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A. Saparbek*, PhD student
L. Bimendiyeva, c.e.s., associate professor
Al-Farabi Kazakh National University
Almaty, Kazakhstan
* – main author (author for correspondence)
e-mail:aida.saparbek98@mail.ru

DIGITALIZATION OF FINANCIAL SERVICES AND ECONOMIC GROWTH: EVIDENCE FROM KAZAKHSTAN

The fundamental changes brought by the digitalization of financial markets have become an essential feature of modern economies. Importantly, they reshape the way financial services are delivered by enhancing their efficiency, lowering transaction costs and broadening the financial inclusion. Despite these significant improvements, the contribution of digital financial services to economic growth of developing countries such as Kazakhstan remains speculative. The study addresses this problem by examining the actual effect of digital financial services on economic growth of Kazakhstan during the period 2000-2023. Multiple linear regression and correlation analyses were utilized including GDP per capita as the indicator of economic growth, and mobile cellular subscriptions as a proxy for digitalization in financial services. The main empirical findings reveal that digitalization of financial services positively affects economic growth by raising GDP per capita. More precisely, a one percent increase in mobile cellular subscriptions (lnMCS) leads to 0.14 percent rise in GDP per capita (lnGDPpc). Hence, it can be said that these results underline the crucial role of digital financial services in fostering sustainable economic growth.

Keywords: *digitalization, financial services, economic growth, mobile cellular subscriptions, GDP per capita*
Кілт сөздер: *цифрландыру, қаржы қызметтері, экономикалық өсу, мобильді ұялы байланыс тіркелімдері, жан басына шаққандағы ЖІӨ*
Ключевые слова: *цифровизация, финансовые услуги, экономический рост, подписки на мобильную сотовую связь, ВВП на душу населения*

Introduction. Information and communication technologies, which were initially invented to connect people across the globe, have now become a powerful driver of modern economic development. Their impact is particularly evident in labor markets, stimulation of business growth and improvement of overall well-being. In this regard, financial services are no exception since many banking operations and financial transactions are now conducted online. Considering this trend, the Organization for Economic Cooperation and Development emphasizes the untapped potential of the digital economy and its far-reaching implications for sustainable economic growth.

Financial technologies, known as fintech, are contributing to this process by creating innovations in the finance sector and meeting capital needs in the long term [1]. The concept of "digital financial inclusion" has emerged within this context referring to the use of Internet, big data, and the cloud to manage risks and enhance effective information share among users. Digitalization of financial services thus provides the users with more equitable, efficient and convenient access to financial products and services [2]. Hence, there is a need to study the economic effects of this digital transformation.

Digital financial services are said to encompass digital payments, lending, insurance and fund management. According to Statista Market Insights, the number of digital payment users is predicted to reach 4.81 billion by 2028. This trend can underline the increasing importance of digital financial services as an effective and secure system capable of reaching underserved populations of the finance sector. At this point, it can be highlighted that by leveraging big data digital financial inclusion also helps reduce inequality in accessing financial services and strengthen risk management. As a result, digitalization of financial services contributes to the development of small and medium-sized enterprises, low-income households and underdeveloped regions by offering affordable and accessible finance tools [3].

Since 2010, the World Bank has recognized digital financial inclusion as one of the most effective tools for economic growth in developing countries. Therefore, the relevance of studying the digitalization of financial services lies in its theoretical and practical significance for economic research and policy recommendations, respectively. However, even though digital financial services are rapidly adopted in

almost all parts of the world, there is still limited empirical evidence on their impact on economic growth. This shortage is particularly noticed in the context of developing countries such as Kazakhstan [4]. Accordingly, this study aims to investigate the impact of digitalization in financial services on economic growth. To achieve this goal, the following tasks were identified in the study:

-to determine the nature of the relationship between digital financial services and economic growth;

-to evaluate the impact of mobile cellular subscriptions on GDP per capita;

-to assess the role of digital financial inclusion in Kazakhstan as an economic driver;

-to identify the external socio-economic factors affecting the relationship between digitalization in financial services and economic growth;

To address the above given tasks, this study employs quantitative research methods such as multiple regression and correlation analyses. Based on these methods, economic model was constructed with mobile cellular subscriptions and GDP per capita serving as indicators of digital financial services and economic growth, respectively. Within this framework, the following hypothesis was formulated:

