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Fintech as an Enabler of Digital Economy Development in the Balkan Countries

Abstract: This paper examines the role of FinTech in advancing digitalization across Balkan economies, analysing key drivers of FinTech adoption and its impact on digital economy development. Using a Principal Component Analysis (PCA) approach, along with descriptive statistics, ANOVA, and cluster analysis, the study identifies the principal factors influencing FinTech penetration and digital financial engagement.

The research utilizes a dataset encompassing key indicators of digital adoption, and digital sectors development across seven Balkan countries—Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Albania, and North Macedonia. Specific variables include digital payment penetration, mobile banking usage, internet access, ATM density per 100,000 adults, POS terminals per 100,000 adults, FinTech startup growth index, regulatory quality, financial literacy, and trust in digital finance.

Findings reveal significant disparities in FinTech adoption across the region, shaped by differences in regulatory policies, digital infrastructure, and population readiness to embrace digital financial solutions. While FinTech serves as the backbone of the digital economy by providing seamless and efficient financial services, the digital transformation is very modest in Balkan countries. Regression analysis further validates that FinTech adoption significantly influences the development of the digital economy. The findings demonstrate a strong positive correlation between the extent of FinTech adoption and the overall growth of the digital economy in the region.

Keywords: FinTech, Digital economy, Balkan countries, Digital transformation, Financial sector development.

JEL Classification: O33, O52.

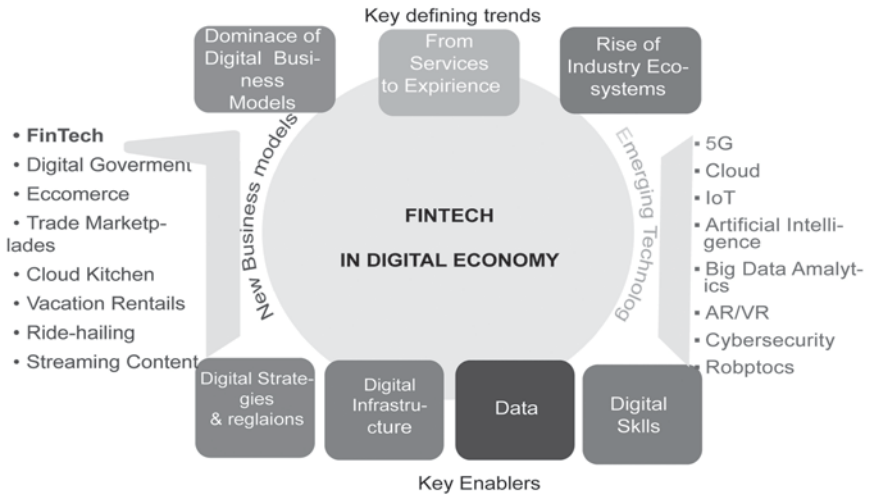
1. Introduction

Financial technologies represent a leading force in integrating new, disruptive innovations that are transforming traditional financial services. This sector encompasses a broad spectrum of advancements, including mobile payment applications, cryptocurrencies, blockchain technology, crowdfunding platforms, and smart contracts. These technologies are redefining how transactions are conducted, financial management is handled, and market access is facilitated, significantly enhancing user experience, efficiency, and transparency within financial systems.

FinTech has become the cornerstone of the digital economy, driving not only innovation within the financial sector but also fostering broader economic inclusion. These technologies provide access to financial services for individuals and businesses that were previously excluded from traditional financial systems, particularly in developing economies. For instance, digital wallets and mobile payment applications enable fast and seamless transactions, reducing reliance on physical banking infrastructure and expanding access to essential financial services. Beyond improving the user experience, FinTech plays a crucial role in the digital transformation of organizations and financial ecosystems. Traditional institutions are increasingly adopting digital solutions to stay competitive in a rapidly evolving landscape, while innovative FinTech companies continue to introduce ground-breaking products and services that shape the future of the financial industry. FinTech supports all sectors of the digital economy: digital government, e-commerce, trade marketplace, rentals, and other, which are illustrated in Figure 1.

All these components integrate the digital economy, creating an ecosystem where financial transactions and innovations drive growth and efficiency. The key pivotal role of FinTech is in shaping the digital economy by enhancing financial inclusion, enabling digital transactions, and driving efficiency in financial services. FinTech innovations facilitate economic growth by improving access to financial resources, reducing costs, and fostering technological advancements across industries.

