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Mathematical Models for Implementation of the Concept of Hard Budget Restrictions in the Budgetary System

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ABSTRACT

The subject of the study is the processes of budget decentralization in the management of public finances, as well as mathematical methods and models for implementing the concept of hard budget restrictions in order to create conditions for the self-development of administrative-territorial units. **The aim** of the study is to develop adaptive economic and mathematical models for implementing the strategy of hard budget constraints implemented in the process of inter-budget regulation. **The relevance** of the study is due to the fact that currently the subject of acute discussion in the scientific community is the self-development of administrative-territorial entities and increasing their financial independence. In this regard, the focus of economic research is focused on the problems of budgetary decentralization as an engine of economic development, as well as the related topics of the use of mathematical tools for modeling decision support in this area. The created models are subject to the requirements of learnability, adaptability to changing conditions of environmental influences, and the ability to operate not only with quantitative, but also with qualitatively defined characteristics. The problem of mathematical modeling is solved by applying an interdisciplinary synthesis of the theories of stochastic automata operating in random environments and fuzzy logic. **The proposed** synthesis of theoretical and methodological devices is the novelty of the research. **As a result**, an economic and mathematical model of a fuzzy automaton is constructed for determining and quantifying the values of the norms for the distribution of tax revenues between budgets of different levels of the budget system. A fuzzy automaton interacts with a simulation model that reproduces budget flows and quantifies the decisions made by the automaton model. **The practical significance** of the research results lies in the program implementation of the developed models and their inclusion in the public finance management circuit. **In the future**, it is planned to create a mathematical model of the collective behavior of fuzzy automata models, the interaction of which solves the problem of coordinating the interests of budgets of different levels of the hierarchy in the distribution of tax revenues.

Keywords: budget decentralization; hard budget constraints; inter-budget regulation; mathematical models; fuzzy automaton

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INTRODUCTION

At present, territorial self-development is a global problem, which is confirmed by the growing interest of a wide range of researchers in various fields of knowledge. There is a consensus in the global community on the need to solve this problem through the lens of budgetary decentralization in order to create conditions for the emergence of incentives for sub-federal and sub-national authorities to develop the economy in their jurisdictions. In the theory of fiscal federalism, the conceptual framework is a balance of centralized and decentralized relations by determining a compromise between the application of "hard" and "soft" budget constraints. Finding this compromise is a challenging task for financial technologies, which are evolving influenced by digital transformation.

Digital transformation is driving the development of financial innovation, including various financial engineering technologies. These are financial instruments (options, bonds, interest rate swaps, futures

contracts, etc.), as well as various engineering developments based on the results of scientific and technological progress.

In the scientific literature, there are different interpretations of the meaning of the phrase "financial engineering". Some researchers, for example, V.I. Flegontov, R.A. Isaev [1, 2], put in it the meaning of a set of measures of financial impact, new schemes for conducting financial transactions aimed at minimizing financial risks.

The author of the article agrees with the point of view of E.F. Sysoeva, D.S. Kozlova [3], N.P. Baryn'kina [4], who interpret "financial engineering" as "a set of intellectual activity based on the achievements of science and technology" (engineering is derived from the Latin "ingenium", meaning ingenuity). According to the author, in the composition of financial engineering technologies, a significant place is occupied by the results of engineering developments used in the financial sector. These developments are influenced by the convergent evolution of computer technology and mathematical tools.

Financial engineering is an important component of the formation of the national economy of any country. Its role is significant in solving the strategic tasks of creating conditions for the endogenous development of territorial economic systems. These problems are solved by looking for internal evolutionary reserves that provide regions and municipalities with a competitive advantage and economic growth.

A wide range of scientific works from different countries is devoted to the development and implementation of economic policies focused on economic growth. At the same time, the subject field of research is expanding by including the methodological and theoretical apparatus of not only economic sciences. Recently, researchers have focused on the convergence of science and technology in order to obtain a synergistic effect in the evolutionary changes of the national economy.

Among the works devoted to solving the problems of managing the development of the national economy, it is worth highlighting the articles by S. Yu. Glaziev, R.M. Nizhegorodtsev, G.L. Kupryashin, N.V. Makogonova, A.V. Sidorov, O.S. Sukharev [5, 6].

Many works of modern foreign scientists are currently devoted to the issues of accelerating economic growth due to the self-development of administrative and territorial units. In their works, they investigate the phenomenon of decentralization of public goods as the most important factor in socio-economic development, based on the theorem of W. Oates. [7–9]. Decentralization of business as a strategy delegates to business entities the right to make independent decisions. This contributes to the creation of conditions for the emergence of incentives for economic agents to search for solutions that allow in the process of economic activity to get as close as possible to the final result, the set goal.

In this context, the studies of G. Everaert and A. Hildebrandt [10] describe the problems associated with the consequences of the application of "soft" budget constraints at the firm level. Attention is paid to the concept of decentralization not only in the field of improving the quality of public services but also in the aspect of stimulating sub-national authorities for the economic development of territories under their jurisdiction. In this regard, the problem arises of the ratio of the use of "soft" and "hard" budget constraints.

The works that reveal the problems of applying "soft" and "hard" budget constraints include articles by D. Chulkov [11], A.O. Hopland [12]. Recently, more and more researchers from different countries are inclined to the need to use mathematical methods to study the phenomenon of decentralization in the theory of fiscal federalism as an evolutionary path of economic development. This is supported by the work of Y. Jin and M. Rider [13], which investigates the impact of decentralization

on economic growth based on the production function. Studying in this regard the application of fiscal decentralization policies in China and India based on the equations of equalization and growth, the authors made a fair conclusion that financial equalization does not always have a positive effect on economic growth. Indeed, the decentralization methods must be approached selectively, considering the characteristics of national and sub-national territories. Numerous works are the proof of the viability of issues related to fiscal decentralization in which the authors, relying on economic theories of decentralization, see them as a source of qualitatively new stimulating effects in the behavior of sub-national authorities in search of additional sources of development of administrative and territorial entities. These works include articles by A. Kappeler [14], M. Onofrei, F. Oprea [15], J. Koo, and B. J. Kim [16]. Thus, according to the content of the study, we can conclude that budget decentralization and "hard" budget constraints are not useful for all territories. This point of view is also shared by the author N.E. Barbashova, who believes that "a subsidy to equalize the level of budgetary provision of the territory is an essential element of the system of inter-budgetary transfers" [17]. But, according to N.E. Barbashova, the mechanism of budgetary equalization does not always create dependent sentiments in the territories [17]. The problems of applying the strategy of budgetary decentralization are caused by the heterogeneity of the development of the country's territorial units. To make decisions on the advantages of applying decentralization methods and studying the impact of their consequences on economic growth, it is advisable to use IT technologies with built-in economic and mathematical models. Since currently, active digitalization covers all spheres of the economy, the digital transformation of technologies for the spatial development of administrative and territorial units is the focus of researchers.

The problems of digital transformation of the financial industry as a driver of economic development, causing a change in the models of interaction between participants in the financial sector, are disclosed in the article by I. D. Kotliarov [18]. Among the works of researchers studying the emerging problems of the digital transformation strategy of European financial service providers, the article by S. Chanias, M. Myers, T. Hess [19] should be noted. A feature of the research results of S. Chanias, M. Myers, T. Hess is the presentation of digital transformation in the field of finance as a developing system and its design as a dynamic, iterative learning process and performing the necessary functions.

Adaptive learning models that formally describe the behavior of economic agents in the decision-making process were built by such authors as E.D. Streltsova, I.V. Yakovenko, S. Ziyadin, A. Borodin, S. Suieubaeva, D. Pshembayeva, O. S. Belokrylova, K. A. Belokrylov, S. S. Tsygankov, V.A. Syropyatov [20–25]. These models, built on the basis of the mathematical apparatus of the theory of stochastic automata operating in random environments, as well as fuzzy logic, perform the function of decision support in the process of intergovernmental regulation as a factor of paramount importance in ensuring economic growth.

Analysis of modern scientific sources indicates that the search for ways of territorial development is a promising trend of economic research on the evolution of any country. In view of the current political and economic situation, the problem of providing conditions for the self-development of administrative and territorial units at the expense of internal resources becomes especially urgent. At the same time, one of the criteria for self-development of regions and municipalities is the level of financial independence, achieved with a sufficient number of own sources of income. In the development of financial independence, a special role belongs to inter-budgetary relations, which develop vertically

between territories. The processes of inter-budgetary regulation can both promote the intensification of actions of local authorities to develop their own tax base, and slow them down. It is advisable for territories with sufficient tax potential to use "hard" budget constraints, giving them the right to use part of the collected tax revenues when establishing optimal standards for their vertical distribution. The use of such a stimulating function of inter-budgetary regulation significantly increases the authorities' interest in intensifying economic activity.

For territories with a low capacity for self-organization, an effective method of inter-budgetary regulation is "soft" budget constraints through various transfer injections. When focusing on the implementation of the stimulating function of inter-budgetary regulation, the problem arises of determining the optimal proportions of the distribution of receipts from the payment of tax revenues between the budgets of the upper and lower levels of the budget system. The solution to this problem requires a formal description of the processes of expedient behavior of the decision-maker when choosing alternatives using methods of mathematical modeling and subsequent computational experiments.

All this mainstream the content of the research conducted by the author aimed at creating digital technologies to support decision-making on establishing the norms for the share distribution of tax revenues based on learning mathematical models. The relevance of the research carried out in this article lies in the need to put on a digital platform inter-budgetary relation between administrative and territorial entities when implementing the strategy of "hard" budget constraints. At present, this approach is the leading one for all countries of the world. And the transition to digital technologies requires the creation and implementation of mathematical models that describe the behavior of the subject of decision-making. This research is aimed at developing mathematical models in the form of fuzzy automata operating in a random environment. The analytical expressions obtained in the article for the probabilities of the automata choosing their states allow one to carry out computational experiments when choosing alternatives in the process of distributing tax revenues between the budgets of territories of different levels.

The research includes the following sections. In the first section, the urgency of the problem being solved is substantiated and analysis of publications devoted to its solution is given. In the second section, the problem of modeling the decision-making processes on the distribution of tax revenues between the budgets of different levels of the budget system is posed and the results of constructing economic and mathematical models are presented. The third section is devoted to the obtained simulation results and their discussion. The last section outlines the main findings of the study.

MATERIALS AND METHODS

Problem formulation

As mentioned earlier, in [20–22], decision-making models were developed to establish norms for the distribution of tax sources between budgets based on the use of the mathematical apparatus of the theory of stochastic automata operating in fuzzy random environments. In this case, the transitions of automata from state to state were determined either on the basis of the selectivity of the tactics of automata [20–22] or the basis of the equiprobability of their transitions to different states. The disadvantage of the models proposed in [20–22] is the lack of flexibility in their structure in the face of changes in the economic situation of administrative and territorial entities.

In this article, to support decision-making in the implementation of the stimulating function of inter-budgetary regulation, it is proposed to use the synthesis of mathematical apparatus of the theory of stochastic automata

and fuzzy algebra. The author has constructed a fuzzy automaton Ω as a mathematical abstraction capable of learning the appropriate behavior of a decision-maker as natural intelligence. According to the theory of stochastic automata [26], the created mathematical model of decision support is immersed in a binary random environment that responds to the actions of the automaton Ω with reactions decomposed into two classes: *Win* and *Loss*. The set of states of automata is indicated by variables $S(t)=\{s_1(t),s_2(t),...,\underline{s_k}(t))\}$. Geometrically, the values $s_i(t)\in S$, $i=\overline{1,k}$ are a set of subsegments of length $\frac{1}{k}$, into which the original segment [0,1] is decomposed as an area of the definition of values $s_i(t)\in S$. Thus, the states will take values equal to $s_i(t)\in S$ will $0,\frac{1}{k},\frac{2}{k},...,\frac{k-1}{k},1$.

Modeling

The automaton's behavior tactics are adopted in accordance with [20–22, 26]: in the case of a reaction of the random environment to states $s_i(t)\in S$, belonging to the class *Win*, the automaton does not leave it, and upon reaction *Loss* it transforms into any other state $s_j(t)\in S$, $j\neq i$. If the automaton Ω in a state $s_i(t)\in S$ wins, then its input receives a signal "win" with probability p_i. The probability of the automaton losing in a state $s_i(t)\in S$ is indicated by a variable $q_i=1-p_i$. The economic meaning of the signals p_i and q_i is described in [32–34] and means, accordingly, the likelihood of a deficit and a surplus in the budget of an administrative and territorial entity. The difference between the model Ω constructed by the author and the previously proposed constructions [20–22] is that the transition matrices of the automaton during the reactions of the class environment *Win* and *Loss* are built on the basis of the logical-linguistic analysis developed by L. A. Zadeh [27]. At the same time, territorial economic systems in terms of applying the methods of inter-budgetary regulation are analyzed from the point of view of the ability to self-organize. The need for such an analysis is stated in a previously published article [28], where it is noted that "to administrative and territorial units of different levels of economic development and different ability to self-organize, a differentiated approach should be applied to the choice of a budget regulation strategy" [28]. In this regard, further research is based on the previously proposed [28] decomposition of territories into two classes: *Capable* and *Unable*. It is proposed to include in the *Capable* class territories with an increased ability for self-development, due to the presence of internal resources and competitive advantages. The second class *Unable* includes territories that do not have the ability to self-development [28]. To carry out the classification, the works of such scientists as A. Łuczak, M.A. Just [29], H. Han, S. Trimi [30], A. Hatami-Marbini, F. Kangi [31], K. Palczewski, W. Salabun [32], T. Wu, X. Liu, F. Liu [33], M. Yucesan [34], F. Shen [35]. At the same time, the authors A. Luczak, M.A. Just [29] stated that there is no standard procedure for the classification of territories at different levels of government. In each specific case, it becomes necessary to apply specific methods, indicators, and algorithms that adequately assess the characteristics of territories for evolution at different levels of the administrative structure.

It is noted in [28] that "the systems of indicators, on the basis of which decision-makers or experts assess the level of socio-economic development of a territorial unit, depend on the professional knowledge of specialists, on the possible development scenarios of they work on, as well as on the specifics of the territory's economy". The list of evolution indicators may include such quantitative indicators as the deficit, surplus, budget revenues, and expenditures; per capita gross regional or municipal product; assessment of production potential; the levels of profitability of the main sectors of the economy, etc. [28]. Also, it is possible to focus on qualitatively expressed indicators, which include many different institutional, environmental, and other characteristics.

The solution of the problem of classifying territories according to the ability of self-development requires the use of mathematical methods of multivariate analysis, which will be studied by the author in future works. This article describes the results of constructing a mathematical model as part of the implementation of the "hard" budget constraint strategy to support decision-making regarding the establishment of the shares of distribution of joint taxes between the budgets of the sub-federal and sub-regional levels.

Some aspects of building such a model were outlined in [28], in which analytical expressions are given for the final probabilities of a fuzzy automaton for determining the shares of distribution of tax revenues between the budgets of different levels of the hierarchy and theorems of expedient behavior of the constructed automaton model are proved. This article demonstrates the derivation of analytical expressions for the final probabilities of the automaton model. Thus, for the territory of each class *Capable* and *Unable* it is proposed to apply a qualitatively expressed measure of the expediency of using the tools of inter-budgetary regulation in terms of establishing specific shares of tax deductions. This measure of expediency is described by a linguistic variable $OR =< T(OR), U, M >$, where $T(OR) = \{Capable,\ Unable\}$ — a term-set of a linguistic variable OR, U — its universe, $M = \{\mu_{Cap}, \mu_{Un}\}$ — is a membership function of fuzzy sets of *Capable* and *Unable*, meaning, respectively, the ability and inability of the territorial economic system to self-organize. The universe U is a segment [0,1], from which the norms of the share distribution of tax revenues between the budgets of the territories are taken. Membership functions $\mu^{Cap} : \{S\} \to [0,1]$, $\mu^{Un} : \{S\} \to [0,1]$ are described by equations:

$$\mu^{Un} = \begin{cases} 0, s_i < 0; \\ 1 - s_i, 0 < s_i < 1; \\ 0, s_i > 1; \end{cases} (1)\ \mu^{Cap} = \begin{cases} 0, s_i < 0; \\ s_i - 0, 0 < s_i < 1; \\ 0, s_i > 1; \end{cases} \quad (1)$$

Based on this, the automaton Ω is represented by a tuple $\Omega =< \Omega_{un}, \Omega_{Cap} >$, the components of which Ω_{un} and Ω_{Cap} describe its behavior in the linguistic environments *Unable* and *Capable*, respectively. A common feature of automata Ω_{un} and Ω_{Cap} is the identity of their matrices of transitions $\|m_{ij}(1)\|$ from state to state in case of *Win*:

$$m_{ij}(Win) = \begin{cases} 1, & for\ \ i = j; \\ 0, & for\ \ i \neq j \end{cases}. \quad (2)$$

Elements of matrices of transitions $m_{ij}^{Un}(Loss)$ and $m_{ij}^{Cap}(Loss)$ of automata Ω_{un} and Ω_{Cap} in case of *Loss* are the values of the membership functions μ_{ij}^{Un} and μ_{ij}^{Cap}:

$$m_{ij}^{Cap}(Loss) = \begin{pmatrix} 0 & \frac{2}{k} & \frac{3}{k} & \dots & \frac{k}{k} \\ \frac{1}{k} & 0 & \frac{3}{k} & \dots & \frac{k}{k} \\ \frac{1}{k} & \frac{2}{k} & 0 & \dots & \frac{k}{k} \\ \dots & \dots & \dots & \dots & \dots \\ \frac{1}{k} & \frac{2}{k} & \frac{3}{k} & \dots & 0 \end{pmatrix}; \quad m_{ij}^{Un}(Loss) = \begin{pmatrix} 0 & \frac{k-2}{k} & \frac{k-3}{k} & \dots & \frac{k-k}{k} \\ \frac{k-1}{k} & 0 & \frac{k-3}{k} & \dots & \frac{k-k}{k} \\ \frac{k-1}{k} & \frac{k-2}{k} & 0 & \dots & \frac{k-k}{k} \\ \dots & \dots & \dots & \dots & \dots \\ \frac{k-1}{k} & \frac{k-2}{k} & \frac{k-3}{k} & \dots & 0 \end{pmatrix}. \quad (3)$$

Elements of the matrix of transitions $\left\| P_{ij}^{Un} \right\|$ and $\left\| P_{ij}^{Cap} \right\|$ of automata regardless of the input signal Win and $Loss$ are determined based on the expressions

$$P_{ij}^{Un} = m_{ij}^{Un}(Win)p_i + m_{ij}^{Un}(Loss)q_i\,;$$

$$P_{ij}^{Cap} = m_{ij}^{Cap}(Win)p_i + m_{ij}^{Cap}(Loss)q_i\,.$$

The matrices $\left\| P_{ij}^{Un} \right\|$ and $\left\| P_{ij}^{Cap} \right\|$ are as follows:

$$P_{ij}^{Un} = \begin{pmatrix} p_1 & \frac{k-2}{k}q_2 & \frac{k-3}{k}q_3 & \dots & \frac{k-k}{k}q_k \\ \frac{k-1}{k}q_1 & p_2 & \frac{k-3}{k}q_3 & \dots & \frac{k-k}{k}q_k \\ \frac{k-1}{k}q_1 & \frac{k-2}{k}q_2 & p_3 & \dots & \frac{k-k}{k}q_k \\ \dots & \dots & \dots & \dots & \frac{k-k}{k}q_k \\ \frac{k-1}{k}q_1 & \frac{k-2}{k}q_2 & \frac{k-3}{k}q_3 & \dots & p_k \end{pmatrix}; \quad P_{ij}^{Cap} = \begin{pmatrix} p_1 & \frac{2}{k}q_1 & \frac{3}{k}q_2 & \dots & \frac{k}{k}q_k \\ \frac{1}{k}q_1 & p_2 & \frac{3}{k}q_3 & \dots & \frac{k}{k}q_k \\ \frac{1}{k}q_1 & \frac{2}{k}q_2 & p_3 & \dots & \frac{k}{k}q_k \\ \dots & \dots & \dots & \dots & \frac{k-k}{k}q_k \\ \frac{1}{k}q_1 & \frac{2}{k}q_2 & \frac{3}{k}q_3 & \dots & p_k \end{pmatrix}. \quad (4)$$

In the theory of random processes, it is substantiated that in the case of a finite number of states of the system and provided that the transition from each state to any other is realizable in a finite number of steps, there are final probabilities. The article provides equations for calculating the final probabilities Z_i^{Cap}, Z_i^{Un}, $i = \overline{1,k}$ the automata in each of the states, subject to immersion in the linguistic environments *Capable* and *Unable*. The system of equations for calculating the final probabilities Z_i^{Un} of the stochastic automaton in its states, if the territorial economic system operates in the linguistic environment *Unable*, which means its inability to self-organize, has the form:

$$\begin{cases} Z_1^{Un} = Z_1^{Un}p_1 + Z_2^{Un}\frac{k-2}{k}q_2 + Z_3^{Un}\frac{k-3}{k}q_2 + \dots + Z_{k-1}^{Un}\frac{k-(k-1)}{k}q_{k-1} + Z_k^{Un}\frac{k-k}{k}q_k \\ Z_2^{Un} = Z_1^{Un}\frac{k-1}{k}q_1 + Z_2^{Un}p_2 + Z_3^{Un}\frac{k-3}{k}q_2 + \dots + Z_{k-1}^{Un}\frac{k-(k-1)}{k}q_{k-1} + Z_k^{Un}\frac{k-k}{k}q_k \\ Z_3^{Un} = Z_1^{Un}\frac{k-1}{k}q_1 + Z_2^{Un}\frac{k-2}{k}q_2 + Z_3^{Un}p_3 + \dots + Z_{k-1}^{Un}\frac{k-(k-1)}{k}q_{k-1} + Z_k^{Un}\frac{k-k}{k}q_k \\ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \\ Z_k^{Un} = Z_1^{Un}\frac{k-1}{k}q_1 + Z_2^{Un}\frac{k-2}{k}q_2 + Z_3^{Un}\frac{k-3}{k}q_3 + \dots + Z_{k-1}^{Un}\frac{k-(k-1)}{k}q_{k-1} + Z_k^{Un}p_k \end{cases}. \quad (5)$$

After some system transformations, we get:

$$\begin{cases} Z_1^{Un}(1-p_1)+Z_1^{Un}\dfrac{k-1}{k}q_1=\sum\limits_{i=1}^{k}Z_i^{Un}\dfrac{k-i}{k}q_i \\ Z_2^{Un}(1-p_2)+Z_2^{Un}\dfrac{k-2}{k}q_2=\sum\limits_{i=1}^{k}Z_i^{Un}\dfrac{k-i}{k}q_i \\ Z_3^{Un}(1-p_3)+Z_3^{Un}\dfrac{k-3}{k}q_3=\sum\limits_{i=1}^{k}Z_i^{Un}\dfrac{k-i}{k}q_i \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ Z_k^{Un}(1-p_k)+Z_k^{Un}\dfrac{k-k}{k}q_k=\sum\limits_{i=1}^{k}Z_i^{Un}\dfrac{k-i}{k}q_i \end{cases}. \quad (6)$$

Thus, we have:

$$Z_1^{Un}q_1+Z_1^{Un}\frac{k-1}{k}q_1=Z_2^{Un}q_2+Z_2^{Un}\frac{k-2}{k}q_2=\ldots=Z_k^{Un}q_k+Z_k^{Un}\frac{k-k}{k}q_k. \quad (7)$$

$$Z_2^{Un}=Z_1^{Un}\frac{q_1}{q_2}\frac{2k-1}{2k-2};\ Z_3^{Un}=Z_1^{Un}\frac{q_1}{q_3}\frac{2k-1}{2k-3};\ldots;\ Z_k^{Un}=Z_1^{Un}\frac{q_1}{q_k}\frac{2k-1}{2k-k}. \quad (8)$$

We use the normalization condition $\sum\limits_{i=1}^{k}Z_i^{Un}=1$:

$$Z_1^{Un}+Z_1^{Un}\frac{q_1}{q_2}\frac{2k-1}{2k-2}+Z_1^{Un}\frac{q_1}{q_3}\frac{2k-1}{2k-3}+\ldots+Z_1^{Un}\frac{q_1}{q_k}\frac{2k-1}{2k-k}=1. \quad (9)$$

Based on this condition, it is determined Z_1^{Un}:

$$Z_1^{Un}=\frac{1}{\sum\limits_{i=1}^{k}\frac{q_1}{q_i}\frac{2k-1}{2k-i}}=\frac{1}{q_1(2k-1)\sum\limits_{i=1}^{k}\frac{1}{q_i(2k-i)}}. \quad (10)$$

Then the values Z_i^{Un}, $i=\overline{1,k}$ are determined based on analytical expressions:

$$Z_2^{Un}=\frac{1}{q_1(2k-1)\sum\limits_{i=1}^{k}\frac{1}{q_i(2k-i)}}\frac{q_1}{q_2}\frac{2k-1}{2k-2}=\frac{1}{q_2(2k-2)\sum\limits_{i=1}^{k}\frac{1}{q_i(2k-i)}}; \quad (11)$$

$$Z_3^{Un}=\frac{1}{q_1(2k-1)\sum\limits_{i=1}^{k}\frac{1}{q_i(2k-i)}}\frac{q_1}{q_3}\frac{2k-1}{2k-3}=\frac{1}{q_3(2k-3)\sum\limits_{i=1}^{k}\frac{1}{q_i(2k-i)}}; \quad (12)$$

$$Z_k^{Un}=\frac{1}{q_1(2k-1)\sum\limits_{i=1}^{k}\frac{1}{q_i(2k-i)}}\frac{q_1}{q_k}\frac{2k-1}{2k-k}=\frac{1}{q_k(2k-k)\sum\limits_{i=1}^{k}\frac{1}{q_i(2k-i)}}. \quad (13)$$

The system of equations for calculating the final probabilities Z_i^{Cap} of the stochastic automaton in its states, if the territorial economic system operates in the *Capable* linguistic environment, which means the ability to self-organize, has the form:

$$\begin{cases} Z_1^{Cap} = Z_1^{Cap} p_1 + Z_2^{Cap} \frac{2}{k} q_2 + Z_3^{Cap} \frac{3}{k} q_2 + \ldots + Z_{k-1}^{Cap} \frac{(1-k)}{k} q_{k-1} + Z_k^{Cap} \frac{k}{k} q_k \\ Z_2^{Cap} = Z_1^{Cap} \frac{1}{k} q_1 + Z_2^{Cap} p_2 + Z_3^{Cap} \frac{3}{k} q_2 + \ldots + Z_{k-1}^{Cap} \frac{(1-k)}{k} q_{k-1} + Z_k^{Cap} \frac{k}{k} q_k \\ Z_3^{Cap} = Z_1^{Cap} \frac{1}{k} q_1 + Z_2^{Cap} \frac{2}{k} q_2 + Z_3^{Cap} p_3 + \ldots + Z_{k-1}^{Cap} \frac{(1-k)}{k} q_{k-1} + Z_k^{Cap} \frac{k}{k} q_k \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ Z_k^{Cap} = Z_1^{Cap} \frac{1}{k} q_1 + Z_2^{Cap} \frac{2}{k} q_2 + Z_3^{Cap} \frac{3}{k} q_3 + \ldots + Z_{k-1}^{Cap} \frac{(1)-k}{k} q_{k-1} + Z_k^{Cap} p_k \end{cases} . \quad (14)$$

After transformations, similar for the determining system, we have:

$$\begin{cases} Z_1^{Cap}(1-p_1) + Z_1^{Cap} \frac{1}{k} q_1 = \sum_{i=1}^{k} Z_i^{Cap} \frac{i}{k} q_i \\ Z_2^{Cap}(1-p_2) + Z_2^{Cap} \frac{2}{k} q_2 = \sum_{i=1}^{k} Z_i^{Cap} \frac{i}{k} q_i \\ Z_3^{Cap}(1-p_3) + Z_3^{Cap} \frac{3}{k} q_3 = \sum_{i=1}^{k} Z_i^{Cap} \frac{i}{k} q_i \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ Z_k^{Cap}(1-p_k) + Z_k^{Cap} \frac{k}{k} q_k = \sum_{i=1}^{k} Z_i^{Cap} \frac{i}{k} q_i \end{cases} \quad (15)$$

Thus:

$$Z_1^{Cap} q_1 \frac{k+1}{k} = Z_2^{Cap} q_2 \frac{k+2}{k} = \ldots = Z_k^{Cap} q_k \frac{k+k}{k}, \text{ from which}$$

$$Z_2^{Cap} = Z_1^{Cap} \frac{q_1}{q_2} \frac{k+1}{k+2};\ Z_3^{Cap} = Z_1^{Cap} \frac{q_1}{q_3} \frac{k+1}{k+3};\ \ldots;\ Z_k^{Cap} = Z_1^{Cap} \frac{q_1}{q_k} \frac{k+1}{k+k}. \quad (16)$$

Using the normalization condition $\sum_{i=1}^{k} Z_i^{Cap} = 1$, we write:

$$Z_1^{Cap} q_1 + Z_1^{Cap} \frac{q_1}{q_2} \frac{k+1}{k+2} + Z_1^{Cap} \frac{q_1}{q_3} \frac{k+1}{k+3} + \ldots + Z_1^{Cap} \frac{q_1}{q_k} \frac{k+1}{k+k} = 1. \quad (17)$$

From this equation we obtain:

$$Z_1^{Cap} = \frac{1}{q_1(k+1) \sum_{i=1}^{k} \frac{1}{q_i(k+i)}}; \quad (18)$$

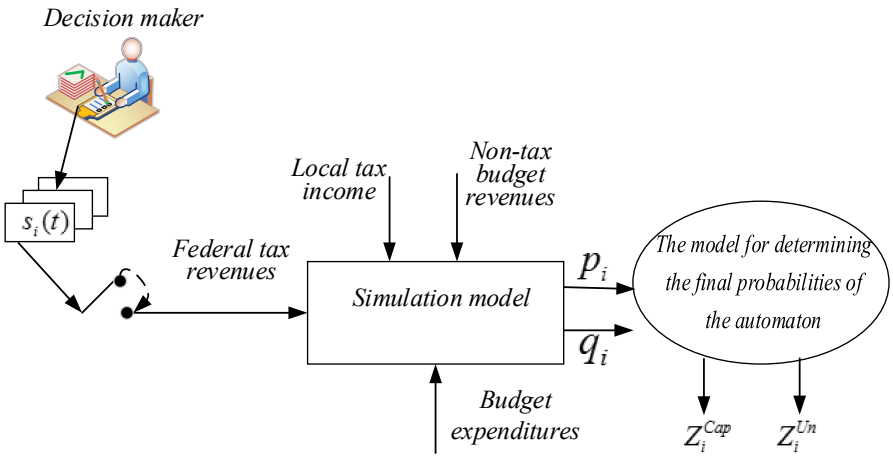


Fig. 1. **Conceptual scheme of interaction of a simulation model with a stochastic automaton**

Source: compiled by the author based on the research results.

$$Z_2^{Cap} = \frac{1}{q_1(k+1)\sum_{i=1}^{k}\frac{1}{q_i(k+i)}}\frac{q_1}{q_2}\frac{k+1}{k+2} = \frac{1}{q_2(k+2)\sum_{i=1}^{k}\frac{1}{q_i(k+i)}}; \quad (19)$$

$$Z_3^{Cap} = \frac{1}{q_1(k+1)\sum_{i=1}^{k}\frac{1}{q_i(k+i)}}\frac{q_1}{q_3}\frac{k+1}{k+3} = \frac{1}{q_3(k+3)\sum_{i=1}^{k}\frac{1}{q_i(k+i)}}; \quad (20)$$

$$Z_k^{Cap} = \frac{1}{q_1(k+1)\sum_{i=1}^{k}\frac{1}{q_i(k+i)}}\frac{q_1}{q_k}\frac{k+1}{k+k} = \frac{1}{q_k(k+k)\sum_{i=1}^{k}\frac{1}{q_i(k+i)}}. \quad (21)$$

Decision-making on the choice of the values of the standards $s_i(t) \in S$, $i = \overline{1,k}$ on the share distribution of funds for paying taxes between the budgets of different levels, is carried out on the basis of using the method of statistical tests for final probabilities Z_i^{Cap}, Z_i^{Un}, $i = \overline{1,k}$.

