ORIGINAL PAPER

DOI: 10.26794/2587-5671-2024-28-5-31-43
UDC 339.73(045)
JEL O11, G15

Economic Growth in Russia with the Integration of Cross-Border Payments into the Blockchain Environment

M.R. Safiullin[a], L.A. Elshin[b], R.T. Burganov[c]
[a, b] Kazan (Volga Region) Federal University, Kazan, Russia;
[a, b] Center for Advanced Economic Research, Academy of Sciences of the Republic of Tatarstan, Kazan, Russia;
[b] TISBI University of Management, Kazan, Russia;
[c] Volga Region State University of Physical Culture, Sports and Tourism, Kazan, Russia

ABSTRACT

International financial organizations and development institutions agree that the implementation of blockchain technologies (DLT) in the process of cross-border payments will significantly contribute to the development of the global international payment system. In this regard, works devoted to the prospects for the creation of specialized blockchain platforms and international transactions implemented on their basis in the framework of the use of digital currencies are of great interest today. This issue is of particular relevance today for the Russian economy, which is faced with unprecedented sanctions pressure, limiting, in particular, the access of the financial system to international clearing services. The **purpose** of this study is to develop and test methodological approaches to the empirical assessment of the potential GDP growth in Russia in the event of simulating the transition of cross-border payments to a blockchain ecosystem. The research consists of **methods** for systematizing macroeconomic externalities that are formed in the financial system of the national economy in the process of using blockchain in the system of international settlements, as well as correlation and regression analysis, which provides the opportunity to identify the impact of blockchain transactions on the prospects of economic dynamics. The **results** of the study consist in the identified potential for a possible increase in Russia's GDP (+4.0% per year) as part of the use of blockchain in the system for securing international payments. The assessments not only indicate the prospects of using blockchain in the implementation of transnational payments, but also determine the potential for their use in localizing the risks of increasing sanctions pressure, expressed, in particular, in restricting access to international clearing services, payment systems (SWIFT, etc.).

Keywords: blockchain; transnational payment systems; economic externalities; macroeconomic effects; GDP growth; economic security; sanctions pressure; international supply chains; sustainability of the national economy

For citation: **Safiullin M.R., Elshin L.A., Burganov R.T. Economic growth in Russia with the integration of cross-border payments into the blockchain environment.** ***Finance: Theory and Practice.*** **2024;28(5):31-43. DOI: 10.26794/2587-5671-2024-28-5-31-43**

INTRODUCTION

Additive technologies, artificial intelligence, digital transformation of the economy, blockchain, and other so-called cross-cutting technologies are today defining new points of economic growth. In this regard, it seems extremely important and relevant to study the macroeconomic externalities generated during the diffusion of technological innovations across all areas of economic activity, including finance. One of the key technologies that has the potential to evolve the Fintech sector is blockchain.

At the moment, the scientific and expert communities are actively and sometimes controversially discussing the prospects of using blockchain (DLT) in the framework of economic relationship building. The question of how in-demand these technologies will be in the process of organizing cross-border payments during the formation of supply chains is equally "acute". Following the fundamental conclusions of foreign and Russian researchers [1–4 and others] and international development institutions (World Economic Forum,[1] Organisation for Economic Co-operation and Development,[2] Bank for International Settlements[3] etc.), DLT technologies hold significant potential for optimizing the financial sector of the economy, including its supranational level. However, how this may impact the development of individual countries and regions integrated into the blockchain ecosystem remains a fairly open question.

The question takes on special significance for the Russian economy, which is facing intense external pressure that has led to restrictions on the access of Russia's financial system to international payment services. This greatly complicates the process of establishing international supply chains, including with friendly countries. In this regard, the question of alternative mechanisms for organizing foreign economic activity and the accompanying cross-border transactions is quite pressing on the agenda of the current day for the Russian economy [5, 6].

Taking into account the highlighted aspects, as well as the rapidly evolving process of studying the prospects for the creation of central bank digital currencies (CBDCs) [7] in many countries around the world, including the Russian Federation, the issue of methodological support for assessing the macroeconomic externalities generated in the context of transitioning cross-border payments to blockchain appears to be extremely relevant. Meanwhile, the solution to this problem is difficult to classify as trivial, especially since this conclusion is clearly substantiated against the backdrop of scientific publications that focus on the use of qualitative, heuristic analysis methods. However, the desire for strict formalization of conclusions based on the study of statistical data and the construction of corresponding models creates a more substantiated foundation for understanding the phenomena or processes being studied. In this regard, the aim of this work is to develop the theoretical and methodological foundations for researching the macroeconomic opportunities emerging in the national economy within the framework of transferring cross-border payments into a blockchain ecosystem. The set goal defined the following key research tasks:

- to develop methodological approaches to assess the impact of blockchain payment systems on the growth prospects of the national economy's GDP;
- to build a forecast of the potential GDP growth of the Russian Federation within the framework of the implemented simulation modeling of blockchain application in the organization of cross-border payments system.

