number of debit cards increases by 1%, this is expected to lead to an average increase in NPLs in the banking system in the region of 1.37%. The positive relationship between NPL and the number of debit cards indicates that as the number of debit cards increases, the level of non-performing loans in the banking system, as represented by NPL, tends to increase.

NPL has a negative and statistically significant relationship (with a significance level of p<1%) with the number of internet banking accounts. If the number of internet banking accounts increases by 1%, it is expected to reduce the NPL of the banking system in the region by 0.97%. The negative relationship between NPL and the number of Internet banking accounts indicates that with the increase in the number of Internet banking accounts, the level of non-performing loans in the banking system tends to decrease. The negative relationship may also reflect the ongoing digital transformation in the banking sector, where internet banking accounts are part of a wider shift towards more efficient and technologically advanced banking operations. This model shows that in this region there is no statistically significant relationship between NPL and such variables as the population of the countries in the region, the number of cases of COVID-19 and the number of POS terminals.

Therefore, all three models above were analysed for the presence of regional fixed effects, and it can be observed that there is a steady trend in the behaviour of the independent variables of influence on the studied dependent variables. On the other hand, all three analysed models meet the conditions of a normal distribution of residuals and the absence of serial autocorrelation of residuals. This means that the analysed models can be used for analysis and forecasting in the medium and long term because of their statistically significant explanatory variables.

4. Discussion

There is a clear existence of a weak positive relationship between the levels of infection

of COVID-19 and indicators of banking productivity, such as ROA and ROE. This may seem unexpected, given the anticipated negative economic dynamics during the pandemic (Palamarchuk & Melnyk, 2022). However, it is worth noting that this effect turned out to be statistically insignificant. The main indicators of banking productivity demonstrated a near-independence with the quantity of COVID-19 cases inside the Western Balkans. Perhaps this can be explained by the fact that governments and banks in the region have indeed taken effective measures to reduce the negative impact of the pandemic on the economy and financial stability.

Carbó-Valverde (2017) assessed in his work the impact of digitalization on banking and financial stability. He found a negative relationship between ROA and the number of ATM terminals in the banking sector. This is indicative of the overall trend towards digitization in the banking sector, which is taking place due to the increasing popularity of digital customer service channels such as mobile banking applications and online platforms (Ronzhes, 2023). As a result of this increase, the use of digital services may lead to a decrease in physical ATMs, which, in turn, negatively affects the ROA of banks that have significant exposure to ATM-related services. Comparing this result with the study of the article, it can be established that in both cases, the importance of digital transformation for banking activity and its profitability indicators is confirmed. If the previous study revealed a negative relationship between the number of ATM terminals and ROA, then in another case it was also established that an increase in the number of ATMs negatively affects the profitability indicator of the banking system, namely ROA. This highlights the need for banks to adapt to the digital environment and develop digital products to ensure sustainability and profitability in the face of growing digital competition.

In her work, Romdhane (2021) points out the importance of digital transformation and the impact of information technologies on the banking sector, as well as the impact of the COVID-19 pandemic on this sector. The author analysed the impact of IT and the digital transformation of financial services on the strategy and functioning of the banking sector before the COVID-19 pandemic and highlighted post-pandemic perspectives. According to the results of this study, the pandemic confirms the need to combine physical proximity and digital offerings for banks and that digitalization can be a solution for banks in reducing risks. In contrast to the paper's research, the previous work notes the general impact of digital transformation and digital services on banks' strategy and operations and looks at changes in crisis management in the context of COVID-19 and future perspectives rather than focusing on the specific impacts of digital transformation. Both studies point to the importance of digital transformation for banks, but they approach the topic from different perspectives and examine it in different contexts.

In their work, Baicu et al. (2020) examine the responsible practices that banks use to mitigate the negative consequences of the pandemic, both for their customers and employees and for the community, with a focus on the Romanian banking system. According to the results, the following measures adopted by banks in response to the coronavirus pandemic were identified: reducing the use of cash by supporting digital channels; reducing

financing costs; participation in the program to support small and medium-sized enterprises; flexibility in paying loan instalments; and providing support to the community to combat the spread of the coronavirus. However, their role in financing the real economy and society should be improved by implementing measures that will promote more favourable financial conditions for both companies and individuals. It should be added that banks must continue to adapt to the changing banking environment, especially in connection with the growth of digital technologies and changes in the consumer habits of customers. Comparing the results regarding the impact of digital transformation on banking, it can be seen that in both cases, banks are taking measures to adapt to the changing environment. In Romania, this includes reducing the use of cash and supporting digital channels, and in the Western Balkans, it concerns the impact of digital innovation on banking productivity.