Hypothesis: Digital financial services positively affect economic growth by increasing GDP per capita

Literature Review. In recent years, the fast expansion of digital financial services has earned increasing attention of many scholars. Various empirical studies on different contexts of digitalization show that Fintech innovations are adjusting financial systems and contributing to diversified and standardized development. Modern governments are now actively promoting digitalization of financial services as a tool to reduce inequality and poverty which in turn enhances sustainable economic growth. However, the scope, mechanisms and regional differences regarding the impact of digital finance on economic growth remain under discussion.

A growing number of studies highlight the positive and significant impact of digital financial inclusion on economic growth. For instance, Ahmad, Majeed, Khan, Sohaib and Shehzad argue that digital financial inclusion is said to enhance the overall economic productivity by providing effective and affordable financial services to previously excluded groups. Their findings imply that digital finance in China significantly correlates with provincial economic growth and human capital, with greater benefits flowing to low-income groups [5]. Similarly, Telukdarie and Mungar hold the view that digitalization of financial services promotes financial inclusion in remote areas, reducing regional inequality and broadening access to basic financial products [6]. Moreover, Afjal also emphasizes that digital innovative projects allow low-income households in less-developed areas to overcome the drawbacks of traditional finance further improving the efficiency of financial services [7].

Another group of scholars underline the role of digital finance as a significant poverty alleviation tool. Ben Naceur and Zhang emphasize that digital financial services enable the poor to accumulate online saving, access digital lending, and start small businesses. This, in turn, creates improved employment opportunities for low-income people, thereby enhancing their livelihoods [8]. Tiony and Yin add that digitalization of financial products decreases the transactions costs of financial intermediaries by reducing the dependence on physical bank branches. The digital finance tools instead provide the services of mobile wallets, platforms and AI-driven customer support tools [9]. These findings support the notion that digital financial inclusion emerging from digitalization in financial services can be an effective instrument for economic growth by reducing the poverty.

Evidence from Kazakhstan also highlights the positive effects of digital financial services on economic growth. Gumar, Zhanibekova, Imramziyeva, Kabdeshova and Issaeva demonstrate that digital technologies promote the efficiency of Kazakhstani banks. The banking services most affected by digitalization are payments, consumer finance and lending services. Also, this research suggests that some commercial banks have the potential to evolve into fintech companies to reduce risks and operational costs. Moreover, the development of automation strategies, artificial intelligence and data analytics are said to improve operational efficiency in forecasting customer behavior. All these findings suggest that digital financial services contribute to economic growth of Kazakhstan by strengthening the overall economic performance of the banking sector [10].

Despite the compelling evidence provided by reviewed literature on positive economic effects of digital financial services, several gaps persist. Firstly, almost all international studies focus on large and developed economies such as China, but case studies from Central Asia, especially Kazakhstan, remain underexplored. Secondly, most studies are descriptive in nature, lacking systematic and quantitative results on macroeconomic impacts of digital financial services. Thirdly, although mobile technologies are recognized as the drivers of digitalization, only few studies utilize mobile cellular subscriptions as the proxy

for digitalization in financial services. Lastly, well-known challenges of digitalization such as cybersecurity, digital literacy and institutional barriers are often included in theory but rarely analyzed in empirical studies.

The research aims to address these limitations by investigating the impact of digitalization in financial services on Kazakhstan's economic growth during the period 2000-2023. By examining the impact of mobile cellular subscriptions, as an indicator of digital financial services, on GDP per capita the study contributes empirical evidence to existing research and offers policy recommendations for developing countries.