RESULTS AND ITS DISCUSSION

As part of the analytical expressions derived by the authors for the final probabilities Z_i^{Cap}, Z_i^{Un}, $i = \overline{1,k}$ there are the probabilities of wins p_i and losses q_i of automaton, for the determination of which the author previously proposed a simulation model [20–22].

A conceptual diagram of the interaction of the simulation model with a stochastic automaton for determining the shares of federal tax splitting is shown in *Fig. 1*.

In [28], the results of simulation experiments were illustrated, carried out to determine the values of the probability of wins p_i and losses q_i of the automaton at various values of deductions $s_i(t) \in S$ from personal income tax. In this article, experiments have been carried out to determine the amount of deductions $s_i(t) \in S$ from the tax "Excise taxes on fuels and lubricants". The experiments were carried out on real information collected for some sub-regions called N 1 and N 2. At the same time, sub-region N 1 is classified as *Capable*, and sub-region N 2 is classified as *Unable*. The experimental results are shown in the *Table*.

Table

Estimates of the probabilities of surplus and deficit of budgets of sub-regions at different values of deductions $s_i(t) \in S$ from the excise tax on fuels and lubricants

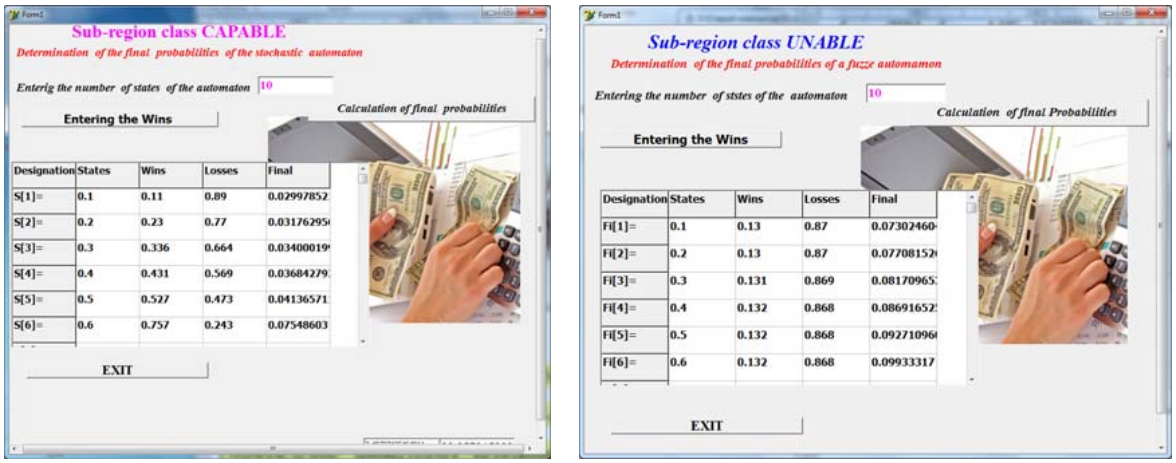
State of automaton $s_i(t) \in S$	Sub-region (capable of self-organization)			Sub-region (unable of self-organization)		
	Surplus Probability Estimate p_i	Deficit Probability Estimate q_i	Final Probability Z_i^{Cap}	Surplus Probability Estimate p_i	Deficit Probability Estimate q_i	Final Probability Z_i^{Un}
$s_1(t) = 0.1$	0.11	0.89	0.029978521	0.13	0.87	0.073024604
$s_2(t) = 0.2$	0.23	0.77	0.031762956	0.13	0.87	0.077081526
$s_3(t) = 0.3$	0.336	0.664	0.034000199	0.131	0.869	0.081709653
$s_4(t) = 0.4$	0.431	0.569	0.036842797	0.132	0.868	0.086916525
$s_5(t) = 0.5$	0.527	0.473	0.041365711	0.132	0.868	0.092710960
$s_6(t) = 0.6$	0.757	0.243	0.075486039	0.132	0.868	0.099333172
$s_7(t) = 0.7$	0.877	0.123	0.140358546	0.133	0.867	0.107097569
$s_8(t) = 0.8$	0.913	0.087	0.187413614	0.133	0.867	0.116022367
$s_9(t) = 0.9$	0.917	0.083	0.186106354	0.134	0.866	0.126716009
$s_{10}(t) = 1$	0.938	0.062	0.236685258	0.134	0.866	0.139387610

Source: compiled by the author based on the research results.

Fig. 2 shows the results of computer processing of experimental data when calculating the final probabilities Z_i^{Cap} и Z_i^{Un}. According to *Fig. 1*, the input of the simulation model receives statistical data characterizing the revenues of the local budget from the payment of local taxes, federal taxes, as well as data on non-tax revenues and expenditures of the local budget.

The probabilities of wins p_i and losses q_i of the automata, which are the output data of the simulation model, were determined on the basis of computer experiments. The decision-maker (DM) should vary the values of the standards for deductions from federal taxes $s_i(t) \in S$. he values obtained at the output of the simulation model p_i and q_i are used to determine the final probabilities Z_i^{Cap} and Z_i^{Un}. The results of experimental studies in determining the final probabilities Z_i^{Cap} and Z_i^{Un}, $i = \overline{1,k}$ are shown in the *Table*.

These *tables* assess the feasibility measures Z_i^{Cap} and Z_i^{Un} the establishment of standard tax deduction rates $s_i(t)$ for territories with a high *Capable* level and a low *Unable* level of self-organization. In this case, the mathematical model gives the following recommendations. For territories of the *Capable* class (that is, those with the ability to self-organize), it is advisable to set the values of the tax deduction rates close to one: for standard rates $s_{10}(t) = 1$, $s_9(t) = 0.9$ and $s_8(t) = 0.8$ final probabilities, respectively, are equal $Z_{10}^{Cap} = 0.23$, $Z_9^{Cap} = 0.18$ and $Z_8^{Cap} = 0.18$. For territories of the *Unable* class (that is, with a low level of self-organization), the model recommends to a greater extent the use of such instruments of interstate regulation as transfer injections than tax deductions. Consequently, the measures of the expediency of establishing standard tax deduction rates close to one are insignificant: the establishment of standard rates $s_{10}(t) = 1$, $s_9(t) = 0.9$ and $s_8(t) = 0.8$, accordingly, is an ineffective solution and is estimated by the values of finale probabilities. $Z_{10}^{Un} = 0.13$, $Z_9^{Un} = 0.12$, $Z_8^{Un} = 0.11$.



a *b*

Fig. 2. **The results of computer processing of experimental data when calculating the final probabilities Z_i^{Cap} and Z_i^{Un} : *a* – for sub-regions of the class *Capable*; *b* – for sub-regions of the class *Unable***

Source: compiled by the author based on the research results.

CONCLUSIONS

The studies carried out allowed us to draw the following conclusions. Methods of inter-budgetary regulation represent a highly efficient register for managing the evolution of administrative and territorial units. The problem of the implementation of its stimulating function is currently especially relevant. In this regard, research on the creation of economic and mathematical models describing the appropriate behavior of decision-makers when choosing alternatives is becoming particularly relevant.

Earlier, mathematical models were proposed to support decision-making in the strategy of "hard" budget constraints, which have the property of learning and adapting to stochastically changing environmental influence [20–22]. But the recent mobility of the external environment leads to a rapid and frequent change of factors, to the use of approximate initial data, on the basis of which management decisions are made. In financial systems, these factors include the volatility of financial flows. Such instability is caused, for example, by the transition of the territory's economy to a qualitatively new level of development in connection with the emergence of new organizations, enterprises, and industries, the introduction of new technologies, etc. All this creates conditions of uncertainty and requires a quick and adequate response of the financial systems of administrative and territorial entities to maintain and enhance their competitiveness, which sharpens the interest in the use of methods of intellectualization in modeling.

The proposed approach to the convergence of the mathematical apparatus of fuzzy algebra and the theory of stochastic automata makes it possible to use qualitatively expressed characteristics when formalizing decision-making processes within the framework of the strategy of "hard" budget constraints, which forms a new basis for studying decision-making models in a fuzzy environment.

The constructed economic and mathematical models of fuzzy automata are of practical importance in connection with their implementation in software products and the possibility of embedding them into the public finance management scheme at the sub-federal and sub-regional levels. This involves the interaction of fuzzy automata models with database systems operating in public finance departments.

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The Role of Public Enterprises in the Innovative Development of the Economy of the Republic of Tajikistan

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ABSTRACT

The **relevance** of the study is due to the lack of scientific research devoted to assessing the state and searching for new tools to activate innovative processes in the economy of Tajikistan, as well as a number of systemic problems that have developed in the innovation sphere. The article **aims** to study the role of state-owned enterprises in Tajikistan in the innovative development of the national economy in modern conditions. The **objectives** of the research are 1) analysis of factors influencing the innovative development of the economy of Tajikistan; 2) assessment of the role of public enterprises in the innovative development of the economy; 3) development of proposals to increase the innovative activity of state-owned enterprises. The author applies **methods** of analysis of statistical data and strategic documents of Tajikistan and the public corporate sector, generalization, grouping, observation, benchmarking, tabular and graphical analysis. The study shows that the problems of innovative development of Tajikistan are determined by the discrepancy between the chosen model of public administration and innovative development, which is a key deterrent to modernization and transition to an innovative path. It was revealed that most of the deterring factors of innovative development were formed not in the external, but the internal environment and they are localized in the field of public administration. Due to the low socio-economic status of the country, insufficient development of state institutions and institutions of a market economy, and control over the expenditure of budgetary resources, even large state-owned enterprises are experiencing financial difficulties. The author **concludes** that the government of Tajikistan should conduct financial rehabilitation of unprofitable enterprises, abandon ineffective management methods, carry out a comprehensive audit of tax incentives, revise the model for managing innovative development of the economy as a whole — shift the focus from large but ineffective state-owned enterprises to comprehensive support for science and small forms of innovative entrepreneurship.

Keywords: innovative development; innovation activity, innovation process; factors of innovative development; public enterprises; Tajikistan

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INTRODUCTION

In the context of the global crisis, the deterioration of the situation in world markets due to the coronavirus (Covid-19) pandemic and other negative global trends, the internal economic policy of the Republic of Tajikistan (RT) is becoming increasingly important, covering not only the commercial but also the state (public) sector of the national economy. One of the key goals of domestic economic policy is the creation of an effective national innovation system (NIS) that contributes to an increase in the technological level and competitiveness of production, the release of innovative products to the domestic and foreign markets, the growth of import substitution, the acceleration of socio-economic development and the achievement of national strategic goals.

Over the past decade, the government of the RT has taken certain steps towards the development of the innovation sphere, in particular, legislative acts and strategic documents aimed at the development of NIS have come into force, including the Law of the RT "On the Technological Park",[1] the Law of the RT "On Innovation Activity",[2] "Program of innovative development of the Republic of Tajikistan for the period up to 2020",[3] Strategy for innovative development of the Republic of Tajikistan for the period up to 2020[4] and other regulations.

In 2015, the formation of innovative research centers and technology parks at the Academy of Sciences and higher professional educational institutions of the country began.

At the same time, the development of innovations in Tajikistan, including in the industrial sector, is hampered by several some problems, without the solution of which the goals and objectives set in strategic documents to increase the innovative activity of economic entities are unattainable. Among such problems:

- weak potential of Tajik science and vocational education;
- low level of spending on research and development (R&D) (0.12% of GDP);
- low quality of state regulation of innovation processes; absence of innovation infrastructure (technology parks, clusters, business incubators, technology transfer centers);
- high dependence of the country on foreign investments and technologies;
- high accounts payable of state-owned enterprises;
- low efficiency of industrial state-owned enterprises, despite the presence of significant government support in the form of subsidies, tax incentives, and preferences.

The formed complex of problems requires critical reflection and updating of existing approaches and models, the search for new tools and incentives to activate innovative processes in the economy of Tajikistan.

DEGREE OF RESEARCH PROBLEM DEVELOPMENT

The issues of innovative development of the economy are hardly the most discussed area of research in modern science. The theoretical and empirical material devoted to this issue is limitless and is constantly updated with new research. Fundamental works, which formulate the main approaches to the economic essence of innovation, the formation of an innovation system,

[1] Law of the Republic of Tajikistan "On the Technological Park" as of July 21, 2010 No. 629. Legislation of the CIS countries; URL: https://base.spinform.ru/show_doc.fwx?rgn=31664 (accessed on 20.03.2021).

[2] Law of the Republic of Tajikistan "On innovative activities" as of April 16, 2012 No. 822. Legislation of the CIS countries; URL: https://base.spinform.ru/show_doc.fwx?rgn=51674 (accessed on 20.03.2021).

[3] Decree of the Government of the Republic of Tajikistan as of April 30, 2011, No. 227 "On approval of the Program of innovative development of the Republic of Tajikistan for 2011–2020"; URL: https://innovation.tj/documents/menu/ru/Ob_utverzhdenii_programma.pdf (accessed on 20.03.2021).

[4] Decree of the Government of the Republic of Tajikistan as of May 30, 2015, No. 354 "On the Strategy of Innovative Development of the Republic of Tajikistan for the Period until 2020"; URL: https://innovation.tj/documents/menu/ru/strategiya%20rus.pdf (accessed on 20.03.2021).

the mechanism of state regulation of innovation processes, include the works of J. Schumpeter [1], B. Szántó [2], A. Toffler [3, 4], F. Fukuyama [5], B.-A. Lundvall [6], R. Nelson [7], L. Edvinsson [8], L.N. Abalkin [9], A. Ya. Yakobson [10], S. Yu. Glaz'ev [11], N.D. Kondrat'ev [12], O.G. Golichenko [13], B.N. Kuzyk [14], Yu.V. Yakovets [15] and others.

A certain contribution to the study of the innovative component of the economy of Tajikistan in various sectors of the economy was made by Tajik economists Kh.A. Abdukodirov [16], U.M. Dzhumaev [17], G.D. Jurabaev [18], N.A. Zhdankin [19], D.B. Kodirzoda [20], F.A. Kodirov [21], S.J. Komilov [22], Yu. Kh. Madzhitov [23], N.R. Mukimova [24], T.D. Nizomova [25], I.S. Okilov [26], J.R. Rakhmonov [27], M.N. Toshmatov [28], M.K. Faizulloev [29], P.D. Khojaev [30], B.K. Sharipov [31] and others.

However, in existing studies, little attention is paid to a critical assessment of the innovative component of the activities of enterprises in the Central Asian region (CAR) in general and state-owned enterprises in Tajikistan, in particular.

The **novelty** of this study is due to the identification of the stimulating and slowing factors for the development and implementation of innovations in Tajikistan; study of the compliance of the activities of state-owned enterprises of the RT with the innovation agenda and the development of proposals to increase innovation activity in the economy.

ANALYSIS OF FACTORS INFLUENCING INNOVATIVE DEVELOPMENT OF THE ECONOMY OF TAJIKISTAN

Modern states, as complex systems in constant interaction with a turbulent external environment, experience a powerful global influence from international actors and institutions. They are also influenced by factors of different types: from political to socio-cultural and scientific and technological. There are two groups of factors influencing the innovative development of the economy:

1) stimulating the development and implementation of innovations;

2) slowing down the implementation of innovative activities.

Both those and other factors can manifest themselves at different levels: global, macro, meso and micro levels. "Factor" in this case is understood as a condition, reason, parameter, indicator that affects the innovation process and the result of this process.[5]

General economic conditions, the state of the world markets for scientific and technological products, the country's position in the Global Innovation Index and other global rankings, scientific achievements of representatives of the national academic community, its participation in international scientific exchange, international projects, etc.

The macro-level is characterized by the main macroeconomic indicators of the country, the structure, and the volume of government spending on education, science, and research and development.

The factors of the meso-level include the conditions of regional development, and the factor of the micro-level is the conditions for the development and achievement of specific economic entities in the innovation sphere [32, 33].

The main indicators of Tajikistan in The Global Innovation Index 2020 (*Fig. 1*) indicate a low level of innovative development of the economy, including in comparison with other CAR countries, the republic ranks only 109th.

Innovative development as an economic phenomenon is a continuous process of searching and using the latest methods for

[5] Dictionary of Economics. M. Yu. Agafonova, A.N. Azrilian, O.M. Azrilian et al. M.: Institute of New Economics, 1997. p. 864.

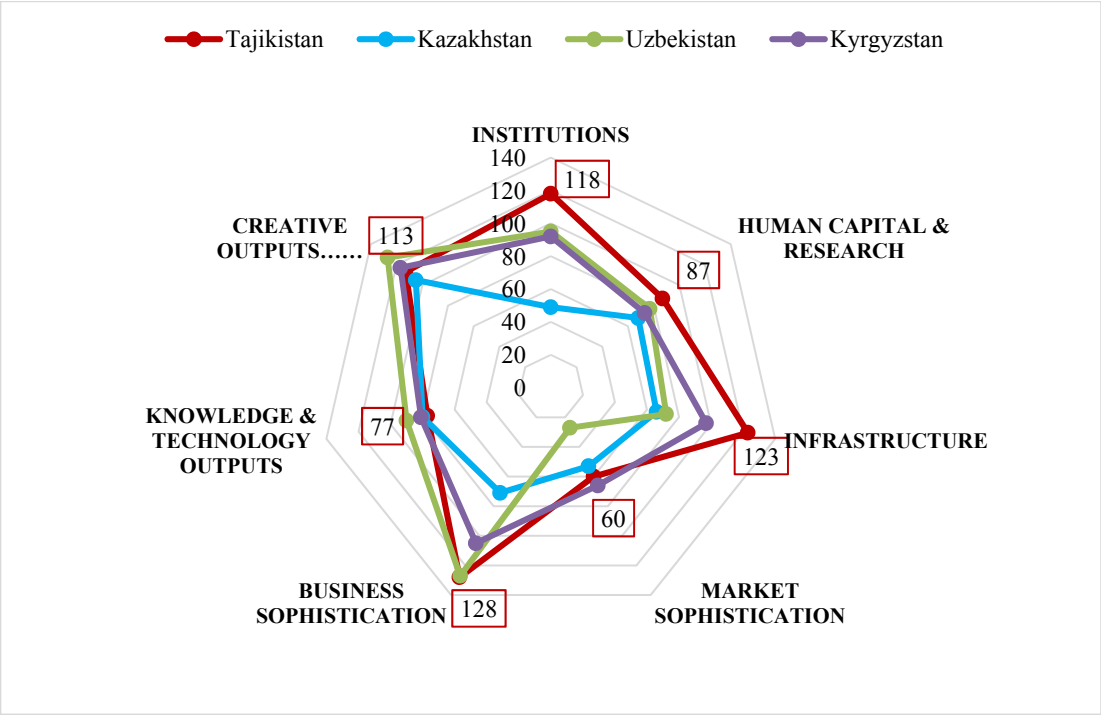

Fig. 1. **Comparison of Tajikistan's position (place by sub-index) with other countries of Central Asia in The Global Innovation Index, 2020**

Source: compiled by the author according to The Global Innovation Index 2020: [40]. URL: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf (accessed on 22.03.2021).

economic and social development, based on knowledge and innovation [31, 34]. Since the formation of an innovative economy is a complex, multidimensional and long-term process associated with socio-political and institutional-economic transformations, as well as the choice of promising directions of state policy [22], the basic conditions created by the state are of particular importance for the innovative development of the economy [35] and regional authorities [19, 36]. These basic conditions are:

- regulatory framework;
- availability of strategic priorities (strategy, concept, government programs);
- the level of protection of the results of intellectual activity;
- innovation policy, investment policy, science, and technology policy;
- tax policy;
- the level of support for science and education, small innovative forms of entrepreneurship, which together provide the actual level of innovative activity of enterprises, etc. [1, 37].

While recognizing certain achievements of Tajikistan over 30 years of independence, many experts note the complexity of the social and economic state of the republic [18, 21]. For Tajikistan, it has become a kind of "tradition" of high dependence on remittances of Tajik migrants (third place in the world (31%) after Tonga — 35.2% and Kyrgyzstan — 33.6%, (*Fig. 2*), permanent inflation, inflated rates on loans, high taxes, a weak judicial system.

These factors are the determinants of the high share of the "shadow" economy, reducing the republic's prestige in the eyes of investors. According to a study by the International Monetary Fund, the average estimate of the share of the "shadow" economy in Tajikistan in the period 1991–2015 is was 42.99%. For comparison: the same indicator in Russia was 38.42% for the indicated period, in Kazakhstan — 38.88%, Kyrgyzstan — 47.92% [39].

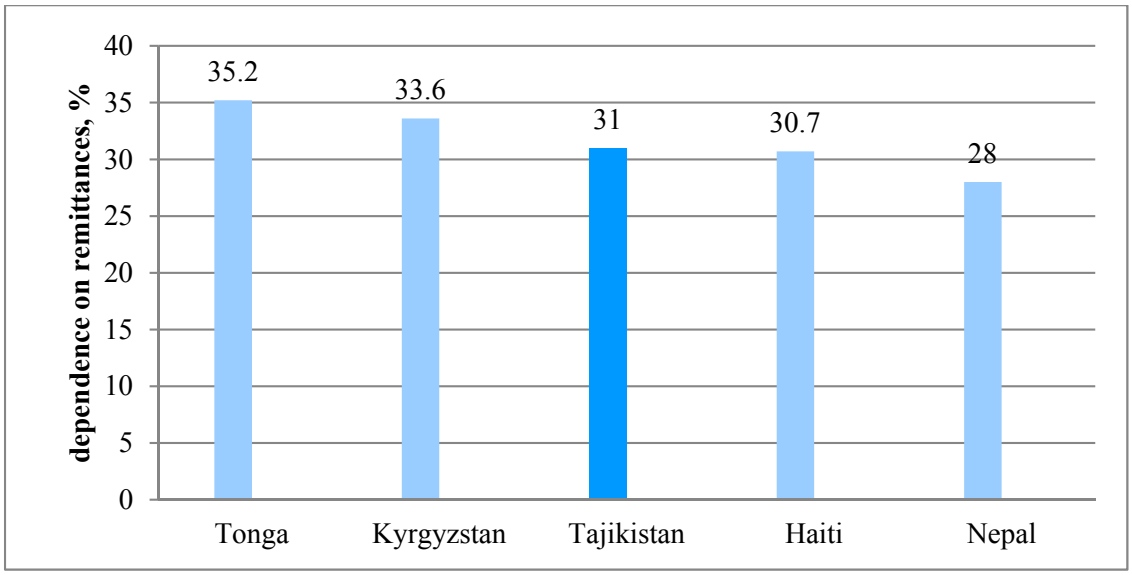

Fig. 2. **The level of dependence of some countries on remittances of migrant workers, %**

Source: compiled by the author according to [38].

The investment climate and business environment in the republic remain unattractive, despite the government's efforts to encourage entrepreneurship and accelerate reforms. Tajikistan traditionally attracts investments and external loans from neighboring countries of the region, including China, Russia, and, to a lesser extent, Iran. In 2019, foreign direct investment (FDI) from China increased by 6% to USD$ 62.3 million; in 2019, Tajikistan's total debt to China exceeded USD$ 1.5 billion, which is more than half of the country's external debt [38, p. 9]. Russia, with USD$ 33.1 million, is the second-largest source of foreign direct investment in 2019, followed by the United Kingdom (USD$ 13.9 million) and Turkey (USD$ 13.5 million). Qatar has invested USD$ 384.5 million in an elite residential complex of the republic and the largest mosque in the region and is also exploring investment opportunities in the infrastructure and banking sector of the RT.

Tajikistan is a challenging place to do business, according to the U.S. Department of State analysts: bureaucratic and financial hurdles, corruption, a largely dysfunctional banking sector, non-transparent tax system, and countless business inspections greatly hinder investors. The absence of private investment creates pressure on the Tax Committee to enforce or reinterpret tax regulations arbitrarily in order to meet ever-increasing revenue targets.[6]

The country's external public debt is increasing annually: if in 2014 it was USD$ 2.6 billion, then in 2019 it reached USD$ 3.5 billion, which is twice the volume of industrial production. At the same time, as follows from the Program of State External Borrowings of the Republic of Tajikistan for 2020–2022,[7] the government plans to receive about USD$ 1 billion more, which may lead to a sharp increase in external debt.

Accounts payable of enterprises of various forms of ownership are even higher, it approached USD$ 7 billion. The situation is getting more complicated, therefore, the government of Tajikistan, on the one hand, expresses interest in attracting foreign investment (this task is designated as a

[6] 2020 Investment Climate Statements: Tajikistan. URL: https://www.state.gov/reports/2020-investment-climate-statements/tajikistan/ (accessed on 21.03.2021).

[7] Decree of the Government of the Republic of Tajikistan as of November 1, 2019, No. 530 "On the draft Program of State External Borrowings of the Republic of Tajikistan for 2020 and the forecast of indicators for 2021–2022". URL: http://www.adlia.tj/show_doc.fwx?rgn=135075 (accessed on 20.03.2021).

Table 1

Factors influencing the innovative development of the economy of Tajikistan

Stimulating factors	Deterring factors
1. Creation of the foundations of legal regulation of innovation activity	1. Low ranking in the Global Innovation Index (109 out of 131)
2. The government has identified the priorities for innovative development of the economy	2. The complexity of the socio-economic situation in the republic, high public debt and credit debt of enterprises, a high proportion of the "shadow" economy
3. Work is underway to form innovative research centers and technology parks	3. Unattractiveness of the innovation sector for Western investors due to the complexity of doing business: bureaucratic and financial hurdles, corruption
	4. The insignificant funding for R&D and the ineffectiveness of spending budget funds allocated for these purposes
	5. The absence of strategic documents of the size of financing for innovative development, as well as in a number of documents of specific (measurable) indicators related to the definition of priority areas of innovation
	6. Absence of updated versions of the Strategy and Program for innovative development of the economy for 2021 and subsequent years
	7. Issues with the creation and implementation of fundamental scientific and technological innovations
	8. Administrative and "innovation" barriers hindering the development of small forms of innovative entrepreneurship
	9. Lack of highly qualified specialists

Source: compiled by the author.

priority in the "National Development Strategy of the Republic of Tajikistan for the period until 2030" (NDS-2030)[8]), and on the other hand, it constantly focuses on the development of the National Innovation System, as evidenced by the Strategy and Program of Innovative Development of the Republic of Tajikistan for the period until 2020 and other regulations.

However, 2020 has already made its own adjustments, the government has not presented the updated draft Strategy and Program for innovative development to the expert community and business circles. At the same time, the same problems remain: absence of funding for R&D; funds allocated for research and development are spent ineffectively; the problem of aging of scientific personnel has not been fully resolved.

Despite the proclamation of an "innovative" course and market priorities for economic development, there is

[8] National Development Strategy of the Republic of Tajikistan for the period until 2030 (NDS-2030); URL: https://mintrans.tj/sites/default/files/2017/september/nacionalnaya_strategiya_razvitiya_rt_na_period_do_2030_goda.pdf (accessed on 18.03.2021).

