

DOES FINTECH AFFECT FINANCIAL INCLUSION IN BALKAN REGION COUNTRIES?

Floriye Miftari *, Lulzim Shabani **, Medain Hashani *

* Faculty of Economics, AAB College, Prishtina, Republic of Kosovo

** Corresponding author, Faculty of Economics, AAB College, Prishtina, Republic of Kosovo

Contact details: AAB College, St. Elez Berisha, No. 56 Fushë Kosovë Industrial Zone 10000, Prishtina, Republic of Kosovo



Abstract

How to cite this paper: Miftari, F., Shabani, L., & Hashani, M. (2024). Does fintech affect financial inclusion in Balkan region countries? [Special issue]. *Journal of Governance & Regulation*, 13(1), 388–395. <https://doi.org/10.22495/jgrv13i1siart12>

Copyright © 2024 The Authors

This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0). <https://creativecommons.org/licenses/by/4.0/>

ISSN Print: 2220-9352
ISSN Online: 2306-6784

Received: 01.06.2023
Accepted: 07.03.2024

JEL Classification: C33, G20, G31, O33
DOI: 10.22495/jgrv13i1siart12

In recent years, the technological revolution and proliferation of financial technology (fintech) have significantly transformed the financial services landscape, potentially addressing gaps in financial inclusion. Fintech is the key driver for financial inclusion (Arner et al., 2020). The purpose of this study is to investigate the effect of fintech on financial inclusion within the Balkan region countries. This research uses a comprehensive analysis of data from different Balkan countries to explore the impact of fintech on financial inclusion. The study uses various econometric models and regression analysis (fixed effects model) to assess the extent to which fintech affects access to banking services, credit availability, and overall financial inclusion within the Balkan region. Using fintech indicators and available global fintech data, we find that the proxy of fintech-digital payment has a positive correlation with financial inclusion in countries of the Balkan region. Findings from this research contribute valuable knowledge to policymakers, financial institutions, and researchers interested in promoting inclusive financial systems in the Balkan region through the strategic integration of fintech solutions.

Keywords: Fintech, Banks, Artificial Intelligence, Digital Payment, Financial Inclusion

Authors' individual contribution: Conceptualization — F.M. and L.S.; Methodology — F.M. and M.H.; Formal Analysis — F.M.; Investigation — L.S. and M.H.; Writing — L.S.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

1. INTRODUCTION

Technological progress has played an essential role in shaping and transforming the financial sector globally, changing the way transactions are carried out, and reshaping the future of finance. Digital technologies are revolutionizing payments, lending, investments, insurance, and other financial products and services, a process that the COVID-19 pandemic has accelerated (Feyen et al., 2023). The impact of financial technology (fintech) in the transformation of the provision of financial services is mainly related to banking services, namely payments and transfers (Sadigov et al., 2020).

The application of fintech in the countries of the Balkan region had its fastest development since the mid-2010s. While the adoption of fintech has

been slower in the Balkan region than in some other regions, the use of fintech has been growing in recent years, driven by several factors, such as the increasing trend of smartphone usage, — the growing adoption of smartphones has made it easier for people to access financial services through mobile banking and digital payment platforms. The regulatory changes — several countries in the Balkan region have implemented regulatory changes to promote fintech, such as creating sandboxes (Serbia, Slovenia, Greece, and Croatia) for fintech startups and introducing regulations to govern digital currencies. Growing demand for financial services in the Balkan region, especially among younger generations who are more tech-savvy and prefer digital channels for banking and payments. The growth of startups in the Balkan

region with more entrepreneurs and investors focusing on fintech startups. The Western Balkan countries witnessed a modest increase in account ownership, rising from 55% in 2011 to 63% in 2017 (Demirgüç-Kunt et al., 2019). The report shows that the percentage of adults with a bank account in the region has increased from 35% in 2011 to 44% in 2017. However, there are still significant inequalities in access to financial services, with rural populations and women being particularly underserved.

Despite the growing interest in fintech in the Balkan region, there are still some challenges to overcome, including high use of cash, especially in the countries of the Western Balkans, such as limited access to financing, low accessibility to payment and information, lack of awareness and understanding of fintech, and regulatory uncertainty. Key regional challenges also include the difficulty for firms and regulators to coordinate operations across small and fragmented markets, within the constraints of complex foreign exchange rules (Odorović et al., 2020).

However, the trend towards greater adoption of fintech is expected to continue, as more people in the region feel comfortable using digital financial services and as fintech startups continue to innovate and grow.

While fintech has the potential to promote financial inclusion, there are also some challenges and risks associated with the technology. The main challenges for the development of fintech in the Western Balkans region include a lack of funding and investment, underdeveloped information and communication technology infrastructure, lack of government and institutional support and regulatory opportunities for fintech innovation, small domestic markets, brain drain, and a lack of skilled workers in the technology space. The main risks of fintech development for this region are consumer financial protection risks arising from new products and business models and cyber security risks (Berg et al., 2020). A risk could also be that fintech could exacerbate existing inequalities if not properly implemented. For example, if fintech companies rely only on alternative data sources, they may inadvertently exclude people without access to digital technologies. Additionally, fintech can also present privacy and data security risks, especially in countries with weak regulatory frameworks.

