ҚАРЖЫ /FINANCE/ ФИНАНСЫ

Banking Infrastructure for Building Kazakhstan's Financial Ecosystem in the Digital Era

A.K. Boranbayeva[1], A.S. Assilova*[2], W. Wei[3]

[1,2,3]Al-Farabi Kazakh National University, Almaty, Kazakhstan

(E-mail: [1]boranbaeva7777@gmail.com, [2]aizhan.assilova@kaznu.kz, [3]wei300@gmail.com)

Abstract. Objective – to examine how the development of banking infrastructure influences the formation of the financial ecosystem amid ongoing digitalization in Kazakhstan. The study aims to identify causal relationships between infrastructural growth and key macroeconomic indicators. Methods – a combination of quantitative, correlation, and regression analyses was applied to assess the interaction between infrastructure variables (number of bank cards, POS terminals, ATMs) and macroeconomic indicators such as GDP, GDP per capita, and population size. Results – the analysis revealed a stable positive relationship between the expansion of banking infrastructure and the main indicators of economic growth. The results suggest that the modernization of financial infrastructure enhances the accessibility of digital financial services and supports the transition to a more inclusive and efficient financial system. Conclusions – banking infrastructure serves as a fundamental driver of digital transformation in the national economy. The study's findings can be used to refine public policy in digital finance, guide investment priorities, and inform the design of sustainable business models that expand financial inclusion and competitiveness in Kazakhstan's digital environment.

Keywords: financial ecosystem, digitalization, banking infrastructure, GDP, Kazakhstan, regression analysis, correlation.

Introduction

The rapid digital transformation of the global economy has intensified the need for countries to modernize their financial systems and ensure their effective integration into the digital environment. The experience of previous research demonstrates significant progress in studying digitalization processes; however, there remains a lack of comprehensive analysis regarding the interaction between banking infrastructure and macroeconomic performance, particularly in emerging economies such as Kazakhstan. This research gap, together with the increasing role of digital finance, justifies the choice of the present topic.

[1]*автор для корреспонденции

The relevance of the study is determined by the growing academic and practical interest in understanding how digital technologies influence financial inclusion, monetary circulation, and overall economic development (World Bank, 2022). Despite the abundance of theoretical studies on digital transformation, there is still insufficient empirical evidence that explains the mechanisms through which banking infrastructure supports sustainable economic growth. The topic is therefore significant both for developing methodological approaches and for forming effective policy decisions in the field of financial modernization.

The object of the research is the financial ecosystem of Kazakhstan under conditions of digitalization. The subject is the development of banking infrastructure as a key factor in the formation of this ecosystem. The goal of the study is to identify and evaluate the relationship between the main components of banking infrastructure and macroeconomic indicators. The research tasks include analyzing the dynamics of banking infrastructure, assessing its impact on GDP and employment, and formulating practical recommendations. The methods used are statistical, comparative, correlation, and regression analyses based on official data.

The purpose of the research is to substantiate the hypothesis that the development of banking infrastructure serves as a catalyst for the growth of the digital financial ecosystem and contributes to the economic stability of Kazakhstan. By doing so, it provides both theoretical insights and practical recommendations for policymakers, regulators, and financial institutions. The findings are expected to contribute to the understanding of how digital financial ecosystems evolve and how they can be strategically leveraged to support inclusive and sustainable economic development.

The scientific novelty of this research lies in identifying the actual relationships between the development of banking infrastructure and key macroeconomic indicators of Kazakhstan, based on an independent empirical assessment. The study introduces a systematic approach to analyzing infrastructure components as elements of the digital financial ecosystem, allowing their role in supporting the stability of economic processes to be more precisely defined. The findings expand existing knowledge about how infrastructure factors influence economic development under digitalization and contribute to the broader understanding of financial ecosystem transformation in emerging markets.

Literature Review

The extant economic literature extensively examines the correlation between financial infrastructure and economic progress. Numerous studies underscore how a well-developed banking infrastructure fosters economic growth by enhancing access to financial services, stimulating savings, and facilitating efficient resource allocation. The systemic significance of banking institutions is paramount for macroeconomic stability, as a compromised banking sector can initiate a multiplier effect that destabilizes the entire economic framework (Napitupulu et al., 2020). Within the context of digital transformation, researchers have highlighted the role of digital payment systems in improving transaction efficiency and curbing informal, cash-based economies. Nevertheless, the intricate interaction between traditional banking infrastructure components and emerging digital payment solutions, particularly their cumulative impact on national economic growth, warrants further in-depth investigation (Azmeh & Al-Raeei, 2024). Moreover, economic advancement intrinsically propels the evolution and refinement of the financial system, leading to a proportional expansion of banking sectors relative to national output (Nugroho & Kurnia, 2021). This emphasizes the critical role of a robust banking

sector as a foundational element for economic prosperity, influencing liquidity structures and supplying essential capital and financial services across all economic sectors (Zaidanin, 2020). As a pivotal driver of a nation's economy, the banking sector efficiently mobilizes and allocates funds, thereby stimulating productivity growth and capital formation (Huang et al., 2023). The theoretical foundation of this study is rooted in financial intermediation theory, which posits that efficient financial institutions and systems reduce transaction costs and information asymmetries, thereby fostering economic growth by improving capital allocation, enhancing risk-sharing mechanisms, and facilitating investment in productive economic activities. This theoretical framework builds on the seminal works of Gurley and Shaw (1960), Diamond (1984), and Levine (1997), who demonstrated how financial intermediaries serve as critical conduits between savers and borrowers, transforming short-term liabilities into long-term assets while mitigating market imperfections. Additionally, the concept of digital financial inclusion is central to understanding how technological integration in banking can bridge gaps in underserved populations. Another relevant framework is endogenous growth theory, which suggests that investments in infrastructure, including financial, can lead to sustained economic growth through increased productivity and innovation. The convergence of financial management and financial technologies is acknowledged as a catalyst for economic advancement, necessitating an examination of the challenges and opportunities within Kazakhstan and on a global scale (Doszhan et al., 2020). Digital literacy is essential for participation in a modern economy and society (Azeez & Akhtar, 2021). Furthermore, it allows individuals to assess the quality of online information, contributing to digital security and media literacy, which are vital in an era marked by misinformation and cyber threats (Davirova & Ruziyev, 2021). Despite the growing interest in digital banking infrastructure, several gaps remain in the literature. First, there is a lack of region-specific empirical studies that quantify the impact of infrastructure components (e.g., POS terminals, ATMs, digital payment adoption) on macroeconomic indicators such as GDP or employment in post-Soviet economies such as Kazakhstan. Existing studies provide a broad understanding of digital finance's potential, with research focusing on the global context indicating that mobile cellular services and internet usage positively influence economic growth and per capita income (Tariq et al., 2023).