In their research, Barua and Barua (2020) examine the impact of the COVID-19 pandemic on the banking sector in a country that already has problems with NPLs and has a developing economy. According to the study, the pandemic has a variable impact on the banking sector, particularly on aspects such as company value, capital adequacy and interest income. The study points to the COVID-19 pandemic as a factor exacerbating NPL problems in the already troubled banking sector. It should be noted that this work, as well as the research of the article, emphasizes the need to take measures and innovative political measures to prevent a crisis in the banking sector under the conditions of the negative impact of the pandemic or other factors.

Aldasoro et al. (2020) investigated the impact of the COVID-19 pandemic on the banking sector and its results on the stock and debt markets. According to the results of the study, after the outbreak of COVID-19, banks found themselves in a similar situation as after the collapse of Lehman Brothers in 2008. The work focuses on financial markets and identifies how banks react in the stock and bond markets after the outbreak of COVID-19 and how this impact varies depending on banks' profitability and financial condition. Comparing the results, it can be noted that both studies show the influence of external factors on the banking sector, but in different aspects. Both works emphasize the importance of external factors in determining the success of banks and show that banks react differently to changes in financial markets.

In general, according to the results of the previous authors' research, it is clear that the COVID-19 pandemic had a significant impact on the banking sector and financial markets around the world. Some authors point to the general deterioration of banks' financial indicators during the crisis, while others pay attention to the variation of this impact depending on the financial condition and profitability of banks in the era of digitalization. However, the main conclusion is that there are significant obstacles to the stability of the financial system when it comes to external shock occurrences. It is important to respond to changes in financial markets and take strategic measures to ensure the stability and success of banks in a changing environment.

In addition, the swift progress of digitalization necessitates calculated risks and planned adjustments in order to maintain competitiveness over time. Banks that can strike

a balance between increasing efficiency and prudent digital risk-taking will set themselves apart. Leading institutions will be identified by their priorities, which include improving early warning system analytics, using technology to improve risk monitoring, and advocating for responsible fintech solutions with regulators and customers.

5. Conclusions

This study shows the impact of the COVID-19 pandemic on the productivity of banking systems in the countries of the Western Balkans. The paper used a robust regression modelling approach, analysing key performance indicators such as ROA, ROE and NPL as dependent variables. Independent variables were used to determine the level of digitization in banking systems and the impact of the pandemic crisis. The obtained results indicate that with the increase in the number of COVID-19 infections, there is a slight improvement in the performance of banks in terms of ROA and ROE. However, this dependence has minimal practical significance, which means that the number of COVID-19 infections has a negligible effect on the profitability of the banking system in the Western Balkans.

Regarding the impact of digitization, the study found that growing ATM usage was linked to decreasing profitability, which may indicate that customers are switching to online banking. Growing digital transaction volumes and fee income are likely the reasons for the favourable correlation between expanding credit card volumes and ROA and ROE. The study also found that an increase in debit cards and ATMs was associated with increased NPL ratios. On the other hand, declining non-performing loan (NPL) percentages are a result of credit card and online banking usage, which suggests improved digital channel risk management.

These findings have strategic and policy significance for Western Balkan banks, which want to build digital capabilities for the future. Product development should take into account the growing desires of digital customers for cashless payments and mobile apps. Gains in profitability while maintaining financial stability will depend heavily on prudent digital lending directed by good data analytics. In order to assist customers in making wise decisions and maintaining manageable debt levels as new digital offers broaden their market reach, regulators should also encourage "digital financial literacy." In general, the leaders of the banking sector in the Western Balkans will be determined by proactive digital initiatives that are in line with the principles of responsible innovation.

From a practical perspective, the study highlights the importance of digital initiatives for banks in terms of preparing for future unexpected events and improving their productivity and competitiveness. The obtained results provide valuable insights for banking product development departments to design and expand digital products that can contribute to improving the productivity of banking services. However, the study had its limitations due to the lack of data for a longer period of time and differences in the structures of banking systems among the countries studied, which led to heterogeneous results at

the national level. Future research can be directed to confirm these findings by collecting relevant data from other countries to further enrich the understanding of the impact of digitalization on the performance of banking systems in a broader context.

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