Fintech is being hailed as a potential solution to the problem of financial exclusion, especially in developing countries. Even the Balkan countries have made important steps in financial inclusion, but there is still a need to do so. The purpose of this research is to explore the effect of fintech on financial inclusion in the countries of the Balkan region and to find out the relationship between fintech and financial inclusion.

This study examines the impact of fintech on financial inclusion in the countries of the Balkan region. Panel data collected from the Global Financial Inclusion database and the World Bank database were used for this research. The analyzed data includes eleven countries of the Balkan region for the years 2011, 2014, 2016, 2017, and 2021. The dependent variable is the financial inclusion index calculated for the eleven countries of the Balkan region. Independent variables are fintech proxies such as mobile banking (using a mobile

phone or internet to make payments, send or receive money using a financial institution account); digital payments (digital payments made or received), and online lending and borrowing (stored at a financial institution or using a mobile money account and borrowing from an official financial institution or using a mobile money account). The control variables in our model are income level, inflation, mobile phone penetration, and internet access.

The results of fixed effects regression analyses revealed that fintech contributes to the expansion of financial inclusion in terms of digital payments and mobile bank account access, while mobile banking payments and online savings have a positive but not statistically significant impact.

The rest of the paper is structured as follows. Section 2 includes reviews of studies on recent developments in fintech, on the benefits and facilitations provided by financial innovations, and on potential barriers affecting financial inclusion. Section 3 describes the methodology used in this study by describing variables and data sources. Section 4 presents the research findings and the discussion of the results of the panel analysis. Section 5 includes conclusions and indicates some questions for future research.

2. LITERATURE REVIEW

The study of fintech and financial inclusion has been a dynamic and evolving field increasing the interest of many researchers to study and investigate the impact of fintech on the efficiency of banking services and the financial inclusion of households, businesses, and all other economic entities. Many studies have focused on the effects, benefits, and barriers of fintech on financial inclusion in developing and developed economies.

Financial inclusion affects financial development and the promotion of economic growth and development of the financial sector is highly dependent on the provision of financial services (Usman et al., 2021; Aniruddh & Kumar, 2021).

Financial technological innovations, commonly known as fintech, are recognized as a factor of financial inclusion. This recognition is underscored by the G20 High-Level Principles for Digital Financial Inclusion (Global Partnership for Financial Inclusion [GPGI], 2016), emphasizing the importance of leveraging fintech's potential to reduce financial exclusion.

Rapid technological developments, such as artificial intelligence, blockchain, cloud computing, big data, etc., have a marked effect on the financial industry by showing a series of so-called "fintech innovations" that have revolutionized the way banks and other financial institutions manage their businesses. Fintech has a huge potential for financial efficiency and inclusion benefits. Fintech innovations are increasingly enabling access to financial services through mobile devices even for many unbanked people (Senyo & Osabutey, 2020). According to Tok and Heng (2022), fintech has a significant positive correlation with digital than traditional measures of financial inclusion. Other research shows that fintech developments have not had any effect on financial inclusion. Ediagbonya and Tioluwani (2023) conclude, that despite various efforts by the government, regulators, and financial

institutions to develop various digital platforms, the financial inclusion gap has expanded. They consider multiple factors that contribute to this gap, including challenges such as illiteracy, inadequate infrastructure, sporadic electricity supply, poor mobile reception in rural areas, persistent bank network failures, unjustified fees, information asymmetry, and data privacy violations, among other issues. Researchers consider that fintech would promote financial inclusion and benefit disadvantaged groups (Breza et al., 2020; Demirgüç-Kunt et al., 2018) by increasing access to financial services for underserved populations. Effective and inclusive financial systems benefit poor people and other disadvantaged groups who can benefit, because in the absence of financial inclusion, poor people have to rely only on their limited savings to invest in their education or to start a business and similar. However, some research, such as those of Donou-Adonsou and Sylwester (2016) and Sukmana and Ibrahim (2018) assess the finance-poverty link and conclude that financial inclusion does not reduce poverty. Also, small enterprises must rely on their own profits to pursue promising growth opportunities. This could contribute to persistent income inequality and slower economic growth (Demirgüç-Kunt & Klapper, 2012). The benefits of fintech are many, it lowers the cost of services and enables easier financial access, which makes banking services more accessible to people living in remote or rural areas. For example, mobile banking services can allow people to access banking services from their homes or workplaces, which can save them time and money. Fintech companies can provide financial education and advice to help poor people improve their financial knowledge and make informed financial decisions. This can help them save money, invest in their future, and achieve their financial goals. Fintech helps reduce barriers to making payments, credit, lending, etc., especially when the traditional distribution of financial services is less accessible to certain groups. Thus, Fuster et al. (2019) note that fintech is more of a complementary form than a replacement for the traditional way of providing banking services. However, other researchers (Hau et al., 2021; Frost et al., 2019; Agarwal et al., 2019) show that fintech and big tech lenders serve borrowers who are traditionally underserved by banks.