[1] World Economic Forum, 'Windows of Opportunity: Facilitating Trade with Blockchain Technology', WEF White Papers, 2019.

[2] OECD, 'The Policy Environment for Blockchain Innovation and Adoption: 2019 OECD Global Blockchain Policy Forum Summary Report', OECD Blockchain Policy Series, 2019.

[3] Rise of the central bank digital currencies: drivers, approaches and technologies. URL: ttps://www.bis.org/publ/work880.htm (accessed on 28.03.2023).

The research methodology consisted of structural and empirical data analysis, as well as correlation-regression analysis, which justified the potential impact of transnational blockchain transactions on the prospects for macroeconomic growth of the national economy of the Russian Federation. Let's get more detailed on the research methods.

MATERIALS AND METHODS

The solution to the problems involves the need to structure the potential macro effects generated within the framework of international blockchain transactions, with the aim of subsequently determining the methodology for their impact on economic growth. At the same time, this structuring should be formed primarily based on the emerging technological possibilities of blockchain application, as well as on the institutional transformations that are reshaping the existing mechanisms and principles of organizing transnational payments in the context of systemic changes.

Abstracting from the potential risks and threats that may arise during the use of blockchain in the international payment system (money laundering; anonymity of blockchain transactions; potential 51% attacks, etc.), and focusing solely on the opportunities that arise, the algorithm for a formalized study of the aggregated impact of blockchain payment systems on GDP growth prospects can be presented in the following flowchart (*Fig. 1*).

The presented approach to studying the impact of blockchain on the formation of aggregated socio-economic effects resulting from the construction of new-format cross-border digital payment systems justifies a rather complex system for conducting empirical assessments. Their summary is presented in *Table 1*.

RESULTS AND DISCUSSION

Based on the methodological approaches presented above, an attempt has been made to empirically assess the most significant economic effects, in our opinion, arising from the transition of transnational payments to a blockchain ecosystem:

- the localization of the mediation institute in financial, logistical, transportation, trade, and other areas of economic relations;
- the absence of the need to use the financial mechanism of a letter of credit in foreign economic activity (the comprehensive creation of a trust space, and therefore, blockchain can lead to significant transformations in the organization of supply chains, lowering the entry barrier to the global market of goods and services while simultaneously increasing the level of security and reliability of transactions carried out within the ecosystem).

At the same time, it should be noted that, guided by the research algorithm presented above (*Fig. 1*), the spectrum of opportunities that arise in the process of building an international payment system based on blockchain is significantly broader. However, considering the substantial, substantive, and methodological limitations, their evaluation is not presented in this study.

Moreover, it is important to emphasize that macroeconomic externalities in the context of the question posed in this study will be formed not only in the form of positive effects. For a comprehensive understanding and study of the process, it is necessary to systematize other possible consequences, risks, and limitations of applying blockchain in the formation of transnational payments. They can be expressed in:

- technical vulnerabilities of implemented operations and transactions;
- cybercrime;
- data privacy;
- increasing tension in the labor market due to the automation of a number of economic operations;
- various jurisdictions and regulatory frameworks in different countries that