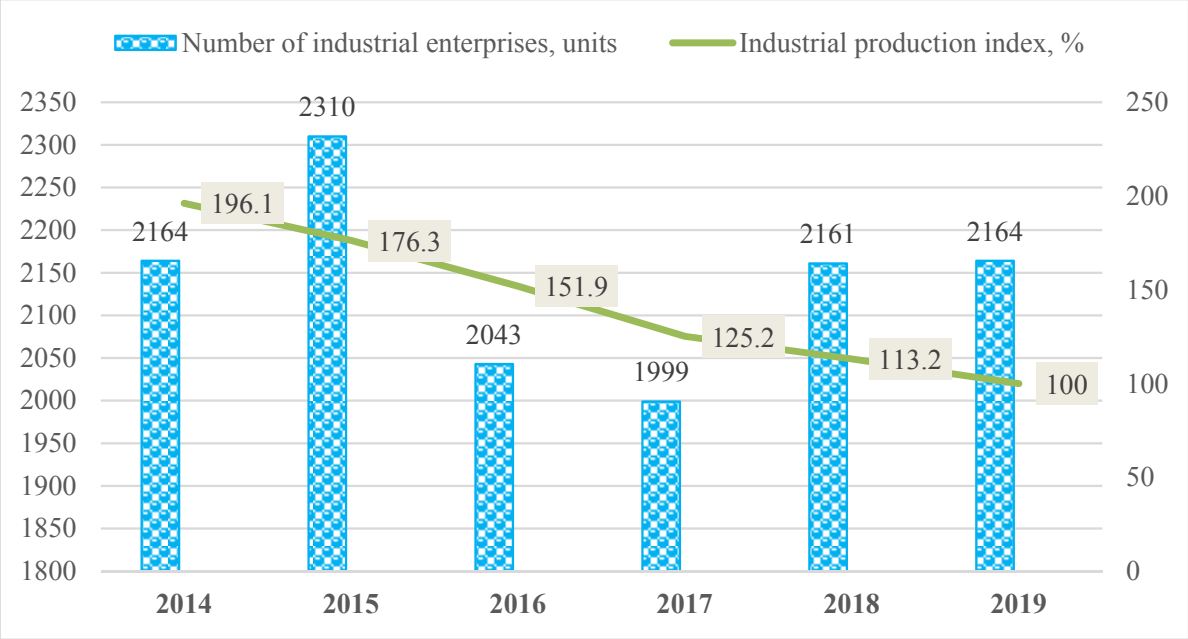

Fig. 3. **Dynamics of the number of industrial enterprises and indices of total industrial production in the Republic of Tajikistan, 2014–2019**

Source: compiled by the author according to the Industry of Tajikistan: Agency on statistics under the President of the Republic of Tajikistan; 2020.

excessive administrative interference in the private sector and "innovative" barriers for enterprises in the republic, including a lack of qualified personnel, insufficient financial resources, and depreciation of fixed assets, a high level of taxation, a high percentage of bank loans, risks of implementing long-term innovative projects.

As of 2020, Tajikistan ranked 106th out of 190 countries in the Doing Business Report.[9] However, a high tax burden remains in the republic, which is associated with the introduction of distorting methods of collecting taxes to achieve the planned income indicators. In turn, the activities of small and medium-sized enterprises are constrained by deficiencies in the regulatory framework and racketeering. A separate problem for businesses is access to credit resources due to high-interest rates.

Another problematic issue is the process of creating and implementing fundamental scientific and technological innovations, which is complex and requires coordinated efforts of diverse teams with reliable funding and organizational support, which can be represented as a multi-channel creative process. This can be achieved through the development and creation of a modern mechanism to support the development and implementation of innovations, which has not yet been created in Tajikistan [40, p. 132].

Based on the analysis of the literature and practice of state management of the innovation process in Tajikistan, it is possible to identify the factors that stimulate and slow down the introduction of innovations (*Table 1*).

As shown in *Table. 1*, the factors that hinder the innovative development of the republic's economy are much greater than the stimulating ones. Moreover, most of the slowing factors were formed not in the external, but in the internal environment, and they are localized mainly in the sphere of state management of innovative development.

[9] Doing Business 2020. URL: https://openknowledge.worldbank.org/bitstream/handle/10986/32436/9781464814402.pdf (accessed on 22.09.2020).

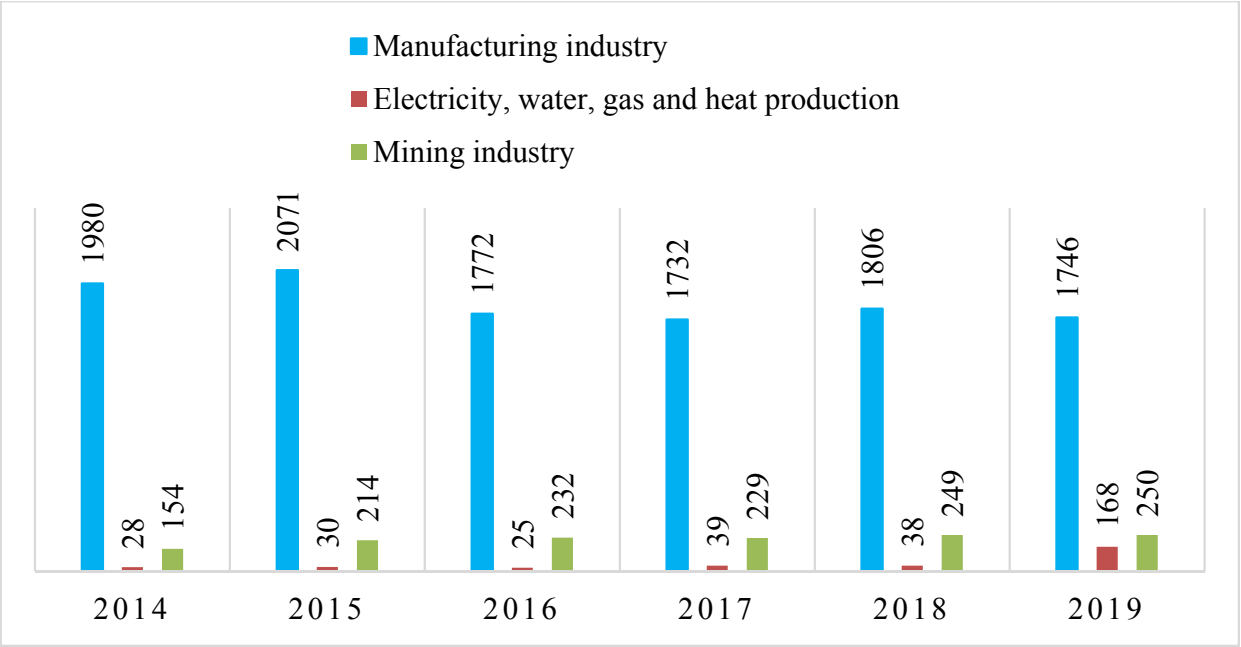

Fig. 4. **Dynamics of the number of industrial enterprises in the Republic of Tajikistan by industry, 2014–2019, %**

Source: compiled by the author according to the Industry of Tajikistan: Agency on statistics under the President of the Republic of Tajikistan; 2020.

ASSESSMENT OF THE ROLE OF STATE ENTERPRISES IN INNOVATIVE DEVELOPMENT OF THE ECONOMY

Tajikistan is an agro-industrial country, as of 2019, the share of agriculture in the structure of GDP was 19.8%, and industry — 17.4%, which actualizes the development of the industrial sector based on innovative technological achievements, including in the field of information technology (IT).

If we analyze the dynamics of the number of industrial enterprises, then it is unstable. For example, at the end of 2019, there were 2,164 units, the same number in 2014. In 2017, there was a sharp decrease in the number of industrial enterprises (to 1999 units), while in 2015 there were 2310 units (*Fig. 3*).

The manufacturing industry occupies the largest share in the structure of production in the RT, followed by the production and distribution of electricity, water, gas, and heat, and the third by the mining industry (*Fig. 4*).

Currently, the government of RT manages state unitary enterprises (GUP) and open joint-stock companies. The Government of the RT has a share in the authorized capital of 140 companies: 136 joint-stock companies and 3 limited liability companies.[10] Large Tajik enterprises, whose shares are owned by the government of the RT, are Tajik Aluminum Company (TALCO) (100%), Rogun (95%), Tajiktelecom (95%), divisions of Barki Tojik (100%), Dushanbe International Airport (100%), Tajiktransgaz (100%), Tajik Air (100%), and others.

However, the practical results of the implementation of state innovation programs and projects in Tajikistan are far from obvious. The state's stake on state-owned enterprises as "drivers" of innovative growth does not justify itself. Neither the private nor the public sector has shown sufficient interest in innovation. Large innovative projects are implemented in the republic only at the initiative of the state.

[10] State-owned enterprises of Tajikistan come under the control of supervisory boards; URL: https://asiaplustj.info/ru/news/tajikistan/economic/20200116/gospredpriyatiya-tadzhikistana-perehodyat-pod-upravlenie-nablyudatelnih-covetov (accessed on 22.03.2021).

Table 2

Key profit and loss indicators of OAO "TALCO", 2015 – 2018, thousand USD

Indicators	2015	2016	2017	2018
Revenue (income)	72.161	62.038	49.137	47.549
Cost price	(177.561)	(139.971)	(133.567)	(95.058)
Profit (loss)	(105.400)	(77.933)	(84.430)	(47.508)
Operating loss	(119.938)	(90.220)	(93.383)	(58.620)
Total comprehensive income / (loss) for the year	(60.800)	(73.847)	12.335	76.956

Source: compiled by the author according to the financial statements of OAO "TALCO" for the period 2015 – 2018.

Typically, these projects are funded by global multinational corporations, which receive significantly more than local state-owned enterprises. An example of this is the State Unitary Enterprise JSC "Tajik Aluminum Company" (TALCO).

TALCO is one of the world's largest aluminum producers and is developing dynamically. The design capacity of TALCO is 517 thousand tons of aluminum per year with the production of 360 thousand tons of baked anodes.

TALCO expresses its intention to implement a program of gradual and complete modernization of aluminum production and its transfer to new modern technologies.[11] One of the first innovative solutions of the enterprise was the target investment project "Transfer of TALCO to the use of local raw materials" and the opening of a chemical plant with an estimated cost of USD$ 111 million.

The second targeted innovation project is "Construction of an alumina complex from alumina-containing ores in the Republic of Tajikistan" based on the Turpi, Devonasu, and Tutek deposits. The implementation of these projects resulted in the creation of a new "Tajik Chemical and Metallurgical Corporation" (TCM).[12]

Since 2017, TALCO has begun to develop cooperation with the large Chinese corporation China Road and Bridge Corporation (CRBC) on the construction of an Industrial Technopark in the Yavan District — a complex of interconnected industries focused on the development of the industrial sector of the RT in the amount of USD$ 100 million.[13]

At the same time, the profit and loss indicators of TALCO according to the financial statements indicate instability and negative dynamics of financial results. Decrease in income, high cost of production, unprofitable operating activities were noted (*Table 2*).

[11] TALCO. Modernization programs. URL: https://www.talco.com.tj/ru/sustainable-development/programmy-modernizacii (accessed on 22.03.2021).

[12] Targeted investment projects of TALCO. URL: https://www.talco.com.tj/sites/default/files/_investors/prezentacii/tselevyye_investitsionnyye_proyekty.pdf (accessed on 25.09.2020).

[13] TALCO. Investment projects. URL: https://www.talco.com.tj/ru/investors/investicionnye-proekty (accessed on 22.03.2021).

Table 3

Key profit and loss indicators of "Barqi Tojik", 2015–2018, thousand somoni

Indicators	2015	2016	2017	2018
Revenue (income)	1,548,665	1,688,621	2,113,647	2,684,735
Cost price	(907,143)	(1,218,902)	(1,956,333)	(1,514,288)
Gross profit	641,522	469,719	599,359	469,719
Net total loss	(2,842,786)	(2,339,218)	(3,406,167)	(3,342,519)

Source: compiled by the author according to the financial statements of "Barqi Tojik" according to IFRS for the period 2015–2018.

From the author's perspective, one of the reasons for the ineffectiveness of the activities of TALCO (not the only one) is the use of a tolling scheme. Tolling — processing of foreign raw materials with the subsequent export of finished products. Under this scheme, foreign counterparties supply raw materials (alumina) to the country and export finished products, while TALCO provides only processing services and receives a fixed income for this. Under this scheme, neither imported raw materials for aluminum plants nor products of its processing are subject to customs duties and VAT. The main advantages are received by the company's foreign counterparties, not TALCO. The huge potential of the plant is used extremely ineffectively, the budget loses millions of dollars annually, subsidizing TALCO's unprofitable activities and receiving fewer taxes.

Another strategically important state corporation in Tajikistan for the modernization of the country is Barki Tojik (engaged in the production, transmission, distribution and sale of electricity and heat energy mainly in the local market). The company is experiencing similar problems. Consolidated statements of Barki Tojik for the period 2015–2018 demonstrates high production costs and unprofitable activities (*Table 3*).

Such financial indicators look paradoxical, given that Tajikistan has enormous hydropower potential, as it owns 4% of the world's hydropower resources and 53% of the CAR resources. The republic is ranked 8th in the world in terms of the potential of hydropower resources and is a leader in terms of specific reserves. The total volume of hydropower resources is estimated at 527 TWh, including a technically feasible capacity of 202 TWh, economically feasible to build — 172 TWh. The total capacity of the installed HPPs is 4,070 MW, and the average annual production is about 17 TWh. However, these resources have yet to be used rationally and efficiently [41, p. 214].

Hydroelectric power plants account for about 94% of the republic's generating capacities, but, according to some estimates, only 5% of their potential is used. The country faces power shortages ranging from 3.0 to 3.5 GWh, resulting in regular power

outages from October to April. But due to the lack of the possibility of exporting surplus electricity in the spring and summer period, hydroelectric power plants do not operate at full capacity, dumping water idle.

The potential of Tajikistan's hydropower resources, a significant part of which has not yet been developed, determines the strategic directions for the development of energy, the most important of which are the construction of large and small hydropower plants, the implementation of energy efficiency programs and the entry of the domestic electric power industry to the external market. Optimization of the structure of energy consumption in the domestic market and the commissioning of new capacities will allow in the future bringing the export potential of the country's electric power industry to 7.5–8 TWh in summer and 2–2.5 TWh in winter.

The increase in electricity exports, which ensures a stable inflow of foreign exchange into the country and contributes to the strengthening of the geopolitical importance of the energy sector in Tajikistan, can perform stabilizing and integrating functions throughout the Central Asian region. From the point of view of national interests, the export of electricity and energy-intensive products, in the production of which the Republic of Tajikistan has a clear benefit, will be effective if it provides the maximum income in foreign currency at the minimum costs associated with their production and delivery to the foreign market.

An equally important branch of the national economy is the gold mining industry. According to B. K. Sharipov [31, p. 110], the disadvantages of the development of gold mining enterprises of the RT include:

1) absence of a clear strategy for innovative development;

2) low qualification of personnel;

3) poor motivation and incentives for staff;

4) imperfection of the mechanisms for training and professional development of personnel;

5) innovative development is not at the appropriate level;

6) a narrow range of goods;

8) low level of technical equipment;

9) low wages.

Thus, despite the fact that state-owned enterprises in Tajikistan play a leading role in the national economy, most of them are in urgent need of financial recovery.

GENERALIZATION OF RESEARCH RESULTS AND PROPOSALS TO INCREASE INNOVATIVE ACTIVITY OF STATE ENTERPRISES

Analysis of the literature and the author's analysis of the practice of state management of the innovation process in Tajikistan made it possible to identify factors that stimulate and slow down innovative development in Tajikistan. Among the stimulating factors identified: the creation of the foundations of legal regulation of innovation; determination of priorities for innovative development of the economy; work on the formation of innovative research centers and technology parks. The slowing down factors include: a low indicator of the Global Innovation Index (109th place out of 131 possible); the complexity of the socio-economic situation in the republic, high public debt and credit indebtedness of enterprises, a high proportion of the "shadow" economy; unattractiveness of the innovation sector for Western investors due to the complexity of doing business: bureaucratic and financial hurdles, corruption; insignificant R&D funding and ineffective spending of budgetary resources allocated for these purposes: absence of funding for innovative development in strategic documents, and in some cases — absence of measurable indicators related to the definition of priority areas of innovation: absence of updated versions

of the Strategy and Program for innovative development of the economy for 2021 and subsequent years; issues with the creation and implementation of fundamental scientific and technological innovations; administrative and "innovation" barriers hindering the development of small forms of innovative entrepreneurship; lack of highly qualified specialists.

Currently, the basis of the economy of Tajikistan is made up of state-owned industrial enterprises, which have already become a special subject of the market. But at the same time, 90are a constant source of financial problems for the state budget. Although the role of state-owned enterprises in innovation processes is quite significant due to their special position in the economy, most of them are in urgent need of financial recovery. The problem is that the role of state-owned enterprises is essentially reduced to attracting investments and grants from foreign investors, international organizations, budget subsidies, and tax incentives. The external debt of enterprises is increasing, and deep structural transformations in the economy with their participation do not occur. The state budget supports unprofitable companies and systematically loses taxes. In recent years, there has never been a cost-benefit analysis of tax incentives provided to state-owned enterprises that identify the advantages and disadvantages of providing industry-specific incentives, lost fiscal costs to the government, and net benefits to the public in the form of new jobs or other social effects.

In the current conditions, it is advisable for the Government of Tajikistan to revise the model of innovative development management: to shift the emphasis from large, but ineffective state-owned enterprises to comprehensive support of the scientific sector and small forms of innovative entrepreneurship. The main argument in favor of such a maneuver is the fact that the key player in the innovation process is an innovative entrepreneur, a person who not only generates an idea but also personally promotes it to the market. The task of the state is to support proactive people, to provide them with access to state funding and free legal aid. In this, we see the key to enhancing the innovation process in Tajikistan. As for the scientific sector, it always initiates new research and development. Support measures here can be an inter-university competition for innovative projects, technology parks, support for young scientists, and an increase in salaries for active researchers in priority areas of R&D.

CONCLUSIONS

Most of the problems in the innovative development of Tajikistan are caused by the discrepancy between the chosen model of state management of innovative development. In general, the socio-economic situation in the country remains difficult both from the point of view of domestic economic policy, budget revenues, and the investment climate, which is a key constraining factor for modernization and the transition to innovative development of the economy.

It was found that most of the slowing factors were formed not in the external, but in the internal environment and are localized mainly in the sphere of state management of innovative development.

The study of the role of state-owned enterprises in the innovative development of the economy showed that the republic, with the help of international organizations and foreign investments of foreign corporations, has achieved certain successes. But due to the weakness of the socio-economic situation, insufficient development of state institutions and institutions of a market economy, control over the expenditure of budgetary resources, even fairly large state-owned enterprises experience financial difficulties, as a rule, the management of

enterprises is highly dependent on the decisions of representatives of the state apparatus.

It is proposed to the Government of Tajikistan to conduct financial recovery of unprofitable enterprises, abandon ineffective management methods, carry out a comprehensive audit of tax incentives, revise the model of managing innovative development of the economy as a whole — shift the focus from large but ineffective state-owned enterprises to comprehensive support of the scientific sector and small forms of innovative entrepreneurship.

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Modeling the Rating System of Export-Oriented Companies in the Agro-Industrial Complex of the Russian Federation. Subsidy Mechanism

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ABSTRACT

The study explores the influence of internal factors on the level of exports of products of the agro-industrial complex of the Russian Federation (AIC RF). The **subject** of the research is the competitiveness of export-oriented companies in the agro-industrial complex of the Russian Federation. The **relevance** of the study is due to the growth of exports of agricultural products, which is gradually becoming one of the most important sources of foreign exchange earnings in the country. The **aim** of the paper is to form a rating model for Russian companies focused on the export of agricultural products, on the basis of which to propose the most effective measures to support agricultural enterprises. The authors apply the following **methods**: systematization and classification of information, statistical, coefficient, and regression analysis. Such tools as linear regression models, logistic regression (logit, probit), ordered probit model are considered. The authors use the Ginny coefficient (area under the curve Roc) for binomial models and an adjusted R^2 for the linear model as a quality criterion for the model. As a **result,** the study identified the key internal and external factors affecting the competitiveness of agricultural exporting companies. Internal factors include stocks, net assets, short-term borrowings, equity capital, fixed assets turnover, long-term liabilities, accounts payable. Among the external factors for both ordinal and binomial models, the most significant were the increase in imports, the logarithm of GDP, and the logarithm of GDP per capita. A model of rating assessment of companies has been developed. Proposals are formulated for using the developed system as a simulation model when making decisions on the development and support of food exports in Russia. The authors propose a combined mechanism for supporting enterprises, depending on the rating determined by the model. It is **concluded** that the implementation of this approach will significantly increase the level of economic efficiency of budget support funds aimed at stimulating exports. The prospect for further research on this topic is to study the influence of qualitative factors that were not included in the model: the drought index, sanctions, and other macroeconomic events and parameters.

Keywords: export; agro-industrial complex; internal factors; subsidy mechanism; linear, binomial, and ordinal models

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INTRODUCTION

The state and private investors are putting more emphasis on increasing the export potential of agriculture with every passing year. Its advanced development is becoming increasingly important. The volume of food exports in 2019 amounted to about 6.5% of the total exports of the Russian Federation (of which 4% were cereals). Russia ranked first in the world in grain exports, overtaking the United States and China.[1]

The government pays special attention to improving the legal and regulatory framework for export regulation. In 2019, more than 9 government resolutions were issued, in one way or another aimed at supporting the export of agriculture, including grain crops and meat products. The volume of subsidies for the introduction of advanced technologies into production is increasing.[2] Steps are being actively taken to improve the attractiveness of investing private funds in this area, and bureaucratic procedures are partially weakened.[3]

The novelty of the study is due to the fact that previously in Russian practice, the rating assessment of exporters of agricultural products was not carried out. The relevance of the topic is emphasized by the growth of agricultural exports, it is becoming one of the most important sources of foreign exchange earnings in the country, the sector of creating new high-paying jobs.

World economic theory has a long tradition of studying international trade. David Ricardo made his contribution to this science. In his theory of comparative advantages, he proved the need for mutually beneficial trade even in the presence of absolute advantage of the country in the production of any product, arguing that the total volume of exports can be increased through specialization [1].

Among the modern researchers who paid attention to this problem, we note the Nobel Prize in Economics Paul Krugman, who states that the theory of "international trade" is based on geographical inequality, the receipt of more revenues by countries with a large amount of production, leading to an increase in exports [2].

Nobel laureates P. Samuelson [3] and W. Leontief [4] also made significant contributions to the theory of export activities.

In the Russian Federation, attention was paid to the development of the export potential of agricultural products in the works of A.G. Paptsov, I.G. Ushacheva, A.I. Altukhov, and others, where special attention was paid to the practice of foreign countries, in particular in their work "Export of AIC products in Russia: Trends and development" [5] and in a number of other works [6].

We also note that earlier some authors attempted to study and describe using econometric models the factors that affect the level of exports and imports of a country or regions as a whole. The study of the relationship between the volume of exports and some factors at the level of a particular region was carried out in the work of A.V. Lapin [7]. The work of D.R. Zarubaiko [8] examines the impact of export operations on one of the macro-factors: the level of China's GDP. S.S. Jana, T.N. Sahu [9] investigated the influence of direct investment on the level of India's foreign trade.

We also highlight the works of J. Laborda, V. Salas [10], and other research [11, 12], which investigated the business and financial cycles of export-oriented companies, the level of their exports depending on the country's competitiveness and demand in the domestic market.

The article by S. Sashi, S. Bhavish [13] presents the results of a study of the impact

[1] Analytics. Export volumes. Agroinvestor. URL: https://www.agroinvestor.ru/ agroinvestor/9930/ (accessed on 15.11.2020).

[2] Development strategy of AO "Russian Export Center" until 2019. URL: https://www. exportcenter.ru/company/document/ (accessed on 15.11.2020).

[3] Federal Scientific and Technical Program for the Development of Agriculture for 2017–2025. Resolution of the Government of the Russian Federation of August 25, 2017, No. 996. URL: http://government.ru/docs/29004/ (accessed on 15.11.2020).

of sanctions on various sectors of the Iranian economy as the main reason for the decline in the level of its exports.

The purpose of this study is to develop a rating model for Russian companies focused on the export of agricultural products, to form, on its basis, the most effective toolkit for subsidizing agricultural enterprises. The following objectives have been set:

- to determine the parameters of indicative growth, on which companies can focus when implementing their strategy, which requires adjustments to current activities;
- to give recommendations on improving the mechanism of budgetary support for the export of agricultural products to increase its economic effectiveness.

In the course of the work, the influence of internal factors on the export level of individual companies was assessed. The article discusses tools such as linear regression models, logistic regression (logit, probit), ordered probit, and logit models (in the rating constructor, an ordinal model was used to build a rating system).

As criteria for the quality of the models the Ginny coefficient (area under the ROC curve), estimates of errors of the first and second kind to test the hypothesis about the significance of the model parameters, and the adjusted R^2 for different models were used.

It is the influence of internal factors that determines the financial condition and the level of competitiveness of the company as a whole. In other words, the internal assessment allows drawing a conclusion about the preliminary state of the enterprise.

The financial indicators of the organizations were downloaded from the SPARK[4] database.

Let us consider the importance of food exports for the Russian economy in comparison with export indicators as a whole. If from 2016 to 2019 Russian exports as a whole increased from 285 to 423.3 billion dollars, or by 48.5%, then non-resource non-energy exports (NE) increased over the same period from 109 to 154.5 billion dollars, or 41.7% (*Fig. 1*), the growth of food exports amounted to 57.1%. It grew from USD 16.3 billion to USD 25.6 billion. That is, at the moment, one of the drivers of the development of NRE in Russia, along with the chemical industry, metallurgy, and mechanical engineering, is the agro-industrial complex.

A positive trend is that, in general, there is a faster growth in food exports, which leads to a gradual increase in the share of the agro-industrial complex[5] in total exports.

It should be noted that for the period from 2016 to 2019, not only the volume but also the structure of exports of products of the agro-industrial complex of the Russian Federation changed significantly. Exports of grain and meat products grew at a faster pace [14].

Thus, the dairy and meat industries showed the highest growth rates among the agro-industrial complex at the end of 2019[6] (+29.8%). The oil and fat industry (+ 28%), food and processing industry (+ 12.7%) demonstrate high growth rates compared to 2018. At the same time, the export of perfumery, cosmetics, and pharmaceuticals increased by about 10.1% (*Fig. 2*).

The growing volumes of agricultural exports in recent years, the rapidly changing economic situation pose new challenges for economic science, lead to the need to develop new tools for regulating economic processes, for example, those that will assess the competitiveness of export-oriented agricultural companies based on the latest retrospective data. The results obtained can be used to improve the management of industry exports, to increase the economic return on

[4] SPARK database. Reporting of agro-industrial companies. URL: http://www. spark-interfax.ru/ (accessed on 15.11.2020).

[5] Russian Export Center, 2020. Analytics on Russian exports. URL: https://www.exportcenter.ru/international_markets/russian_exports/ (accessed on 15.11.2020).

[6] Export center. Volumes of non-resource exports. 2020. URL: https://www.exportcenter.ru/press_center/news/obemy-nesyrevogo-neenergeticheskogo-eksporta-vyrosli-v-2019-godu/ (accessed on 15.11.2020).

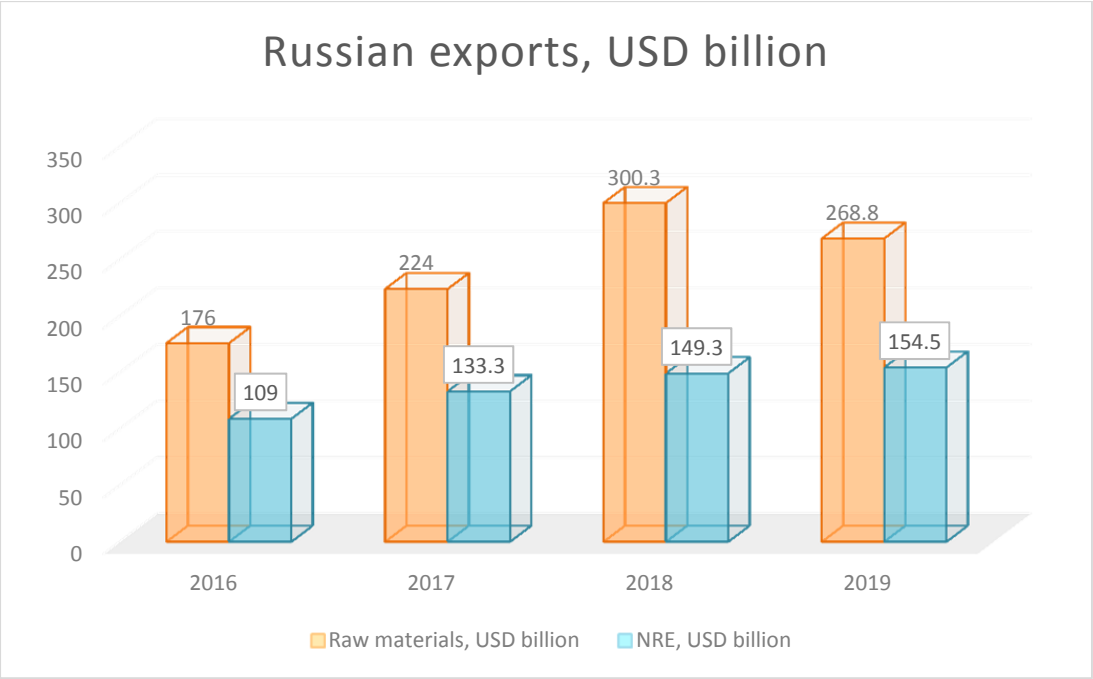


Fig. 1. **Dynamics of Russian exports in 2016–2019**

Source: Rosstat.