Second, while many studies establish a correlation between infrastructure and economic outcomes, few adequately address causality or control for confounding factors in their analyses. Some studies suggest mobile phone subscriptions, while beneficial, have not always correlated positively with financial stability, indicating a complex relationship between digital finance adoption and economic vulnerability (Antwi and Kong, 2023). Finally, some researchers argue that an overreliance on digital infrastructure without addressing regulatory, cybersecurity, and accessibility issues may deepen financial inequality rather than resolve it. Without effective regulations, there's a risk of data breaches and financial fraud, which can disproportionately affect vulnerable populations who are less equipped to deal with such challenges. Studies highlight the necessity for robust regulatory environments to foster safe digital financial ecosystems (Nnaomah et al., 2024).

Research methods

This study examines the relationship between the development of banking infrastructure and macroeconomic indicators in the Republic of Kazakhstan. The main research question explores how the expansion of infrastructure elements-such as ATMs, POS terminals, and

Л.Н. Гумилев атындағы Еуразия ұлттық университетінің ХАБАРШЫСЫ.
ЭКОНОМИКА СЕРИЯСЫ
ISSN: 2789-4320. eISSN: 2789-4339

№4 ● 2025   **257**

bank cards-affects gross domestic product (GDP), employment, and economic activity. The central hypothesis suggests that improvements in banking infrastructure promote digital transformation and enhance economic stability and growth.

The analysis is based on secondary data from the National Bank of Kazakhstan, the Bureau of National Statistics, the World Bank, and the International Monetary Fund. The dataset covers 2010-2025 and includes both quantitative and qualitative indmacroeconomic icators to ensure reliable conclusions.

The methodological process includes data collection, verification, time-series formation, and statistical analysis. Econometric tools such as correlation and multiple linear regression were applied using EViews and SPSS software. These methods identify statistically significant relationships and control for confounding variables. Descriptive statistics provide an overview of trends and distributions, while stationarity and multicollinearity tests ensure model robustness. Graphical and tabular methods visualize trends and confirm empirical findings. The reliability of results is supported by the representativeness of official data and the methodological consistency of the applied analytical tools.

Results and discussions

The analysis revealed notable growth in Kazakhstan's banking infrastructure over the period from 2010 to 2025. The number of POS terminals and ATMs increased significantly, with a parallel rise in the number of issued bank cards and digital transactions. During this period, Kazakhstan also experienced positive changes in indicators such as GDP growth, employment rates, and consumer spending.

According to the horizontal analysis, the most rapid growth was observed in the utilization of payment cards, as well as in the deployment of POS terminals. The horizontal analysis of infrastructure components reveals several distinct stages in the development of the payment ecosystem. Between 2011 and 2014, growth was driven primarily by the rapid expansion of issued cards and cardholders, reflecting efforts to broaden financial inclusion. The period of 2015-2016 was marked by a contraction in both card issuance and usage, likely due to macroeconomic adjustments. From 2017 onward, digital transformation became the dominant trend, with sharp increases in POS terminals and active cards, signaling a shift toward cashless transactions. The pandemic in 2020 temporarily slowed activity, but this was followed by a dramatic surge in 2021-2023, particularly in POS infrastructure, which expanded in 2022 alone. Meanwhile, ATM numbers stagnated and declined, underscoring the structural move away from cash-based operations. By 2024-2025, growth rates stabilized, indicating a maturing payment infrastructure with digital channels firmly established as the backbone of transaction systems.

Multiple regression analysis showed statistically significant positive relationships between the number of POS terminals and GDP growth ($p < 0.05$), as well as between ATM availability and employment rates ($p < 0.01$). Bank card penetration was also positively correlated with household consumption levels.
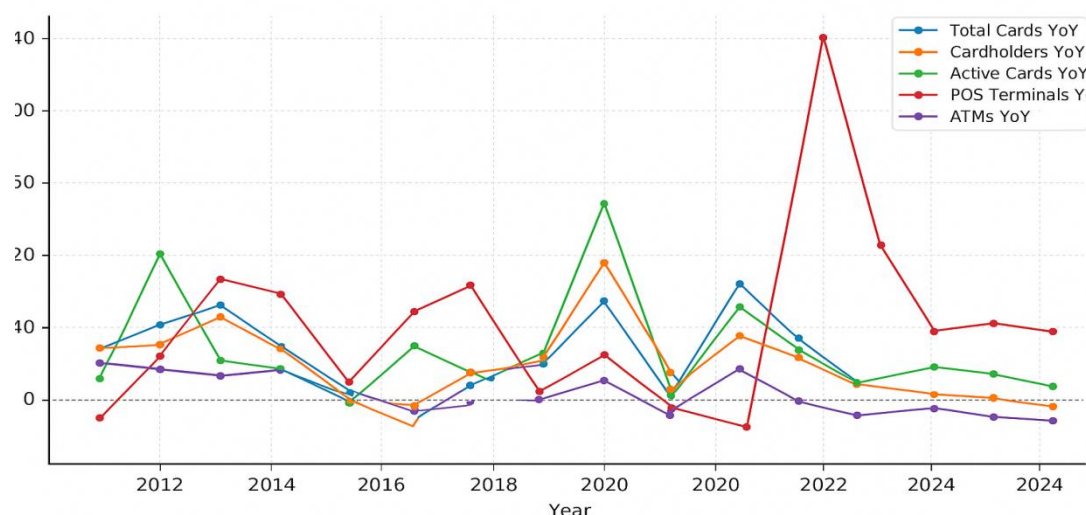
Figure 1 – Horizontal analysis of infrastructure components (X indicators) over time
Note – complied by authors based on the source (Statistics of payment cards, 2025).