Figure 1: FinTech in digital economy



Source: Jovovic, 2023, p. 44

This study examines the Balkan countries which share a similar historical background under communist regimes. These countries were shaped by political and economic systems that prioritized centralized control and state ownership over market-driven mechanisms. A key feature of these communist regimes was the underdevelopment of financial systems and the absence of institutions that are typical in market economies, such as stock markets. The economic landscape was largely dominated by state-run enterprises, and the idea of private ownership was almost non-existent.

In particular, the communist regimes in the Balkans, like those in other parts of Central and Eastern Europe, were marked by limited private entrepreneurship, and the state played an overwhelming role in the management and operation of businesses. The lack of competition, market-driven incentives, and private sector innovation contributed to a modest development of the financial sector. While the state-controlled economy was stable, it did not foster the kind of financial infrastructure necessary to support a thriving market economy.

The absence of private companies and the heavy state control over enterprises stunted the development of essential financial mechanisms, such as capital markets, venture financing, and even basic banking systems. As a result, financial institutions were underdeveloped and unable to support the kind of dynamic growth seen in more market-oriented economies. This lack of a robust financial

system also contributed to a general mistrust in financial and digital transactions, as individuals and businesses had limited experience with complex financial products and services.

Under the communist regime, economic stability was maintained largely through a planned economy where financial transactions were primarily restricted to basic activities like payments and receipts tied to the exchange of goods. This economic model left little room for speculative activities or risk management strategies such as hedging. Speculative operations, which are common in market economies, were virtually non-existent, as the state tightly regulated prices and production.

In recent years, the Balkans have made significant strides in developing their FinTech and digital economy sectors, driven by global trends and regional needs. As digital technologies have proliferated worldwide, Balkan countries have begun to embrace the potential of FinTech to modernize their financial ecosystems. While these countries still face challenges related to infrastructure and regulatory frameworks, the adoption of mobile payments, cryptocurrencies, and blockchain technologies is steadily increasing. These innovations are helping bridge the gap between the traditional financial systems of the past and the demands of the modern, digital economy. However, despite these advancements, the intersection of FinTech and the digital economy in the Balkans remains largely underexplored in academic research. Few scientific papers and studies have been dedicated to examining the unique challenges and opportunities presented by the region's adoption of digital financial technologies. This paper aims to fill this gap by contributing new knowledge and insights into the evolving FinTech landscape in the Balkans, offering a deeper understanding of how these countries are navigating the broader global trends in financial technology and digital economic transformation.

2. Literature review

The growth of FinTech is influenced by numerous factors, primarily consumer behaviour, education (both STEM and financial), business digitalization, and innovation capacity (Grigorescu & Bortea, 2020; Ndou, Scorrano, Mele & Stefanizzi, 2021; Vasile, Panait, & Apostu, 2021). Technical innovations promoted by banks and companies have driven the rapid expansion of FinTech. The literature has extensively explored the technological innovations adopted by banks and companies. These innovations have facilitated and accelerated FinTech growth. However, consumers play a crucial role in technology adoption, as they

need to understand and efficiently use new tools and techniques. This depends on their knowledge, experience, openness to new technologies, and risk perception (Jünger & Mietzner, 2020; Schipor & Duhnea, 2020; Sharma et al., 2020; Yue, Cao, Duarte, Shao & Manta, 2019).

Additionally, unexpected events such as the COVID-19 crisis have accelerated the expansion of digital financial transactions, despite consumer scepticism stemming from a lack of trust or limited financial literacy (Nawayseh, 2020; Fu & Mishra, 2022; Vasenska et al., 2021). "The acceptance of FinTech innovations by the population largely depends on how public authorities balance the benefits of new innovations with the risks they bring" (Rabbani & Khan, 2020, p. 70), and how cybersecurity risks are managed (Najaf, Mostafiz & Najaf, 2021).

Europe is experiencing transformations in the FinTech sector, but significant differences exist in terms of the pace of digital transformation (Kaspar, 2021) and the extent of FinTech adoption among consumers, particularly individuals. On one end of the spectrum, Sweden, Germany, and Lithuania exhibit highly dynamic FinTech ecosystems, especially in digitalized business sectors. Conversely, several countries, including Bulgaria, Serbia, and Albania, display lower levels of consumer openness and adoption, with the highest cash payment rates in Europe in 2021 (Taranyuk, 2022).