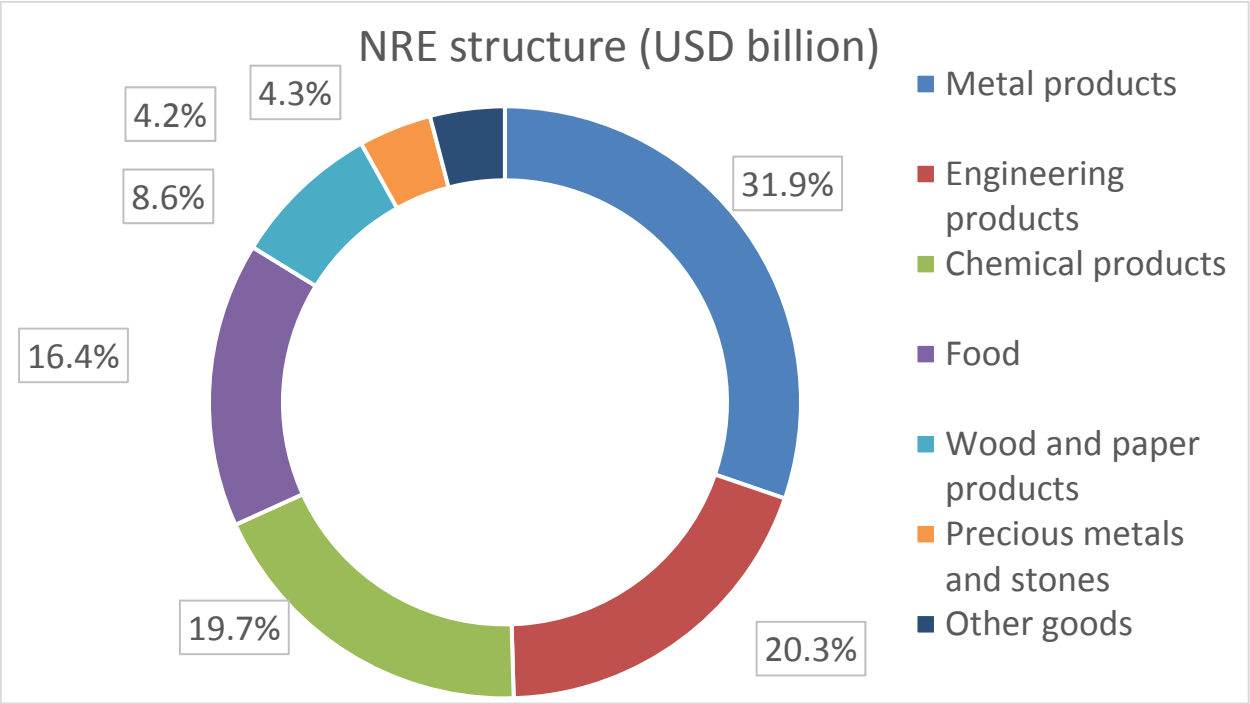


Fig. 2. **Structure of non-primary exports in 2019**

Source: compiled by the authors.

budgetary funds spent on export promotion. In this case, it becomes quite obvious that exporting companies should be differentiated according to their competitive capabilities.

As mentioned earlier, an econometric model based on an ordered logit/probit model was used to construct a rating of export-oriented agro-industrial companies. The

dependent variable y_i (the company's export growth rate) will take the following values: 1, 2,... 5 — depending on the growth rate. x_i — vector of values of independent variables [15].

$$y^* = x_i' + \varepsilon_i; \quad (1)$$

$$\left\{ \begin{array}{l} y_i = 1, if \ \ y_i^* \le c_i; \\ y_i = r, if \ \ c_{r-1} \le y_i^* \le c_r, 2 \le r \le k-1; \\ y_i = k, if \ \ y_i^* \le c_{k-1.} \end{array} \right\}. \quad (2)$$

The ordered selection method involves obtaining estimates of the model parameters, the vector of coefficients β and a set of threshold values ($c_1, ..., c_{k-1}$) by the maximum likelihood method for the system of equations:

$$\left\{ \begin{array}{l} P(y_i = 0) = F(c_1 - x_i'\beta); \\ P(y_i = r) = F(c_{r-1} - x_i'\beta) - F(c_r - x_i'\beta), 2 \le r \le k-1; \\ P(y_i = k) = 1 - F(c_{k-1} - x_i'\beta), \end{array} \right\}, \quad (3)$$

where errors ε_i are assumed to be independent, have zero mathematical expectation and are normally distributed in the ratio.

PRELIMINARY DATA ANALYSIS

The paper estimates the regression of the dynamics of exports (million rubles) of agricultural products in Russia concerning the last year in the context of individual companies.

The initial data were downloaded from the Rosstat databases, the Bank of Russia website (open data), the expert.ru website, the SPARK database (these companies' indicators are based on RAS and other sources), as well as the ACRA rating agency website for the period from 2005 to 2019 for 14 leading exporters of agricultural products (annual data, 210 observations). The data on the list of leaders was prepared based on the rating of the largest exporters of Russia for 2018.[7] The list of companies from the original sample is presented in *Table 1*.

[7] Expert. Online. Russian exporters rating for 2018. URL: https://expert.ru/dossier/story/rating200/ (accessed on 15.11.2020).

Table 1

List of leading companies in the export of agricultural products

No.	Organizational and legal form	Name of the company
1	AO	AGROPRODUCT (SODRUZHESTVO)
2	AO	ASTON
3	OOO	BUNGE CIS
4	OOO	RUSAGRO GROUP OF COMPANIES
5	OOO	CARGILL
6	OOO	MARS
7	AO	NMZhK
8	AO	NEFIS-BIOPRODUCT
9	OOO	PRODIMEX
10	OOO	RUSSIAN OILS (KERNEL)
11	AO	SOLAR PRODUCTS HOLDING
12	AO	EFKO
13	OOO	YUG RUSI
14	OOO	YUG SIBIRI

Source: Journal Expert Online, 2018. URL: https://expert.ru/dossier/story/rating200/ (accessed on 15.11.2020).

The companies in the sample have the organizational and legal form "OOO" — a limited liability company or "AO" — a joint-stock company.

All calculations, building models were performed in Stata and Excel programs.

As a dependent variable for the linear model, an increase in the export of agricultural products was selected in relation to the previous period (year) in the context of the company, at the same time, for binomial models, the binary variable of the export of the agricultural sector (Export_logit, where 1 — if there was an increase in export by 5 or more percent in relation to the previous year, 0 — in the opposite case).

The ordinal model, the variable responsible for the Export_logit export, level will be converted into the Export_ordered_logit, variable, based on 5 levels (categories) of export growth (*Fig. 3*):

- category 7 (SS) — more than 30% in relation to the previous year;
- category 6 (S) — from 20 to 30%;
- category 5 (A) — from 10 to 20%;
- category 4 (B) — from 5 to 10%;
- category 3 (C) — from 0 дto 5%;
- category 2 (D) — from –5 to 0%;
- category 1 (E) — less than –5%.

We note a relatively high number of assessments of the SS level, which is driven by macro parameters: changes in the exchange rate, business reputation, technological improvement, and some other factors that were not included in the model.

After a preliminary analysis of the initial data and calibration of the models — both linear, binomial, and ordinal — the variables described in *Table 2* act as explanatory parameters.

Table 3 presents descriptive statistics of the initial parameters of the model and more detailed characteristics of the studied variables.

The selection of indicators was based on the absence of multicollinearity and correlation between the dependent parameters.

The number of observations for each of the parameters, depending on the availability of data, varies from 152 to 170. The dollar exchange rate varied in the range from 24.8 to 68.1 rubles.

It is also worth noting that the increase in the level of export of agricultural products by companies for the entire observation period mainly ranges from –90 to + 100%.

At the same time, we note that only 14% of companies from the sample have a joint ownership form (*Fig. 4*).

MODELING

As the null hypothesis H_0 in linear, binomial, and ordinal models, we take the hypothesis

Table 2

Explanatory variables of the internal factor model

Explanatory variable	Variable designation
Currency rate (USD)	Course
Type of ownership	Ownership
Stocks	Stocks
Net assets	Net_assets
Short-term debt	Short_borrowed
Equity	Equity
Revenue	Revenue
Fixed assets turnover	Fixed_assets_ turnover_times
Total assets turnover ratio	Total_assets_ turnover_ratio
Return on costs	Return_costs
Return on earnings before interest and taxes	EBITM
Return on assets (ROA)	ROA
Return on equity (ROE)	ROE
Revenue per employee	Revenue_on_staff
Revenue to salary	Revenue_to_ salary
Long-term investment	Long_ investments
Intangible assets	Intangible_assets
Non-current assets	Non-current_ assets
Long term duties	Long_duties
Accounts payable	Accounts_ payable
Debt-to-equity ratio	Debt_equity_ ratio
Equity capital concentration ratio (autonomy)	Equity_capital_ concentration
Absolute liquidity	Absolute_ liquidity_ ratio

Source: compiled by the authors.

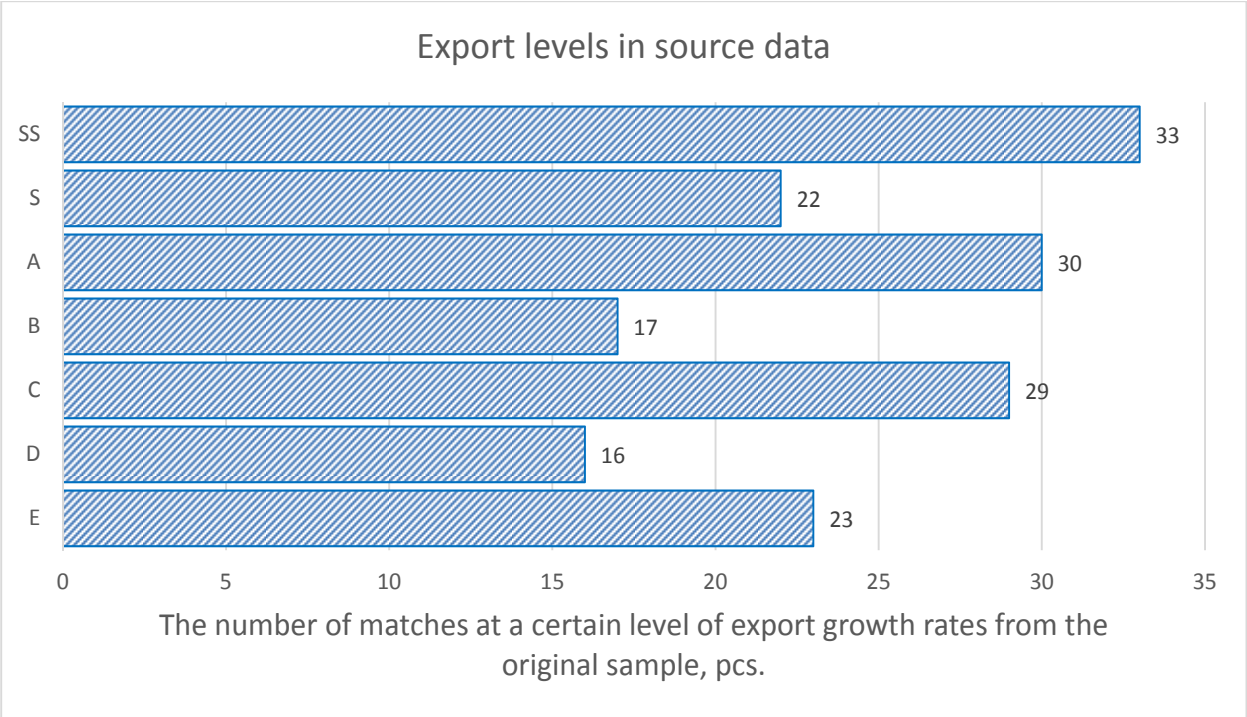


Fig. 3. **Assessment of the dynamics of exports in accordance with the delineation by levels**

Source: compiled by the authors.

of the significance of the parameters for the explanatory variables (i.e. H_0 : the coefficients are zero), which will be one of the criteria for the significance of the model. In the linear model, F- statistics will be used, in binomial and ordinal — Prorb.

At the first stage, we will carry out a correlation analysis. There is a high positive relationship between the assets of companies and their stocks, revenue, and capital of the organization, reserves, and assets of companies, long-term investments and capital of companies, turnover, and long-term investments. Subsequently, the combination of these parameters was excluded from the model.

To check for multicollinearity, VIF, was calculated, its values > 12 indicate its presence. To adjust in further calculations, excess variables (net assets, long-term debt, non-current assets, EBIT) were excluded, after which the average VIF value was 1.92. In other words, there is no multicollinearity between the parameters and the corrected model.

The *F*-statistic of the constructed model is 3.54, while the critical value at a significance level of 0.001 for this set of initial data is 0.99, which suggests that the proposed null hypothesis is rejected and the regression model is generally recognized as significant.

Table 4 shows the output data of the linear model (model 1), binomial (logit-model 2, probit-model 3), and ordinal models (ordered logit-model 4, ordered probit-model 5).

Linear model

Checking the presence of heteroscedasticity in a linear model, where the null hypothesis assumes homoscedasticity according to the results of the Breusch-Pagan test, showed that the probability of rejecting the hypothesis is 0.0198, which is less than 5%. Therefore, in the absence of a non-constant variance of random errors of the model, the null hypothesis of homoscedasticity is accepted.

After calibrating the model, we note the significance of the parameters of the linear model (*Table 4*):

- at 1% level — currency rate (Course), intangible assets (Intangible_assets);

Table 3

Descriptive statistics for the sample. Company data

Variable	Unit of measure	Numb. of obs.	Average	Std. Error	Min	Max
Currency rate (USD)	RUB	170	43.56	16.11	24.86	66.08
Type of ownership	1 – foreign, 2 – joint, 3 – private	170	1.77	0.90	1	3
Stocks	RUB million	169	2670	2990	0	14100
Net assests	RUB million	170	6700	15000	–8190	82700
Short-term debt	RUB million	170	4630	5530	0	27400
Equity	RUB million	170	7180	15200	–8190	82700
Revenue	RUB million	169	20000	25700	0	139000
Fixed assets turnover	Times	140	280	934	0	5991
Total assets turnover ratio	%	140	1.27	1.53	0	8.34
Debt-to-equity ratio	%	167	19.78	154.22	–153,74	1880.00
Return on costs	%	168	5.42	70.06	–1	908.13
EBITM	%	141	3.50	22.98	–29.22	238.39
ROA	%	164	0.038	0.34	–3.29	2.25
ROE	%	166	0.50	2.74	–5.96	31.73
Absolute liquidity	%	166	0.34	0.69	0	4.58
Revenue per employee	RUB million	170	55.6	141	0	957
Revenue to salary	–	170	48.81	120.39	–21.14	683.54
Long-term investment	RUB million	152	5500	13900	0	75000
Fixed assests	RUB million	168	2960	4150	0	21000
Intangible assets	RUB million	147	30.30	93.60	0	744
Non-current assets	RUB million	169	8750	16600	0	86700
Long-term duties	RUB million	167	3760	10300	0	70900
Accounts payable	RUB million	170	2850	3970	0	2330
Equity capital concentration(autonomy)	%	170	0.27	0.27	–0.42	0.99

Source: compiled by the authors.

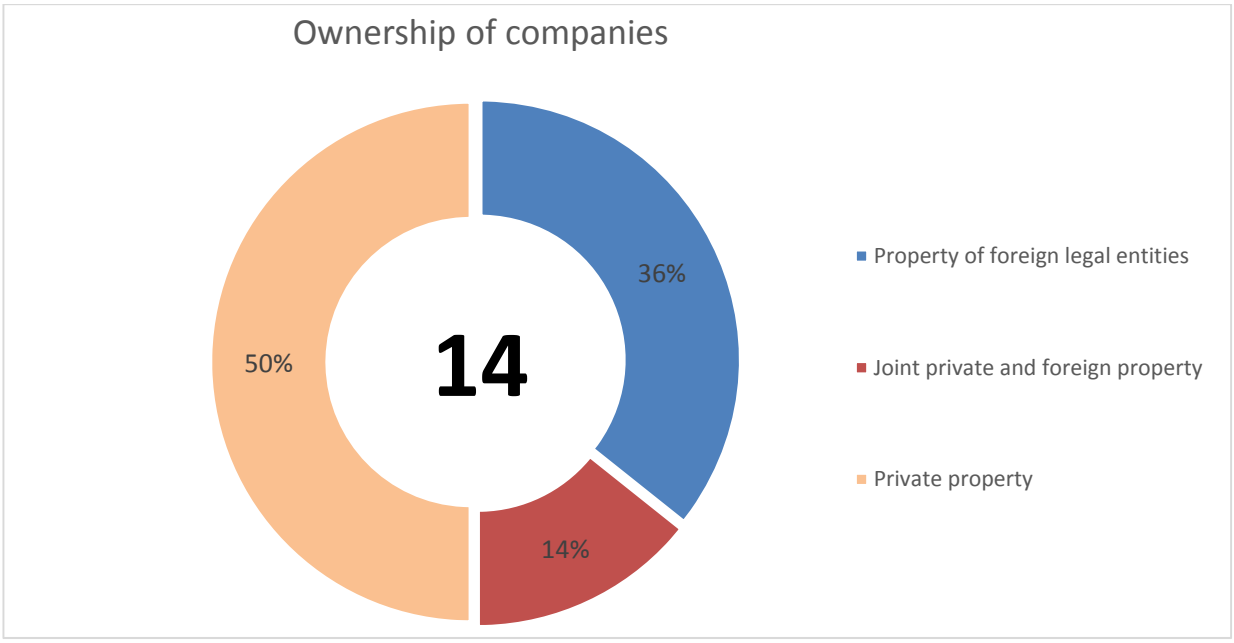


Fig. 4. **Ownership of companies from the original sample**

Source: compiled by the authors.

• at a 5% level — stocks (Stocks), accounts payable (Account_paybale);

• at a 10% level — revenue (Revenue), revenue on staff (Revenue_on_staff), revenue to salary (Revenue_to_salary).

Note the relatively high adjusted R^2 of 0.62.

It is also worth noting the insignificance of the linear independent variables: ownership, absolute liquidity ratio, return on equity (ROE) and return on assets (ROA), return on earnings before interest and taxes (EBITM), and long-term borrowing.

Binomial models

The following variables are significant in logit and probit models:

• at 1% level — short-term borrowings (Short_borrowed) for the probit model;

• at 5% level — stocks (Stocks), intangible assets (Intangible_assets), long-term liabilities (long_duties) for the logit model;

• at the 10% level — the turnover ratio of total assets (Total_assets_turnover_ratio), return on equity (ROE) for the probit model.

The rest of the variables are not significant even at the 10% level, as evidenced by the p-value for the corresponding variables. Both models are also statistically significant in general, as evidenced by the Chi2 statistic (0.0002 for probit and logit models).

Let us move on to analyzing the results of modeling order models.

The Gini coefficient was used as a quality criterion [16]. For logit and probit models, its value is greater than 0.8, which indicates a high predictive quality of the model (*Fig. 5*).

Ordinal models

As a result of regression analysis (*Table 4*), it was revealed that the following parameters have the greatest influence on the ordinal model:

• at 1% level — stocks (Stocks);

• at a 5% level — net assets (Net_assets), short-term borrowings (Short_borrowed), equity (Equity), fixed assets turnover (Fixed_assets_turnover_times), long-term liabilities (long_duties), accounts payable (Account_paybale);

• at 10% level — the turnover ratio of total assets, (Total_assets_turnover_ratio), return on earnings before interest and taxes (EBITM), return on equity (ROE).

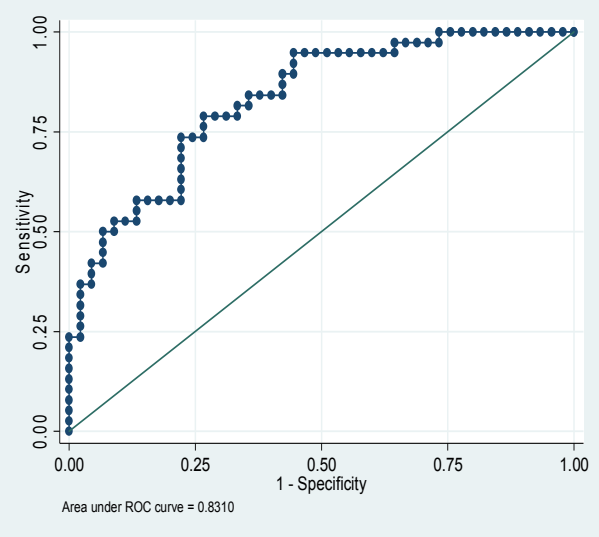
Table 4

Models for assessing the impact on the competitiveness of companies in the field of export

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Course	243.398***	−0.0312	−0.0170	−0.0175	−0.00670
	(78.849)	(0.0232)	(0.0133)	(0.0176)	(0.00959)
Ownership	737.769	−0.880	−0.528	−0.336	−0.214
	(1.864e+06)	(0.595)	(0.358)	(0.376)	(0.226)
Stocks	0.00162**	5.80e-10**	3.34e-10**	3.87e-10***	2.32e-10***
	(0.000679)	(2.70e-10)	(1.53e-10)	(1.44e-10)	(8.44e-11)
Net_assets	0.000173	−1.76e-10	−1.09e-10	−2.30e-10**	−1.33e-10**
	(0.000512)	(1.52e-10)	(8.74e-11)	(1.05e-10)	(6.29e-11)
Short_borrowed	0.000343	−2.91e-10**	−1.67e-10***	−1.30e-10**	−8.48e-11**
	(0.000285)	(1.17e-10)	(6.45e-11)	(6.00e-11)	(0)
Equity	−0.000469	1.46e-10	9.24e-11	1.76e-10**	9.60e-11*
	(0.000433)	(1.20e-10)	(6.58e-11)	(8.67e-11)	(0)
Revenue	0.000223*	−0	−0	−0	−0
	(0.000116)	(0)	(0)	(0)	(0)
Fixed_assets_turnover_times	1.137	−7.30e-05	−5.80e-05	−0.000866**	−0.000521**
	(2.000)	(0.000597)	(0.000352)	(0.000425)	(0.000246)
Total_assets_turnover_ratio	−725.465	0.358*	0.215*	0.344*	0.157
	(787.387)	(0.215)	(0.129)	(0.177)	(0.0958)
Return_costs	5.763	−1.354	−0.829	−0.00130	−0.000795
	(10.260)	(2.024)	(1.155)	(0.00166)	(0.00115)
EBITM	45.847	0.0616	0.0362	0.0526*	0.0306*
	(39.037)	(0.0438)	(0.0254)	(0.0282)	(0.0166)
ROA	1.496e+06	1.333	0.807	0.275	0.175
	(2.770e+06)	(1.664)	(0.921)	(0.470)	(0.320)
ROE	−79.677	−0.226	−0.137*	−0.165*	−0.0996*
	(298.016)	(0.144)	(0.0805)	(0.0850)	(0.0510)
Revenue_on_staff	−0.0311*	1.15e-08	6.59e-09	2.95e-09	1.53e-09
	(0.0179)	(8.40e-09)	(4.96e-09)	(3.20e-09)	(2.04e-09)
Revenue_to_salary	47.377*	−0.00605	−0.00326	0.000865	0.00107
	(24.660)	(0.00779)	(0.00453)	(0.00471)	(0.00284)
Long_investments	0.000746	8.07e-11	8.70e-11	2.23e-10	1.36e-10
	(0.000742)	(4.67e-10)	(2.44e-10)	(1.67e-10)	(1.07e-10)
Intangible_assets	0.0338***	1.74e-08**	1.02e-08**	2.73e-09	1.30e-09
	(0.00909)	(7.24e-09)	(4.11e-09)	(2.25e-09)	(1.04e-09)
Non-current_assets	−0.000416	−1.17e-10	−1.06e-10	−2.03e-10	−1.16e-10
	(0.000733)	(4.62e-10)	(2.43e-10)	(1.76e-10)	(1.11e-10)
Long_duties	−0.000220	2.35e-10**	1.36e-10**	1.06e-10**	5.80e-11*
	(0.000204)	(9.67e-11)	(5.50e-11)	(5.24e-11)	(0)
Accounts_payable	−0.00144**	2.12e-10	1.21e-10	2.57e-10**	1.38e-10*
	(0.000560)	(1.95e-10)	(1.13e-10)	(1.29e-10)	(7.51e-11)
Debt_equity_ratio	–	–	–	–	–
Equity_capital_concentration	5.716e+06	−1.455	−0.897	−0.593	−0.394
	(5.005e+06)	(1.465)	(0.892)	(1.028)	(0.627)
Constant	−4.402e+06	2.289*	1.318		
	(4.331e+06)	(1.378)	(0.811)		
Observations	120	120	120	120	120
R-square	0.620				

Note: significance level *** – p < 0.01; ** – p < 0.05; * – p < 0.1.

Source: compiled by the authors.



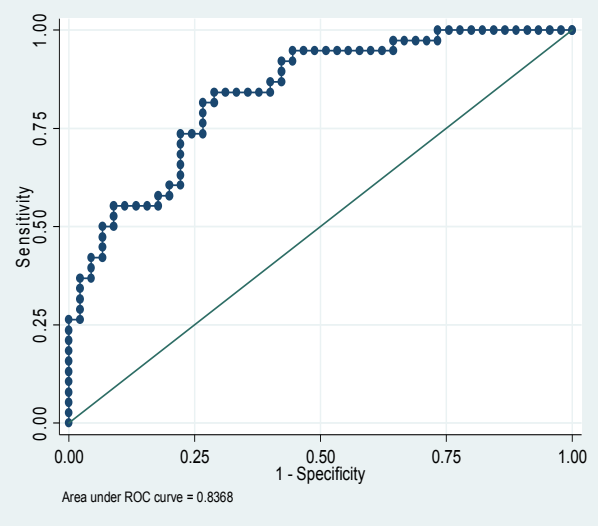


Fig. 5. **Roc-curve logit and breakout models**

Source: compiled by the authors.

Table 5

Prediction error in relative expression for the ordered logit model, %

Rating	Rating forecast					Total
	S	A	B	C	D	
S	10	60	30	0	0	100
A	10	70	20	10	0	100
B	0	15	75	10	0	100
C	0	5	15	70	10	100
D	0	0	5	15	70	100

Source: compiled by the authors.

The rest of the variables (including the exchange rate, the type of ownership of the company, the ratio of revenue to salary) are not significant even at the 10% level, as evidenced by the p-value for the corresponding variables.

Let us move on to the analysis of errors of the first and second kind when predicting the rating from D to S for the ordinal model (*Table 5*).

In general, the forecast across the entire scale is characterized by a relatively small number of discrepancies, which indicates the applicability of calculations as a simulation model in predicting a situation. The exception is level S, which is influenced by other factors that are not included in the internal model (non-quantitative factors such as business reputation, quality of management, etc.).

With regard to the assessment of the export level, it can be concluded that the logit, probit and ordered probit models are generally significant (chi2 = 0.0002; 0.000001). Also, the Gini coefficient can be the quality criterion in calculations for logit and probit models, the value of which is more than 0.8.

Generalizing the simulation results for internal factors, we can conclude that, in general, both binomial and ordinal models showed adequate results.

It was revealed that for ordinal models the most significant parameters were such

indicators as stocks, net assets, short-term borrowings, equity capital, long-term duties, accounts payable, as well as fixed assets turnover. Less significant: the turnover ratio of total assets, return on earnings before interest and taxes, return on equity. At the same time, the form of ownership and the currency rate in the short term (one year) turned out to be insignificant parameters for the model, which may indicate the importance of these parameters over longer time periods.

Next, we move on to a general assessment of the competitiveness of export-oriented companies.

RESULTS OF THE STUDY

The assessment of competitiveness cannot be based only on external or only on internal factors. It is also necessary to consider their mutual influence on each other. Rating modeling based on external factors and the mechanism of pre-rating assessment is described in the theses of the previous work [17].

In addition, not all factors can be estimated using econometric models due to the lack of data or the difficulty of calculating the impact of these indicators. Additionally, one should consider investment support from the state or private investors for a certain direction of export (for example, for political reasons) [18], therefore, a qualitative assessment will be used for them based on the methodology of the existing rating agencies RA Expert and ACRA for non-financial companies (*Table. 6*). The method used to estimate the influencing parameter will be indicated in the "Explanation" column.

The weight of factors within one "direction" is equal. The score for the qualitative factor also ranges from D to SS (or numerically from 1 to 7, where 7 is the best and 1 is the worst). In accordance with the methodology of the above agencies, it was decided to assign specific weight to external assessment — 0.2, internal assessment — 0.4, state support and support of company owners — at 0.2 level.

The final assessment of the competitiveness of export-oriented companies was determined by calculating using the following formula:

$$Comp.asses.\ i = w_{\text{internal}} \times R_{\text{internal}} + \\ + w_{\text{external}} \times R_{\text{external}} + w_{\text{support}} \times R_{support}\ , \quad (4)$$

where: *comp.asses i* is the final assessment of the organization's competitiveness from level D to S;

w — the proportion of the assessment of the direction: internal, external, or support;

R — an assessment of competitiveness at one of the levels.

Internal factors remain the key parameters for the assessment because they primarily determine the state of affairs in the company, its financial stability, and competitive capabilities. Their share is 60%.

Considering external factors and the influence of government and investor support allows us to supplement the model, adjust the assessment of the organization's competitiveness for better or worse, and within the interval value determine the weighted rank from D to SS for an export-oriented company.

The developed system of the final assessment of competitiveness can be used as an auxiliary tool when making decisions on the development of food exports in Russia at the stage of project development.

It can also be used to improve the effectiveness of funds used to subsidize export-oriented agricultural enterprises.