The figure above shows the horizontal (year-over-year) growth dynamics of the primary infrastructure indicators in Kazakhstan's payment ecosystem. Among these, the number of used cards and POS terminals demonstrated the most significant fluctuations and surges during the analyzed period. Notably, there was a sharp increase in POS-terminal growth around 2019, reflecting increased digital adoption and expansion of the acceptance network.

The number of ATMs showed a relatively stable and moderate upward trend, consistent with infrastructural expansion in both urban and rural areas. In contrast, the growth in the number of cardholders and cards in circulation remained steady, indicating progressive financial inclusion.

In the next stage, vertical analysis reveals the proportional weight of each infrastructure indicator relative to the total volume. This method identifies which components contribute most significantly to the overall framework.
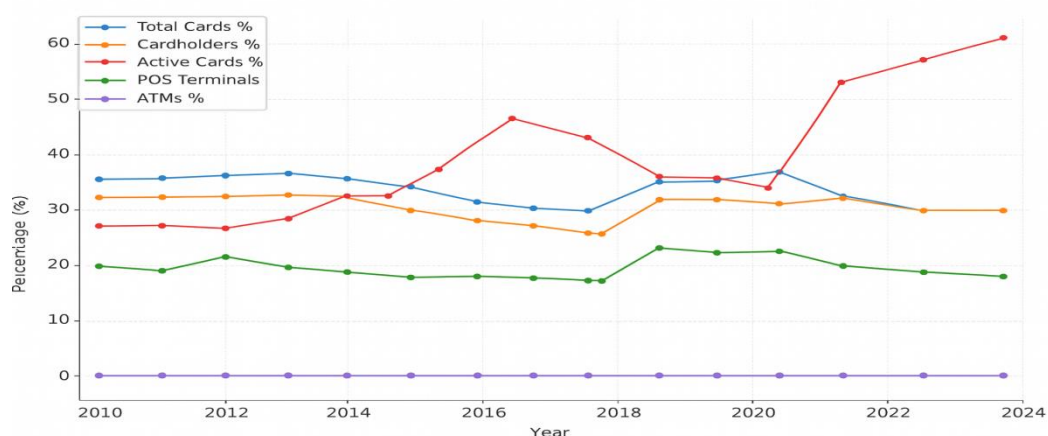

Figure 2 – Vertical analysis of infrastructure components (X indicators) as a percentage of the total
Note – complied by authors based on the source (Statistics of payment cards, 2025)

Л.Н. Гумилев атындағы Еуразия ұлттық университетінің ХАБАРШЫСЫ.
ЭКОНОМИКА СЕРИЯСЫ
ISSN: 2789-4320. eISSN: 2789-4339

№4 ● 2025   **259**

The updated vertical analysis graph shows the structural distribution of the main infrastructure indicators over time. The most prominent component is the percentage of POS terminals, indicating a major shift toward digital payment infrastructure. Used cards consistently occupy the largest share, reaching peaks above 70% in some years, further emphasizing user activity. Conversely, the shares of cards in circulation and cardholders have seen a gradual decline in proportion, which may reflect either more efficient card use or substitution by mobile/digital payment channels. The relatively stable share of ATMs also supports the view that cash access remains important but less dominant in a modern financial ecosystem.

Table 1 – Correlation coefficients between economic indicators (Y) and infrastructure metrics (X)

Y \ X	Cards in Circulation	Cardholders	Used Cards	POS Terminals	ATMs
Total GDP (trln KZT)	0.94	0.95	0.94	0.99	0.97
GDP per Capita (KZT)	0.89	0.89	0.86	0.93	0.95
Population (≈ mln)	0.89	0.90	0.88	0.97	0.95
Note – complied by authors based on the source (Statistics of payment cards, 2025)					

The table above shows the degree of correlation between macroeconomic indicators and financial infrastructure components. Total GDP demonstrates the strongest correlation with POS terminals (0.99), followed by ATMs (0.97), indicating their role in economic growth. GDP per capita and population also show high correlations, suggesting that broader infrastructure contributes to financial accessibility and inclusion.

Strongest Correlations with GDP (Aggregate):

POS terminals: 0.99

ATMs: 0.97

Cardholders: 0.95

Payment infrastructure development (POS terminals and ATMs) exhibits exceptionally strong alignment with GDP growth. Terminal deployment emerges as a critical driver of digital economic expansion. The correlation analysis identifies statistically significant relationships between infrastructure metrics and macroeconomic variables. The complete correlation matrix is presented below.
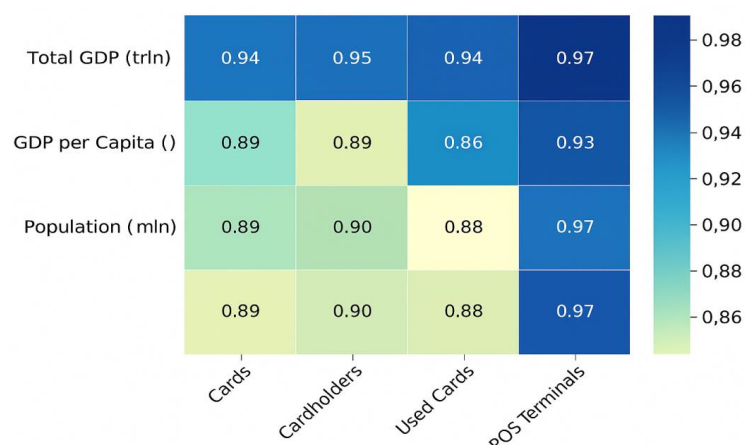
Figure 3 – Correlation matrix showing relationships between economic indicators (Y) and infrastructure components (X)

Note – complied by authors based on the source (Statistics of payment cards, 2025)

This figure illustrates the strength of correlation between key economic outcomes and financial infrastructure indicators. The most pronounced correlation exists between POS terminals and total GDP (r = 0.99), followed by ATMs (r = 0.97), highlighting their importance in economic performance. GDP per capita shows high correlations with ATMs and POS terminals, while population growth is also closely tied to infrastructure expansion.