Main part. This study used quantitative research methods to analyze the impact of digitalization in the financial services on economic growth of Kazakhstan. The annual dataset consists of 24 observations for the period 2000-2023 and was taken from the *World Development Indicators* database. No empty values were detected in the series, and they were checked for consistency before use in the analysis. Based on the variables the following model was developed:

$$\ln GDP_{pct} = \beta_0 + \beta_1 \ln MCS_t + \beta_2 \ln UPT_t + \beta_3 \ln EXP_t + \beta_4 \ln GGFCE_t + \epsilon_{it}$$

where **GDP per capita** (constant 2015 US$) is the dependent variable. While **MCS** (mobile cellular subscriptions per 100 people), **UPT** (urban population), **EXP** (exports of goods and services) and **GGFCE** (general government final consumption expenditure) stand for independent variables. Table 1 below presents a detailed description of dependent and independent variables. All variables were changed to natural logarithmic form to linearize the relationships and interpret variable coefficients as elasticities. Hence, this specification allows to indicate the percentage change in GDP per capita in accordance with one-percent change in each of the independent variables.

Table – 1

Description of dependent and independent variables

Variables	Definitions	Source
GDPpc	GDP per capita (constant 2015 US dollars)	World Development Indicators
MCS	Mobile cellular subscriptions (for 100 people)	World Development Indicators
UPT	Urban population (% of total population)	World Development Indicators
EXP	Exports of goods and services (% of GDP)	World Development Indicators
GGFCE	General government final consumption expenditure (% of GDP)	World Development Indicators

**Compiled by the authors based on World Development Indicators Databank [11*

In this study, GDP per capita (constant 2015 US$) (GDPpc) reflects real income per person excluding inflation and population growth effects. It allows to show how productive the individual is and how it contributes to the economy, thereby serving as the best proxy for human well-being and economic development. Moreover, it is consistent with economic models such as Solow and endogenous growth models which cover both capital accumulation and technology. While mobile cellular subscriptions (MCS) serve as the proxy for digitalization of financial services. The reason for this is that mobile cellular subscriptions represent the number of people with access to mobile communication technologies. These people get facilitated financial services in the form of digital transactions and delivery services. While UPT, EXP and GGFCE were included as control variables to avoid omitted variable bias and promote statistical robustness. Precisely, urban population (UPT) acts as a structural control which prevents overestimation of financial digitalization effect. Exports of goods and services (EXP) account for the growth impacts of trade openness and globalization excluding growth bias induced by them. Lastly, general government final consumption expenditure (GGFCE) is a fiscal control which isolates the market-enhanced growth impacts from government-driven effects.

Before estimating the model, Augmented Dickey-Fuller (ADF) test was utilized to check the stationarity of all variables. This test is essential to prevent biased regression results and misleading relationships between indicators. It was conducted by regressing each variable's first-differenced series on its lagged level. The null hypothesis states that the series have a unit root, while the alternative one proves stationarity of the data.

The Table 1 below presents the results of ADF test. The null hypothesis of non-stationarity is rejected for all variables since all p-values are below 0.05 threshold. Thus, ADF results indicate that all variables are stationary in their levels and ensure that they are suitable for further econometric analysis.