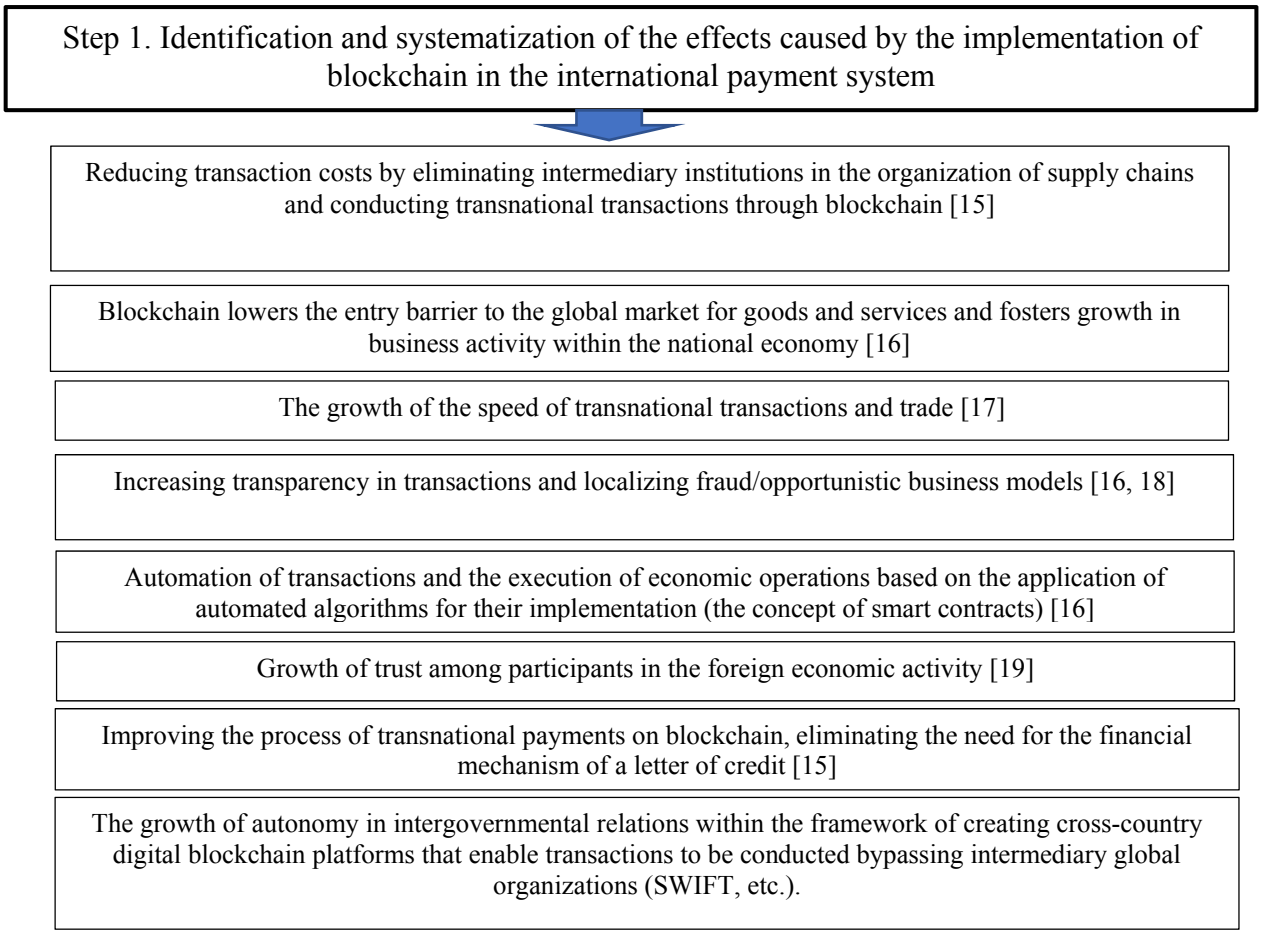

Fig. 1. **An Algorithm for Studying the Aggregate Impact of Blockchain Payment Systems on GDP Growth Prospects**

Source: Compiled by the authors.

govern the digital space and the system of international economic relations;

• differentiated level of development of the digital environment at the country level, which may also limit access of individual states to the digital blockchain ecosystems created (lack of standards and unified ICT-infrastructure);

• technical limitations and the effectiveness of blockchain in the context of large-scale deployment etc.

Abstracting from the risks and threats of using blockchain in international transactions and focusing solely on the most significant positive macroeconomic externalities, the main findings of the study are presented below in terms of the effects considered.

1. Assessment of the impact of the elimination of intermediary institutions in the organization of supply chains and the conduct of transnational transactions through blockchain.

Table 1

Methodological Approaches to the Study of the Impact of Blockchain on the Prospects for Building a New System for Organizing Cross-border Payments and Developing the National Economy