Fintech innovations, in addition to the above-mentioned benefits, also bring various risks but also exacerbate existing risks such as cyber-attacks, money laundering, terrorist financing, and threats to data privacy and consumer protection. Fintech also increases regulatory and supervisory risk. All these risks may express increased financial stability risks with the growing importance of fintech. However, the rapid development of fintech products presents regulatory challenges with a careful evaluation of regulatory approaches, for example, innovation offices, regulatory sandboxes, and regulatory technology in the regulation of the financial system (Adjasi et al., 2023).

Ozili (2018) studied digital finance and its implications for financial inclusion and financial stability, noting that digital finance through fintech providers has positive effects on financial inclusion in developing and advanced economies, and the convenience that digital financing provides to

individuals with low and variable incomes is often more valuable to them than the higher cost they will pay to obtain such services from conventional regulated banks. Also, the empirical analysis of Sahay et al. (2020) points out that digital finance is increasing financial inclusion complementing or substituting traditional finance. They suggest that digital financial inclusion could play an important role in mitigating the economic and social impact of the ongoing COVID-19 crisis.

Empirical and theoretical studies show that innovative developments in the financial area influence the expansion of financial inclusion and have changed and facilitated access to financial services. However, the effects of fintech on financial inclusion are heterogeneous and differ between different countries. Many factors influence the relationship between fintech and financial inclusion, such as the level of economic development of the country, financial structure, extent of financial innovations, financial education, regulatory policies, etc.

Even the Balkan countries are not homogeneous in terms of fintech and financial inclusion. The changes are created both by public policies in the financial field, but also by the development of IT and the opening of the population to the use of new financial services and products (Apostu et al., 2023). Odorović et al. (2020), in their research on fintech innovation in the Balkan countries, conclude that the Balkan countries show high growth in the use of digital payments, but other fintech services have an untapped potential due to the high penetration of mobile and internet and skilled IT workforce. For this situation, the authors consider that the region's banking sector, which is characterized by high levels of foreign ownership, has influenced innovation at the local level and remains underdeveloped, causing some services, such as payments, to remain expensive for consumers and small and medium-sized enterprises.

The hypothesis of this research is as follows:

H1: Fintech positively affects financial inclusion in the Balkan region.

As the research gap, we can mention that social and cultural contexts in which fintech is used have not attracted significant attention from researchers. In addition, there is a lack of empirical research in the context of the Balkan region to identify the most important factors for the success or failure of using fintech.

3. RESEARCH METHODOLOGY

3.1. Data description and measurement

This study examines the impact of fintech (*Fintech*) on increasing financial inclusion (*FI*). In this context, we analyze the relationship between *Fintech* and *FI*, where the study's dependent variable is *FI*. Based on the data available to measure the variables for the years 2011, 2014, 2016, 2017, and 2021, this study focuses on 11 Balkan region countries: Albania, Bosnia and Herzegovina, Kosovo, North Macedonia, Montenegro, Serbia, Bulgaria, Croatia, Romania, Greece, and Slovenia.

The data for the analyzed variables obtained from the Financial Inclusion Indicators of the International Monetary Fund (IMF), and

the World Development Indicators of the World Bank shows significant missing data. To deal with missing data, we do data imputation by replacing missing values with the mean of the observed values for those variables.

Following Sarma (2008), we calculated the index of financial inclusion (IFI) based on three components: 1) access, 2) availability, and 3) use of financial services. We have calculated a general index of financial inclusion (digital and traditional). The component variables of the index are: branches per 100,000 adults (*component 1*), ATMs per 100,000 adults (*component 2*), borrowed any money (% age 15+), and accounts (% age 15+) (*component 3*). The IFI is calculated using principal component analysis (PCA) in Stata.

The variables used to create the IFI are positively correlated and have a relatively weak or low level of correlation. In PCA, it is common to include variables that are not strongly correlated with each other to capture different aspects of the data.

In our case, the eigenvalue for component 1 is 1.6305, while the difference between this eigenvalue and the next one (component 2) is 0.7753, which indicates that the first component explains more variance in the data compared to the second component. Component 1 accounts for 53.4% of the total variance in the data.

The eigenvalue for component 2 is 0.8551, and the difference between the eigenvalues of components 2 and 3 is 0.34082. This indicates

that component 2 explains less variance compared to component 1 but more than component 3. Component 2 accounts for 28.51% of the total variance in the data.

The eigenvalue for component 3 is 0.5143, and it accounts for 17.51% of the total variance in the data. This suggests that component 3 explains the least amount of variance among the three components.

To test the data distribution we used the Shapiro-Wilk normality test. The result showed that the response variable is normally distributed ($p = 0.240$).