Table – 2

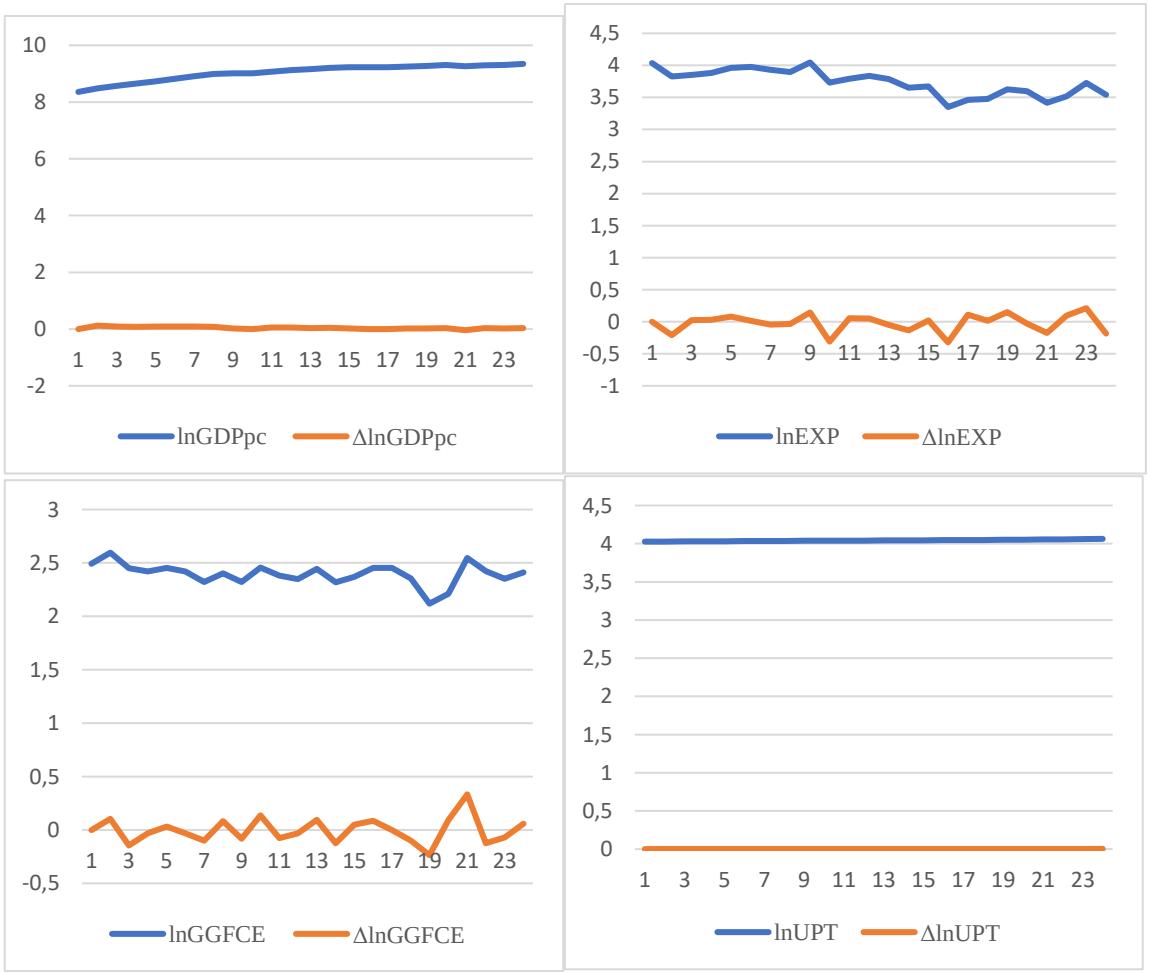
Results of the Augmented Dickey-Fuller (ADF) Test

Variable	ADF p-value	Stationarity (Level)
$\Delta lnGDP_{pc}$ vs $lnGDP_{pc(t-1)}$	0.0000005	Yes
$\Delta lnMCS$ vs $lnMCS_{(t-1)}$	0.00000001	Yes
$\Delta lnUPT$ vs $lnUPT_{(t-1)}$	0.00001	Yes
$\Delta lnEXP$ vs $lnEXP_{(t-1)}$	0.04	Yes
$\Delta lnGGFCE$ vs $lnGGFCE_{(t-1)}$	0.001	Yes

**Compiled by the authors based on the results*

It can be seen from the table above that most variables show strong evidence of stationarity rejecting the null hypothesis of a unit root (lnGDPpc, lnMCS and lnUPT). While, the variable lnEXP indicates slightly weaker evidence with a p-value of 0.04, but still stationary at 5% significance level. Overall, all series satisfy the stationarity requirement thereby can be included in the regression model.

To complement the ADF test, the study conducted graphical analysis for all variables in their level and differenced forms. This analysis illustrates the trends of each time series over the chosen period giving the visual interpretation of evolution and mean reversion. For validation of stationarity, the level forms of each variable should exhibit increasing trend. While differenced forms should demonstrate constant variance fluctuating around zero. The Figure 1 below shows the results of graphical analysis for stationarity of time series variables.