No.	The content of the economic effect	Methodological approaches to estimates
1	Reducing transaction costs by eliminating intermediary institutions in the organization of supply chains and conducting transnational transactions through blockchain [8, 9]	Sequence of the evaluation algorithm: 1. Reduction of transaction costs due to lower commission rates (in accordance with the parameters of the EC Roadmap*) for conducting transactions 2. Increase in working capital of economic entities 3. Growth of business and investment activity 4. GDP growth
2	Blockchain lowers the entry barrier to the global market for goods and services and fosters growth in business activity within the national economy [9, 10]	1. Reduction of transaction costs as a result of the localization of the mediation institution 2. Strengthening the integration of small and medium-sized enterprises into international supply chains 3. Growth of business activity in the national economy 4. GDP growth
3	The growth of the speed of transnational transactions and trade [11, 12]	1. Localization of potential economic losses for participants in international transactions due to the reduction of the time lag required for executing transactions in conditions of increased currency volatility (separately for exporters and separately for importers) 2. Growth of financial results of economic entities participating in the foreign economic activity 3. GDP growth
4	Increasing transparency in transactions and localizing fraud/opportunistic business models [13]	1. Localization of potential economic losses for participants in an international transaction due to the elimination of opportunistic business models 2. Decrease in the volume of funds allocated by participants in foreign economic activity within the framework of the open account international trade model, in the context of export credit insurance 3. Growth of financial results of participants in foreign economic activity 4. GDP growth
5	Automation of transactions and the execution of economic operations based on the application of automated algorithms for their implementation (the concept of smart contracts) [14]	The methodological basis for determining the economic effect at the macro level consists of the algorithms for assessing externalities presented in points 1–4. They express the effectiveness of implementing smart contracts in foreign economic activity in an aggregated form
6	Growth of trust among participants in foreign economic activity [14]	The methodological basis for determining the economic effect at the macro level consists of algorithms for assessing externalities, as presented in point 4. They express the growth of trust among participants in foreign economic activity in an aggregated form, which is reflected in the intensification of business activity in the economy
7	Improving the process of transnational payments on blockchain, eliminating the need for the financial mechanism of a letter of credit [14, 15]	1. Localization of bank fees for participants in foreign economic activity regarding the use of the financial instrument of a letter of credit 2. Growth of financial results of participants in foreign economic activity 3. GDP growth

Table 1 (continued)

No.	The content of the economic effect	Methodological approaches to estimates
8	The growth of autonomy in intergovernmental relations within the framework of creating cross-country digital blockchain platforms that enable transactions to be conducted bypassing intermediary global organizations (SWIFT, etc.) [13, 15] Blockchain as a promising technology for international settlements in the context of sanctions and an unfriendly external environment: an economic aspect	1. Assessment of cash flows in the Russian Federation by export/import directions within the framework of the use of transnational payment systems (SWIFT) in a consolidated form and by individual countries and country groups 2. Assessment of the damage to the Russian economy as a result of disconnection from SWIFT 3. Simulation modeling of enhancing the sustainable development of the national economic system of Russia within the framework of building blockchain platforms with a number of friendly countries, bypassing SWIFT

Source: Compiled by the authors.

Note: * Blockchain for supply chains and international trade. Report on key features, impacts and policy options. European Parliamentary Research Service. Scientific Foresight Unit (STOA). PE 641.544. May 2020.

The basis for conducting calculations is data on the movement of export-import flows for the period from 2013 to 2021. An abstract model is accepted as a hypothesis, allowing for a total transition of cross-border payments to blockchain. At the same time, the main effect within the framework of the localization of intermediary institutions in the system of organizing international transactions will be formed within the context of import flows. This is related to the fact that export shipments are paid for by buyers from third countries, and the entire burden of the commission falls on them, which is not within the "scope" of this study.

In accordance with the previously presented arguments, the application of blockchain in the system of organizing international payments will lay the foundation for the localization of commission fees charged for transaction processing. This, in turn, will contribute to the release of capital for economic entities and ensure the growth potential of their working capital and, consequently, their financial results.

In solidarity with position [15], the potential increase in working capital for participants in foreign economic activity — residents of the Russian Federation — is assessed based on the hypothesis that the average commission rate for retail cross-border payments will decrease from 7.45% to 1% with the implementation of blockchain.[4] As a result of calculations modeling the possible increase in working capital for economic entities in accordance with the proposed reduction in the commission level for retail cross-border payments during the transition to blockchain, estimates have been obtained indicating the potential increase in working capital ranging from 15.0 to 19.0 billion USD per year (the calculation is made as the difference between the current gross commission fees for conducting cross-border payments and the projected fees, taking into account the reduction of the commission rate to 1% of the payment amount).

Relying on the identified reserves for the growth of working capital among foreign economic activity participants, further assessments of the potential changes in their financial results have been implemented. The implementation of this research stage was carried out using econometric modeling

[4] Blockchain for supply chains and international trade. Report on key features, impacts and policy options. European Parliamentary Research Service. Scientific Foresight Unit (STOA). PE 641.544 — May 2020.