According to Sahay et al. (2020), digital financial inclusion is about using mobile phones and computers to access and use financial services in a digital format. Such services include a range of offerings such as digital payments, digital lending/credit, marketplace lending, mobile money, and mobile banking. An important trend of fintech has been the growth of mobile financial services as a key financial inclusion opportunity. Mobile banking, payments, and other services have become essential tools for expanding access to financial services, especially in regions with limited traditional banking infrastructure.

Due to the limited availability of data on fintech proxies for Balkan countries, our research employs the adoption of digital financial services as a substitute for fintech. This serves as an indicator for fintech, as outlined in Table 1.

Table 1. Description of variables and data sources

Variable	Measurement	Source
Financial inclusion (<i>FI</i>)	ATMs per 100,000 adults Borrowed any money (% age 15+) Account (% age 15+)	FII*
Fintech (<i>Fintech</i>)		
Mobile banking (<i>MB</i>)	Use a mobile phone or the internet to make payments, send or receive money using a financial institution account (% with a financial institution account, % age 15+)	FII
Digital payments (<i>DP</i>)	Made or received digital payments (% age 15+)	
Online lending and borrowing (<i>OLB</i>)	Saved at a financial institution or using a mobile money account (% age 15+); Borrowed any money from a formal financial institution or using a mobile money account (% age 15+)	
Incom level (<i>IL</i>)	GDP per capita	WDI**
Infaltion (<i>INF</i>)	Change of consumer price index	WDI
Mobile penetration (<i>MP</i>)	Ownership of mobile phones	FII
Internet access (<i>IA</i>)	The proportion of the population that has access to the internet	FII

Note: * Financial Inclusion Indicators (International Monetary Fund); ** World Development Indicators (World Bank).

3.2. Econometric model

Our empirical strategy seeks to test whether fintech expands financial inclusion. We do this by running a traditional panel regression analysis through six models. Therefore, this study decides which of the two growth models, fixed effects or random effects, is the most appropriate. Following Tok and Heng (2022) and Khalaf and Wadi (2023), and based on our tests for choosing the appropriate econometric model to investigate if fintech affects financial inclusion in the countries of the Balkan region, we used the fixed effects model as the most appropriate econometric regression model, since the analysis of the Hausman test reveals significant results for all models (Prob > chi2 = 0.0267). This confirms that the fixed effects model is more

suitable than the random effects model. Since the heteroskedasticity test (modified Wald test) showed that there is a problem with heteroscedasticity, we used the robust fixed effects model to test the relationship between fintech and financial inclusion. Accordingly, we constructed the following models:

$$Y_{it} = \alpha_i + \beta_k X_{k,it} + \varepsilon_{it} \tag{1}$$

The fixed effects model data in our cases is as follows:

$$FI_{it} = \alpha + \beta_1 Fintech_{it} + \beta_2 IL_{it} + \beta_3 INF_{it} + \beta_4 IA_{it} + \beta_5 MP_{it} + \varepsilon_i \tag{2}$$

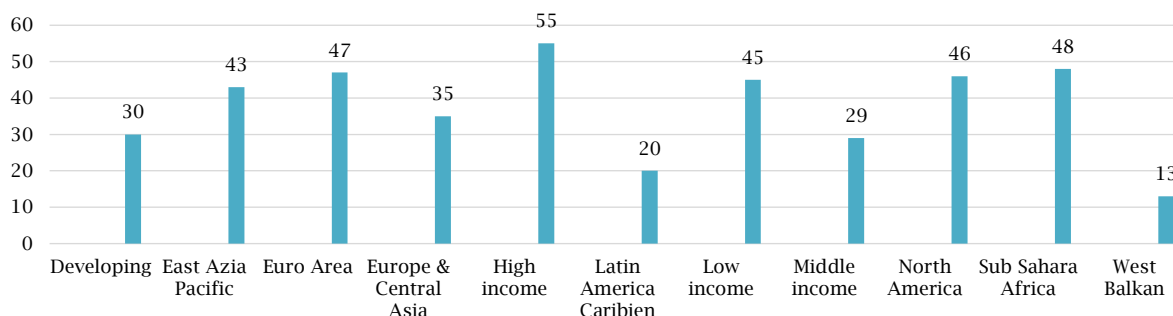
where,

- FI = the dependent variable (index);
- α_i = unknown intercept for each entity;
- it = entity and time;
- β_k = coefficient for respective independent and control variables;
- $X_{k,it}$ = the independent fintech variable and control variables (income level, inflation, access to internet, and mobile penetration);
- ε_{it} = error term.

4. RESULTS AND DISCUSSION

While fintech has a rapid trend of development in Europe, Asia, North America, and Sub Sahara, this potential is very low in the Balkans region, especially in the West Balkan countries. However, access to the internet and ownership of mobile phones is of an average level compared to other regions (60–70% of adults), the use of mobile phones or the internet to access accounts is particularly low, even the lowest in the world (Figure 1).