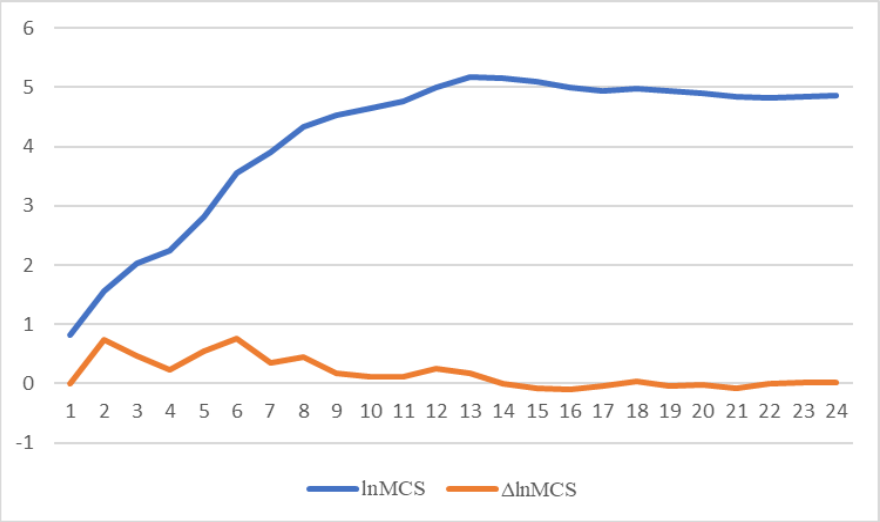


Figure – 1. **Time series plots of lnGDPpc, lnEXP, lnGGFCE, lnUPT and lnMCS in their levels and first differences**
*****compiled by the authors*

It is clear from the Figure 1 that all variables indicate upward trend in the level forms (particularly lnGDPpc and lnMCS) and first differences fluctuate around a zero mean. This visual analysis confirms stationarity with no visible trend and constant variance. Having confirmed the stationarity of all variables the study conducted correlation analysis. Table 3 given below presents the correlation coefficients among two pairs of model variables.

Table – 3

Correlation matrix of variables

	lnGDPpc	**lnMCS**	**lnUPT**	**lnEXP**	**lnGGFCE**
lnGDPpc	1				
lnMCS	0.95	1			
lnUPT	0.89	0.74	1		
lnEXP	-0.72	-0.5	-0.75	1	
lnGGFCE	-0.5	-0.4	-0.3	0.03	1

**compiled by the authors based on correlation analysis*

The correlation matrix above makes it clear that lnGDPpc strongly and positively correlates with lnMCS (r=0.95) and lnUPT (r=0,89) indicating that both digital financial services and urbanization are closely associated with economic growth. However, MCS and UPT illustrate high correlation between each other (r=0,75) which might lead to potential multicollinearity in the model. While, lnEXP and lnGGFCE show negative correlation with lnGDPpc and low correlations with other independent variables. To verify the potential effects of correlations, the study calculated Variance Inflation Factors (VIFs) for all independent variables. The VIF values are shown in Table 4.

Table – 4

Variance Inflation Factor (VIF) results

Variable	**VIF**
MCS	2.7
UPT	3.5
EXP	2.7
GGFCE	1.4

**compiled by the authors based on VIF diagnostic results*

It is seen from Table 4 that all VIF values are below the threshold (10). Even the highest VIF of 3,5 does not suggest the correlation with other explanatory variables. Complementing these results with correlation matrix, it can be said that although some independent variables are moderately correlated with

each other the multicollinearity does not cause the bias of standard errors. Thus, all variables can be included in the regression analysis.

After the test for multicollinearity the study conducted multiple regression using lnGDPpc(constant 2015 US$) as the dependent and lnMCS, lnUPT, lnEXP and lnGGFCE as four independent variables. The regression results are given in Table 5.

Table – 5

Regression results - dependent variable: GDP per capita (constant 2015 US$)

Variable	Coefficient	Std.error	t-Statistic	p-Value	95%Confidence Interval
Constant	-29.903	2.73	−10.952	0.000000001	[−35.62; −24.19]
lnMCS	**0.1386**	0.0046	30,29	**< 0.001**	[0.129; 0.148]
lnUPT	**9.7250**	0.6542	14,86	**< 0.001**	[8.36; 11.09]
lnEXP	**−0.1273**	0.0294	-4,32	**0.00036**	[−0.189; −0.066]
lnGGFCE	**−0.1988**	0.0440	-4,52	**0.00023**	[−0.291; −0.107]
$R^2 = 0.9971$; Adj. $R^2 = 0.9965$; $F = 1641.01$ ($p < 0.001$); $n = 24$.					

**compiled by the authors based on regression results*

Regression model of this study shows high explanatory power with $R^2 = 0.99$ suggesting that chosen variables together well-explain all variations in Kazakhstani economic growth.