Table 2

Forecast Estimates of the Increase in the Net Financial Result for the Period from 2017 to 2021

No.	Indicator	2017	2018	2019	2020	2021
1	Predicted value of the net financial result (according to the model), thousand rubles	8 989 335 700	13 823 577 781	15 214 092 358	16 128 138 080	25 367 835 246
2	Predicted value of the net financial result considering the growth of working capital, thousand rubles	9 110 467 363	13 963 547 558	15 335 957 541	16 285 160 727	25 571 741 644
3	Increase in net financial result, thousand rubles (the difference between lines 1 and 2)	121 131 663.4	139 969 777.2	121 865 182.4	157 022 647.2	203 906 397.9

Source: Compiled by the authors.

methods within the framework of constructing a linear regression model that assesses the relationship between the net financial result (endogenous parameter) and the potential change in working capital (exogenous parameter of the model). Statistical estimates and parameters of the obtained model (R2 = = 0.93; t-statistic = 2.25342; P-value for the exogenous factor is 0.037 etc.) allowed for the construction of a forecast for the potential increase in the net financial result, taking into account the current and adjusted (projected) values of working capital (*Table 2*).

The final step in conducting calculations aimed at assessing the macroeconomic effect, expressed in GDP growth as a result of the increase in the net financial result of economic entities, is the construction of an econometric model that evaluates the relationship between the parameters under consideration, formula (1). The calculations were made based on data from 2010 to 2021. Considering the nonlinear nature of the relationship between the factors under study (which aligns with the views of several Russian researchers [16, 17]), appropriate mechanisms for constructing a logarithmic model have been employed.

The equation has the form:

$$LnGDP = Ln\ (103.36) + 1.006 LnNFR \qquad (1)$$

(R2 = 0.83; t-statistics = 6.876; P-value for the exogenous factor is 0.0009 etc.),

where GDP — gross domestic product of the Russian Federation, billion rubles; NFR — net financial result, billion rubles.

Transforming the obtained equation from logarithmic form into a power function, the following logarithmic model has been constructed:

$$GDP = 4.63 * NFR^{1.006}. \qquad (2)$$

This model has made it possible to obtain predictive estimates of Russia's GDP, taking

Table 3

Forecast of GDP Growth in Accordance with the Simulation of the Transition of Transnational Payments for Gross Imports of the Russian Federation to the Blockchain

Year	GDP forecast by model, million rubles	GDP forecast with growth of the net financial result, million rubles	Deviation, million rubles	GDP growth, in %*
1	2	3	4	5
2017	95 891 918.05	96 201 337.75	309 419.7	0.32
2018	104 772 665	105 130 204.8	357 539.9	0.34
2019	109 782 531.6	110 093 825	311 293.3	0.28
2020	101 257 564.5	101 658 664.4	401 099.9	0.40
2021	145 266 626.6	145 787 486.7	520 860.1	0.36

Source: Developed by the authors based on data from EMISS. URL: https://www.fedstat.ru/indicator/38574 (accessed on 12.04.2023).

Note: * calculated as the ratio of column 4 to column 2, in %.

into account current and new values of the net financial result (*Table 3*).

The results of the conducted analysis demonstrate a situation in which the reduction of the cost of transnational payments across the Russian economy can ensure an average GDP growth of 0.4% within the total volume of import flows. This perspective on the effect is largely an abstraction. It's hard to imagine that all partner countries importing goods and services to Russia will switch to blockchain transactions. At the same time, the obtained assessments may reveal hypothetical effects related to the localization of commission costs for servicing and conducting transnational transactions within the transition of international payments to a blockchain ecosystem.

2. Assessment of the impact of the transition of transnational payments to blockchain, eliminating the need for the financial mechanism of letters of credit.

According to the data presented in the GLOBE NEWSWIRE analytical report, the global letter of credit market amounted to 3.9 trillion USD in 2022.[5] At the same time, according to information published at the UN Conference on Trade and Development (UNCTAD), the volume of global trade for that year reached a level of 32 trillion dollars.[6] Thus, it is quite evident that the letter of credit market plays a significant role in servicing global trade.

Using the given relationship between the indicators in question, it seems reasonable to project it onto the Russian national economy. In other words, in the absence of publicly available statistical data on

[5] Insights on the Letter of Credit Confirmation Global Market to 2027 — Demand for Customized Trade Services Presents Opportunities. URL: https://translated.turbopages.org/proxy_u/en-ru.ru.3cc4889d-643910c1-45b8d6bd-74722d776562/https/www.yahoo.com/lifestyle/insights-letter-credit-confirmation-global-095800655.html (accessed on 14.04.2023).