Accordingly, organizations with a higher rating can receive not only a larger amount of funding through government support, but also have a preferential form of guarantee when issuing a loan in terms of reducing the amount of the insurance premium or reducing the interest rate (*Table 6*).

Subsidizing is also possible: purchases of resource-saving equipment, fertilizers; activities in the field of land reclamation; cheaper services and tariffs for companies in the agro-industrial complex; reimbursement

Table 6

Comprehensive structure of the model for assessing the competitiveness of export-oriented companies in the agro-industrial complex of the Russian Federation

Valuation type	Share (w_i)	Destinations	Factor	Explanation
External assessment	0.2	Macroeconomic factors	Import growth	Econometric model
			GDP	
			GDP per capita	
			Industry pre-rating assessment	Scoring model
Internal assessment	0.6	Financial and economic condition	Subsidies (share of subsidies in cost, ratio of subsidies to revenue)	Econometric model
			Stocks	
			Net assets	
			Fixed assets turnover	
			Long-term duties, accounts payable	
			Total assets turnover ratio	
			Return on EBITM	
			Return on Equity (ROE)	
		Technical and technological support	Technological equipment (equipment level, wear)	Qualitative assessment (from level D to S)
			Automation (share of manual labor)	
			Performance indicators (production of meat/grain crops from 1 ha of land, production costs of one ton, amount of fertilizers per unit area)	
			Dependence on imports (share of imported equipment, fertilizers)	
		Personnel and qualifications	The level of qualifications of employees (undergoing retraining, work experience, etc.)	
			Competitiveness of wages	
			Staff motivation	
			Management	
		Management of companies (operational factors)	Business profile (share of products with high added value, degree of vertical integration, product diversification)	
			Market indicators (market share, demand for products, arable land area)	
			Economic development of the region	
			Governmental support	
		Business reputation and market discipline	Business reputation (brand, company connections, etc.)	
			Product quality	
			Entering foreign markets (export share)	
External influence	0.2	State support	The level of support from the state, including the company's influence on the country's industry as a whole	Qualitative assessment (from level D to S)*
		Owner support	Level of support from the owner of the company	

Source: compiled by the authors.

* To consider external influence, it is possible to increase or decrease the assessment only by two levels.

Table 7

Support measures for agribusiness companies depending on a certain rating

Rating	Investment support			Financial support	
	Guarantee in % of the loan amount	Subsidizing the rate of export credits, %	Reduction of the amount of the insurance premium by %	Tax incentives, %	Income compensation, %
SS	50	3	35	35	35
S	45	3	30	30	30
A	30	2	20	20	20
B	15	2	10	10	10
C	5	1	0	0	0
D	0	0	0	0	0
E	0	0	0	0	0

Source: compiled by the authors.

of a part of direct costs for the creation or modernization of real estate of enterprises of the agro-industrial complex, supplying products for export, etc. [19].

The proposed set of preferential support measures in accordance with the final assessment (rating) of export-oriented companies in the agro-industrial complex is presented in *Table. 7.*

The proposed mechanism for subsidizing exports, depending on the rating level, was developed based on the current system of measures of state support for agricultural enterprises used by the Ministry of Agriculture of the Russian Federation and other institutions (Rosselkhozbank, Export Center, etc.[8]).

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Note that the proposed list of measures in accordance with the rating can be applied to companies in the form of a combined mechanism, i.e. depending on certain circumstances, several support measures will be applied to companies [20]. In addition, it can be differentiated depending on the

Table 8

Reducing export tax duties on grain and fat and oil products, depending on a certain rating

Rating	Reduction of tax duties, %
SS, S	15
A	10
B, C	5
D, E	10

Source: compiled by the authors.

[8] Resolution of 06.09.2018 No. 1063 "On the provision and distribution of other inter-budgetary transfers from the federal budget to the budgets of the constituent entities of the Russian Federation to reimburse part of the cost of paying interest on investment loans in the agricultural sector". Ministry of Agriculture of Russia. URL: http://static.government.ru/media/files/kaXA7XlYwVWNX-7fr7KWA1AiUD 6u84e6a.pdf (accessed on 20.12.2020).

Table 9

Non-financial support measures

Rating	Non-financial support
SS, S, A	Services of the Russian Export Center (REC): search for foreign counterparties, consultation on customs clearance issues, free training and free access to some analytical products of the center
	Priority access to services of export-import hubs at a preferential rate
B, C	REC services: one-time assistance in finding counterparties, consultations on customs regulation (once every three years), free access to some analytical products of the center

Source: compiled by the authors.

industry specialization of the business, priority industries can be supported at maximum rates, less significant ones — at minimum or by a limited number of support areas, for example, only by investments (if, moreover, the business is well-established and with high profits).

For example, for the fat and oil industry, sugar production, it is necessary to use only investment support, for flax growing — a starting, growing industry, both investment and financial support can be used.

Also, within the framework of financial support (section tax incentives), the item "reduction of tax duties" can be separately noted. Since February 2021, some agricultural products, in particular grain and fat and oil products,[9] are subject to tax duties: up to 50% — over quota and up to 30% — for fat and oil products. Accordingly, depending on a certain rating of the organization, a reduction in the size of the fee is proposed (*Table 8*).

The reduction in tax duties is a temporary support measure in effect at the time of the execution of the government decree on the introduction of duties on these products.

As a point support for enterprises, additional measures are possible in the form of compensation for part of the costs of transporting agricultural products for companies with a rating from B to SS.

Separately, it is worth noting, within the framework of the factor "business profile" of the scoring model (see *Table 6*), the indicator of the degree of processing in the supply of agricultural products to other countries (the share of products with high added value). Processed products are goods with higher profitability, which reduces the cost of transporting the exported product abroad and creates new jobs within the country [21]. Based on this, it is necessary to increase the share of deliveries to other countries of processed agricultural products. Therefore, within the framework of this indicator, regardless of the rating results, an additional level of correction of the proposed benefits is possible. Depending on the share of exports of processed products of the agro-industrial complex in the context of individual goods, the following mechanism for adjusting the benefits described in *Table 7* is proposed: if the share of exports of processed products corresponds to the industry average, then the level of support, depending on the calculated rating, remains unchanged if it is lower, the level of support will decrease proportionally.

For example, budgetary support for grain supplies for export can be differentiated by the share of grain processing when it is supplied for export [22]. If the share of a processed grain of a company is 10%

[9] Resolution of 10.12.2020 No. 2065 "On Amendments to the Rates of Export Customs Duties for Goods Exported from the Russian Federation outside the States Parties to Agreements on the Customs Union". Ministry of Agriculture of Russia. URL: http://static.government.ru/media/files/mYu01fw5fXSAWSYgAbcbpVAjzB 94Klst.pdf (accessed on 20.12.2020).

(in general, according to data for 2020, the share of processed grain and flour products from grain exports is 11.9%[10]), then the company receives support in the amount of 84% (10: 11,9) × 100, if even less, then the support level will be proportionally reduced [23, 24].

In addition to investment or financial support, non-financial assistance can be singled out separately [25], which consists of providing companies with additional services to enter the foreign market (*Table 9*).

In addition to the combined mechanism described above, measures of non-financial support can be proposed for both mature, mature sectors of the agro-industrial complex, and only for developing ones.

CONCLUSIONS

The export of agricultural products every year acquires an increasingly significant role in the Russian economy. With the entry into the world market, the recognition of Russian products is growing, their quality is increasing in accordance with international standards, the dependence on raw materials of the country's economy is decreasing, and new highly profitable jobs are being created.

In addition to state participation (development of sanitary and veterinary, technical, legal norms and rules, support programs, as well as regulation of import and export duties, subsidies of certain industries or certain companies), private investors also show significant interest in the export of agricultural products. As a result, it becomes necessary to identify the most promising, competitive companies to increase the economic efficiency of interaction mechanisms within the framework of public-private partnerships in the field of export.

There are projects related to the development of export opportunities for the agro-industrial complex of individual regions of the Russian Federation, which also need to be assessed as promising.

Both Russian and foreign rating agencies are developing additional sections in their methodologies for assessing the financial stability of agricultural companies. However, the calculations are based only on coefficient adjustments relative to other industries. There is no separate methodology for agribusiness companies, including the development of which is aimed at export. This is not enough to characterize the essence of the processes; the results obtained cannot be used to predict the situation.

In this study, a rating model has been developed for export-oriented agro-industrial companies, taking into account the influence of internal and external factors on the performance of their activities within the framework of the econometric modeling method. In addition, the importance of quality factors is considered.

The article analyzes the companies — leaders in the export of agricultural products of the Russian Federation for the period 2005–2019. The results obtained made it possible to build a simulation model for assessing the rating of export-oriented companies in the agricultural sector of the Russian Federation, which is applicable as an additional forecasting tool in making planning decisions for the future.

The methodological substantiation is based on an assessment of the cumulative impact of both external and internal factors on the performance of the subjects of the export market, which in turn depend on support from the state or investors in a particular industry. Note that the analysis of the company's financial indicators (internal factors), as well as external ones, was based on ordered logit/probit regression and binomial models. The best results for both external and internal factors were shown by binomial and ordinal models. For factors for which it is rather difficult to collect data or assess their impact, qualitative expert judgment was used.

[10] Russian export center. Export of regions. Analytical portal. 2020. URL: http://regionstat.exportcenter.ru/hs/list/ (accessed on 12.02.2021).

As a result of modeling ordinal models, the most significant parameters for internal factors were stocks, net assets, short-term borrowings, equity, fixed assets turnover, long-term liabilities, and accounts payable. Less significant: the turnover ratio of total assets, return on earnings before interest and taxes, return on equity.

For external factors, both for ordinal and binomial models, the most significant parameters were the increase in imports, the logarithm of GDP, and the logarithm of GDP per capita.

However, it should be noted that after a certain period of time, the constructed model will gradually to a lesser extent reflect the current level of competitiveness, that is, it will require periodic adjustments of both econometric models, which are the basis for the assessment. internal and external factors, as well as qualitative indicators based on new data.

The formed system can be used as supporting material, namely, as a simulation model when deciding on the development of food exports in Russia at the stage of developing design solutions.

Accordingly, higher-rated organizations can receive more funding from government support, preferential guarantees when issuing a loan in terms of reducing the insurance premium or lowering the interest rate, as well as other support measures described in the previous section of this study.

Implementation of this approach will significantly increase the level of economic effectiveness of budget support funds aimed at stimulating exports.

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The Influence of the Corporate Venture Capital on the Innovative Development of the Russian Economy

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Thinking is easy, acting is difficult,
and to put one's thoughts into action
is the most difficult thing in the world.
Johann Wolfgang von Goethe

ABSTRACT

The author examines the place and role of corporate venture funds, the state of the venture capital market in Russia, and the impact of venture financing on the innovative activity of corporations, in particular, on the innovative development of the economy as a whole. The **purpose** of the study is to provide an economic assessment of the importance of using corporate venture capital for the innovative economy of the Russian Federation. The author applies methods of statistical, financial, and logical analysis. The study covers the period 2013–2020 and is based on the analysis of data from international organizations, analytical centers, mass media, official data sources of the Government of Russia, and the Central Bank of the Russian Federation. The author reviewed the literature and analyzed the practice of corporate venture capital funds to understand investment in innovation in Russia and around the world. The article analyses the history of the emergence and development of corporate venture funds in Russia and other countries and provides an assessment of the innovation activity of corporations and the Russian state. The theoretical aspects of corporate venture funds, the dynamics of the development of the innovative activity, and the venture market in Russia are considered. The author makes a **conclusion** about the need for state regulation of the processes of financing scientific and technological development and the effective use of market instruments, such as corporate venture funds.

Keywords: corporate venture fund; venture market; investment; innovation; financing innovation; Russian economy

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INTRODUCTION

The innovative activity of companies is the basis of industrial development, which is aimed at constantly updating all aspects of the business, looking for new ways to invent, promote, produce, trade, etc. 2020 has provided new challenges for society and business. In these conditions, the creation, production, and management of innovation become vital to a successful business. But at the same time, in the context of a high level of digitalization, research devoted to corporate venture funds, the choice of investment projects, and the conditions for financing innovations are gaining special relevance. Today, capital acts not so much as a set of means of production, but as a new vision of the world and a process of creating value, in which the ability to be an innovator is important. However, innovative products are for the most part unique and, therefore, very risky in terms of the investment efficiency of their development and market promotion. In this regard, there is an objective need for such an economic category as the institution of venture financing, which acts as a catalyst for the emergence and development of innovative projects. The intensity of innovation activity characterizes the innovation activity of the corporation.

The share of innovatively active enterprises in Russia is only 9–10% (for comparison, in Germany — about 80%, in Finland — more than 50%, in Lithuania — more than 30%). The share of private funding for research and development is extremely small. The share of Russian civilian products in world high-tech exports is scanty — 0.5%, the same share of the USA — 36%, Japan — 30%, Germany — 16%, China — 6%. Small volumes of funding for technological innovations in the industry are incommensurate with the real needs of the economy in a fundamentally new economic and political situation [1].

First of all, the innovation activity is aimed at the practical implementation of research and development results and consists in the ability to commercialize new or improving technologies, choose directions for innovative development and create an effective business.

CORPORATE VENTURE FUND

Transformations of integration processes, global changes in all human activities, and, above all, completely new approaches to the total digitalization of all aspects of life, on the one hand, intensify the innovative activities of both companies and states, and on the other hand, become the driver or cause of the search for new, more profitable ways of financing them.

For example, through open exchange and expanding their own capabilities, parent companies and startups are able to significantly accelerate the promotion of specific technologies. A prime example is Microsoft, which has increased its revenues since March 2020. Analysts at Bank of America named Microsoft the best software investment for 2020, and Microsoft shares have already risen 56% year-to-date and remain upside.

The COVID-19 crisis has affected innovation and required particular actions from leaders as they move from isolation to economic recovery and a new wave. The technological transformation processes of the 21st century and the unprecedented recession in the global economy have only strengthened the role of financing disruptive technologies and innovation.

At the same time, the knowledge economy or innovative economy becomes the key to future progressive development and presupposes the dominance of high-tech goods and services in the total volume of world production. In fact, the pandemic has changed nothing in that disruptive technology and innovation remain at their greatest potential. Obviously, leading companies and R&D investors will recklessly abandon R&D and innovation if they want to remain competitive in the future. The creation of new technology or improvement of a certain process, prototype, or model is always

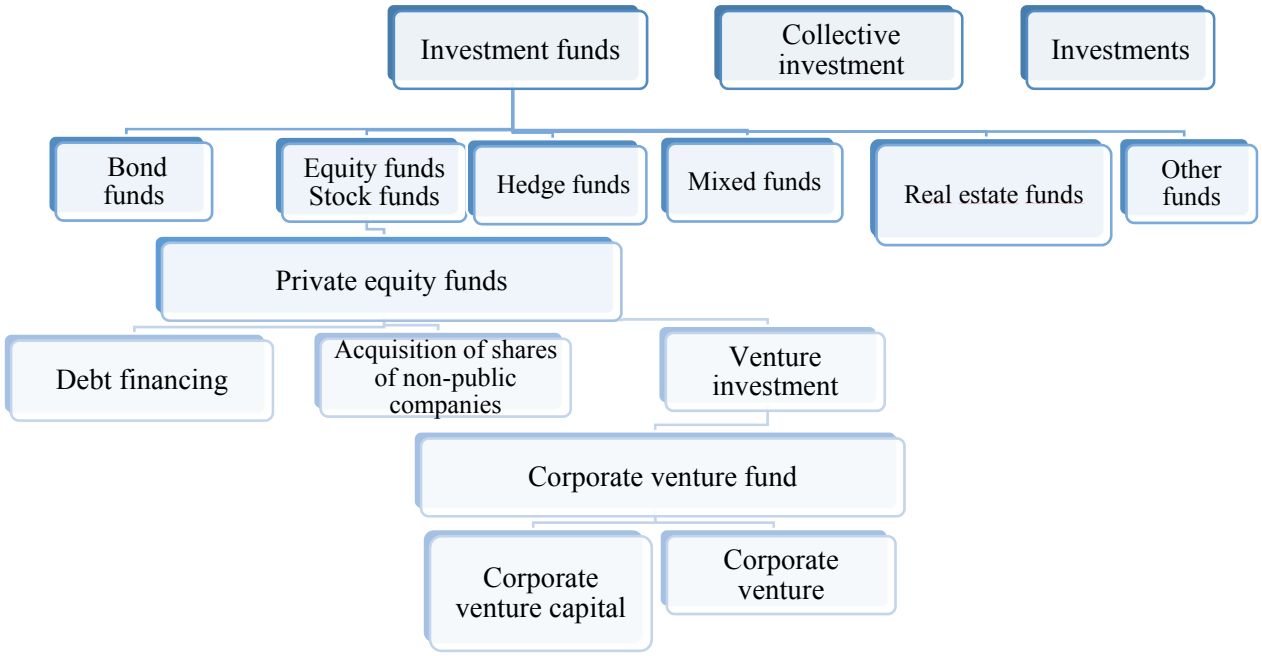

Fig. 1. **Classification of funds**

Source: compiled by the author.

associated with financial costs, the investment of which in world practice is carried out by venture capital. Thus, the total volume of investments in the Russian venture capital market in 2019 became a record one and amounted to USD$ 868.7 million. Compared to 2018, the growth was 13% — and this is in the context of very weak economic growth.[1]

The most popular source of funding for the creation and promotion of innovative products and technologies for corporations today is **corporate venture capital**, a tool for diversifying and hedging innovation-related risks.

The concept of "**corporate venture capital**" is young. It has become widespread since the end of the last century when the processes of globalization and business consolidation began to accelerate. Back in 1997, D. Teece, G. Pisano and A. Shuen wrote that the creation of private capital in the context of rapid technological development largely depends on the improvement of internal technological, organizational, and management processes within the company, whereas the identification of new opportunities for their effective use in the organization tend to be more important to private capital than strategy [2].

In the modern world which is expanding exponentially, large companies need to use new knowledge, not only internal research and development of the corporation but also external [3]. In recent years, corporate investment in capital in the form of corporate venture capital has been recognized as the most effective strategy for operating firms aimed at developing new opportunities [4]. Corporate venture capital (hereinafter CVC) is a form of collective investment of a large company aimed at the innovative development of the corporation through financial investments in external firms, most often startups, through a corporate fund (*Fig. 1*) [5].

In other words, CVC investments are made by operating corporations that finance or invest in startups with high technological potential for their strategic goals (*Fig.* 2).

CVCs can only be provided by large companies with stable cash flow as they

[1] Venture Russia: results of the first half of 2020. URL: https://www.ey.com/ru_ru/news/2020/10/ey-dsight-2020 (accessed on 20.12.2020).

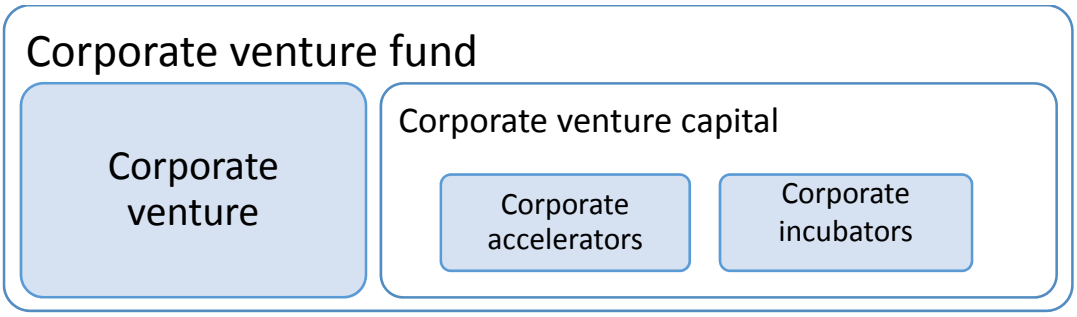

Fig. 2. **Corporate venture fund**

Source: compiled by the author.

use their own cash reserves to complement internal research and development.

P. Gompers, W. Gornal, S. N. Kaplan and I. A. Strebulaev found out what factor private equity investors consider in the first place when deciding whether to finance a particular startup. "Private equity investors are primarily guided by how talented and balanced the team leads the startup, and to what extent the product it develops meets the needs of the market. In turn, analysts working in the funds of large corporations, when deciding on financing, look at how the project corresponds to the concept of the entire company and what potential benefit the company can get from it" [6].

A prime example is the story of Lucent, which, through CVC, funded the startup Lucent Digital Video, which developed analog-to-digital converters to move audio and video content over analog networks. After successfully launching a new startup product, Lucent began selling its own hardware with the new product. The development of digital technologies required the refinement of the corporation's technologies, Lucent realized the key strategic advantages of corporate venture capital investments, and the corporation began to partner with a successful startup again [7].

For CVC, the most important are incentives and additional investments that can bring significant long-term benefits and advantages to the corporation. The main goal of CVC is to develop technology entrepreneurship. CVCs with quick access to new technologies can dramatically change the structure of the industry and at the same time are a potential threat and source of income for market leaders [8].

Considering the motives behind European CVC deals in 2016, Corporate Venture Capital obtained the following data:

- 54% of European parent firms invest primarily for strategic reasons, yet with financial concerns;
- 33% invest primarily for financial reasons with strategic concerns;
- 13% invest for purely financial purposes.[2]

Corporate venture capital investments are not always clearly financially rewarding, but they are an important driver of long-term business growth.

Harvard Business School Assistant Professor Henry W. Chesbrough identifies three types of corporate venture capital investments — driving, emergent, and enabling — and shows six ways different types of corporate venture capital investments can drive business growth [7]:

- *promoting a standard* (investment in startups making products and services that promote the adoption of a technology standard of the corporation);
- *stimulating demand* (investment in startups developing complementary products and services that increase demand for the investor's own products);
- *leveraging underutilized technology*;

[2] Corporate venture capital. World heritage encyclopedia. URL: http://community.worldheritage.org/articles/Corporate_venture_capital (accessed on 21.01.2020).

- *experimenting with new capabilities*;
- *developing a backup technology;*
- *exploring strategic whitespace*.

Over the past few years, the number of CVCs has grown from a few players in the market to a thousand. At the beginning of 2017, there were 965 corporate venture funds worldwide [9]. According to research by the Stanford Business School, 33% of global investments are in corporate venture capital with a total transaction value of USD$ 1.5 billion [10]. For many large corporations, CVC is becoming an increasingly popular diversification and hedging tool.

The success of Google Ventures, which funded startups such as Uber, 23 and Me, Nest, Slack, and Jet, also undoubtedly inspired companies to follow in their footsteps. Additional CVCs will only intensify the growing competition to fund the best startup ideas, but it remains to be seen if other CVCs will achieve the same success [11].

Exploring the financial aspects of corporate venture capital, Cyril Vančura identifies three requirements for a sustainable CVC: strategic goals, continuity, and financial sustainability. He argues that financial sustainability is the most critical requirement, which is a complex combination of financial equilibrium and growth in the value of capital, which is ensured by the rational use of technical, material and human resources [12]. However, according to most experts, CVC is mainly aimed at achieving the strategic goals of the corporation, as opposed to institutional venture capital, which focuses solely on financial returns.

CVCs, especially when investing in early-stage technologies, must be in the game for at least as long as the life of the companies they invest in (an average of more than eight years). Long-term sustainability in a corporate setting can only be achieved if the unit is not losing money over a longer period of time, as corporations are often quick in cutting loss-making programs during times of crisis [11].

A survey by NVCA (National Venture Capital Association) published in 2012 shows that a strategic focus is core to 95% of the surveyed CVC groups. Furthermore, about 75% of surveyed CVC groups value delivering on the strategic interest as high as or higher than delivering financial returns [11]. Over the past decade, the use of CVC as an important tool for the innovative development of companies has increased significantly. Thus, in 2018, 264 corporate venture funds were funded, which is 35% more than in 2017. The largest contributors to CVC are Google Ventures, Intel Capital, Salesforce Ventures, Comcast Ventures, and Qualcomm Ventures.[3] Startups for such giants provide an opportunity for learning and gaining experience, immersion in strategic issues of company development.

GV (formerly known as Google Ventures, now is the venture capital investment arm of Alphabet Inc), a subsidiary of Google, is a typical example of the concept of independent CVC. GV's main investment objective is to explore new markets, invest in disruptive innovations and a variety of technologies that are of little relevance to each other, but allow broadening the knowledge to cope with future changes. For example, prior to the popularization of smartphones, Google was able to respond to changes from the web-based ecosystem to mobile-based ecosystem by acquiring Android, a startup possessing mobile OS development technology. Recently, GV continues to invest in new and diverse technology areas, including mobile, internet, and software technologies, as well as renewable energy, bio-health care, and organic agricultural products. GV can operate this adventurous exploratory investment portfolio as it has been granted almost complete investment autonomy from Google [13].

New CVCs cover everything from logistics and delivery (Maersk Ventures) to

[3] Corporate venture capital growth (TWTR, FB) — 2020 — Talkin go money. TalkingOfMoney.com. 2020. URL: https://ru.talkingofmoney.com/rise-of-corporate-venture-capital (accessed on 22.10.2020).

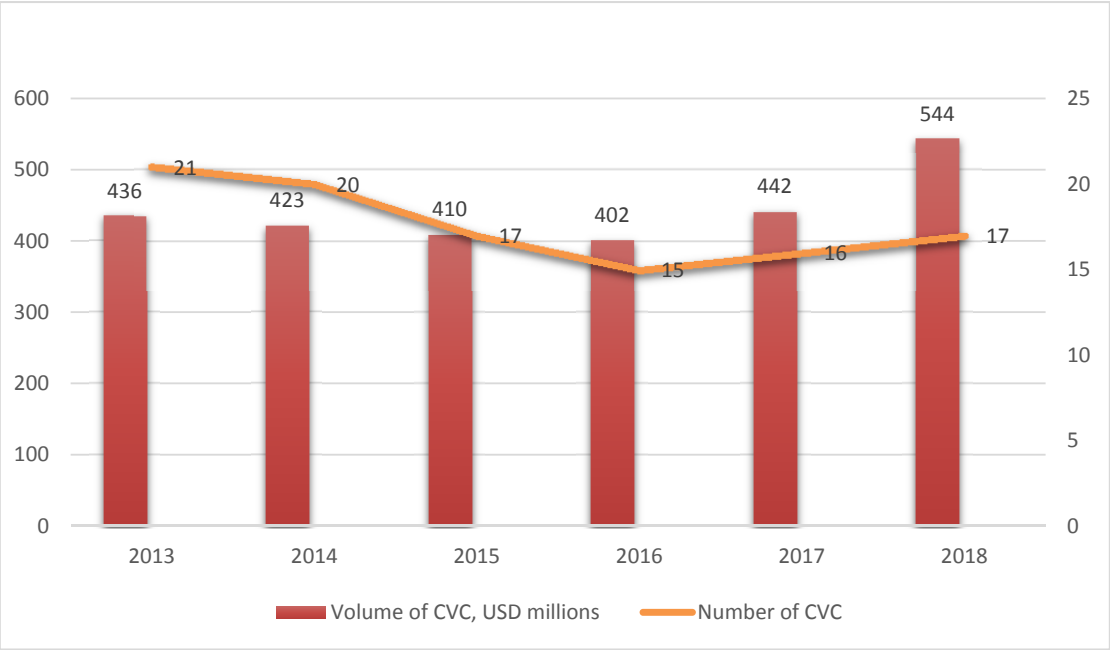

Fig. 3. **Dynamics of volumes and number of CVCs in Russia 2013–2019**

Source: compiled by the author.

vehicles and mobility (Porsche Ventures) to cryptocurrency exchange (Coinbase Ventures).[4] In 2019, CVC participated in nearly 1,700 transactions, highlighting how important start-up investments are to corporations in terms of their overall growth strategy. The strategic implications of investing in new technologies for managers were significantly lower, as they competed not only with young startups but also with other large corporations.

CVC AND INNOVATIVE ECONOMY

Venture capital is mainly focused on tech startups as they have the fastest growth potential and relatively low overhead costs. Industries such as biotechnology and telecommunications are gaining increasing attention for CVC. Through open exchange and increased in-house capabilities, parent organizations and startups have the opportunity to significantly accelerate the advancement of specific technologies.

The problems of financing innovative behavior cannot be easily separated from systemic effects. Funding for innovation, mainly related to long-term and uncertain payments, shows that different financial systems are embedded in different financial markets and legal structures cover different elements.

There are numerous corporate strategic investment enterprises, such as Amazon Venture Capital, T-Mobile Venture Fund, Nokia Growth Partners, Motorola Ventures, and Intel Capital, which are devoted to making investments in innovative companies, technological and business process innovations [14]. Firms are increasingly working with CVC's geographically dispersed investment portfolios to access a variety of location-specific knowledge, alongside traditional external strategy knowledge such as technology alliances. Diversity in corporate venture capital investment has a positive impact on companies' technology performance in the context of a simultaneously pursued technology alliance strategy [14]. The geographic diversity in CVC portfolios enhances performance of

[4] Corporate venture capital growth (TWTR, FB) — 2020 — Talkin go money. TalkingOfMoney.com. 2020. URL: https://ru.talkingofmoney.com/rise-of-corporate-venture-capital (accessed on 22.10.2020).