Digital financial services indicated by lnMCS has a strong positive and highly significant impact on economic growth represented by lnGDPpc (β=0.1386, p-value **< 0.001**). It means that one percent increase in lnMCS raises lnGDPpc by approximately 0.14 percent. This result indicates that expansion of digital access facilitates digital financial inclusion and economic productivity (consistent with the results of Lu et al. and Ozili). Urban population (lnUPT) also positively and significantly affects lnGDPpc (β=9,73, p-value **< 0.001**). It suggests that increase in urbanization enhances economic growth by improving service access, productivity and digital landscape. While government final consumption expenditure (lnGGFCE) has a negative and significant coefficient (β=-0.1988, p-value **< 0.00023)** possibly implying that private investment might be crowded out by excess amount of government expenditures. Moreover, exports of goods and services also exhibit negative and significant relationship with lnGDPpc **(**β=-0.1273, p-value **< 0.00036).** This effect might be due to Kazakhstan's economic reliance on resources since the volatility of their prices restrict economic profits.

These regression results were tested for validity using robustness checks such as autocorrelation, heteroskedasticity and normality. The Darbin-Watson statistic (DW) for residuals was equal to 1.7. It indicates no evidence of autocorrelation in the model and confirms residuals' independence. Moreover, the model was checked for heteroskedasticity and normality using Breusch-Pagan (BP) and Jarque-Bera (JB)tests, respectively. The results are given in Table 6.

Table – 6

Breusch-Pagan (BP) and Jarque-Bera (JB)test results

Statistic	Value	Interpretation
LM-statistic	**0.267**	
BP p-value	**0.605**	>0.05
F-statistic	**0.248**	
F-test p-value	**0.624**	>0.05
JB p-value	**0.792**	>0.05

**compiled by the authors based on results*

Table 6 demonstrates that both p-values of Breusch-Pagan (BP) test are greater than 0.05 indicating that residuals exhibit constant variance. Thus, the model does not show the evidence of heteroskedasticity. While Jarque-Bera p-value also exceeds 0.05 threshold implying that model residuals are normally distributed. Hence, it can be concluded that the model of this study satisfies the requirements of Gauss-Markov assumptions.

Taken together, the results of this study support prior hypothesis that digital financial services enhance economic growth of Kazakhstan. They confirm that MCS, serving as a proxy for digital financial services, has a significant and positive impact on GDPpc. These findings correspond to international studies by Ahmad et al. [5], Ben Naceur and Zhang [8], Tiony and Yin [9], which highlight the growth-fostering role of digital financial services in both developed and developing economies. The results also align with the findings of Gumar et al. [10], who showed the role of digital financial services in the performance of Kazakhstani banks. This study completes existing literature with evidence from Kazakhstan as a country receiving restricted scholarly attention. In summary, the results have important implications for policy recommendations:

-to expand mobile penetration and provide affordable access to digital financial services in remote and underserved areas

-to promote urban investment

-to increase the efficiency of public expenditures

-to encourage cybersecurity, data protection and regulatory channels

Conclusion. This study investigated the impact of digital financial services on economic growth of Kazakhstan across the period 2000-2023. Utilizing multiple regression and correlation analyses, the study determined that digital financial services, proxied by mobile cellular subscriptions, play a critical role in enhancing economic development.

The findings validated a strong positive relationship between GDP per capita and mobile cellular subscriptions. Regression results revealed that one-percent increase in lnMCS leads to 0.14 percent rise in lnGDPpc. This provides strong empirical evidence for initial hypothesis that digital financial services foster economic growth. Another important finding indicated that urban population has also strong positive and highly significant impact on economic growth. Thus, it can be suggested that digitalization and urbanization serve as complementary forces in enhancing economic growth. It is due to the fact that urbanization encourages the development of digital infrastructure and access to financial and technological services.

The practical significance of this research is associated with its importance for policymakers and financial institutions. For policymakers, the results underscore the need for expansion of mobile penetration, promotion of digital financial inclusion and integration of advanced financial technologies. For banks and fintech companies this study highlights the essential value of investments in digital finance services and urbanization.