[6] Global trade set a record in 2022. URL: https://kz.kursiv.media/2023-03-24/lgtn-worldtrade/#:~:text=Объем%20мировой%20торговли%20в%202022-м,продаж%20«зеленых»%20(экологически%20чистых)%20товаров (accessed on 14.04.2023).

Table 4

Assessment of the Gross Level of Export Letters of Credit for the Russian Federation

Indicator	2017	2018	2019	2020	2021
Export, million dollars	525 396.58	528 438.54	527 177.33	529 576.6	528 691.72
Volume of export letters of credit in Russia, million dollars	22 592.05	22 722.86	22 668.63	22 771.79	22 733.74

Source: URL: https://translated.turbopages.org/proxy_u/en-ru.ru.3cc4889d-643910c1–45b8d6bd-74722d776562/https/www.yahoo.com/lifestyle/insights-letter-credit-confirmation-global-095800655.html (accessed on 12.04.2023).

Table 5

Forecast of GDP Growth in Accordance with the Simulation of the Transition of Transnational Payments to the Global Blockchain Ecosystem, which Contributes to the Growth of Trust Between the Participants in the Transaction, Million Rubles

Year	GDP forecast by model	GDP forecast with growth of the net financial result	Deviation	Contribution to GDP, in %
1	2	3	4	5
2017	95 891 918.05	98 078 253.78	2 186 335.7	2.70
2018	104 772 665	107 161 481.7	2 388 816.8	2.73
2019	109 782 531.6	112 285 573.4	2 503 041.7	2.71
2020	101 257 564.5	103 566 237	2 308 672.5	3.23
2021	145 266 626.6	148 578 705.7	3 312 079.1	3.46

Source: Developed by the authors based on data from EMISS. URL: https://www.fedstat.ru/indicator/38574 (accessed on 12.04.2023).
Note: * calculated as the ratio of column 4 to column 2, in %.

documentary operations related to foreign economic transactions in the field of foreign economic activity, it is advisable to use this ratio in calculations. It is important to emphasize that in conducting the relevant calculations, all attention is focused solely on export operations. This is due to the fact that import transactions accompanied by letters of credit are not within the "scope" of research attention, as the financial burden falls on the importers. At the same time, considering that the aim of the research is focused on the empirical assessment of macroeconomic externalities in relation to the national economy of the Russian Federation, attention is specifically directed towards export letters of credit that are part of the "burden" of Russian economic entities.

Based on this approach, *Table 4* presents the calculated data assessing the gross level of export letters of credit for the Russian Federation.

Based on the data on the volume of the export letter of credit mar*ket* (*Table 4*), one