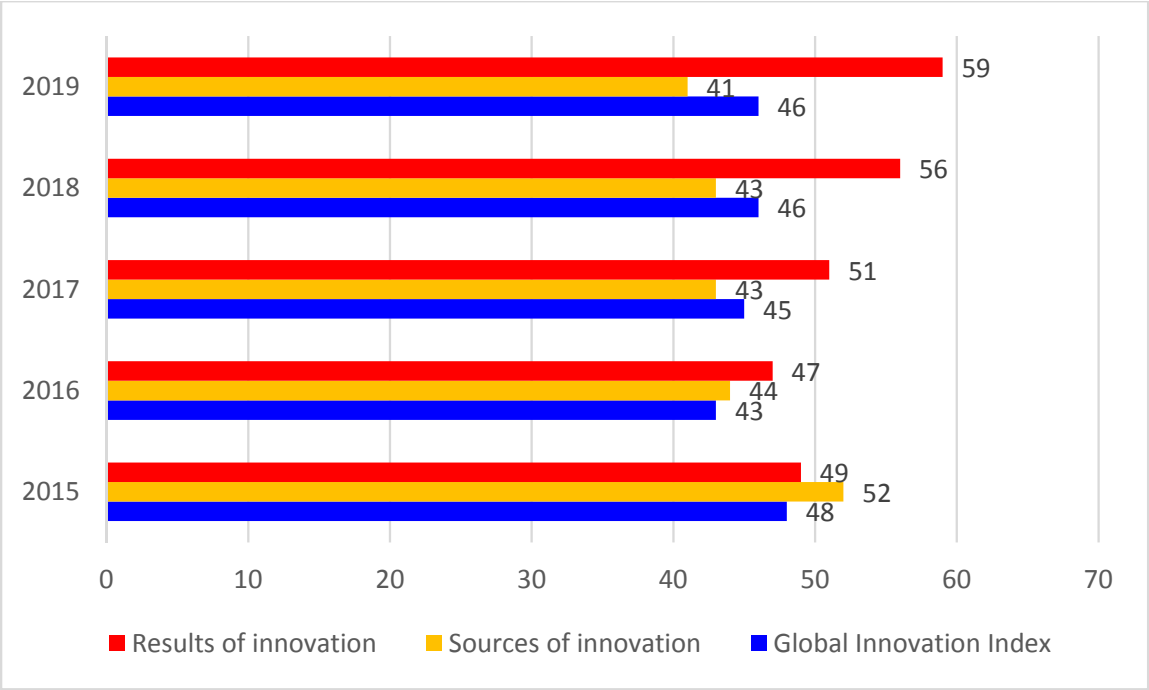

Fig. 4. **Dynamics of Russia's positions in the GII ranking: 2015–2019**

Source: compiled by the author. Global Innovation Index 2019. URL: https://www.wipo.int/global_innovation_index/ru/2019/ (accessed on 29.11.2020).

investments, on the other hand, increases the managerial complexity. Coordination costs and resource constraints stem from the simultaneous pursuit of diversity in both technology alliances and CVC investments. Our findings are based on a panel data set on the patents, CVC investments, and technology alliances of 55 CVC-active firms in a variety of industries [15].

For incumbent firms to adapt to the modern market environment of rapid and radical changes in technological paradigms, dynamic capabilities are needed to obtain valuable knowledge from external companies and integrate them with internal knowledge [2]. Many scholars argue that in order to have such dynamic capabilities, it is necessary to use external knowledge of supplier selection strategies, such as strategic mergers, strategic alliances, or joint ventures with other firms that have useful knowledge, as well as to use internal research and development of the firm [16].

In recent years, CVC has been recognized as a very useful strategy for incumbent companies as a tool for developing strategic opportunities. This is evidenced by the increase in the volume of corporate venture capital funds from USD$ 436 million in 2013 to USD$ 544 million in 2018 against the background of a decrease in their number from 21 to 17, respectively (*Fig. 3*).

CVCs are created by incumbent companies that make small investments in startups with good technology potential. CVC investments made by a non-financial company differ from independent venture capital, as most often they pursue not financial goals, but strategic ones, such as finding a new business, opportunities or acquiring valuable knowledge. In Russia, the term "corporate venture fund" is mainly used, which in practice, applying the model of "open innovation", purchases technologies, external research and development from outside.

Funding for innovation is a highly profitable but risky investment. According to the latest results of the study of the level of countries on the development of innovations in the Global Innovation Index, the Russian

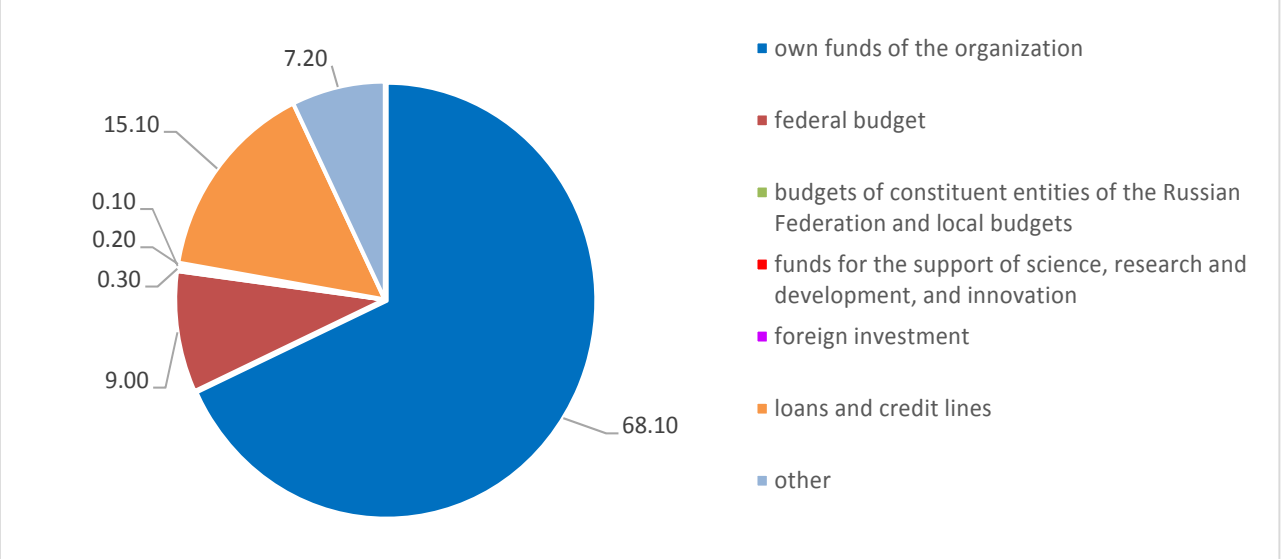

Fig. 5. **Structure of expenditures on technological innovations of industrial enterprises in Russia by sources of funds in 2017**

Source: data from the Institute for Statistical Studies and Economics of Knowledge, National Research University Higher School of Economics. 28 November 2019.

Federation ranks 46th among 129 countries, behind Thailand, Qatar, Chile, Moldova and Estonia [1] (*Fig. 4*). Estonia [1] (*Fig. 4*).

Russian's low position in the ranking is due to such factors as the pace of modernization and innovative transformations, the lack of their compliance with the goals of the country's long-term socio-economic development [1].

The main driver for the development of the state's innovative economy is the innovative activity of entrepreneurs in all its forms [17]. Economic innovation implies that the activities of entrepreneurs are aimed at creating and introducing new products, combinations, and business processes. Experts agree that for the progressive development of the economy, not only innovative products are needed, but also innovative technologies. The main source of funding for R&D in Russia is public funds — their share in the total volume of domestic expenditures in 2018 amounted to 67%. The absolute value of R&D expenditures at the expense of the state in 2018 reached 689.3 billion rubles [18]. Financing of innovative activities of industrial companies is carried out mainly from their own funds. In the total cost of technological innovations, their share in 2017 was 68.1% (*Fig. 5*) [19].

Only 7.2% of the cost of technological innovation in Russia is financed from funds to support science, research and development, and innovation.

Considering local peculiarities and innovative potential, corporate venture funds can significantly contribute not only to the growth of the business of domestic corporations but also to the development of the innovative economy of Russia. For the transition to an innovative model, specific directions of the rise of traditional sectors of the economy and the main breakthrough guidelines for the development of high-tech sectors of the economy, which should form the basis of innovative strategic programs of Russian corporations, are highlighted. To achieve results on the priorities of the scientific and technological development of the Russian Federation, complex scientific and technical programs and projects are developed and approved, including all stages of the innovation cycle: from obtaining new fundamental knowledge to their practical use, creating technologies

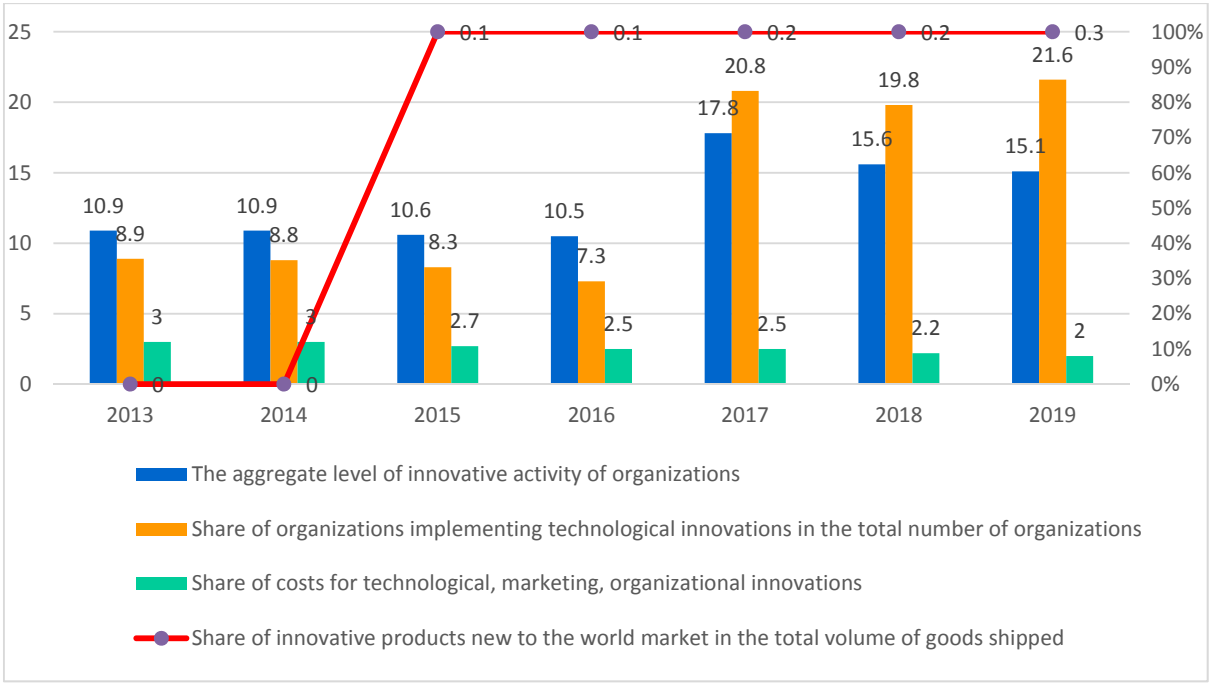

Fig. 6. **Dynamics of innovative activity of organizations in Russia in 2013–2019**

Source: compiled by the author, based on the data of statistical digest "Indicators of innovation: 2020" by Gokhberg L.M., Ditkovskiy K.A., Evnevich E.I. et al. Moscow: National Research University Higher School of Economics; 2020.

and products and services and their release to the market.[5]

The strategy of scientific and technological development of the Russian Federation was approved by the Presidential Decree of the Russian Federation of December 1, 2016, No. 642.[6] But, despite all the government's efforts to revive the venture capital market, government funds remain the main source of R&D funding in Russia — their share in total domestic spending in 2018 amounted to 67%. In previous years, this indicator had higher values (from 67.1 to 70.3%), except for 2017 (66.2%). The absolute value of expenditures on R&D at the expense of the state in 2018 reached 689.3 billion rubles [18], this accounted for about 10% of the total budgetary support for technological innovation. In high-tech industries this figure is noticeably higher — 22.1%, including in the production of computers, electronic and optical products — 24.2%. In organizations involved in the production of finished metal products, more than half of the cost of innovation is covered by budget funds [20]. The costs of technological innovations are mainly associated with the introduction of process innovations aimed at improving the efficiency of production processes: in the total volume of investments, their share is about 60%. Slightly lower costs for more innovative — product — innovations (41.2%); moreover, in recent years, there has been a trend towards narrowing this gap [20]. Most Russian companies prefer to buy ready-made solutions on the market than invest in their own R&D. This is evidenced by the low share of industrial companies introducing technological, organizational, and marketing innovations in the total number of organizations (*Fig. 6*).

Currently, most businesses choose phased financing to finance innovative projects. The innovation process includes specific stages. The result of each of them is quite

[5] V.V. Putin. Presidential Address to the Federal Assembly. 2018. URL: http://www.kremlin.ru/acts/bank/42902 (accessed on 22.04.2021).

[6] Presidential Decree of the Russian Federation of December 1, 2016, No. 642.URL: http://www.kremlin.ru/acts/bank/41449 (accessed on 22.04.2021).

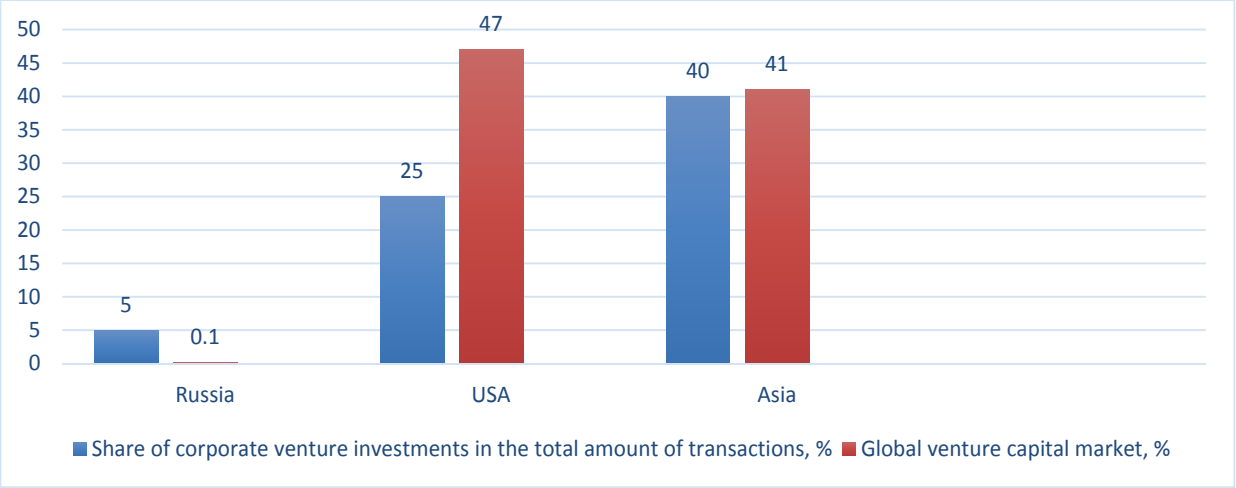

Fig. 7. **Share of corporate funds in venture capital investments in Russia, 2018**

Source: complied by the author.

unpredictable due to the great uncertainty and the degree of risk of the innovative project. In addition, during the implementation of each stage, an unexpected urgent decision may appear to adjust the project as a whole or its components. In some cases, already before the start of commercialization, it becomes clear that the project is unprofitable.

In this case, it must be cancelled. The R&D stage is accompanied by a large number of unforeseen situations [21]. At best, when developing or creating an experimental prototype, new functional features of the product or its application area are revealed. The phased method of financing can significantly reduce the level of risk, use a high degree of uncertainty as a means, not a threat.

CVC PRACTICE IN RUSSIA

In 2017, one of the main instruments of state innovation policy was the creation of special units and corporate venture funds in state corporations Rostec, Roskosmos, Rosatom, PJSC United Aircraft Corporation, JSC United Shipbuilding Corporation. The Government of the Russian Federation has ensured that it is necessary to invest in small innovative companies and startups. The system of financing innovative activities is a complex interweaving of sources and forms that differ in the degree of centralization, type of ownership, forms of financing, and the level of owners. Financing of innovation activities, carried out at the expense of budgetary funds in accordance with the priorities and goals of the state innovation policy, is intended to solve large-scale scientific and technical problems and support small and medium-sized innovative businesses [21] at the expense of CVC. However, according to a study by Strategy&, the share of corporate funds in Russian venture capital investments in Q1 2018 was only 5% (*Fig. 7*), which is significantly less than in other countries, according to a study by Strategy& (a consulting division of PwC).[7]

According to the executive director of the Russian Venture Capital Association Albina Nikkonen, the institution of corporate venture funds in the country is in its infancy, there are no more than 10. Corporate venture capital has only one shareholder in the person of a corporation, therefore a state corporation, having strong state participation, is inactively working with startups. They also rarely and cheaply buy startups, which is the main pain of private venture investors

[7] Yastrebova S. Corporations are in no hurry to create venture funds. Therefore, they may miss out on interesting technological innovations. Vedomosti.21.05.2018. URL: https://www.vedomosti.ru/technology/articles/2018/05/22/770232-korporatsii-venchurnie-fondi (accessed on 20.11.2020).

in the Russian market. Therefore, strong Russian startups that attract money from private venture capital funds are now usually focused on the global market, where Russian corporations are poorly represented. At the same time, there are points of growth in the Russian venture capital market. The industrial holding Russian Helicopters invested 300 million rubles in the industrial fund Skolkovo Ventures, a subsidiary of the Skolkovo fund that manages three of its venture capital funds. In 2018–2019 the activity of corporations in various forms of participation increased, new funds of RVC, VTB, VEB were created.[8] Private corporations are starting to implement their strategy more than state-owned ones, although state corporations remain the largest participants.

CVC is a way for corporations to access innovations at a reasonable price, to ensure strategic development, corporations need to constantly monitor and attract innovations. CVC is a way for corporations to access innovations at a reasonable price, to ensure strategic development, corporations need to constantly monitor and attract innovations. Due to the pursued goals, corporate funds have much more simplified access to financing and can develop where full-fledged venture profitability is not available. Only 8% of such funds, according to Pitchbook, have purely monetary motives. 26% of them are driven by strategic goals, but the majority of CVCs — 66% — skillfully combine these two motives.

At the same time, in 2018, Dsight analysts recorded a significant increase in both the number and volume of seed-stage transactions: the number of transactions increased by 46%, from 97 to 142 transactions, the total volume of segment transactions increased by a record 139%, to 11 million. At the same time, the number of business angels and seed funds did not increase, the increase in the number of transactions and the volume of injections occurred due to several corporate accelerators, including Sberbank, Kamaz, and MTS. Some corporations carry out acceleration within the framework of the annual RVC Generation S program, including Alrosa, Ilim Pulp and Paper Corporation, VTB Bank, and others. 2018 saw a growing interest in e-commerce from corporations and strategic indicators.[9] In the first half of the year, Yandex and Sberbank launched a joint Beru marketplace. Then in September Mail.ru Group, Megafon, the Russian Direct Investment Fund (RDIF), with the participation of the Chinese platform Alibaba Group, announced a joint venture in e-commerce called AliExpress Russia. The largest shareholders of the online hypermarket Ozon — MTS and the Baring Vostok fund — invested at least 3.5 billion rubles on these sites. The multi-corporate model of the fund, in which several corporations act as investors at once, is an innovation for the Russian investment market, says Alexei Solovyov, partner of the iTech Capital fund (participates in the co-management of the Skolkovo Ventures IT fund). Given the small size of the Russian technology market, for corporations, this is the only way to effectively search for technology for themselves — to give this task to experienced managers, and not "push" the market on their own.[10]

CONCLUSIONS

Thus, the activation of innovation activity through CVC investments in Russia is only developing and largely depends on the business reputation and personal qualities

[8] Solovyov A. Venture Investors Don't Leave Russia. Yandex Zen. 19.12.2019. URL: https://zen.yandex.ru/media/id/5c34c677cffc6400aaed02c4/venchurnye-investory-iz-rossii-ne-uhodiat-5df90cbd74f1bc00ad769de3 (accessed on 29.10.2020).

[9] Indicators of investment activity of the Russian economy. Bulletin of the Department for Promotion of Investments and Innovations of the CCI RF. 18.06.2019. URL: http://alipina.vi-person.ru/uploads/attachment/file/951633/%D 0%92%D 0%B 5%D 1%81%D 1%82%D 0%BD%D 0%B 8%D 0%BA_%D 0%94 %D 0%A1%D 0%98%D 0%98_%D 0%B 8%D 1%8E%D 0%BD% D 1%8C__2019.pdf (accessed on 29.01.2020).

[10] Sukharevskaya A. Russian Helicopters invested 300 million rubles in the Skolkovo Ventures industrial fund. Vedomosti. 31.05.2018. URL: https://www.vedomosti.ru/technology/articles/2018/05/31/771494-vertoleti-rossii (accessed on 29.11.2020).

of managers. Any investor, institutional or CVC, should strive to become a reliable and sustainable partner for entrepreneurs, startups, and other investors. Consequently, to create a successful CVC program in Russia, continuity is required in terms of strategy, investment focus, and core corporate team.

Therefore, the innovation process or the commercialization of scientific and technical developments is very risky, which is explained by the peculiarities of the market of ideas and know-how and requires precisely venture financing, which is based on the creation of the value of risk-adjusted capital. It is a corporate venture capital that can specialize in both early-stage R&D financing and partnerships with parent company CVC, which can offer industry expertise and a strong financial position in new markets for already successfully developed products. Such partnerships increase the value of the company and act as a kind of advertising that increases interest in this business.

On the other hand, today it is extremely important for the state and companies to unleash their potential in terms of digital threats, which requires state policy aimed at developing new models of interaction and further investment of the private sector and the state in innovation. The choice of the development path in the new conditions of total digitalization and trade-in information resources and data will determine the further development of not only an individual state but also of all mankind as a whole. Our future will depend on what innovations will be financed, from what sources (public or private), who will be at the origins of development management: whether we take the path of a digital concentration camp or a highly spiritual-cultural development based not on maximizing the welfare of owners, but on ideas of social equality and justice.

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Formal and Functional Analysis of the Role of Money in the Reproduction Process: New Aspects of the Modern Theory of Money

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ABSTRACT

The authors investigate the role of money in the reproduction process from the perspective of a functional approach, including the influence of external factors. The **aim** of the study is to develop the modern theory of money at the formal and functional level based on the analysis of the role of money in the reproduction process in the concept of coordination of monetary, macroprudential and financial policies of Russia for the purpose of economic growth. The **novelty** of the research is due to the development of the modern theory of money on the basis of clarifying the role of money in the reproduction process influenced by decisions made to coordinate the monetary, macroprudential and financial policy. The authors apply **methods** of system-structural, formal-functional, comparative economic analysis, econometric modeling using correlation-regression analysis, economic and mathematical methods. The authors developed a methodological framework for analysis, identified and structured the possibilities and risks of applying macroprudential policy measures for monetary circulation, illustrated the threats to the economy and its main macroeconomic entities due to the spread of coronavirus disease, summarized measures in the field of monetary and financial regulation to overcome threats and strengthen the role of money in the reproduction process. The authors **conclude** that it is necessary to form a trusted digital space, that forms the possibility of leveling the negative impact of external factors on the reproduction process and restoring the reproduction potential of money for economic growth, considering the coordination (conjugation) of monetary, macroprudential and financial policies. The implementation of the authors' proposals to enhance the role of money in the reproduction process will allow to "revive" the economy by increasing the demand for money and ensuring an adequate money supply. It will also enhance the ability of monetary, macroprudential, and financial policy instruments to influence reproduction processes and economic growth.

Keywords: formal and functional level of research; role of money; reproduction process; economic growth; information economy; financial policy; monetary policy; macroprudential policy; liquidity surplus; coronavirus pandemic; trusted digital space

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INTRODUCTION

It is well-known that the role of money in the economy is determined by its functions, which ensure the influence of money as carriers, objects of monetary factors on various forms of social relations, uniting them into a single reproductive process. The authors studied the role of money in the reproduction process at the formal-functional level, which implies the research of the influence of external factors on them. It is important for the study to make judgments about the variability of the role of money influenced by both external economic and behavioral factors, including decisions made in the framework of monetary, macroprudential, and financial policies.

The monetary system, which is a special type of "ecological self-developing" system [1, p. 5–17; 2, p. 6–22], actively interacts with other functional macroeconomic subsystems (monetary, financial, payment, currency, etc.). Therefore, it makes sense to turn to the study of changes occurring in the reproduction process under the influence of monetary, macroprudential, and financial policies, and to determine what role money plays in this process from the standpoint of a functional approach.

This study aims to develop the modern theory of money at the formal-functional level based on the analysis of the role of money in the reproduction process in the concept of coordinating monetary, macroprudential, and financial policies of Russia for economic growth.

The target of the study is the role of money in the reproduction process, the scope of the study is the features of the manifestation of their role under the influence of measures of monetary, macroprudential, and financial policies, regardless of the forms and types of money.

To achieve the goal, the following tasks were consistently solved:

- a methodological basis for the analysis have been developed;
- the features of the implementation of the functions of modern money from the standpoint of their reproductive potential have been formulated;
- the threat of the spread of coronavirus disease as an external factor in the reproduction process that affects the role of money has been identified;
- the opportunities and risks of applying macroprudential policy measures for money turnover and other macroeconomic processes have been identified;
- measures in the field of monetary and financial regulation have been generalized, which make it possible to overcome external threats and enhance the role of money in the reproduction process.

The results of the analysis allowed us to identify the main threats to money turnover as a result of the spread of coronavirus disease as an external factor in the reproduction process and, in connection with this, restrictions on business activity in the economy, which can disrupt the performance of monetary functions. The authors also assessed the measures taken by monetary and financial regulators to support citizens, the economy, and the financial sector in the context of the coronavirus pandemic, seen as an opportunity to increase the role of money in the reproduction process from the point of view of a functional approach to the study of modern money.

RESEARCH METHODOLOGY

General research methodology

To study the role of money in the reproduction process in the concept of possible coordination of monetary, macroprudential, and financial policies, the following main stages are distinguished:

- studying the change in the role of money in the reproduction process influenced by monetary, macroprudential, and financial policies in the historical retrospective, as well as in the conditions of the formation of the digital space;

• identifying opportunities and threats of the impact of decisions in the field of monetary, macroprudential, and financial policies on money turnover and the reproduction process in the context of leveling the consequences of the coronavirus pandemic for various economic entities (state, business, households), as well as for the financial sector as a whole.

In our study, we concluded that in the information economy, the key to the successful fulfillment of its functions by money is the formation of such a trusted digital space, which is distinguished by the presence of effective models for managing economic, technological processes and big data [3, 4]. Only in this case, as well as in the absence of physical boundaries in the information space, numerous participants in economic activity become available to an almost limitless array of information [5], which allows money to freely perform its functions and the monetary system of active properties that allow it to be a catalyst of the reproduction process.

Under these conditions, the role of money in the reproduction process will largely depend on the quality of decisions taken by the monetary and financial regulatory authorities. They must control important aspects of the reproduction mechanism since their decisions can become both a driver of economic growth and a significant brake on it. In this regard, the role of money in the reproduction process will either be realized in accordance with objective economic laws and become significant, or it will be distorted and significantly limited.

An example of the distortion of the role of money in the reproduction process can be the period of the early 1990s, when, influenced by unrelated decisions in the field of monetary and fiscal policy, the structure of money turnover was transformed. Money turnover in the general structure of money turnover reached such high values that a significant part of it was outside the regulated turnover (to a greater extent, this is due to the expansion of the shadow economy and shadow money turnover), which actually deprived the economy of the opportunity to use it for the development of active properties of the monetary system and government regulators — the ability to effectively influence the reproduction process through monetary and financial policies.

Note that the effectiveness of only monetary and financial policy is not a necessary and sufficient condition for the progressive development of the national economy. It is necessary to achieve a high level of conjugation of the actions of these structural elements of the reproductive mechanism. As for our research — the harmonization of the applied instruments of monetary, macroprudential, and financial policies in achieving the goal of economic growth.

Empirical research methodology

Considering that money acts as an integral institution, consisting of the institution of money and its forms of existence and regulation in various spheres, it is advisable to limit the scope of the study to economic relations, abstracting from the legal and psychological aspects of their manifestation. In this case, the target of the study is the role of money in the reproduction process from the standpoint of the formal-functional approach, and the subject of the study is the features of the manifestation of the role of money under the influence of monetary, macroprudential and financial policies, regardless of the forms and types of money.

To study the impact of monetary, macroprudential, and financial policies on money turnover, lending to small and medium-sized businesses, economic growth, real incomes of the population, and the financial sector, econometric models were used using correlation-regression analysis. Their specifications have been determined in the conditions of the Russian economy. The main model used in the empirical study is as follows:

$$y_t = \alpha + \beta \times i_t + \gamma \times FII_t + \delta \times bb_t + \varepsilon_t, \quad (1)$$

where i_t — consumer price index, in % to the corresponding period of the previous year;

FII_t — the level of financial stability at the end of the quarter, in %;

bb_t — the balance of the state (federal — for Russia) budget to GDP compared to the corresponding period of the previous year;

$\alpha, \beta, \gamma, \delta$ — the coefficients of the model $\alpha, \beta, \gamma, \delta > 0$;

ε_t — noise at time *t*.

As y_t we checked step-by-step:

GDP_t — GDP growth over the corresponding period of the previous year as an indicator of economic growth;

V_t — the velocity of money supply M2 at the end of the period as an indicator of the rate of money turnover;

A_t — assets of credit institutions at the end of the period as an indicator of the development of the financial sector, including the banking sector;

SME_t — the volume of loans provided to small and medium-sized businesses (hereinafter referred to as SMEs) at the end of the period, as an indicator of lending to small and medium-sized businesses;

RDI_t — growth in real disposable income of the population as an indicator characterizing the real income of the population.