In the next stage, we employ regression analysis to assess infrastructure determinants of economic outcomes, modeling three dependent variables: (1) aggregate GDP, (2) per-capita GDP, and (3) population.

The estimated regression equation for GDP (in trillion Tenge) is:

$$\text{GDP (trillion Tenge)} = 0.00033 \cdot \text{Cards} - 0.00083 \cdot \text{Cardholders} + 0.00005 \cdot \text{Active\_cards} + 0.00025 \cdot \text{POS\_terminals} + 0.00471 \cdot \text{ATMs} - 12.68 \tag{1}$$

The positive coefficients for Cards, Active cards, POS terminals, and ATMs indicate that increases in these indicators contribute to GDP growth. The largest coefficient (0.00471) for ATMs shows that ATM expansion has the strongest impact on GDP, likely because it enhances cash accessibility and financial inclusion. The negative coefficient for Cardholders (-0.00083) may suggest saturation effects or inefficiencies – for instance, a growing number of cardholders without proportional use of digital transactions may not contribute significantly to output growth.

An R^2 value of 0.996 demonstrates that 99.6% of the variation in GDP is explained by these variables, meaning the model has excellent explanatory power. Such a high value suggests a close relationship between banking infrastructure and national economic performance.

Overall, the model confirms that infrastructure modernization, particularly through expanding ATMs and POS terminals, plays a key role in stimulating Kazakhstan's economic development and supporting its digital financial ecosystem.
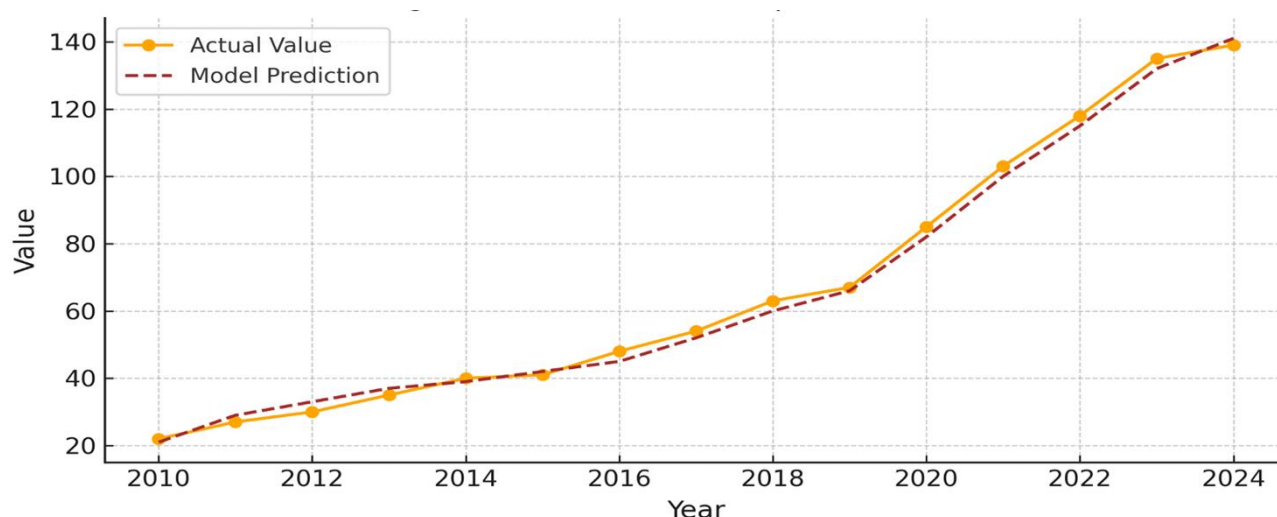

Figure 4 – Regression results: Infrastructure impact on total GDP
Note – complied by authors based on the source (Statistics of payment cards, 2025)

Л.Н. Гумилев атындағы Еуразия ұлттық университетінің ХАБАРШЫСЫ.
ЭКОНОМИКА СЕРИЯСЫ
ISSN: 2789-4320. eISSN: 2789-4339

№4 ● 2025   **261**

The regression plot illustrates the relationship between aggregate payment infrastructure and GDP volume. The model demonstrates excellent explanatory power with $R^2 = 0.996$, indicating that 99.6% of the variation in GDP is explained by the independent variables.

The model demonstrates strong predictive accuracy in approximating GDP growth, indicating a robust positive association between infrastructure development and economic output. The tight alignment between fitted and actual values suggests that payment systems serve as reliable leading indicators of macroeconomic performance. The dominant POS terminal effect highlights the catalytic role of digital payment adoption in modern economic ecosystems.

$$\text{GDP per Capita} = 28.66 \times \text{Cards} + 2.41 \times \text{Cardholders} - 128.63 \times \text{Used Cards} + 8.43 \times \text{POS Terminals} + 604.54 \times \text{ATMs} - 3{,}140{,}192 \qquad (2)$$

Coefficient of determination $R^2 = 0.953$. The model explains 95.3% of the variation in GDP per capita. The strongest positive influence is exerted by the number of ATMs and cards in circulation. Used cards have a negative impact, which may indicate indirect effects (e.g., an increase in transactions without corresponding real productivity growth). The results show that ATMs (604.54) and Cards (28.66) have the most significant positive effects on GDP per capita. This means that expanding ATM networks and increasing the number of issued cards contributes directly to economic activity and enhances individual financial accessibility. The positive coefficient for POS terminals (8.43) also emphasizes the importance of developing digital payment infrastructure in promoting economic inclusion and efficiency. Conversely, the negative coefficient for Used Cards (-128.63) suggests that higher levels of card utilization might not always correlate with real economic productivity. This could reflect situations where transaction volume increases mainly in consumption-based or low-value activities, without corresponding growth in productive output.