Many authors (e.g., Lacovoiu & Stancu, 2017) highlight that, despite the potential of the Balkan region, certain weaknesses persist due to the communist legacy of these countries, weak political commitment will reflected in the quality of institutions, the absence of strategic frameworks and mechanisms to promote financial inclusion, and brain drain to Western Europe, which diminishes the potential for financial technological innovation. Additionally, consumer protection remains low. Statistics indicate that cash payments for utility bills remain high in Balkan countries, which can be attributed to low financial literacy levels, limited adoption of online transactions by older generations, and heavy reliance on financial education models from the communist era.

Following the COVID-19 pandemic, FinTech and digitalization emerged as key solutions for improving market access, prompting an increasing number of studies on this topic. A literature review has identified studies analysing either groups of countries or individual economies, such as developing nations or specific regions of Europe, Asia, or Africa. These studies emphasize the significance of FinTech and financial inclusion in reducing poverty, mitigating income inequality, enhancing social inclusion, and promoting sustainable development.

Regarding FinTech dynamics in the Balkans, the literature remains relatively scarce. Sadfakowski and Sobieraj (2017) focused on the potential FinTech development in the Visegrad Group countries, considering their similar economic and geopolitical contexts. Their study highlights a low level of innovation potential among IT companies and insufficient openness to financial technologies among the population. Stefanovic, Barjaktarovic & Bataev (2021) analyzed digitalization and sustainability in Serbia's banking sector from 2011 to 2020 to assess its impact on the financial performance of credit institutions. The authors introduced a novel concept linking digitalization and sustainability, arguing that digital sustainability could be a crucial factor in uncertain times and an essential component of banks' post-COVID-19 strategies. They demonstrated a direct correlation between intangible investments and net results. Bulgarian researchers Vasenska et al. (2021) identified the potential of FinTech financial transactions during this period. Their study, based on primary data collected through surveys, revealed a positive impact of the COVID-19 crisis on Bulgarian consumers' adoption of FinTech solutions. Due to physical distancing restrictions imposed by public authorities, consumers were compelled to use online payments. However, the uncertainty caused by the crisis led many consumers to limit online transactions due to perceived risks. For Albania, Mexhuani and Ribaj (2018) examined financial inclusion using both qualitative and quantitative research methods, including public reports, surveys, and interviews. Their study revealed low financial inclusion levels and underscored the importance of financial education programs and consumer protection measures. They advocated for the adoption of regulatory frameworks successfully implemented in the European Union.

This research aims to fill the gap in studies on FinTech adoption and impact on digital economy development in Balkan countries. The starting hypothesis are:

H_0: There is significant relationship between FinTech adoption and digital economy growth.

H_1: FinTech adoption has a positive and significant impact on the digital economy.

H_3: Thera is significant differences in Balkan counties in FinTech and digital economy

There is a notable gap in the international scientific literature regarding the relationship between FinTech and the digital economy in Balkans, with only five studies on this topic available on the Web of Science platform. Furthermore, there has been no research focusing on Balkan countries in this context. This paper seeks to fill this gap by exploring the connection between FinTech and the digital economy specifically in the Balkan countries. The primary contribution

of this paper lies in its focus on the Balkans, which, while sharing some common features, also exhibits significant differences due to the diverse paths these countries have taken in transitioning to market economies. This paper aims to fill this gap by contributing new knowledge and insights into the evolving FinTech landscape in the Balkans, offering a deeper understanding of how these countries are navigating the broader global trends in financial technology and digital economic transformation. By presenting the results of this analysis, this paper represents the scientific effort to overcome the lack of studies on the Balkans in this field. It highlights the region's relatively marginal position in Europe in terms of FinTech and digital economy,

3. Data and methodology

The sample consists of seven Balkan countries: Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Albania, and North Macedonia. The study utilizes secondary data from the next sources: World Bank Global Findex (https://globalfindex.worldbank.org/), International Monetary Fund (IMF) (https://www.imf.org/), and the CEE FinTech Atlas (https://www.cee-fintechatlas.com/). The dataset includes variables related to[1]:

- Digital payment penetration (%) – percentage of the population using digital payments.
- Mobile and internet banking usage (%) – percentage of individuals using mobile banking apps.
- Internet access (%) – percentage of the population with internet access.
- ATM and POS terminal density – number of ATMs per 100,000 adults.
- POS terminals – number of point-of-sale (POS) terminals per 100,000 adults
- FinTech startup growth index – scaled score measuring the growth of FinTech startups.
- Regulatory quality (0 - 100) – a score measuring the efficiency of financial regulations.
- Financial literacy (%) – percentage of the population demonstrating basic financial literacy.
- Trust in digital finance (0 - 100) – a measure of consumer confidence in digital financial services.