The variables listed above were chosen by us as the most indicative ones, which can give an idea of the analyzed questions, although each of them can be supplemented by many other indicators. In addition, we adopted price and financial stability, as well as the ratio of the balance of the state (federal) budget to GDP as indicators characterizing monetary, macroprudential, and financial policies, on the assumption that they are the result of the implementation of these policies and that the goals of these politicians are achieved.

Thus, the following five varieties of the model (1), presented below, were estimated:

1. $GDP_t = \alpha + \beta \times i_t + \gamma \times FII_t + \delta \times bb_t + \varepsilon_t, \quad (2)$

2. $V_t = \alpha + \beta \times i_t + \gamma \times FII_t + \delta \times bb_t + \varepsilon_t, \quad (3)$

3. $A_t = \alpha + \beta \times i_t + \gamma \times FII_t + \delta \times bb_t + \varepsilon_t, \quad (4)$

4. $SME_t = \alpha + \beta \times i_t + \gamma \times FII_t + \delta \times bb_t + \varepsilon_t, \quad (5)$

5. $RDI_t = \alpha + \beta \times FII_t + \gamma \times bb_t + \varepsilon_t. \quad (6)$

The estimation of these models was carried out based on quarterly data for the period 2009–2019. In the course of the analysis, first of all, pairwise correlation coefficients were calculated, and not multiple, to exclude collinearity; lags were determined and evaluated by *t*-statistics and *P*-value; autocorrelations were checked with the identification of the Durbin-Watson coefficient, autocorrelations were eliminated using the "generalized least squares method" and the seasonality factor was eliminated.

Empirical analysis result

The performed empirical analysis made it possible to determine the technical characteristics of the models 2–6, presented in *Table 1*.

Estimates of the model specifications (2–6), as well as summary conclusions, are presented below.

Model analysis results (2):

As a result of the analysis of the influence of the balance of the federal budget on economic growth, the hypothesis of the existence of a relationship between them is rejected due to the absence of a significant correlation coefficient. However, even if the balance of the federal budget does not have a direct impact on economic growth, fiscal policy can affect the development of the economy indirectly. This issue is discussed further.

The task of further empirical research is to analyze the impact of price and financial stability on economic growth. Our early works [3, 4, 6] were devoted to this issue. The

Table 1

Analysis model specifications

	Regression variable	Model	Model specification
1	GDP_t	$GDP_t = \alpha + \beta \times i_t + \gamma \times FII_t + + \delta \times bb_t + \varepsilon_t$ (2)	$GDP_t = 0,03 - 0,32 \times i_{t-1} + \varepsilon_t$, (7) $GDP_t = 0,05 - 0,14 \times FIIi_t + \varepsilon_t$ (8)
2	V_t	$V_t = \alpha + \beta \times i_t + \gamma \times FII_t + \delta \times bb_t + \varepsilon_t$ (3)	$V_t = 1,43 - 0,0002 \times bb_t + \varepsilon_t$ (9)
3	A_t	$A_t = \alpha + \beta \times i_t + \gamma \times FII_t + \delta \times bb_t + \varepsilon_t$ (4)	$A_t = 0,0002 \times bb_t + 0,3 \times FII_t - 0,12 + \varepsilon_t$ (10)
4	SME_t	$SME_t = \alpha + \beta \times i_t + \gamma \times FII_t + + \delta \times bb_t + \varepsilon_t$ (5)	$SME_t = 2,16 - 1,06 \times FIIi_t + \varepsilon_t$ (11)
5	RDI_t	$RDI_t = \alpha + \beta \times i_t + \gamma \times FII_t + + \delta \times bb_t + \varepsilon_t$ (6)	$RDI_t = 112 - 0,002 \times bb_t - 11,6 \times FII_t + \varepsilon_t$ (12)

Source: compiled by the authors.

analysis was carried out for two periods: long-term and short-term.

The analysis results for the short-term period are presented in the *Appendix (Table 1)* and *Fig. 1*. Model of the impact of price stability on economic growth in the short term (7):

$$GDP_t = 0,03 - 0,32 \times i_{t-1} + \varepsilon_t . \quad (7)$$

The results of the analysis of the impact of price and financial stability on economic growth for the long term are presented in the *Appendix* (*Table 2*) and in *Fig. 2*. Model of the influence of financial stability on economic growth in the long run (8):

$$GDP_t = 0,05 - 0,14 \times FII_t + \varepsilon_t . \quad (8)$$

Thus, according to the results of the analysis obtained in the study of the influence of price and financial stability, as well as the balance of the federal budget, it can be argued that the balance of the federal budget does not have a statistically significant direct effect on economic growth, while the impact on price and financial stability is obvious. However, their impact is different: in the long term, price stability does not have a significant impact on economic growth, and changes in financial stability can explain 30.9% of GDP changes; In contrast, in the short term, financial stability does not significantly affect economic growth, and changes in price stability can explain 93% of GDP changes. Consequently, although in the short term, the change in price stability explains a significant share of changes in GDP, in the long term, its influence weakens, while financial stability, on the contrary, increases.

Model analysis results (3):

As a result of the analysis of the influence of price and financial stability on the velocity of money, the hypothesis of the existence of a relationship between them is rejected due to the absence of a significant correlation coefficient. Therefore, the task of further empirical research was to analyze the influence of the federal budget balance on the velocity of M2 money stock (hereinafter referred to as the velocity of money). As a result of the analysis, the following results were obtained, presented in the *Appendix* (*Table 3*) and in *Fig. 3*. Model of the influence

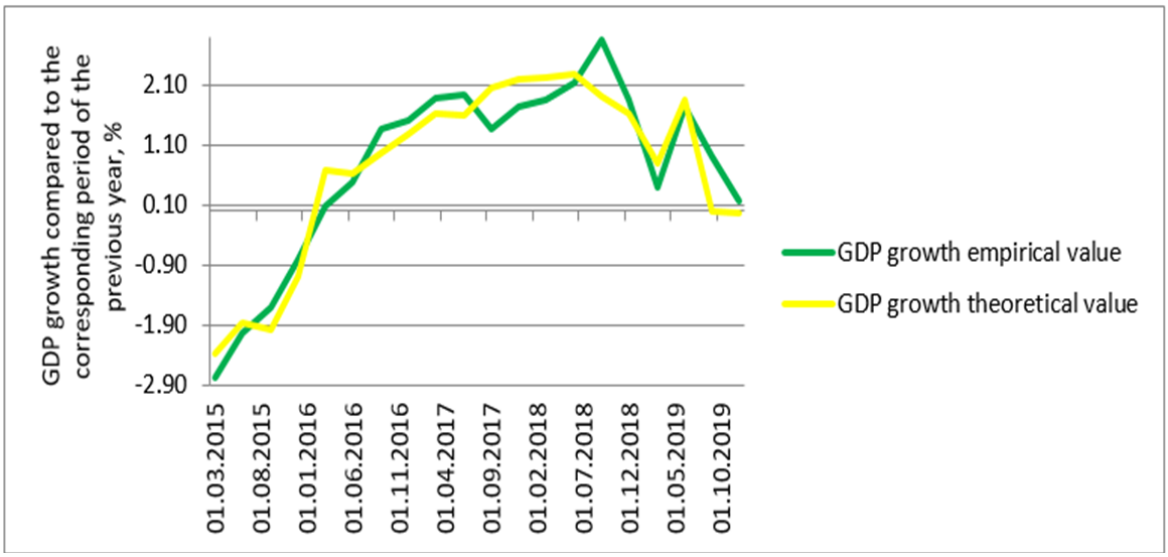

Fig. 1. **Empirical and theoretical values of GDP growth**

Source: compiled by the authors.

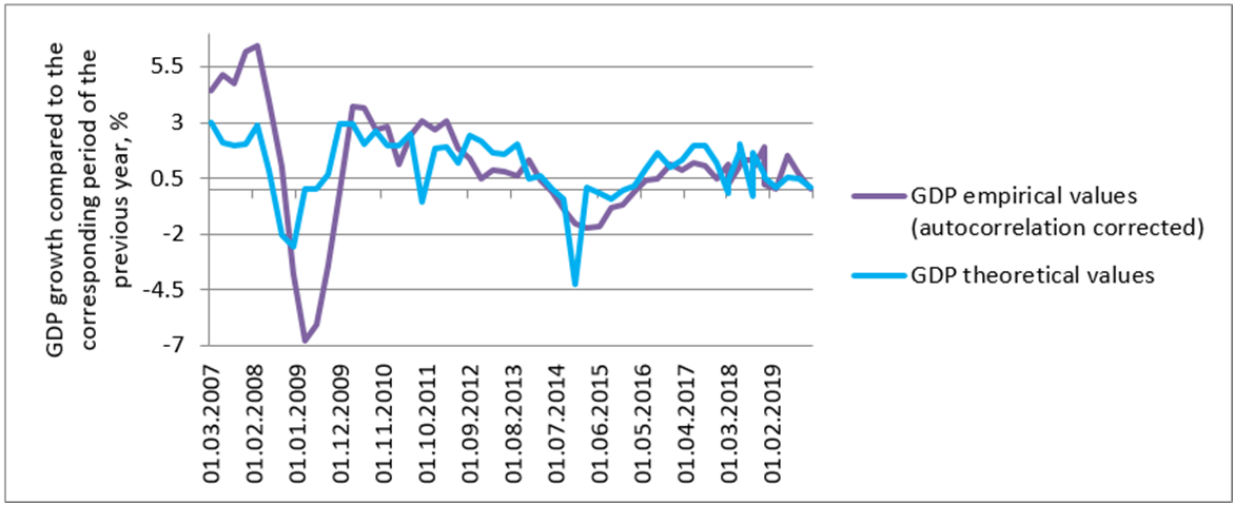

Fig. 2. **Empirical and theoretical values of GDP**

Source: compiled by the authors.

of the federal budget balance on the velocity money (9):

$$V_t = 1,43 - 0,0002 \times bb_t + \varepsilon_t \cdot \quad (9)$$

Thus, the analysis of the impact of price and financial stability, as well as the balance of the federal budget, suggests that price and financial stability does not have a statistically significant effect on the velocity of money, but the influence of the balance of the federal budget is confirmed. Changes in the balance of the federal budget can explain 67.2% of changes in the velocity of money.

Model analysis results (4):

Correlation analysis of price stability and assets of credit institutions allows us to reject the hypothesis that there is a relationship between them. Consequently, in the future, the impact of financial stability and balance of the federal budget on the change in the assets of credit institutions was assessed. The results are reflected in the model (10), in the *Appendix* (*Table 4*), and *Fig. 4*. Model of the influence of financial stability and the balance of the federal budget on the change in the assets of credit institutions (10):

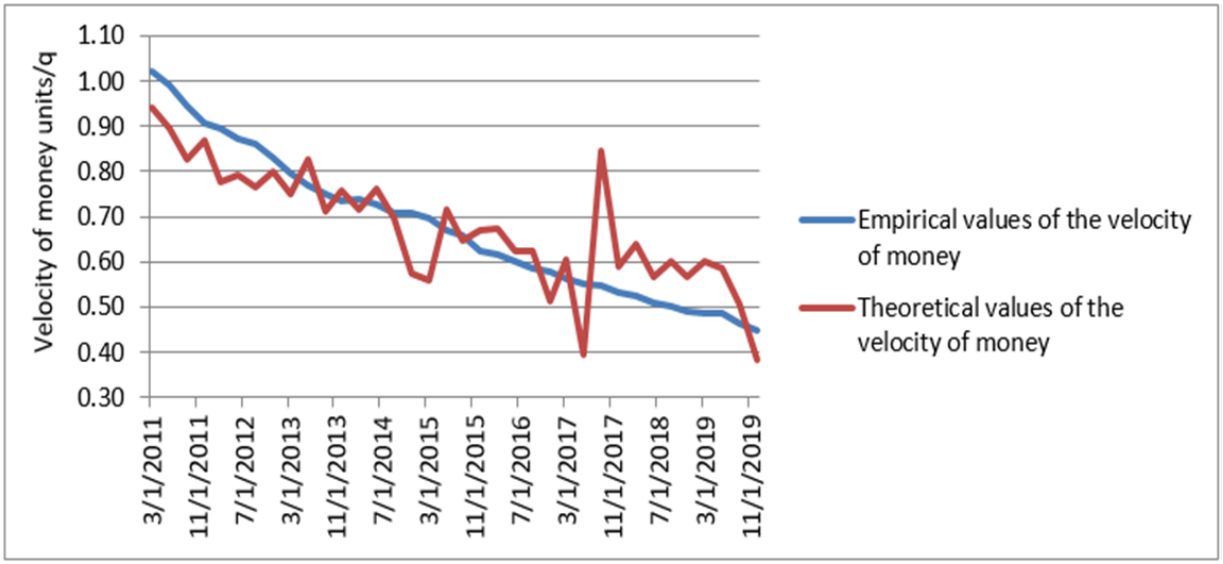

Fig. 3. **Empirical and theoretical values of the money turnover rate**

Source: compiled by the authors.

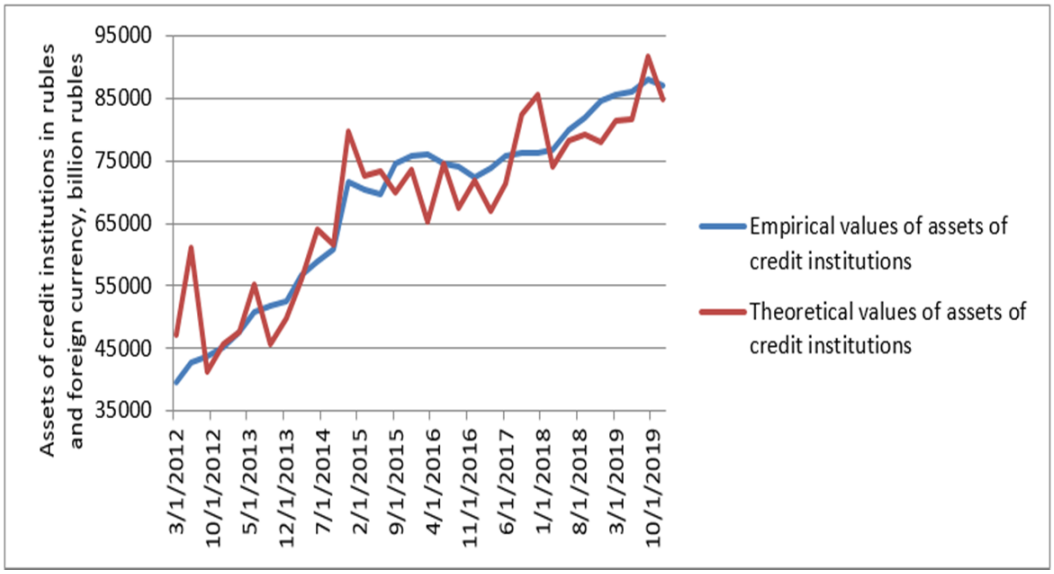

Fig. 4. **Empirical and theoretical values of the assets of credit institutions**

Source: compiled by the authors.

$$A_t = 0,3 \times FII_t + 0,0002bb_t - 0,12 + \varepsilon_t . \quad (10)$$

Thus, the analysis of the influence of price and financial stability, as well as the balance of the federal budget on the assets of credit institutions, suggests that the influence of financial stability and balance of the federal budget is confirmed, and price stability is confirmed. have no statistically significant effect. If, together with financial stability and the federal budget balance, 85% of changes in the assets of credit institutions are explained, then with each increasing unit of the financial stability index, the assets of credit institutions increase by RUB 0.3 billion, and with each increasing unit, the balance of the federal budget, the assets of credit institutions increase by RUB 0.2 million.

Model analysis results (5):

Regression analysis of the impact of price stability and the balance of the federal budget on the volume of lending to SMEs allows us to reject the hypothesis of a causal relationship between them. However, the assessment of

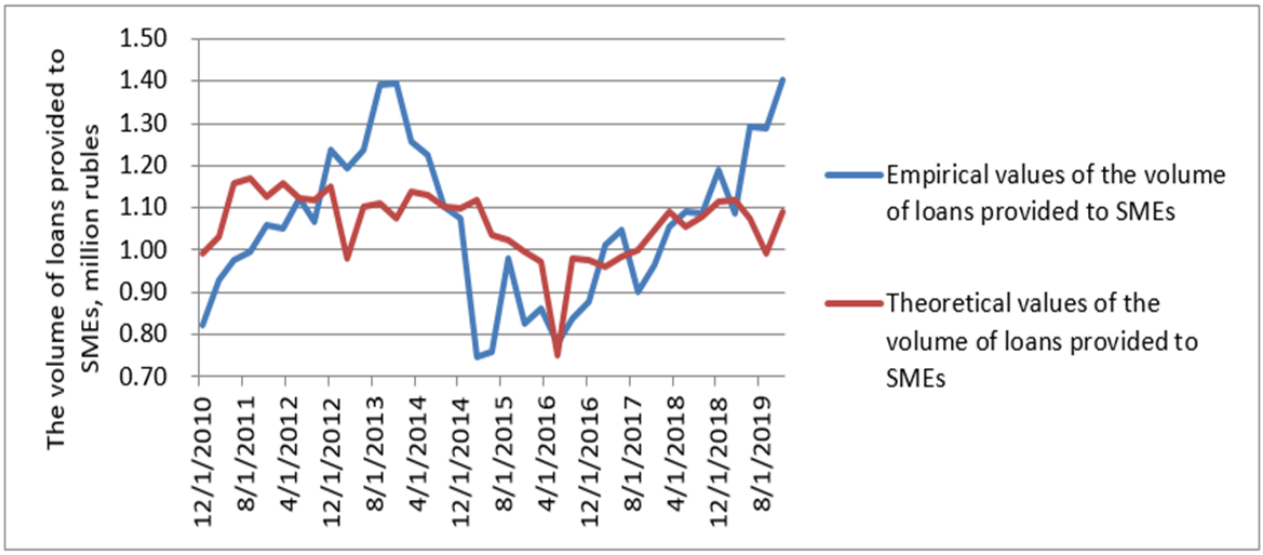

Fig. 5. **Empirical and theoretical values of the volume of loans provided to SMEs**

Source: compiled by the authors.

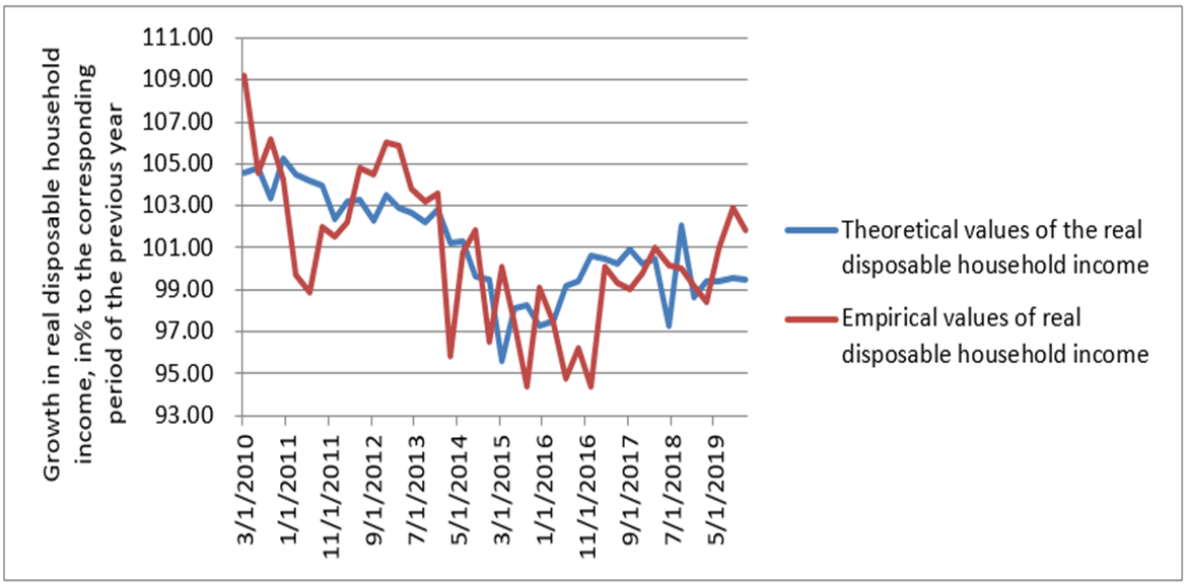

Fig. 6. **Empirical and theoretical values of the real disposable household income**

Source: compiled by the authors.

the impact of financial stability on the volume of loans provided to SMEs yielded positive results. The results are reflected in the model (11), in the *Appendix* (*Table 5*), and *Fig. 5*. Model of the influence of financial stability on the volume of loans provided to SMEs (11):

$$SME_t = 1{,}3 - 0{,}8 \times FII_{t-1} + \varepsilon_t . \qquad (11)$$

Based on the results of the analysis, price stability and balance of the federal budget do not have a statistically significant effect on the volume of loans provided to SMEs. At the same time, the impact of financial stability is statistically significant. Financial stability explains 20% of the change in the volume of loans issued to SMEs, and with an increase in the financial stability index per unit, the volume of loans issued to SMEs decreases by an average of RUB 0.8 trillion.

Model analysis results (6):

The analysis of the influence of financial stability and the balance of the federal budget on the real disposable income of

Table 2

The impact of price and financial stability and the balance of the state budget on some economic indicators

Indicator	Price stability	Financial stability	Federal budget balance
Economic growth (in the short term)	+		
Economic growth (in the long run)		+	
Velocity of money			+
Assets of credit institutions		+	+
Volume of loans provided to SMEs		+	
Real disposable household income	+	+	+

Source: compiled by the authors.

the population was carried out. At the same time, the influence of inflation was excluded, since the inflation factor was initially excluded from the indicator of real disposable income of the population. Regression analysis of the influence of financial stability and the balance of the federal budget on the real disposable income of the population confirms the hypothesis that there is a relationship between them. The results of the analysis are reflected in the model (12), in the *Appendix* (*Table 6*), and *Fig. 6*. Model of the influence of financial stability and the balance of the federal budget on real incomes of the population (12):

$$RDI_t = 112{,}4 - 11{,}6 \times FII_t - 0{,}002 \times bb_t + \varepsilon_t. \quad (12)$$

Thus, financial stability and the balance of the federal budget have a statistically significant effect on the real disposable household income. Moreover, if together these factors explain 40% of changes in the level of real disposable household income, then with each increased unit of the financial stability index, the real disposable household income decreases by 11.6 points, and with each increased unit of the balance of the state budget, the real disposable household income decreases by 0.002%.

Based on the above analysis of the impact of price and financial stability and the balance of the federal budget on economic growth, the velocity of money, the assets of credit institutions, the volume of loans provided to SMEs, and the real disposable household income, it was clarified, the results of which of the analyzed policies affect certain indicators of the economy (*Table 2*).

Thus, the conducted empirical analysis allows us to conclude that the result of the implementation of monetary policy, the purpose of which is to target inflation, has a statistically significant effect on economic growth and real disposable household income in the short term. The result of the implementation of macroprudential policy (the indicator is the level of the financial stability index) has a statistically significant effect on economic growth in the long term, the assets of credit institutions, the volume of loans provided to SMEs, and the real disposable household income. The result of the implementation of financial policy (the indicator is the balance of the federal budget) has a statistically significant effect on the velocity of the money, the assets of

credit institutions, and the real disposable household income.

Theoretical part: monetary, macroprudential, and financial policies as factors in the manifestation of the role of money in the reproduction process

The role of money is significantly influenced by measures of financial and monetary policy. Financial policy tools (tax base, length of the tax period, structure of taxes and fees, rates of taxes and fees, special tax regimes, structure of revenue and expenditure parts of the budget, budget surplus and deficit, inter-budgetary transfers, budget rule, and other elements of the financial regulation mechanism) — work for the state to fulfill its functions in the process of forming and using various funds, influencing the money turnover. At the same time, in countries with emerging markets, the effect of "fiscal dominance" is observed [7, 8]. Monetary policy decisions directly affect the supply and demand of the money market. Meanwhile, it would be wrong not to consider the impact of macroprudential regulation and measures in the field of macroprudential policy on it. Although the macroprudential policy is a separate regulatory segment with its own targets and instruments, the object of its influence is the credit market and its individual segments, and as a result, through the credit channel of the transmission mechanism of monetary policy, money turnover. Above, we have confirmed the impact of macroprudential policy on the assets of credit institutions, as well as the volume of loans provided to SMEs. In this regard, it is advisable to consider and evaluate the influence of these policies on the functioning of money in the aggregate, considering their measures as factors of changing the role of money in the reproduction process.

Financial and monetary policies, influencing the role of money in the reproduction process, also interact with each other. Some researchers believe that both policies should be applied to ensure economic growth [9]. Others, while agreeing with the importance of both policies, note that fiscal policy is at the same time a constraint on monetary policy [10]. In this regard, some authors have proved that in pursuing financial and monetary policy, it is first of all necessary to determine which policy is dominant in a particular economy and to pursue the corresponding second policy [11]. There is also a point of view according to which the state budget deficit leads to a depreciation of the national currency, thereby affecting monetary policy [12]. In our earlier works, we investigated the mechanism of mutual influence of financial and monetary policy instruments, as well as measures necessary for their coordination in the context of achieving financial stability and ensuring economic growth [13]. Given the stable set of applied tools of these policies, it is necessary to note the relevance of some recommendations in relation to the current economic situation.

In our opinion, the period 1999–2002 is a striking example of a noticeable increase in the role of money in the economy in the modern history of Russia. During these years, the financial policy of the government and the monetary policy of the Bank of Russia was aimed at increasing the level of monetization of the economy. It was then that the volume of money turnover increased significantly, the level of monetization of the Russian economy reached high values of 40%, the monetary income of the population increased significantly, and the rate of economic growth reached the highest rates of 12% per year (we recall, the above calculations proved the impact of all three policies: financial, monetary, and macroprudential, on the income of the population). This period is characterized by some balanced decisions in the field of monetary and financial policy, which, despite their restrictive nature (restrictions on the foreign exchange positions of commercial banks in monetary policy, restrictions on tariffs of natural monopolies in financial policy, etc.), were

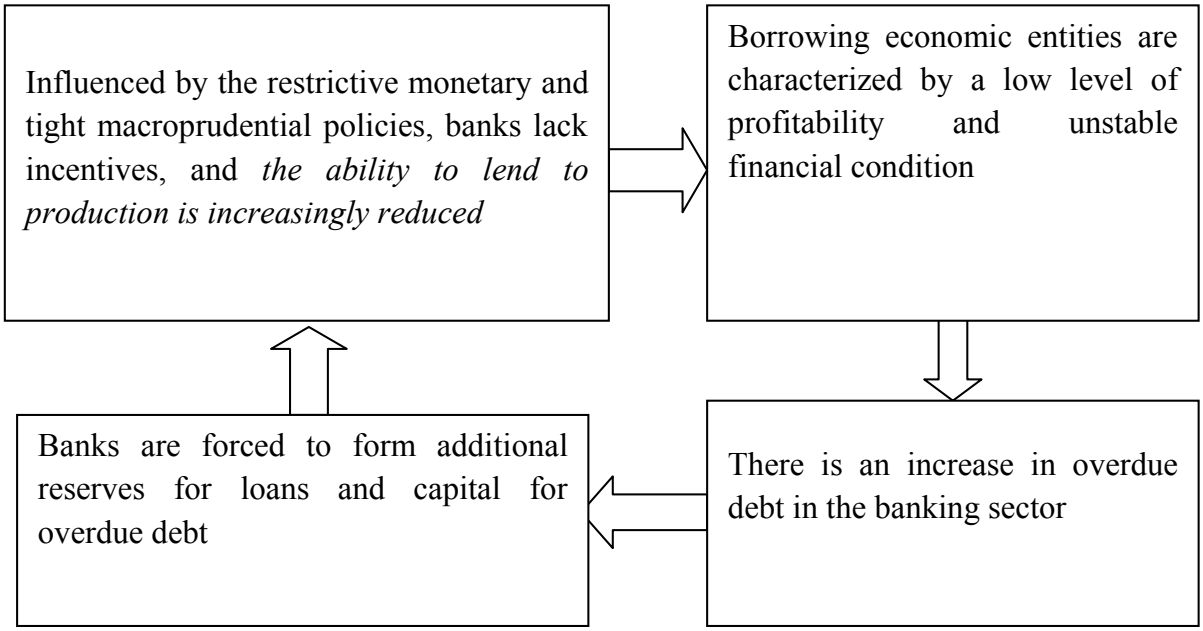

Fig. 7. **Banking sector impulses influenced by monetary and macroprudential policies**

Source: compiled by the authors.

aimed at harmonizing money turnover, which significantly influenced the reproduction process and gave its positive results.

Following the classical concepts of monetary policy, in all other periods of the modern history of Russia, inflation in the economy was restrained by a significant restriction of the money supply and, in connection with this, by a reduction in money turnover. This was both in the early 1990s and the period 2008–2020. The growth rates of the economy in these years were very modest, if not negative, and the crisis of 2009 hit the Russian economy worse than similar countries with emerging markets. At that time, the economy was characterized by a significant reduction in credit, a necessary component of the reproduction process. Restrictive monetary and tight macroprudential policies have formed a vicious circle, namely: in these conditions, banks lost incentives, and *opportunities for lending to production were increasingly narrowed*; business entities-borrowers were characterized by a low level of profitability, had an unstable financial condition; the share of overdue debts was growing in the banking system; banks were forced to form additional reserves for loans and capital for this overdue debt; *banks' abilities to lend to the economy were reducing.*

These effects and their conditions indicate *a significant suppression during these periods of the active properties of the monetary system and a significant limitation of the role of money in the reproduction process* (*Fig. 7*).

Exploring the role of money in the reproduction process, one cannot ignore the problem of excess/shortage of liquidity in the banking sector, which arose as a result of a violation of the reproduction function of the monetary system.