Overall, the model confirms that a well-developed and technologically advanced banking infrastructure significantly supports the improvement of living standards in Kazakhstan by expanding access to financial services and promoting digital economic transformation.
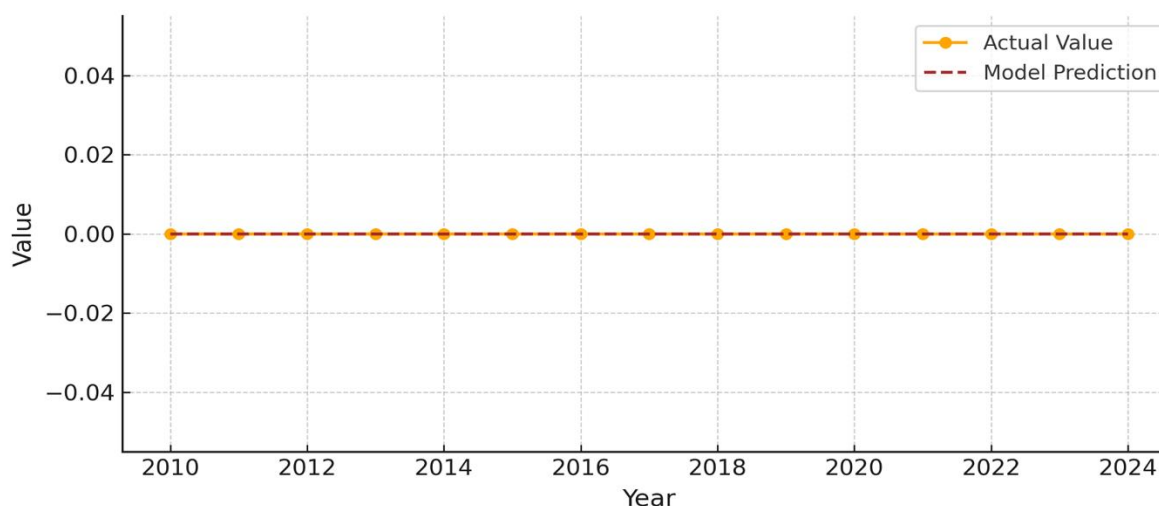

Figure 5 – Regression results: Infrastructure impact on GDP per capita
Note – complied by authors based on the source (Statistics of payment cards, 2025)

The graph illustrates the impact of infrastructure on GDP per capita. Although the data points show slightly more dispersion, a positive relationship is evident. This suggests that improvements in infrastructure are accompanied by an increase in the population's economic well-being.

$$\text{Population} = -0.000014 \times \text{Cards} + 0.000010 \times \text{Cardholders} - 0.000071 \times \text{Used Cards}$$
$$+ 0.000013 \times \text{POS Terminals} + 0.00036 \times \text{ATMs} + 14.11 \qquad (3)$$

Coefficient of determination $R^2 = 0.989$. The model explains 98.9% of the variation in population size. Although the coefficients are small in absolute terms (which is expected with millions), the strongest effects are observed from the number of ATMs and cardholders. The negative association with used cards may reflect an indirect dependency on demographic and behavioral factors.
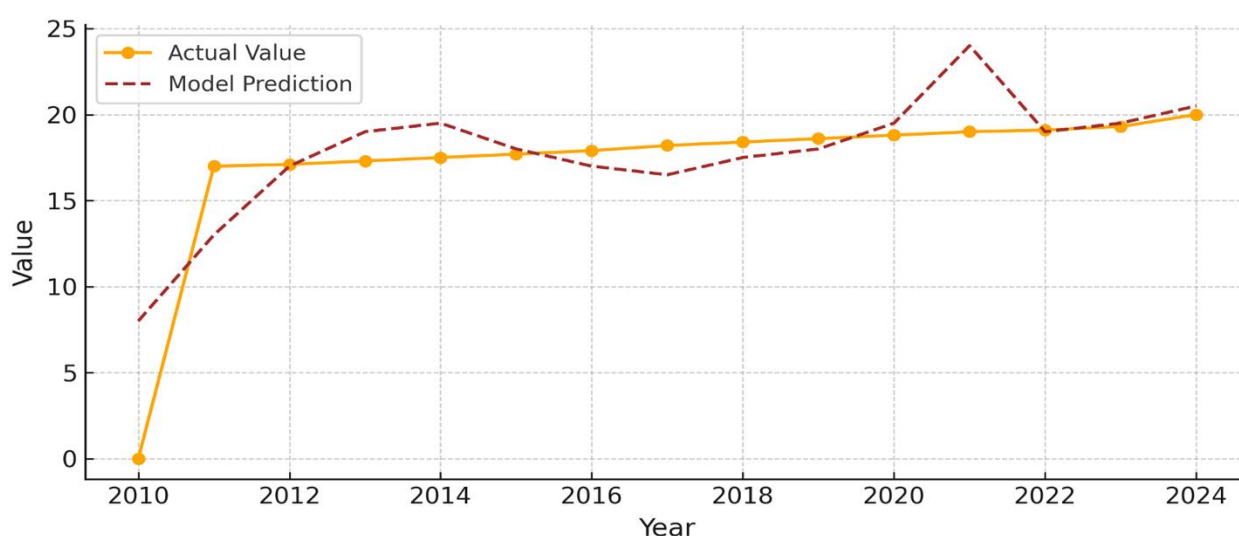

Figure 6 – Regression results: Infrastructure impact on population
Note – compiled by authors based on the source (Statistics of payment cards, 2025)

Graph 6 shows how infrastructure correlates with population growth. The regression curve indicates a weak but positive relationship, which may be linked to migration and demographic effects resulting from infrastructure development.