[1] The data that support the findings of this study are available from the corresponding author upon reasonable request.

To test the hypotheses, we applied a variety of statistical methods, including descriptive statistics, ANOVA, cluster analysis, principal component analysis (PCA), and regression analysis. PCA was employed to identify the key variables associated with FinTech adoption, while cluster analysis was used to determine whether there are significant differences in the FinTech landscapes across Balkan countries. ANOVA was then applied to assess variations between the identified clusters.

PCA is a statistical technique that analyses observations described by inter-correlated quantitative variables to extract essential information and visualize patterns of similarity through data mapping (Abdi & Williams, 2010). It helps to summarize data and identify individual differences (Kherif & Latypova, 2020). The method reduces dimensionality by preserving the majority of the data's variation, with the first few components capturing the most significant variance (Groth, Hartmann, Klie & Selbi, 2013). PCA achieves this by transforming the dataset into a new set of orthogonal coordinate axes, identifying directions of maximal variance (Richardson, 2009). This method assumes linear relationships among the variables (Syms, 2008).

Cluster analysis, on the other hand, is used to classify observations into groups based on similarity. This can be achieved using various methods and algorithms (Fredes, & Matthiesesn, 2010). The grouping methods are typically based on similarity matrices and the distance between individual vectors and vector groups (Wilks, 2011).

Regression analysis is a statistical technique used to understand the relationship between a dependent variable and one or more independent variables. In our case, regression analysis helped us assess how factors such as regulatory policies, digital infrastructure, and population readiness impact the digital economy development cross the Balkans. By applying regression analysis, we were able to quantify the influence of these factors and test the hypothesis that FinTech adoption significantly contributes to the development of the digital economy. This analysis also provided insights into the strength and nature of the relationships, whether linear or non-linear, between the variables. Through this method, we confirmed that FinTech adoption indeed plays a crucial role in driving digital economic development in the region.

This comprehensive approach, combining PCA, cluster analysis, ANOVA, and regression analysis, enabled us to develop a robust framework for understanding the dynamics of FinTech adoption in the Balkans and its implications for the digital economy.

4. Emprical results and discussion

As Fintech refers to integrating technology in finance, data in Table 1 presents a comparison of several key indicators related to financial infrastructure and digital finance across seven countries[2].

Table 1: Summary statistics of variables

	Minimum	Maximum	Mean	Std. Deviation
Digital payment penetration	35.0	85.0	55.571	17.3480
Mobile banking usage	28.0	70.0	44.000	15.1767
Internet access	72.0	95.0	82.000	8.1240
ATM density per 100000 adults	45.0	90.0	62.429	16.3183
POS Term. per 100000 adults	1.2	3.2	2.129	.7296
Regulatory quality 0-100	55.0	80.0	65.714	8.8452
Financial literacy	45.0	68.0	54.714	8.0770
Trust in digital finance 0-100	50.0	75.0	60.714	8.0563

Source: Authors' calculations

Here's a brief summary:

- Digital Payment Penetration shows moderate variation, with countries having digital payment adoption ranging from 35% to 85%. On average, digital payments are somewhat well-established, but there are notable differences between countries.
- Mobile Banking Usage also varies significantly, with usage ranging from 28% to 70%. The average usage of 44% suggests moderate adoption, but again, the countries exhibit different levels of mobile banking engagement.
- Internet Access is consistently high across all countries, with access ranging from 72% to 95%. The low standard deviation indicates that all countries have relatively similar levels of internet availability.
- ATM Density per 100,000 Adults shows moderate variation, ranging from 45 to 90 ATMs. The average density of 62 ATMs per 100,000 adults indicates moderate access to ATMs, with some countries having more dense networks than others.
- POS Terminals per 100,000 Adults has a narrower range, between 1.2 and 3.2, suggesting a more consistent availability of POS terminals across countries.