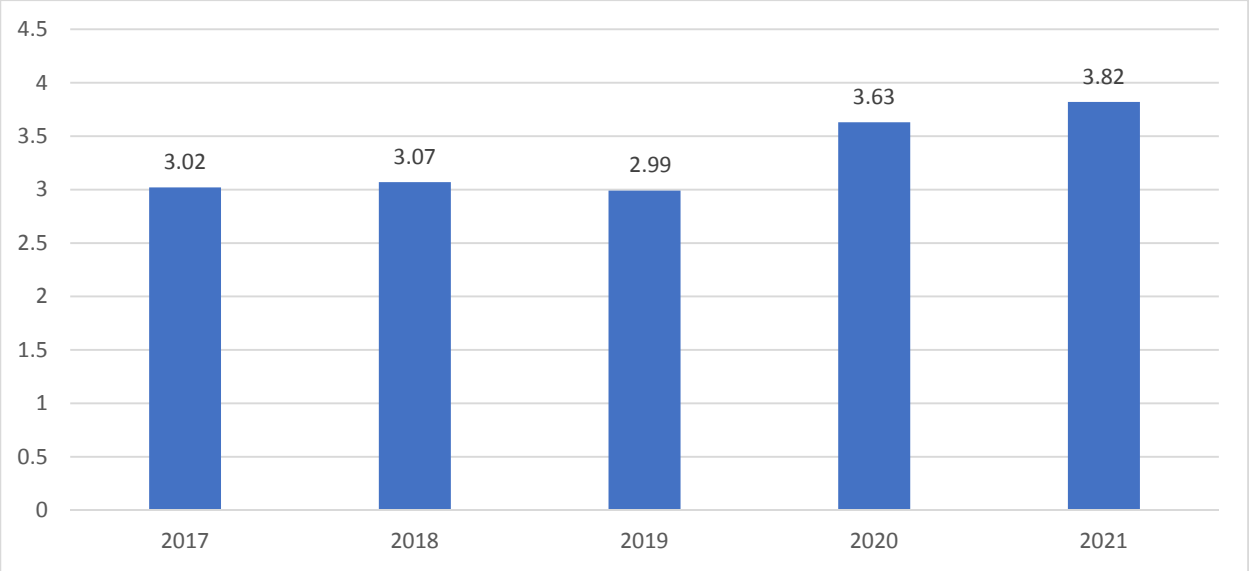

Fig. 2. **The Potential for the Cumulative Increase in the GDP of the Russian Federation as Part of the Transition of Transnational Payments to the Blockchain**

Source: Compiled by the authors.

can assume the potential for growth in the net financial results of economic entities in the Russian Federation in accordance with the level of released costs from documentary operations.

The final step in conducting calculations is the assessment of the macroeconomic effect, expressed in the increase of GDP as a result of the growth in the net financial results of economic entities in the context of the localization of the letter of credit institution. As part of the application of the previously constructed model, formula (1), the results of the calculations are presented in *Table 5*.

Summarizing the effects obtained in terms of potential GDP growth according to the macroeconomic effects arising from the transition of cross-border payments in the Russian Federation to blockchain, *Fig. 4* presents consolidated estimates in the form of the potential increase in the gross domestic product of the Russian Federation.

CONCLUSION

1. The question of justifying the feasibility of transitioning transaction organization processes to a blockchain environment remains an unresolved issue to this day. This is largely due to methodological limitations. This conclusion is justified by the fact that in the realm of scientific and journalistic papers, there are virtually no studies that address the posed question in the context of formalized assessments. The present paper is intended not so much to fill this gap (primarily from a methodological perspective) as to offer the scientific community a discussion on the development of theoretical and methodological approaches to the study of externalities generated for national economic systems in the context of a possible transition of payment systems into the blockchain space.

2. Abstracting from the potential risks of applying blockchain technologies in the organization of international transactions, and relying on the proposed methodological tools for the empirical assessment of macroeconomic externalities related to the most significant effects, predictive estimates have been obtained that characterize the potential GDP growth of the Russian Federation as a result of transferring transnational payments into the blockchain environment. According to them, the potential for the application of DLT-technologies in the system of international transactions is

estimated for the Russian economy at around 4.0% of GDP, which corresponds to 6.05 trillion rubles (75.6 billion dollars).

3. The assessments and conclusions obtained gain particular relevance in the context of the intense external pressure currently exerted on the national economy of the Russian Federation, which limits the potential for maintaining and developing international supply chains and the accompanying international transactions. In this regard, the methodological solutions and justifications presented by the authors in the field of building a new architecture for transnational payment operations could significantly enhance the system of arguments for transitioning international payments to blockchain. The use of these technologies in foreign economic activity will not only facilitate the growth potential of GDP but also ensure the stability of transnational payments with friendly countries in the context of localized access to international clearing services.

ACKNOWLEDGMENTS

The study was supported by a grant from the Russian Science Foundation (project No. 23-28-00587). Kazan (Volga Region) Federal University, Kazan, Russia.