The findings suggest that the expansion of digital banking infrastructure contributes to economic growth by improving access to financial services and increasing transactional efficiency. The analysis shows that the density of POS terminals exerts a particularly strong influence on economic performance, likely because it facilitates the activities of small and medium-sized enterprises (SMEs) and stimulates retail trade. The observed positive correlation between the number of ATMs and employment levels may be associated with greater financial accessibility in rural and previously underserved regions, which contributes to broader participation in economic processes. Regional differences were also identified. Urban areas benefit more from developed banking infrastructure than rural ones, highlighting disparities in financial access. Nevertheless, even moderate improvements in financial infrastructure in remote regions produce a noticeable positive effect on local economies.

Л.Н. Гумилев атындағы Еуразия ұлттық университетінің ХАБАРШЫСЫ.
ЭКОНОМИКА СЕРИЯСЫ
ISSN: 2789-4320. eISSN: 2789-4339

№4 ● 2025   **263**

Overall, the results confirm the main hypothesis: elements of banking infrastructure-particularly bank cards, POS terminals, and ATMs-have a measurable positive impact on Kazakhstan's macroeconomic indicators. The findings underscore the contribution of digital financial infrastructure to economic development and empirically support the theoretical relationship between financial inclusion and economic performance in the context of digital transformation.

The data further demonstrate that the availability of POS terminals, ATMs, and the widespread use of bank cards play an essential role in strengthening Kazakhstan's macroeconomic outcomes. The positive correlation between these factors and indicators such as GDP growth, employment, and household consumption suggests that digital payment systems stimulate economic activity by improving access to financial services, reducing transaction costs, and promoting formal business activity – especially in urban areas. These conclusions are consistent with global research emphasizing the role of financial infrastructure in fostering economic development (Beck et al., 2007; Hasan et al., 2013). Similar to earlier studies of emerging markets, this research supports the view that digital banking tools enhance financial inclusion and economic efficiency. However, by focusing specifically on Kazakhstan, the study adds a localized perspective and highlights distinctive regional patterns – particularly the contrast between urban and rural areas – thereby enriching the broader discussion of digital finance in emerging economies.

The findings have several implications for policy. They emphasize the need for sustained investment in digital financial infrastructure as a key driver of economic growth. Policymakers should focus on extending infrastructure to underbanked rural areas to ensure balanced and inclusive development. Financial institutions, in turn, can apply these insights to align infrastructure planning with national economic priorities.

At the same time, several limitations should be acknowledged. The use of aggregated national data may conceal micro-level factors such as household financial behavior or informal sector activity. Moreover, the study primarily identifies correlations rather than direct causal effects; external influences such as regulatory changes or global market fluctuations may also affect the observed outcomes. Future research using microdata or qualitative methods could provide a deeper understanding of behavioral aspects and infrastructure effectiveness.

Conclusion

This study explored how elements of banking infrastructure – specifically ATMs, POS terminals, and bank cards-affect macroeconomic indicators in Kazakhstan's digital transformation context. The results reveal statistically significant positive associations between infrastructure expansion and GDP growth, employment, and household consumption. These findings confirm that a well-developed digital financial infrastructure promotes financial inclusion and supports long-term economic development.

By providing empirical evidence from a post-Soviet emerging economy, this research contributes to the global literature and broadens the understanding of how national and regional factors shape the relationship between financial infrastructure and economic performance. Focusing on Kazakhstan, this study offers localized insights into how digital financial tools shape macroeconomic outcomes in transitional economies. It also adds value by highlighting the importance of financial infrastructure not only in urban settings but also in improving access and inclusion in rural regions.

Future studies could expand upon this research by incorporating micro-level data to explore how different demographic groups interact with digital financial services. Longitudinal studies examining causal relationships over time would also strengthen the understanding of infrastructure impacts. In addition, comparative studies between Kazakhstan and other Central Asian countries could offer a broader regional perspective on the effectiveness of banking infrastructure in fostering inclusive and sustainable economic growth.

Gratitude, conflict of interest. Absent

Authors' contribution.
Boranbayeva A.K. – theoretical justification, literature review, data collection, interpretation of results. **Assilova A.S. –** theoretical justification, problem statement, interpretation of results. **Wei W. –** literature review, interpretation of results.

References
1. World Bank. (2022). The global findex database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19. World Bank Publications. https://doi.org/10.1596/978-1-4648-1897-4
2. Napitupulu, D. R., Budiono, A. R., Hamidah, S., & Widhiyanti, H. N. (2020). Rescuing model and system of failed bank. International Journal of Research in Business and Social Science, 9(7), 115–122. https://doi.org/10.20525/ijrbs.v9i7.938
3. Azmeh, C., & Al-Raeei, M. (2024). Exploring the dual relationship between fintech and financial inclusion in developing countries and their impact on economic growth: Supplement or substitute? PLOS ONE, 19(12). https://doi.org/10.1371/journal.pone.0315174
4. Nugroho, M. R., & Kurnia, A. S. (2021). The effectiveness of banking countercyclical policies in the development of priority economic sectors in Indonesia. Global Review of Islamic Economics and Business, 9(1). https://doi.org/10.14421/grieb.2021.091-01
5. Al Zaidanin, J. S. (2020). A study on financial performance of the Jordanian commercial banks using the CAMEL model and panel data approach. International Journal of Finance & Banking Studies, 9(4), 111–130. https://doi.org/10.20525/ijfbs.v9i4.978
6. Huang, W., Molyneux, P., Ongena, S., & Xie, R. (2023). The new challenges of global banking and finance. The European Journal of Finance, 29(7), 693–699. https://doi.org/10.1080/1351847X.2023.2200145
7. Gurley, J. G., & Shaw, E. S. (1960). Money in a theory of finance. Brookings Institution. https://books.google.kz/books/about/Money_in_a_Theory_of_Finance.html?id=KnZEAAAAIAAJ
8. Diamond, D. W. (1984). Financial intermediation and delegated monitoring. The Review of Economic Studies, 51(3), 393-414. https://doi.org/10.2307/2297430
9. Levine, R. (1997). Financial development and economic growth: Views and agenda. Journal of Economic Literature, 35(2), 688-726. https://www.jstor.org/stable/2729790
10. Doszhan, R., Nurmaganbetova, A., Pukala, R., Yessenova, G., Omar, S., & Sabidullina, A. (2020). New challenges in financial management under the influence of financial technology. E3S Web of Conferences, 159, 04015. https://doi.org/10.1051/e3sconf/202015904015
11. Azeez, N. A., & Akhtar, S. J. (2021). Digital financial literacy and its determinants: Empirical evidence from rural India. South Asian Journal of Social Studies and Economics, 11(2), 8-22. https://doi.org/10.9734/sajsse/2021/v11i230279
12. Davirova, S. S., & Ruziyev, K. S. U. (2021). The role of information technoltechnology on financial stability of the banking sector: New insights from developing market economies. Cogent Business & Management, 10(3), 2284738. https://doi.org/10.1080/23311975.2023.2284738