[2] The data that support the analysis of this study are available from the corresponding author upon reasonable request.

- Regulatory Quality ranges from 55 to 80, showing some variation in how strong the financial regulatory frameworks are in these countries. On average, the regulatory quality is moderate.
- Financial Literacy ranges from 45% to 68%, indicating that financial literacy varies across countries, with an average level of 54.71%.
- Trust in Digital Finance ranges from 50% to 75%, showing a moderate level of trust across the countries, with some showing more confidence in digital finance than others.

Overall, the data highlights both similarities and differences between the countries in terms of their financial infrastructure and the adoption of digital finance. While internet access and POS terminal availability are relatively consistent, areas like digital payments, mobile banking, and financial literacy show more variation, suggesting that different countries are at different stages in their transition to a more digital financial system.

Because the Balkan countries are not very homogenous regarding Fintech and digital economy, we clustered them according to this topic. Therefore, this resulted in three clusters (Table 2). Using the K-Means algorithm with 3 clusters, the countries are grouped as follows:

Table 2: Groped countries in clusters

Cluster	Countries
Cluster 0	Slovenia
Cluster 1	Albania, Bosnia & Herzegovina, Montenegro, North Macedonia
Cluster 2	Croatia, Serbia

Source: Authors' calculations

Cluster 0: Slovenia, positioned in a separate cluster, demonstrates the highest level of financial and digital adoption. The country benefits from a well-developed banking sector, strong regulatory support, and a high degree of digital payment penetration. Factors such as advanced digital literacy, widespread use of electronic banking, and a favourable business environment for FinTech startups contribute to its leading position. Slovenia's integration with the EU's digital financial regulations has further accelerated innovation in financial services, making it a regional benchmark for digital finance transformation.

Cluster 1: This group consists of countries with relatively lower levels of FinTech adoption and digital penetration. Several key characteristics define this cluster:

- Limited financial infrastructure: These countries generally have fewer digital banking services, lower internet penetration rates, and less-developed electronic payment systems.
- Regulatory and institutional challenges: Inconsistent or underdeveloped FinTech regulations create uncertainties that hinder rapid adoption.
- Consumer trust issues: A lack of confidence in digital financial services, combined with concerns over cybersecurity and fraud, slows down adoption rates.
- Cash-dominated economies: Traditional cash transactions remain prevalent, limiting the widespread use of digital payment methods.

Despite these challenges, there is significant growth potential, especially with the increasing presence of mobile banking and digital wallets. The development of regulatory frameworks and financial education initiatives could accelerate digital transformation in these markets.

Cluster 2: Croatia and Serbia occupy an intermediate position between Slovenia and the less developed markets. These countries exhibit a stronger financial infrastructure than Cluster 1, yet they do not reach Slovenia's level of digital adoption. Key features of this cluster include:

- Moderately developed banking and payment systems: While digital banking is widespread, traditional banking institutions still play a dominant role.
- Growing FinTech ecosystem: Both Croatia and Serbia have seen an increase in FinTech startups and regulatory advancements supporting digital finance.
- Higher digital literacy: Compared to Cluster 1, digital finance users in these countries show a greater willingness to adopt online banking, mobile payments, and other FinTech solutions.
- Challenges in full-scale digital transition: Despite progress, barriers such as regulatory gaps, economic volatility, and cybersecurity concerns still exist.

The cluster analysis highlights the digital finance divide in the Balkans, with Slovenia leading, Croatia and Serbia in a transitional phase, and Albania, Bosnia & Herzegovina, Montenegro, and North Macedonia lagging behind. To bridge these gaps, targeted policy interventions—such as improving financial literacy, strengthening regulatory frameworks, and promoting investment in digital infrastructure—are essential. The findings also suggest that regional cooperation in digital finance strategies could enhance financial inclusion and innovation across all clusters.

Principal component analysis (PCA) is a dimensionality reduction technique that transforms correlated variables into a smaller set of uncorrelated components. Since PCA is sensitive to the scale of the data, it's crucial to standardize the data (i.e., scale the variables) before applying PCA. Standardization involves rescaling each variable to have a mean of 0 and a standard deviation of 1, ensuring that all variables contribute equally to the analysis. The principal components (PCs) are new variables created as linear combinations of the original ones. These components are uncorrelated and are ordered based on the amount of variance they explain in the dataset. The total variance explained Table 3 is a key component in PCA because it shows how much of the overall variance in the dataset is captured by each principal component (PC). This information is crucial for understanding how effectively the PCA model reduces dimensionality while still retaining the important patterns or structure of the original data.