REFERENCES

1. Allen D., Berg C., Davidson S., Novak M., Potts J. International policy coordination for blockchain supply chains. *Asia & the Pacific Policy Studies*. 2019;6(3):367–380. DOI: 10.1002/app5.281
2. Ganne E. Can blockchain revolutionize international trade. Geneva: World Trade Organization; 2018. 163 p. URL: https://www.wto.org/english/res_e/booksp_e/blockchainrev18_e.pdf
3. Kochergin D. Central banks digital currencies: World experience. *Mirovaya ekonomika i mezhdunarodnye otnosheniya = World Economy and International Relations*. 2021;65(5):68–77. (In Russ.). DOI: 10.20542/0131–2227–2021–65–5–68–77
4. Safiullin M.R., Abdukaeva A.A., Elshin L.A. Integral multicomponent assessment of the development of the blockchain technologies market in the national economy of Russia. *Innovatsii = Innovations*. 2019;(7):41–49. (In Russ.). DOI: 10.26310/2071–3010.2019.249.7.006
5. Stone S., Flaig D., Van Tongeren F. Modeling local content requirements: Quantitative restrictions in a CGE model. OECD, Trade and Agriculture Directorate. 2015. URL https://www.gtap.agecon.purdue.edu/resources/download/7203.pdf (accessed on 07.03.2021).
6. Dubrovskaya E.S. The Russian economy under sanctions: Current situation and prospects for innovative development. *Kreativnaya ekonomika = Journal of Creative Economy*. 2022;16(11):4553–4564. (In Russ.). DOI: 10.18334/ce.16.11.116637
7. Tapscott D., Tapscott A. How blockchain will change organizations. *MIT Sloan Management Review*. 2017;58(2):10–13.
8. Zhang T., Huang Z. Blockchain and central bank digital currency. *ICT Express*. 2022;8(2):264–270. DOI: 10.1016/j.icte.2021.09.014
9. Alonso S.L.N., Jorge-Vazquez J., Forradellas R.F.R. Central banks digital currency: Detection of optimal countries for the implementation of a CBDC and the implication for payment industry open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*. 2021;7(1):72. DOI: 10.3390/joitmc7010072
10. Sidorenko E. Digital currency of central banks: Economic scenarios and forecasts. *Mezhdunarodnye protsessy = International Trends*. 2021;19(2):151–165. (In Russ.). DOI: 10.17994/IT.2021.19.2.65.8
11. Boar C., Holden H., Wadsworth A. Impending arrival — a sequel to the survey on central bank digital currency. Bank for International Settlements. BIS Papers. 2020;(107). URL: https://www.bis.org/publ/bppdf/bispap107.pdf (accessed on 21.05.2023).

12. Nazarenko Yu. L. Application of blockchain technology for security of banking operations. *European Science*. 2018;(3):27–31. (In Russ.).
13. Mancini-Griffoli T., Martinez Peria M. S., Agur I., et al. Casting light on central bank digital currencies. IMF Staff Discussion Notes. 2018;(008). DOI: 10.5089/9781484384572.006
14. Boar C., Wehrli A. Ready, steady, go? Results of the third BIS survey on central bank digital currency. Bank for International Settlements. BIS Papers. 2021;(114). URL: https://www.bis.org/publ/bppdf/bispap114.pdf (accessed on 18.04.2023).
15. Engert W., Fung B. S.C. Central bank digital currency: Motivations and implications. Bank of Canada Staff Discussion Paper. 2017;(16). URL: https://www.bankofcanada.ca/wp-content/uploads/2017/11/sdp2017–16.pdf (accessed on 28.04.2023).
16. Alibaev A., Abdyldaeva A. A. Economic growth and some topical issues of economic growth. *Aktual'nye nauchnye issledovaniya v sovremennom mire = iScience in UA*. 2021;(6–2):70–74. (In Russ.).
17. Gao L., Sabitov R. A. The economic growth. Models of economic growth. *Progressivnaya ekonomika = Progressive Economy*. 2022;(6):15–26. (In Russ.). DOI: 10.54861/27131211_2022_6_15

ABOUT THE AUTHORS

Marat R. Safiullin — Dr. Sci. (Econ.), Prof., Vice-Rector for Economic and Strategic Development, Kazan (Volga Region) Federal University, Kazan, Russia; Director, Center for Advanced Economic Research of the Academy of Sciences of the Republic of Tatarstan, Kazan, Russia
https://orcid.org/0000-0003-3708-8184
C.p@tatar.ru

Leonid A. Elshin — Dr. Sci. (Econ.), Assoc. Prof., Head of the Department of Territorial Economics, Kazan (Volga Region) Federal University, Kazan, Russia; Deputy Director for Science, Center for Advanced Economic Research of the Academy of Sciences of the Republic of Tatarstan, Kazan, Russia; Prof. of the Department of Economics, University of Management TISBI, Kazan, Russia
https://orcid.org/0000-0002-0763-6453
Corresponding author:
Leonid.Elshin@tatar.ru

Rafis T. Burganov — Dr. Sci. (Econ.), Assoc. Prof., Rector, Volga Region State University of Physical Culture, Sports and Tourism, Kazan, Russia
https://orcid.org/0000-0002-8943-0781
C.p@tatar.ru

Authors' declared contribution:
M.R. Safiullin — problem statement, development of the concept of the article, critical analysis of the literature.
L.A. Elshin — development of methodological approaches to assessing the impact of blockchain on the prospects of transnational payments.
R.T. Burganov — macroeconomic assessment of externalities formed as a result of blockchain-based payment systems; development of conclusions.

Conflicts of Interest Statement: The authors have no conflicts of interest to declare.

The article was submitted on 30.05.2023; revised on 30.06.2023 and accepted for publication on 07.07.2023.
The authors read and approved the final version of the manuscript.

Translated by V. Timonina