Figure 1. Adults who use a mobile phone or the internet to access an account (% , 2017)

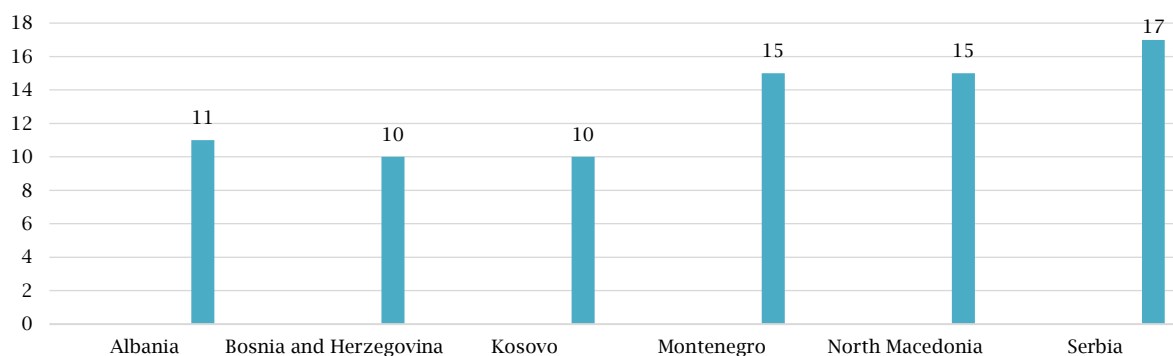


Source: The Global Findex Database, authors' calculations.

Based on the Digital Readiness Index (DRI), regulatory and policy initiatives related to fintech, and the supply landscape of fintech providers, the level of development of fintech in the Western Balkans region is basic (IMF, 2019). The countries of

this region have not yet adopted a national fintech strategy, some of them are in the process of developing a national strategy for fintech (Montenegro, North Macedonia, Serbia).

Figure 2. Adults who use a mobile phone or the internet to access an account in selected Balkan countries (% , 2017)



Source: The Global Findex Database.

Table 2 presents the summary statistics of the variables used in the assessment and testing for the 11 countries of the Balkan region for the years 2011, 2014, 2016, 2017, and 2021. The data show significant variation of variables between all sample countries. This variation is understandable and expected due to the Balkan region countries encompassing different levels of economic development, different uses of digital financial innovations, and financial inclusion. The variables taken in the construction of the financial inclusion index (ATMs per 100,000 adults, account ownership, and borrowing) vary evidently between countries. ATM per 100.000 adults was found to be lowest in Kosovo in 2017 and was highest in Croatia in

the same year. Account ownership was lowest in Albania in 2021 (44% of adults have a bank account) and highest in Slovenia in 2021 (99% of adults have a bank account). Borrowing any money has no significant difference between countries, the lowest was in Kosovo and Romania in 2021 (41%) and the highest in Slovenia in 2021 (50%).

In this regard, the results of the research of Apostu et al. (2023) have shown that the Balkan countries are not homogeneous in terms of financial inclusion and fintech, the changes, according to them, are created both by public policies in the financial field, but also by the development of IT and the readiness and trust of the population to use new financial services and products.

Table 2. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Financial inclusion (FI)	1.44e-08	1.241931	-3.024072	2.73972
Mobile banking access to account (MBA)	37.0404	10.57527	12.9364	72.977
Mobile banking payment (MBP)	38.9	7.029453	17	68
Online lending (OD)	20.61591	3.618312	10	39.8455
Online borrowed (OB)	23.6019	3.465965	13.3898	42.3512
Digital payment (DP)	61.4565	15.96394	22.4609	97.0184
Income level (IL)	1.659058	3.59755	-8.96791	7.94156
Inflation (IFL)	1.324635	2.305578	-1.5841	11.1374
Internet access (AI)	88.19309	1.857729	78.1315	92.5489
Mobile penetration (MP)	95.3851	.8328345	90.6096	97.6867

The results of the descriptive analysis of the variables for financial inclusion and fintech variables showed a significant difference (Table 2). In order to compare this difference between the samples, we have developed a t-test for the equality of means, dividing the sample into two groups of countries that differ in terms of economic development: countries of the Balkan region, members of the EU, including Bulgaria, Croatia, Greece, Romania, and Slovenia, and EU non-member

countries include Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia (Table 3). The result shows that the financial system of EU member states has the highest involvement, access, and use of fintech for all variables. The most significant difference is observed in mobile banking payments ($p = 0.0072$) and digital payments ($p = 0.0018$). Our findings are in line with those of Demir et al. (2022).

Table 3. Results of the t-test for the equality of means

Variable	Mean		Difference in mean	P-value
	EU member countries Balkan region	Candidate countries EU Balkan region		
Mobile banking access to account (MBA)	40.86902	33.73987	7.129158	0.0154**
Mobile banking payment (MBP)	41.64	36.53793	5.102069	0.0072*
Online lending (OD)	21.82807	19.57093	2.257138	0.0249**
Online borrowed (OB)	24.5207	22.80983	1.710861	0.0856***
Digital payment (DP)	68.53494	55.3544	13.18053	0.0018*

Note: * significance at 1%, ** significant at 5%, *** significant at 10%. EU member countries include Bulgaria, Croatia, Greece, Romania, and Slovenia. EU non-member countries include Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia and Serbia.