Table 3: Total variance explained

Component	Initial eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of variance	cumulative %	Total	% of Variance	Cumulative %
1	8.921	99.125	99.125	8.921	99.125	99.125
2	.034	.375	99.499			
3	.026	.291	99.790			
4	.013	.148	99.938			
5	.005	.056	99.994			
6	.001	.006	100.000			

Source: Author's calculations

The component matrix (or loading matrix) reveals the contribution of each original variable to the principal components. The loadings indicate how much each variable influences a given component.

In this analysis, three principal components (PC1, PC2, and PC3) were extracted. The first principal component (PC1) accounts for the vast majority of the variance (99.12%), while PC2 (0.37%) and PC3 (0.29%) contribute minimally. Given that PC1 explains most of the variance, it is the dominant factor in distinguishing the countries based on the variables analysed (given in Table 4).

Table 4: Principal components PC1

Variable	PC1
Digital Payment Penetration (%)	0.996
Mobile Banking Usage (%)	0.997
Internet Access (%)	0.999
ATM Density (per 100,000 adults)	0.993
POS Terminals (per 100,000 adults)	0.994
FinTech Startup Growth Index	0.998
Regulatory Quality (0-100)	0.996
Financial Literacy (%)	1.000
Trust in Digital Finance (0-100)	0.987

Source: Authors' calculations

This suggests that most of the differences between the countries are captured by the combination of variables in PC1. The variables with the highest loadings on PC1—such as Financial Literacy (%), Internet Access (%), and Mobile Banking Usage (%)—indicate that digital finance infrastructure and literacy are the dominant factors in explaining the observed variance among these countries. The relatively small contributions of PC2 and PC3 (0.37% and 0.29%, respectively) suggest that these components capture very little of the overall variation in the dataset. This implies that the first component (PC1) is sufficient to understand the primary differentiators between the countries, with little additional explanatory power coming from the other components.

4.1 Regression analysis

A regression model can estimate how FinTech development influences the digital economy in Balkan countries. The general form of the regression equation:

$$\mathrm{DigitalEconomyIndex} = \beta_0 + \beta_1\ \mathrm{FinTechAdoption}$$

Where:

Y - Digital Economy Index (Dependent Variable): Measured using the DESI/WB DESI Score (European commission, 2021, 2024; Tintor et al., 2022).

X_1 - To calculate FinTech adoption for Balkan countries we define a formula that incorporates the previously selected the indicators of FinTech adoption. A

weighted index approach is used, where each factor contributes differently based on its importance to FinTech adoption.

FinTech adoption index (FAI) formula could be:

$$FAI = w_1 \cdot DP + w_2 \cdot MB + w_3 \cdot IA + w_4 \cdot ATM + w_5 \cdot POS + w_6 \cdot FSG + w_7 \cdot RQ + w_8 \cdot FL + \cdot w_9 \cdot TDF$$

Where: *DP* = Digital Payment Penetration (%)

- *MB* = Mobile Banking Usage (%)
- *IA* = Internet Access (%)
- *ATM* = ATM Density (per 100,000 adults)
- *POS* = POS Terminals (per 100,000 adults)
- *FSG* = FinTech Startup Growth Index
- *RQ* = Regulatory Quality (0-100)
- *FL* = Financial Literacy (%)
- *TDF* = Trust in Digital Finance (0-100)

Table 5: Here are the FinTech adoption index scores for the Balkan countries:

Country	Digital economy index	FinTech Adoption Index
Albania	41.5	38.23
Bosnia & Herzegovina	36	41.71
Croatia	47.6	57.66
Montenegro	45	47.33
North Macedonia	43	44.3
Serbia	53.8	53.83
Slovenia	66.1	66.61

Source: Author's calculations

4.2. Interpreting the Results

The indicators for model summary are the next:

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.904	0.818	0.781	2.693761

- R (0.904): This represents the correlation coefficient between the Digital Economy Index and the FinTech Adoption Index. A value of 0.904 indicates a strong positive correlation, meaning that higher digital economy development is strongly associated with higher FinTech adoption.
- R^2 (0.818): This shows that 81.8% of the variation in the FinTech Adoption Index can be explained by the Digital Economy Index. This is a high explanatory power, suggesting that digital economy development is a strong predictor of FinTech adoption.
- Adjusted R^2 (0.781): Since this adjusts for the number of predictors, it accounts for sample size and model complexity. At 0.781, it confirms that even after adjustments, the model explains a substantial portion of the variance.
- Std. Error of the Estimate (2.693761): This indicates the average deviation of actual FinTech adoption values from the predicted values. A lower value suggests a better fit. Given the scale of the dependent variable (FinTech Adoption Index), this value appears moderate, meaning the model's predictions are relatively precise.