Nonetheless, this study has certain limitations. The analysis did not consider institutional and cultural factors which might affect the relationship between digital financial services and economic growth. Incorporation of digital literacy and cybersecurity in future research would give a comprehensive knowledge of digital-driven growth indicators.

In conclusion, the evidence found in this study underlines pivotal role of digital financial services in fostering long-term economic growth of Kazakhstan. Reinforcing the digital financial ecosystem by strengthening digital infrastructure, regulation and technological advances is thus an essential step toward establishing sustainable and inclusive development.

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Сапарбек А.С., Бимендиева Л.А.

ҚАРЖЫЛЫҚ ҚЫЗМЕТТЕРДІ ЦИФРЛАНДЫРУ ЖӘНЕ ЭКОНОМИКАЛЫҚ ӨСУ: ҚАЗАҚСТАН ДӘЛЕЛДЕРІ

Аңдатпа

Бүгінде қаржы нарықтарын цифрландыруға байланысты туындаған түбегейлі өзгерістер заманауи экономикалардың маңызды ерекшелігіне айналды. Ең маңыздысы, аталмыш өзгерістер қаржылық қызметтердің тиімділігін арттыру, транзакциялық шығындарды азайту және қаржылық инклюзияны кеңейту арқылы қаржылық қызметтерді көрсетумен анықталады. Мұндай елеулі жақсартуларға қарамастан, цифрлық қаржылық қызметтердің Қазақстан сияқты дамушы елдердің экономикалық өсіміне қосқан үлесі толық зерттелмеген болып қала береді. Бұл зерттеу цифрлық қаржылық қызметтердің 2000-2023 жылдар

аралығындағы Қазақстанның экономикалық өсуіне нақты әсерін зерттеу арқылы осы мәселені шешеді. Зерттеуде көптік сызықтық регрессия және корреляциялық талдаулар қолданылды, онда жан басына шаққандағы ЖІӨ экономикалық өсу көрсеткіші ретінде және мобильді ұялы байланыс жазылымдары қаржылық қызметтерді цифрландыру үшін прокси ретінде алынды. Негізгі эмпирикалық тұжырымдар қаржылық қызметтерді цифрландыру жан басына шаққандағы ЖІӨ-ні арттыру арқылы экономикалық өсуге оң әсер ететінін көрсетеді. Дәлірек айтқанда, мобильді ұялы байланыс тіркелімдерінің (lnMCS) бір процентке артуы жан басына шаққандағы ЖІӨ-нің (lnGDPpc) 0.14 пайызға артуына әкеледі. Демек, бұл нәтижелер тұрақты экономикалық өсуді қамтамасыз етудегі цифрлық қаржылық қызметтердің шешуші рөлін көрсетеді деп айтуға болады.

Сапарбек А.С., Бимендиева Л.А.

ЦИФРОВИЗАЦИЯ ФИНАНСОВЫХ УСЛУГ И ЭКОНОМИЧЕСКИЙ РОСТ: ПРИМЕР КАЗАХСТАНА

Аннотация

Фундаментальные изменения, вызванные цифровизацией финансовых рынков, стали неотъемлемой чертой современной экономики. Важно отметить, что они меняют способ предоставления финансовых услуг, повышая их эффективность, снижая транзакционные издержки и расширяя финансовую доступность. Несмотря на эти значительные улучшения, вклад цифровых финансовых услуг в экономический рост развивающихся стран, таких как Казахстан, остается спорным. Данное исследование решает эту проблему, изучая фактическое влияние цифровых финансовых услуг на экономический рост Казахстана в период 2000–2023 годов. Были использованы множественный линейный регрессионный и корреляционный анализы, включая ВВП на душу населения в качестве индикатора экономического роста и подписки на мобильную связь в качестве косвенного показателя цифровизации финансовых услуг. Основные эмпирические результаты показывают, что цифровизация финансовых услуг положительно влияет на экономический рост, увеличивая ВВП на душу населения. Точнее, увеличение подписок на мобильную связь (lnMCS) на один процент приводит к росту ВВП на душу населения (lnGDPpc) на 0.14 процента. Таким образом, можно сказать, что эти результаты подчеркивают решающую роль цифровых финансовых услуг в содействии устойчивому экономическому росту.