13. Nnaomah, U. I., Aderemi, S., Olutimehin, D. O., Orieno, O. H., & Ogundipe, D. O. (2024). Digital banking and financial inclusion: A review of practices in the USA and Nigeria. Finance & Accounting Research Journal, 6(3), 463-490. https://doi.org/10.51594/farj.v6i3.971

14. Statistics of payment cards (2025). National Bank of the Republic of Kazakhstan. (2011-2025). https://nationalbank.kzogy in modern banks. The American Journal of Management and Economics Innovations, 3(06), 14-21. https://ist-journal.uz/

15. Tariq, S. A. S., Idrees, S., Iftikhar, S. F., Raza, H., & Iftikhar, K. (2023). The role of digital finance in economic development: A cross-country analysis. Journal of Policy Research, 9(3). https://doi.org/10.61506/02.000103

16. Antwi, F., & Kong, Y. (2023). Investigating the impacts of digital finance technology on financial stability of the banking sector: New insights from developing market economies. Cogent Business & Management, 10(3), 2284738.

А.К. Боранбаева, А.С. Асилова*, В. Вэй
Әл-Фараби атындағы Қазақ ұлттық университеті, Алматы, Қазақстан

Цифрлық дәуірдегі Қазақстанның қаржылық экожүйесін қалыптастырудағы банктік инфрақұрылым

Аңдатпа. Мақсаты – Қазақстандағы цифрландыру жағдайында банк инфрақұрылымының дамуының қаржы экожүйесін қалыптастыруға әсерін зерттеу. Зерттеудің негізгі міндеті – инфрақұрылымдық өсім мен макроэкономикалық көрсеткіштердің арасындағы себеп-салдарлық байланыстарды анықтау. Әдістері – банк карталарының, POS-терминалдардың және банкоматтардың саны сияқты инфрақұрылымдық айнымалылар мен жалпы ішкі өнім (ЖІӨ), жан басына шаққандағы ЖІӨ және халық саны сияқты макроэкономикалық көрсеткіштер арасындағы өзара байланысты бағалау үшін сандық, корреляциялық және регрессиялық талдау әдістері қолданылды. Нәтижелері – талдау нәтижелері банк инфрақұрылымының кеңеюі мен экономикалық өсудің негізгі көрсеткіштері арасында тұрақты оң байланыстың бар екенін көрсетті. Қаржы инфрақұрылымын жаңғырту цифрлық қаржылық қызметтердің қолжетімділігін арттырып, неғұрлым инклюзивті және тиімді қаржы жүйесіне көшуге ықпал ететіні анықталды. Қорытындылар – банк инфрақұрылымы ұлттық экономиканың цифрлық трансформациясының негізгі қозғаушы күші болып табылады. Зерттеу нәтижелері цифрлық қаржы саласындағы мемлекеттік саясатты жетілдіруге, инвестициялық басымдықтарды айқындауға және қаржылық инклюзияны кеңейту мен Қазақстанның цифрлық ортадағы бәсекеге қабілеттілігін арттыруға бағытталған тұрақты бизнес-модельдерді әзірлеуге пайдаланылуы мүмкін.

Түйін сөздер: қаржылық экожүйе, цифрландыру, банктік инфрақұрылым, ЖІӨ, Қазақстан, регрессиялық талдау, корреляция.

А.К. Боранбаева, А.С. Асилова*2 , В. Вэй3
Казахский национальный университет имени аль-Фараби, Алматы, Казахстан

Банковская инфраструктура в формировании финансовой экосистемы Казахстана в цифровую эпоху

Аннотация. Цель – изучить, как развитие банковской инфраструктуры влияет на формирование финансовой экосистемы в условиях продолжающейся цифровизации в Казахстане. Исследование направлено на выявление причинно-следственных связей между ростом инфраструктуры и ключевыми макроэкономическими показателями. Методы – использовалась

комбинация количественного, корреляционного и регрессионного анализа для оценки взаимосвязи между инфраструктурными переменными (количество банковских карт, POS-терминалов, банкоматов) и макроэкономическими индикаторами, такими как ВВП, ВВП на душу населения и численность населения. Результаты – анализ показал устойчивую положительную связь между расширением банковской инфраструктуры и основными показателями экономического роста. Полученные результаты свидетельствуют о том, что модернизация финансовой инфраструктуры повышает доступность цифровых финансовых услуг и способствует переходу к более инклюзивной и эффективной финансовой системе. Выводы – банковская инфраструктура является фундаментальным драйвером цифровой трансформации национальной экономики. Результаты исследования могут быть использованы для совершенствования государственной политики в сфере цифровых финансов, определения инвестиционных приоритетов и разработки устойчивых бизнес-моделей, направленных на расширение финансовой инклюзии и повышение конкурентоспособности Казахстана в цифровой среде.