Based on ANOVA indicators (in Table 6: $F(4,3) = 24.41$, $p < 0.05$): The model is statistically significant, meaning at least one predictor significantly affects the digital economy index.

Table 6: ANOVA indicators

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	162,613	1	162,613	22,410	,005b
	Residual	36,282	5	7,256		
	Total	198,894	6			

Source: Author's calculations

The regression equation is: $Y = 18,47 + 0,53\ X_1$

The regression analysis yields the following coefficients for the relationship between the FinTech Adoption Index and the Digital Economy Index:

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	18.407	5.673	-	3.244	0.023
FinTech adoption	0.530	0.112	0.904	4.734	0.005

- The intercept (18.407) represents the predicted Digital Economy Index when the FinTech Adoption Index is zero. While this value may not have direct real-world interpretation, it serves as a necessary component of the regression model.
- The coefficient for the FinTech Adoption Index (0.530) indicates that for each 1-unit increase in the FinTech Adoption Index, the Digital Economy Index is expected to increase by 0.530 units. This suggests a positive and statistically significant relationship between the two indices.
- The t-value (4.734) for the FinTech Adoption Index is high, demonstrating that the effect of FinTech adoption on the Digital Economy Index is not due to random chance and is a significant predictor.
- The p-value (0.005) for the FinTech Adoption Index is below the standard significance threshold of 0.05, confirming the statistical significance of the relationship. This suggests that the effect of FinTech adoption on the Digital Economy Index is indeed meaningful and reliable.

5. Conclusion

This study investigates the state of FinTech adoption and its impact on the digital economy across Balkan countries, revealing significant variation in the level of digital financial infrastructure and adoption. Through a combination of statistical analyses, including cluster analysis and principal component analysis (PCA), it becomes evident that the Balkan region is characterized by a digital divide in financial technology adoption.

The cluster analysis identified three distinct groups of countries. Slovenia stands out with its advanced financial and digital adoption, driven by a robust banking sector, favorable regulatory conditions, and a high level of digital payment penetration. In contrast, countries such as Albania, Bosnia & Herzegovina, Montenegro, and North Macedonia are grouped in a cluster characterized by lower levels of digital finance development, highlighting the challenges they face in terms of financial infrastructure, regulatory quality, and consumer trust. Croatia and Serbia occupy an intermediate position, with more developed financial systems and growing FinTech ecosystems, yet still facing barriers to full digital transition.

Principal Component Analysis (PCA) further emphasized that most of the variation in digital finance adoption in the region is explained by a single dominant factor (PC1), likely related to digital payment systems, mobile banking, and regulatory support. This finding underlines the importance of improving these key areas to foster greater digital transformation in the region.

Regression analysis confirmed the strong relationship between FinTech adoption and the digital economy, with FinTech adoption emerging as the most significant predictor of digital economy growth. These results suggest that targeted investments in FinTech infrastructure, regulatory improvements, and financial education are essential for driving further digital economy growth, particularly in less developed countries in the region.

Overall, this study highlights the need for tailored policy interventions to bridge the digital divide in the Balkans. Strengthening regulatory frameworks, fostering digital literacy, and promoting the adoption of digital payment systems and mobile banking can accelerate the digital transformation in these countries, improving financial inclusion and innovation across the region. Regional cooperation and knowledge-sharing between countries can further enhance these efforts, creating a more cohesive and integrated digital financial landscape in Balkan countries. In addition to its theoretical and practical contributions, the study also offers a notable methodological contribution to the research on digital economy development and FinTech adoption, through the application of a weighted index approach and comparative analysis across countries in the region. This framework establishes a solid foundation for future empirical studies and supports the formulation of targeted policy recommendations aimed at accelerating digital transformation in the financial sector throughout the Balkans.

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