Table 4. Regression results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Financial inclusion index (FI)						
Income level (IL)	-0.04822** (0.020)	-0.04295** (0.045)	-0.5602** (0.012)	-0.05701 * (0.009)	-0.05674** (0.012)	-0.03643** (0.046)
Inflation (IFL)	-0.11936* (0.007)	-0.1001* (0.007)	-0.10552* (0.005)	-0.10441** (0.006)	-0.10464* (0.006)	-0.11532** (0.012)
Internet access (AI)	-0.02881 (0.430)	-0.04841 (0.494)	-0.5193 (0.563)	-0.05547 (0.523)	-0.06990 (0.389)	-0.03343 (0.531)
Mobile penetration (MP)	-0.03599 (0.670)	0.06164 (0.664)	0.06401 (0.773)	0.06867 (0.749)	0.16566 (0.341)	-0.01722 (0.887)
Mobile banking access to account (MBA)	-0.0823 (0.134)	0.00998*** (0.086)				
Mobile banking payment (MBP)	-0.00344 (0.867)		0.00588 (0.767)			
Online savings (OS)	0.04811 (0.340)			0.01141 (0.689)		
Online borrowed (OB)	-0.3614 (0.348)				-0.01166 (0.484)	
Digital payment (DP)	0.02806* (0.000)					0.02636*** (0.000)
Constant	4.7886 (0.670)	-1.7763 (0.828)	-28.1155 (0.578)	7.135794 (0.878)	-9.1284 (0.360)	3.1848 (0.673)
Observation	54	5	54	54	54	54
Rho	0.50270	0.62201	0.6265	0.62500	0.62892	0.176525
R-squared	0.6790	0.4881	0.3746	0.3962	0.3740	0.5279

Note: * significance at 1% ($p < 0.01$), ** significant at 5% ($p < 0.05$), *** significant at 10% ($p < 0.1$).

Table 4 presents empirical findings obtained from our model estimations. Model 1 analyzes the relationship between the financial inclusion index and all the independent variables associated with fintech. The results of this analysis show that digital payments have a statistically significant influence on the financial inclusion index. In Model 2,

we regress mobile banking access to accounts as a proxy of fintech. The influence of this independent variable on financial inclusion is positive and significant at the level of 10%. This indicates that a one-unit increase in the use of mobile banking for account access leads to a corresponding increase in the financial inclusion index.

In Model 3, mobile banking payment we consider as a proxy of fintech. Although it shows a positive impact on the financial inclusion index, this impact is insignificant. In Model 4, we explore the impact of using financial services for online savings on the financial inclusion index. In this case, the results reveal a positive insignificant impact on the financial inclusion index. In Model 5, our analysis focuses on online borrowing, which exhibits an insignificantly negative relationship with the financial inclusion index.

Model 6 evolves into a relationship between digital payments and the financial inclusion index. The results here are noteworthy, showing a positive and statistically significant relationship at a 1% level. These findings can be explained by the relatively large percentage of ownership of mobile phones, but the percentage of people who use mobile phones for bank payments is very low, while the use of mobile phones to access accounts, and the use of digital payment are slightly higher. These results align with the findings of Odorović et al. (2020) in terms of the significant positive impact of digital payments on financial inclusion. In this regard, Al-Smadi (2023), Kouladoun et al. (2022), Siddik and Kabiraj (2020), and Ozili (2018) also find a significant positive relationship between digital finance and financial inclusion.

In the countries of the Balkan region, despite the differences in the level of fintech development between them, in general, fintech promotes financial inclusion. Changes in economic and financial development, regulatory environments, technological infrastructure, and socio-economic factors can affect the extent to which financial innovation is adopted and its impact on inclusion. Regulatory authorities in the Balkan countries can play a key role in creating a supportive and appropriate environment for financial innovation by guaranteeing consumer protection and financial stability. However, the trend of digital advancement is moving rapidly, especially during the period of COVID-19 and beyond, so the discussion of financial innovation and financial inclusion is not instantaneous, but will be an issue that will arouse great interest in research and future debates. The impact of fintech on financial inclusion is dynamic and ongoing, so it is challenging and essential to track developments and improve strategies to maximize positive outcomes.