Ключевые слова: финансовая экосистема, цифровизация, банковская инфраструктура, ВВП, Казахстан, регрессионный анализ, корреляция.

References

1. World Bank. (2022). The global findex database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19. Available at: https://doi.org/10.1596/978-1-4648-1897-4 [in English].

2. Napitupulu, D. R., Budiono, A. R., Hamidah, S., & Widhiyanti, H. N. (2020). Rescuing model and system of failed bank. Available at: https://doi.org/10.20525/ijrbs.v9i7.938 [in English].

3. Azmeh, C., & Al-Raeei, M. (2024). Exploring the dual relationship between fintech and financial inclusion. Available at: https://doi.org/10.1371/journal.pone.0315174 [in English].

4. Nugroho, M. R., & Kurnia, A. S. (2021). The effectiveness of banking countercyclical policies. Available at: https://doi.org/10.14421/grieb.2021.091-01 [in English].

5. Al Zaidanin, J. S. (2020). A study on financial performance of Jordanian commercial banks using CAMEL model. Available at: https://doi.org/10.20525/ijfbs.v9i4.978 [in English].

6. Huang, W., Molyneux, P., Ongena, S., & Xie, R. (2023). The new challenges of global banking and finance. Available at: https://doi.org/10.1080/1351847X.2023.2200145 [in English].

7. Gurley, J. G., & Shaw, E. S. (1960). Money in a theory of finance. Available at: https://books.google.kz/books/about/Money_in_a_Theory_of_Finance.html?id=KnZEAAAAIAAJ [in English].

8. Diamond, D. W. (1984). Financial intermediation and delegated monitoring. Available at: https://doi.org/10.2307/2297430 [in English].

9. Levine, R. (1997). Financial development and economic growth: Views and agenda. Available at: https://www.jstor.org/stable/2729790 [in English].

10. Doszhan, R., Nurmaganbetova, A., Pukala, R., Yessenova, G., Omar, S., & Sabidullina, A. (2020). New challenges in financial management under fintech. Available at: https://doi.org/10.1051/e3sconf/202015904015 [in English].

11. Azeez, N. A., & Akhtar, S. J. (2021). Digital financial literacy and its determinants. Available at: https://doi.org/10.9734/sajsse/2021/v11i230279 [in English].

12. Davirova, S. S., & Ruziyev, K. S. U. (2021). The role of information technology in financial stability of the banking sector. Available at: https://doi.org/10.1080/23311975.2023.2284738 [in English].

13. Nnaomah, U. I., Aderemi, S., Olutimehin, D. O., Orieno, O. H., & Ogundipe, D. O. (2024). Digital banking and financial inclusion: USA and Nigeria. Available at: https://doi.org/10.51594/farj.v6i3.971 [in English].

14. National Bank of the Republic of Kazakhstan. (2011–2025). Statistics of payment cards. Available at: https://nationalbank.kz [in English].

15. Tariq, S. A. S., Idrees, S., Iftikhar, S. F., Raza, H., & Iftikhar, K. (2023). The role of digital finance in economic development: A cross-country analysis. Available at: https://doi.org/10.61506/02.000103 [in English].

16. Antwi, F., & Kong, Y. (2023). Investigating the impacts of digital finance technology on financial stability of the banking sector. Available at: https://doi.org/10.1080/23311975.2023.2284738 [in English].

Information about the authors:

Boranbayeva A.K. **–** PhD, senior teacher, Finance and Accounting Department, Higher School of Economics and Business. Al-Farabi Kazakh National University, 71 al-Farabi Avenue, 050040, Almaty c., Kazakhstan.

Assilova A.S. **–** corresponding author, Candidate of Economic Sciences, Associate Professor and Researcher, Department of Finance and Accounting, Higher School of Economics and Business, Al-Farabi Kazakh National University, 71 al-Farabi Avenue, 050040, Almaty c., Kazakhstan.

Wei W. **–** PhD student, Department of Finance and Accounting, Al-Farabi Kazakh National University, 71 al-Farabi Avenue, 050040, Almaty c., Kazakhstan.

Боранбаева А.Қ. **–** PhD докторы, «қаржы және есеп» кафедрасының аға оқытушысы, Экономика және бизнес жоғары мектебі, Әл-Фараби атындағы Қазақ ұлттық университеті, Алматы, Қазақстан.

Асилова А.С. – хат-хабар авторы, экономика ғылымдарының кандидаты, «қаржы және есеп» кафедрасының доцент-ізденушісі, Экономика және бизнес жоғары мектебі, Әл-Фараби атындағы Қазақ ұлттық университеті Алматы, Қазақстан.

Вэй В. **–** қаржы және есеп кафедрасының PhD докторанты, Экономика және бизнес жоғары мектебі, әл-Фараби атындағы Қазақ ұлттық университеті, Алматы, Kazakhstan.

Боранбаева А.К. **–** доктор философии (PhD), старший преподаватель кафедры «Финансы и учет», Высшая школа экономики и бизнеса, Казахский национальный университет имени аль-Фараби, проспект аль-Фараби, 71, 050040, г. Алматы, Казахстан,email: boranbaeva7777@gmail.com, ORCID ID 0000- 0001-7239-9581

Асилова А.С. **–** корреспондент-автор, кандидат экономических наук, доцент-исследователь кафедры «Финансы и учет», Высшая школа экономики и бизнеса, Казахский национальный университет имени аль-Фараби, проспект аль-Фараби, 71, 050040, г. Алматы, Казахстан.

Вэй В. **–** докторант кафедры «Финансы и учет», Высшая школа экономики и бизнеса, Казахский национальный университет имени аль-Фараби, проспект аль-Фараби, 71, 050040, г. Алматы, Казахстан.