REFERENCES

- Adjasi, C., Hamilton, C., & Lensink, R. (2023). Fintech and financial inclusion in developing countries. In T. Walker, E. Nikbakht, & M. Kooli (Eds.), *The fintech disruption: How financial innovation is transforming the banking industry* (pp. 297–328). Springer International Publishing. https://doi.org/10.1007/978-3-031-23069-1_12
- Agarwal, S., Qian, W., Yeung, B. Y., & Zou, X. (2019). Mobile wallet and entrepreneurial growth. *AEA Papers and Proceedings*, 109, 48–53. <https://doi.org/10.1257/pandp.20191010>
- Al-Smadi, M. O. (2023). Examining the relationship between digital finance and financial inclusion: Evidence from MENA countries. *Borsa Istanbul Review*, 23(2), 464–472. <https://doi.org/10.1016/j.bir.2022.11.016>
- Aniruddh, S., & Kumar, R. (2021). A cross country study of financial inclusion and economic development with special emphasis on India. *Indian Journal of Economics and Development*, 17(1), 11–24. <https://www.indianjournals.com/ijor.aspx?target=ijor:ijed1&volume=17&issue=1&article=002>
- Apostu, S. A., Panait, M., Vasile, V., Sharma, G. D., & Vasile, R. (2023). FinTechs and financial inclusion — Balkan experience: Digital perspectives on financial markets. *The Electronic Journal of Information Systems in Developing Countries*, 89(2), Article e12257. <https://doi.org/10.1002/isd2.12257>
- Arner, D. W., Buckley, R. P., Zetsche, D. A., & Veidt, R. (2020). Sustainability, FinTech and financial inclusion. *European Business Organization Law Review*, 21, 7–35. <https://doi.org/10.1007/s40804-020-00183-y>

5. CONCLUSION

Fintech holds the promise of enhancing financial inclusion in Balkan region countries by minimizing the expenses associated with delivering financial services and broadening access to credit. Nevertheless, it is crucial to recognize the obstacles and potential risks linked to fintech, particularly concerning privacy and data security. It is imperative to implement fintech in a manner that fosters benefits for all members of society, irrespective of their status, location, socio-economic standing, and other relevant factors.

This study explores the effects of fintech on financial inclusion for 11 Balkan region countries for the years 2011, 2014, 2016, 2017, and 2021. The results of our findings reveal the varying influence of fintech variables as independent variables on the financial inclusion index. Notably, digital payments and mobile banking access have a positive significant effect on the financial inclusion index. The other fintech variables, payment with mobile banking and the use of financial services for online savings show a positive insignificant relation with the financial inclusion index. While online borrowing is negatively and insignificantly related to the dependent variable of the financial inclusion index. These results are expected and can be explained by the fact that despite substantial ownership of mobile phones and widespread internet access, the utilization of these technologies for activities such as making payments, purchasing items, or conducting financial transactions is remarkably low. However, a slightly higher prevalence is noted in the use of mobile phones for accessing accounts and engaging in digital payments.

Based on the results achieved, we consider that future research should focus on exploring user preferences, demographic, regional, and cultural factors, trust in technology, and ease of use of these services.

The study of fintech and financial inclusion in the Balkan region, like any research effort, has its limitations that may affect the results, scope, and generalizability of the findings. Some limitations we faced during the study were: limited up-to-date and comprehensive financial data; different levels of economic development, technological infrastructure, and internet penetration rates may affect the adoption and impact of fintech.

- Berg, G., Guadamillas, M., Natarajan, H., & Sarkar, A. (2020). *Fintech in Europe and Central Asia: Maximizing benefits and managing risks*. The World Bank Group. <https://documents1.worldbank.org/curated/en/640021585934004225/pdf/Fintech-in-Europe-and-Central-Asia-Maximizing-Benefits-and-Managing-Risks.pdf>
- Breza, E., Kanz, M., & Klapper, L. F. (2020). *Learning to navigate a new financial technology: Evidence from payroll accounts* (NBER Working Paper No. 28249). National Bureau of Economic Research. https://www.nber.org/system/files/working_papers/w28249/w28249.pdf
- Demir, A., Pesqué-Cela, V., Altunbas, Y., & Murinde, V. (2022). Fintech, financial inclusion and income inequality: A quantile regression approach. *The European Journal of Finance*, 28(1), 86–107. <https://doi.org/10.1080/1351847X.2020.1772335>
- Demirgüç-Kunt, A., & Klapper, L. F. (2012). *Measuring financial inclusion: The Global Findex Database* (World Bank Policy Research Working Paper No. 6025). The World Bank Group. <https://doi.org/10.1596/1813-9450-6025>
- Demirgüç-Kunt, A., Hu, B., & Klapper, L. (2019). *Financial inclusion in the Europe and Central Asia region: Recent trends and a research agenda* (World Bank Policy Research Working Paper No. 8830). <https://doi.org/10.1596/1813-9450-8830>
- Demirgüç-Kunt, A., Klapper, L. F., Singer, D., & Ansar, S. (2018). *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution*. World Bank Group. <http://documents.worldbank.org/curated/en/332881525873182837/The-Global-Findex-Database-2017-Measuring-Financial-Inclusion-and-the-Fintech-Revolution>
- Donou-Adonsou, F., & Sylwester, K. (2016). Financial development and poverty reduction in developing countries: New evidence from banks and microfinance institutions. *Review of Development Finance*, 6(1), 82–90. <https://doi.org/10.1016/j.rdf.2016.06.002>
- Ediaghonya, V., & Tioluwani, C. (2023). The role of fintech in driving financial inclusion in developing and emerging markets: Issues, challenges and prospects. *Technological Sustainability*, 2(1), 100–119. <https://doi.org/10.1108/TECHS-10-2021-0017>
- Feyen, E., Natarajan, H., & Saal, M. (2023). *Fintech and the future of finance: Market and policy implications*. World Bank Group. <https://documents1.worldbank.org/curated/en/099450005162250110/pdf/P17300600228b70070914b0b5edf26e2f9f.pdf>
- Frost, J., Gambacorta, L., Huang, Y., Shin, H. S., & Zbinden, P. (2019). *BigTech and the changing structure of financial intermediation* (BIS Working Paper No. 779). Bank for International Settlements. <https://www.bis.org/publ/work779.pdf>
- Fuster, A., Plosser, M., Schnabl, P., & Vickery, J. (2019). The role of technology in mortgage lending. *The Review of Financial Studies*, 32(5), 1854–1899. <https://doi.org/10.1093/rfs/hhz018>
- Global Partnership for Financial Inclusion (GPFI). (2016). *G20 High-level principles for digital financial inclusion*. <https://www.gpfi.org/publications/g20-high-level-principles-digital-financial-inclusion>
- Hau, H., Huang, Y., Lin, C., Shan, H., Sheng, Z., & Wei, L. (2021). *FinTech credit and entrepreneurial growth* (Swiss Finance Institute Research Paper No. 21–47). <https://doi.org/10.2139/ssrn.3899863>
- International Monetary Fund (IMF). (2019). *Fintech: The experience so far* (Policy Paper No. 2019/024). <https://www.imf.org/en/Publications/Policy-Papers/Issues/2019/06/27/Fintech-The-Experience-So-Far-47056>
- Khalaf, L., & Wadi, R. A. (2023). Fintech and financial inclusion: Evidence from MENA countries. In M. Al Mubarak & A. Hamdan (Eds.), *Technological sustainability and business competitive advantage* (pp. 185–198). Springer International Publishing. https://doi.org/10.1007/978-3-031-35525-7_12
- Kouladoun, J.-C., Wirajing, M. A. K., & Nchofoung, T. N. (2022). Digital technologies and financial inclusion in Sub-Saharan Africa. *Telecommunications Policy*, 46(9), Article 102387. <https://doi.org/10.1016/j.telpol.2022.102387>
- Odorović, A., McKain, G., Garvey, K., Schizas, E., Zhang, B. Z., Rowan, P., & Ziegler, T. (2020). *FinTech innovation in the Western Balkans: Policy and regulatory implications and potential interventions*. <https://doi.org/10.2139/ssrn.3619214>
- Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, 18(4), 329–340. <https://doi.org/10.1016/j.bir.2017.12.003>
- Sadigov, S., Vasilyeva, T., & Rubanov, P. (2020). *Fintech in economic growth: Cross-country analysis* [Paper presentation]. The 55th International Scientific Conference on Economic and Social Development, Baku, Azerbaijan. SumDU Repository. <https://essuir.sumdu.edu.ua/handle/123456789/92190>
- Sahay, M. R., von Allmen, M. U. E., Lahreche, M. A., Khera, P., Ogawa, M. S., Bazarbash, M., & Beaton, M. K. (2020). *The promise of fintech: Financial inclusion in the post COVID-19 era* (Departmental Paper No. 2020/009). International Monetary Fund. <https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2020/06/29/The-Promise-of-Fintech-Financial-Inclusion-in-the-Post-COVID-19-Era-48623>
- Sarma, M. (2008). *Index of financial inclusion* (Working Paper No. 215). Indian Council for Research on International Economic Relations (ICRIER). <https://www.econstor.eu/handle/10419/176233>
- Senyo, P. K., & Osabutey, E. L. (2020). Unearthing antecedents to financial inclusion through FinTech innovations. *Technovation*, 98, Article 102155. <https://doi.org/10.1016/j.technovation.2020.102155>
- Siddik, M. N. A., & Kabiraj, S. (2020). Digital finance for financial inclusion and inclusive growth. In B. George & J. Paul (Eds.), *Digital transformation in business and society: Theory and cases* (pp. 155–168). Springer International Publishing. https://doi.org/10.1007/978-3-030-08277-2_10
- Sukmana, R., & Ibrahim, M. H. (2018). Financial access and inequality: A quantile assessment. *International Journal of Economics and Management*, 12(2), 551–557. <http://www.ijem.upm.edu.my/vol12no2/14%20Financial%20Access%20and%20Inequality.pdf>
- Tok, Y. W., & Heng, D. (2022). *Fintech: Financial inclusion or exclusion?* (Working Paper No. 2022/080). International Monetary Fund. <https://www.imf.org/en/Publications/WP/Issues/2022/05/06/Fintech-Financial-Inclusion-or-Exclusion-517619>
- Usman, M., Makhdum, M. S. A., & Kousar, R. (2021). Does financial inclusion, renewable and non-renewable energy utilization accelerate ecological footprints and economic growth? Fresh evidence from 15 highest emitting countries. *Sustainable Cities and Society*, 65, Article 102590. <https://doi.org/10.1016/j.scs.2020.102590>