Shortage of liquidity is common in the economy. The reasons for the shortage of liquidity in the banking sector may be an insufficient amount of resources attracted by banks; lack of long-term money resources in banks in the structure; imbalance in economic development, capital outflow from the country, restriction or closure of foreign capital markets for national banks; lack of refinancing instruments in the system of monetary policy instruments. With the help of refinancing instruments, central banks, as a rule, are very successful in leveling the problem of the

shortage of both ruble and foreign currency liquidity.

The reasons for the excess liquidity are: unstable, including due to the introduction of anti-Russian sanctions, economic situation; changes in tax legislation that increase the burden on business; declining confidence in the banking sector amid active revocation of banking licenses; reorganization of major market players; a significant drop in the creditworthiness of organizations in the real sector due to the low level of their profitability; a high level of credit risks, causing a decrease in the business activity of banks in the field of lending [14], as well as the receipt of funds from the budget channel as a result of the implementation of the "budget rule". The reproduction potential of Russian commercial banks has grown over the past few years, but at the same time, it has come into conflict with the interests of the real sector of the economy due to restrictive measures in the field of monetary, financial, and macroprudential policies. This was the impetus for the emergence of *excess liquidity* and the consolidation of this trend. In our opinion, we should consider the excess liquidity as a result of destructive phenomena due to the disruption of the reproduction process in the monetary sphere, where the functioning of the basic institution of the market economy — commercial banks — was trapped in a dubious strategy for the development of credit relations and led to numerous violations with their side of the legislation, including those aimed at combating the legalization of proceeds from crime and the financing of terrorism, the withdrawal of capital abroad, the loss of licenses. And money, influenced by these restrictions, lost the ability to perform its functions in full.

The majority of the reasons noted above for the emergence of the excess liquidity are in the sphere of influence of monetary and financial policies, which means that it is their influence or the lack of proper influence that is the result of the emergence and consolidation of this negative trend for the reproduction process. In conditions of excess liquidity, there is a risk of the regulator (Bank of Russia) losing the ability to effectively manage liquidity, since under these conditions the effect of the key rate on the banking sector is reduced.

When studying the role of money in the reproduction process and its impact on economic growth, it is impossible to leave aside the *aspect related to the population's money income*, since money is the most sensitive element of economic relations, bearing a significant economic and greatest social burden. The Guidelines for the Unified State Monetary Policy for 2020 and the period of 2021 and 2022 rightly noted that the slowdown in GDP growth is caused by weak investment activity, a significant decrease in annual export growth rates against the backdrop, inter alia, of weakening external demand.[1] Our studies [15, 16] confirm this thesis. Meanwhile, the fall in real disposable household income over some years has become a serious problem constraining economic growth (*Fig. 6*). These processes inevitably lead to a decrease in the role of money in the economy: they restrain consumption, lead to the formation of non-monetary incomes by the population, which further deforms the reproduction process.

The Bank of Russia, when studying the dynamics of monetary incomes and expenditures of the population, confirms the fact of a fall in the real disposable household income. At the same time, an increase in interest payments on loans and a revaluation of the negative impact of an increase in interest payments on the budget of the population due to a significant share of mortgage loans in the loan portfolio is indicated as a factor that has a significant

[1] Bank of Russia website "Main Directions of the Unified State Monetary Policy for 2020 and the Period of 2021 and 2022". URL: https://cbr.ru/about_br/publ/ondkp/on_2020_2022/ (accessed on 27.11.2020).

negative effect on this trend.[2] The regulator is also concerned about the transition of the population from savings to consumer behavior. We believe that monetary and financial policy has sufficient tools to influence both nominal and real disposable household income, which is confirmed by the empirical analysis, and today there are the prerequisites for their increase to stimulate reproduction processes. Their adjustment with the help of measures of this policy can have a positive effect on economic growth, as well as on the quality of loan portfolios of commercial banks.

As noted above, the impact of macroprudential policy on the reproduction process requires research and evaluation. Studies show that macroprudential policy has an impact not only on macro-financial stability, but also on economic growth, price levels, and lending volumes [17–19]. Under the influence of systemic risks, its toolkit is significantly replenished by regulators.

The main goal of macroprudential policy is to maintain the stability of the financial system as a whole and to minimize the likelihood of crisis phenomena and their consequences. The goal is good, but today there is an acute question of how much the efforts of the Bank of Russia to maintain macroeconomic stability contribute to the development of lending. Is it necessary to the extent that the Bank of Russia is doing it today, to use measures to curb the formation of bubbles in the financial market? Does it not hinder the development of the national economy? And, finally, what effect do macroprudential regulation instruments have on money turnover? Note that above we have proved the influence of financial stability on the velocity of money.

Macroprudential policy reducing systemic risk is aimed at the accumulation and reliable placement of bank reserves of sufficient liquidity, which forms a margin of safety for financial institutions and creates material prerequisites for strengthening the financial stability of the banking sector [20]. Based on this, it is no accident that the question arose about the ability of macroprudential policy to restrain the development of lending. Considering that, at the request of the regulatory body, the banking sector forms required reserves, the creation of excess reserves or fixed capital, which in the event of a stress scenario will ensure the ability of financial institutions to lend to the economy, currently significantly reduces the liquidity of the banking sector and limits its lending and investment potential [21, 22]. Considering the fact that the credit channel is a channel for increasing money, we note that this is reflected in the money turnover, which is undoubtedly influenced by these measures.

When systemic risks arise in the financial sector, regulators use aggregated macroprudential instruments that can affect the entire financial system. In this regard, such a tool as the countercyclical capital buffer has proven itself well. It should cover losses of banks in the event of the occurrence of systemic risk limit values in the banking sector. Another macroprudential instrument that has the ability to influence the entire financial system is the requirements for global and national systemically important financial institutions. Concerning them, national regulators, including the Bank of Russia, introduce additional increased requirements.

In the Russian economy, risks often arise in its individual segments, therefore, macroprudential policy is implemented through the use of sectoral instruments aimed at preventing the formation of bubbles and limiting the risks associated with the growth of lending in these risky segments. Over the past few years, such risky segments in Russia have been the foreign currency lending sector, M&A lending (mergers and acquisitions), as well as mortgage and consumer lending. Sectoral instruments of macroprudential policy are aimed at limiting credit and,

[2] Monetary Policy Report No. 3. Bank of Russia website. URL: https://cbr.ru/Collection/Collection/File/19993/2019_02_ddcp.pdf. (accessed on 27.11.2020).

by limiting systemic risks, restrain the development of lending and the possibility of a multiplicative increase in the money supply, the growth of money turnover.

In general, macroprudential policy measures provide some opportunities, but also carry, as shown above, certain risks for money turnover. The possibilities and risks of applying macroprudential policy measures for money turnover through their impact on various macroeconomic actors are presented in the *Appendix* (*Table 7*). Note that these risks for the state as a subject of economic relations are practically balanced with opportunities, while risks prevail for citizens and businesses. The latter testifies to the restrictive impact of macroprudential measures on the business activity of the population and businesses as a result of increased requirements for financial market institutions. This limits their business activity, participation in supporting economic entities with credit resources, thereby suppressing reproduction processes in the national economy. Opportunities are seen as very conditional and have no real prospects of becoming catalysts for economic growth. Against this background, the predominantly negative impact of these measures on money turnover is noticeable, especially in terms of its growth prospects, which limits the growth opportunities of the national economy. The role of money in the reproduction process in such conditions decreases.

In our opinion, the macroprudential policy toolkit has a high potential for suppressing the reproduction function of the monetary system, aimed at limiting the role of money in the reproduction process as a result of a reduction in credit, its functional and organizational components. Given the fact that financial stability affects economic growth in the long term, it is advisable to make decisions in the field of macroprudential policy considering the reproductive vision, avoiding destructive shifts: preferential regulation of macro-financial proportions to the detriment of the prospective development of microeconomics.

As noted above, the role of money in the economy changes under the influence of external economic and behavioral factors, including measures of monetary, macroprudential, and financial policies, which can both enhance and weaken the role of money in the reproduction process. This conclusion was also reached by researchers of the European Central Bank, who argue that to resolve this issue, it is necessary to "co-ordinate" (coordination) these policies [23]. In this regard, an example of the strengthening of the role of money in the reproduction process, as well as a positive example of the conjugation of actions of monetary and financial policies, is observed in Russia today in the context of the coronavirus pandemic.

The results of the analysis of the main threats to money circulation at the very beginning of the coronavirus pandemic, as well as restrictions in this regard to business activity in the economy, which may disrupt the performance of the functions of money, are presented in the *Appendix* (*Table 8*). It also summarizes the monetary regulation measures to support citizens, the economy, and the financial sector in the context of the coronavirus pandemic, adopted by the Bank of Russia as a regulator to overcome these threats, and which we see as opportunities to enhance the role of money in the reproduction process.

We conducted a similar analysis of fiscal policy measures. Its results are presented in the *Appendix* (*Table 9*) in the form of an analysis of the threats to the economy with the spread of coronavirus disease and measures in the field of financial regulation to overcome these threats and increase the role of money in the reproduction process.

CONCLUSIONS

Our hypotheses about the variability of the role of money under the influence of external economic and behavioral factors, including the decisions made in the framework of various areas of economic policy, primarily

monetary, macroprudential, and financial, have been confirmed.

The results of an analysis carried out over a short time period under conditions of significant restrictions on economic activity influenced by the threat of the coronavirus disease as an external factor affecting the role of money showed that the actions of the government of the Russian Federation and the Bank of Russia in the very first weeks of introducing quarantine measures aimed at various participants in the reproduction process — citizens, enterprises of the real sector of the economy, as well as the financial sector, were of a complex nature. Support for the participants in the reproduction process was carried out simultaneously by measures of monetary and financial policies. These measures did not duplicate, but, on the contrary, complemented each other.

Taken together, these measures simultaneously eliminated the disruptions in money turnover resulting from the decline in business activity and supported the process of reproduction of the economy through monetary and financial policies. It is too early to conclude the effectiveness of these measures (*Tables 4, 5*). However, it is already clear today that money plays a significant role in this process, and money turnover, supported by soft quantitative easing under the influence of agreed decisions in the field of monetary and financial policy, has a positive effect on the restoration of reproduction process disrupted by business restrictions.

In today's challenging environment, it is important to preserve the trust of the population and business in the decisions of the monetary policy, to create a trusted digital space that allows neutralizing the negative impact of external factors on the reproduction process and restoring the reproduction potential of money in the interests of economic growth, including based on coordination (conjugation) of monetary and credit, macroprudential and financial policies.

It seems important to develop a joint strategy for the development of the credit system, reoriented with the help of monetary, macroprudential, and financial policies to increase its reproductive potential in the interests of economic growth. This will make it possible, against the background of the increasing role of money in the reproduction process, to revive the economy by increasing the demand for money and ensuring an adequate money supply. It can be seen that under these conditions the ability of instruments of both monetary and macroprudential and financial policies to influence reproduction processes and economic growth will increase.

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APPENDIX

Table 1

Results of the regression model evaluation (7)

RESULTS				
Regression statistics				
Multiple *R*		0.96		
R-square		0.93		
Normalized *R*-square		0.93		
Standard error		0.005		
Observations		16		
ANOVA				
	Df	*F*	*Significance F*	
Regression	1	188.87	0.00	
Remaining	14	–	–	
Total	15	–	–	
	Coefficients	*P-value*	*Lower 95%*	*Upper 95%*
Y-intersection	0.03	0.00	0.03	0.03
Inflation	–0.32	0.00	–0.37	–0.27

Source: calculated by the authors.

Table 2

Results of the regression model evaluation (8)

RESULTS				
Regression statistics				
Multiple *R*		0.56		
R-square		0.31		
Normalized *R*-square		0.29		
Standard error		0.02		
Observations		48		
ANOVA				
	Df	*F*	*Significance F*	
Regression	1	20.60	0.00	
Remaining	46	–	–	
Total	47	–	–	
	Coefficients	*P-value*	*Lower 95%*	*Upper 95%*
Y- intersection	0.05	0.00	0.03	0.06
FII	–0.14	0.00	–0.20	–0.08

Source: calculated by the authors.

Table 3

Results of the regression model evaluation (9)

RESULTS				
Regression statistics				
Multiple *R*		0.82		
R-square		0.67		
Normalized *R*-square		0.66		
Standard error		0.094		
Observations		36		
ANOVA				
	Df	*F*	*Significance F*	
Regression	1	69.61	0.00	
Remaining	34	–	–	
Total	35	–	–	
	Coefficients	*P-value*	*Lower 95%*	*Upper 95%*
Y- intersection	1.43	0.00	1.24	1.62
bb	–0.0002	0.00	–0.00	–0.00

Source: calculated by the authors.

Table 4

Results of the regression model evaluation (10)

RESULTS				
Regression statistics				
Multiple *R*		0.93		
R-square		0.86		
Normalized *R*-square		0.85		
Standard error		0.06		
Observations		33		
ANOVA				
	Df	*F*	*Significance F*	
Regression	1	90.6	0.00	
Remaining	30	–	–	
Total	32	–	–	
	Coefficients	*P-value*	*Lower 95%*	*Upper 95%*
Y-intersection	–0.116	0.00	–0.24	0.01
FII	0.302	0.00	0.13	0.47
State budget balance	0.0002	0.00	0.00	0.00

Source: calculated by the authors.

Table 5

Results of the regression model evaluation (11)

RESULTS				
Regression statistics				
Multiple *R*		0.44		
R-square		0.15		
Normalized *R*-square		0.12		
Standard error		0.11		
Observations		37		
ANOVA				
	Df	*F*	*Significance F*	
Regression	1	8.83	0.01	
Remaining	35	–	–	
Total	36	–	–	
	Coefficients	*P-value*	*Lower 95%*	*Upper 95%*
Y-intersection	1.29	0.00	1.12	1.45
FII	–.78	0.01	–1.30	–0.25

Source: calculated by the authors.

Table 6

Results of the regression model evaluation (12)

RESULTS				
Regression statistics				
Multiple *R*		0.65		
R-square		0.42		
Normalized *R*-square		0.40		
Standard error		2.84		
Observations		41		
ANOVA				
	Df	*F*	*Significance F*	
Regression	1	14.27	0.00	
Remaining	38	–	–	
Total	40	–	–	
	Coefficients	*P-value*	*Lower 95%*	*Upper 95%*
Y-intersection	112.37	0.00	107.80	116.94
FII	–11.57	0.00	–19.07	–4.07
bb	–0.002	0.01	–0.0031	–0.0004

Source: calculated by the authors.

Table 7

Opportunities and risks of applying macroprudential policy measures for money turnover

OPPORTUNITIES	RISKS
For the state	
Stimulating the development of the national economy, innovative technologies through ensuring the stability of the financial system as a whole and reducing the likelihood of crisis phenomena and their consequences	The creation of excess reserves or capital stock at the current moment significantly reduces the liquidity of the country's banking sector, limits its lending and investment potential, and the possibility of increasing money turnover
Building a unified system of macroprudential policy instruments, using foreign experience in macroprudential regulation on this basis	Using well-proven macroprudential policy instruments not in accordance with the current state of the national economy (systemic risks), but as a tribute to fashion
The focus of instruments on restrictions in certain sectors of the credit market, which allows harmonious development of its other sectors, excludes regulatory arbitrage	The focus of instruments is mainly on credit restriction, which hinders the development of lending and limits the possibility of a multiplicative increase in the money supply, limiting the growth of money turnover
The opportunity to protect national markets and the interests of national economic entities in the process of applying sectoral instruments aimed at de-dollarization of the national economy	Proportional, but not entirely justified application of restrictions to various institutions of the credit market reduces regulatory arbitrage but can expand the "gray zone" in lending and money turnover
For business and citizens	
Ensuring the stability of the financial system as a whole and minimizing the likelihood of crisis phenomena and their consequences, which has a beneficial effect on the confidence of businesses and citizens in financial market institutions, contributes to the harmonious growth of money turnover	Decrease in liquidity and profitability of financial market institutions due to additional requirements for creating reserves and capital, potential contraction of the volume of money supply
Protecting the interests of financially illiterate and high-risk borrowers — individuals	Impossibility to meet the need for lending of borrowers — individuals in the regulated zone of the credit market, expansion of the "gray zone" in lending and money turnover
Decrease in interest rates in the sector of unsecured consumer lending, decrease in the level of household debt, which contributes to the harmonious development of money turnover	Restriction of opportunities for refinancing loans in the context of a decrease in the key rate, which does not allow high-quality borrowers to increase the volume of debt through newly taken loans and does not contribute to the growth of money turnover
Reorientation of banks' portfolios to segments with a low value of the total cost of a loan	Loss of profitability of banks due to moving into low-risk, low-margin areas, leaving the highest quality segments of lending (mortgage), limiting the opportunities for growth in money turnover
Creation by banks that are actively working in the segment of unsecured consumer lending, the necessary volume of reserves and capital, allowing to reduce the risks of disruption in cash flow	Banks' loss of licenses due to the impossibility of meeting increased regulatory requirements in the process of creating reserves and increasing capital
	Disruption of money turnover due to the impossibility of carrying out payment circulation by economic entities due to the revocation of licenses from banks

Source: calculated by the authors.

Table 8

Threats to the economy associated with the spread of coronavirus disease, and the monetary regulation measures that provide opportunities to overcome threats and strengthen the role of money in the reproduction process

OPPORTUNITIES	THREATS
For citizens	
Recommendations to banks on the implementation of debt restructuring in connection with a decrease in the level of income of citizens, refusal to collect increased interest, fines and penalties from borrowers; enabling banks to not recognize such loans as restructured; restructuring of mortgage loans and the introduction of mortgage vacations for borrowers with an officially confirmed illness	Decrease in the level of income of citizens, disruptions in money circulation, reduction in the volume of the money supply
Measures to protect citizens from the negative impact on the credit history of events related to debt restructuring in connection with the spread of coronavirus infection, and measures to preserve the full ability of such borrowers to attract loans and borrowings in the future	The negative impact of restructuring on the credit history of the borrower and the inability to attract loans and borrowings in the future, a possible reduction in the volume of money supply
Introduction of restrictions on the maximum amount of fees charged by banks from their clients for transfers between individuals; is working on the issue of establishing limit commissions for acquiring when making online purchases using cards	Reducing the ability for citizens to carry out free and online transfers between individuals, disruptions in money circulation
Decrease in the value of the ratio of the premium to risk on mortgage loans and loans for financing under an equity participation agreement in construction, changing the procedure for applying premiums on loans with a low-down payment	Decrease in the availability of mortgage lending in the context of the suspension of mortgage rates by banks, a possible reduction in the money supply
For organizations of the real sector of the economy	
Dissemination of measures aimed at supporting lending (including payment of wages, reducing the burden on servicing existing loans) of organizations in some industries experiencing difficulties	Significant cost reduction of the enterprise due to work restrictions within the framework of the implementation of measures to contain the pandemic, disruptions in money circulation, compression of the money supply
Implementation of measures aimed at exchanging the lending currency into rubles against the background of increased volatility in the foreign exchange market, which helps to reduce credit risks	Increased volatility in the foreign exchange market, contributing to the growth of credit risks of enterprises – foreign currency borrowers, disruptions in money circulation
Concessional lending to SMEs (simplification of requirements for the borrower: the assessment does not consider debts on taxes, fees, wages, delays on existing loans). Implementation of instruments to limit interest rates on loans to borrowers, instruments to maintain the volume of lending to SMEs, including by expanding the target focus on lending wage liabilities, reducing the rate on the instrument, removing all industry restrictions on lending to SMEs	Significant decrease, and in some cases, the cessation of income generation for the SME sector as the most vulnerable sector of the economy due to work restrictions within the framework of the implementation of measures to contain the pandemic, disruptions in money circulation, a potential reduction in the money supply
Support measures for distance selling the context of the spread of coronavirus pandemic by limiting the maximum value of acquiring commissions for online shopping	Restriction or impossibility of participation in the reproduction process of traditional wholesale and retail trade enterprises, disruptions in money turnover, potential reduction in money supply
For financial sector	
Softening the conditions for the provision of irrevocable credit lines within the framework of compliance with the short-term liquidity ratio N 26 (N 27), reducing the fee for the right to use an irrevocable credit line, revising the procedure for calculating the maximum limit of ICL in the direction of increasing the ability of systemically important credit institutions (SICIs) to manage liquidity in an environment of increased volatility; maintaining the value of the national countercyclical capital buffer at a zero level; indulgence in the calculation of required reserves; change in the timing of the introduction of previously planned restrictions on SICIs	Decreased potential of the financial sector to provide resources to the real economy, potential contraction of the volume of money supply

Table 8 (continued)

OPPORTUNITIES	THREATS
Expansion of the Lombard List and mitigation of requirements for the level of liquidity of securities used by credit institutions in refinancing operations with the Bank of Russia, while maintaining requirements for credit quality; intention of the Bank of Russia to use a set of instruments for providing liquidity for longer periods: resumption of long-term repo auctions and auctions of long-term loans secured by credit claims	Reduction of cash inflows in a number of banks due to credit vacations by companies from affected industries, growth of uneven distribution of liquidity, imbalances in access to medium-term and long-term funding, disruptions in money circulation, potential contraction of money supply
Temporary reduction of the regulatory and supervisory burden, non-application of penalties for some violations for credit institutions, participants in the securities market, and trade and clearing infrastructure	Decreased potential of the financial sector to provide resources to the real economy due to the application of restrictive organizational measures, potential contraction of the volume of money supply
Cancellation in accordance with the countercyclical approach to the implementation of the macroprudential policy of the premium to the risk ratios; a separate 5% limit was allocated for investing pension savings in mortgage-backed bonds	Decrease in interest income of banks, a decrease in mortgage lending, a potential contraction in the volume of money supply
Possibility of credit institutions not to increase reserves for possible losses on overdue loans of borrowers with an officially confirmed illness, borrowers with a significant decrease in the level of income; permission of the MFO, CCCs, and ACCCs not to recognize these loans as restructured	Shrinking the volume of the money supply due to a decrease in the level of income of citizens, an increase in overdue debts with creditors: banks, MFO, CCCs, ACCCs, disruptions in money circulation
The opportunity of credit institutions not to worsen the assessment of the quality of debt service, regardless of the assessment of the financial position of the borrower to create provisions for losses	Significant reduction in the costs of enterprises due to work restrictions within the framework of the implementation of measures to contain the pandemic, the need for banks to create provisions for possible losses on loans due to the deterioration of the financial position of the borrower, disruptions in money circulation, compression of the volume of money supply
Expansion of the refinancing program for SME loans; the ability for lenders not to increase provisions for possible losses on loans to SMEs, as well as self-employed citizens; softening the requirements for the minimum rating of credit institutions for their participation in the new mechanism to support lending to SMEs; the possibility of providing these loans without collateral to credit institutions with a high credit rating, and to credit institutions that do not have such a rating, if there is a guarantee from JSC "SME Corporation"	Significant reduction, and in some cases, termination of income generation by the SME sector as the most vulnerable sector of the economy due to limitations in the implementation of measures to contain the pandemic, disruptions in money circulation, potential contraction of the volume of money supply
Recommendations for keeping banknotes in a credit institution for a period ensuring the cessation of virus activity, limiting the function of issuing and accepting banknotes in ATMs with a recycling mode; recommendations for preventive disinfection of cash transfer devices, as well as ATMs and terminals; recommendations on the priority use of non-cash forms of payment for goods and services: online transfers and contactless payments by cards	Risk of infection and spread of coronavirus in cash service of customers, disruptions in money circulation, compression of the money supply

Source: compiled by the authors based on press releases of the Bank of Russia.

Table 9

Threats to the economy associated with the spread of coronavirus disease, and the monetary regulation measures that provide opportunities to overcome threats and strengthen the role of money in the reproduction process

OPPORTUNITIES	THREATS
For the state	
A significant increase in government spending on the production and purchase of equipment and products for the diagnosis, detection, prevention and treatment of epidemic diseases, personal protective equipment, drugs and medical devices	The spread of coronavirus disease, failures in the protective function of the state, failures in money circulation, a possible reduction in the volume of money supply
Expansion of measures to support the budgets of the Russian Federation	Falling tax revenues to the budget system, disruptions in monetary circulation, reduction in the volume of money supply
The procedure for granting subsidies to regions for taking urgent measures to support small and medium-sized businesses has been established	nsufficiency of own revenues of the budgets of the constituent entities of the Federation, disruptions in money circulation, compression of the money supply. money supply
For citizens	
Distribution of inter-budgetary transfers between the constituent entities of the Russian Federation for financial support of medical workers providing medical care to citizens diagnosed with COVID-19, and to persons at risk of contracting such a disease; implementation of measures to actively support employment	Decrease in the level of income of citizens, disruptions in money circulation, reduction in the volume of money supply
For enterprises of the real sector of the economy	
Delays in the payment of all taxes (except VAT), fees, company contributions in a number of the most affected industries and areas, a moratorium on debt collection and fines by creditors; introduction of a mechanism for subsidizing the interest rate on loans from trade organizations received for the formation of stocks of food and essential goods; introduction of measures of financial support for manufacturers of enterprises producing essential goods, financial support for socially significant industries and enterprises (including transport, culture, etc.); subsidizing interest rates on loans to developers within the framework of project financing in the event of a drop in sales rates in the primary market; creation of a guarantee fund for restructuring loans to companies affected by the exacerbation of the situation in connection with the spread of coronavirus infection; introduction of a mechanism for the non-application of penalties on government contracts	Significant reduction in the costs of enterprises by limiting work in the framework of the implementation of measures to contain the pandemic, disruptions in money circulation, and a reduction in the volume of the money supply
The programs of concessional lending for small and medium-sized businesses have been expanded; deferrals were introduced for the payment of insurance premiums for micro-enterprises; temporary deferral (or moratorium) on the payment of lease payments by SMEs-tenants of state or municipal property	A significant reduction, and in some cases a cessation of income generation by the SME sector as the most vulnerable sector of the economy due to work restrictions within the framework of the implementation of measures to contain the pandemic, disruptions in money circulation, and a potential reduction in the volume of money supply
For the financial sector	
Subsidizing part of the interest on loans to SMEs to credit institutions; establishing the procedure for granting subsidies to credit institutions to ensure deferral of repayment of loans issued to SMEs; the allocation of funds from the reserve fund of the Government of Russia to credit institutions to ensure the deferral of repayment of loans issued to SMEs; increasing the capitalization of regional MFOs to cover preferential microloans of SMEs; increasing the capitalization of regional guarantee organizations in order to expand the ability of SMEs to obtain concessional loans in the absence of collateral	Significant reduction, and in some cases – the cessation of income generation by the SME sector as the most vulnerable sector savings due to restrictions in the implementation of measures to contain pandemic disruptions in money circulation possible reduction in the volume of money supply

Source: compiled by the authors based on materials from the website of the Government of the Russian Federation.

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Bayarsaikhan Z. — described the results and wrote the conclusions of the article.

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Digital Technologies in the Financial Sector: Evolution and Major Development Trends in Russia and Abroad

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ABSTRACT

The **subject** of the research is a complex of financial technologies that are actively used in the financial and credit sector in Russia and abroad. The study **aims** to show the place of technological progress based on the use of FinTech and the development of human capital in the Russian economy; transformation of business processes based on modern financial technologies, creating new promising opportunities, and responding to the challenges of Industry 4.0. The paper considers the issues related to the study of the prospects for the development of financial technologies in global practice and the possibilities of their adaptation in the activities of Russian financial organizations. The research is based on the analysis of data provided by international consulting companies, analytical centers, and official data sources of the Central Bank (Bank of Russia). The authors apply **methods** such as comparative research, empirical, logical, graphical, analysis, interpretation, and comparison. The study assesses the growing role of financial technologies in the Russian economy, identifies the main problems, and outlines development prospects based on the integration of traditional institutions and FinTech companies for the reproduction of financial innovations in the future. As a result, it was **concluded** that improving the technological effectiveness of banking processes is possible on the basis of digitalization using various financial technologies, which will lead to the simplification and optimization of traditional operations, prevention of fraud, create new and more personalized offers according to customer needs, while changing the way of interaction with them.

Keywords: digital economy; financial technology; artificial intelligence; big data; blockchain

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INTRODUCTION

The global development of the pandemic has led to a revolutionary transition from physical to digital format of organizing various processes, accelerating natural progress. The unique situation of 2020 has further increased the importance of digitalization and the commitment of users towards a remote format for receiving services. People have adopted a new style of life, the availability of technology, which has changed their skills and habits. Financial technology did not stand aside in this process. 2020 has completely changed customer expectations towards telecommuting, forcing financial institutions to rethink outdated work technologies. Amid the pandemic, 88% of customers would expect companies to step up their digital initiatives according to Salesforce, and 68% stated COVID-19 raised their expectations for the power of digital financial instruments. The new digital paradigm includes the following directions of transformation [1, 2]:

1. Expanding digital perspectives. The global transition to digital technology has opened up entirely new opportunities. Nearly 70% of customers expect banks to create new ways to promote existing products and services, such as digital versions of traditional interactions as well as modern product lines. At the same time, despite the obvious need for well-developed digital channels, the pandemic has highlighted the fact that the financial industry is highly unprepared to enter the digital age.

"If you want to be a leading bank, you have to be a technology company," predicted Brett King, American futurist, author, co-founder, and CEO of New York-based mobile banking startup Moven. Successful digital business is always two steps ahead, constantly monitoring changing customer behavior, inventing new ways to adapt their products in accordance with growing expectations [3].

2. Customer-oriented thinking. A key factor here is to develop a dedicated, customer-centric mindset at every level, including operational and strategic processes while ensuring that financial decisions are aligned with the needs and expectations of users.

3. Modification of key performance indicators, as the digital paradigm is increasingly shifting towards customer focus. It is important to rethink not only the internal culture and business approach of the company, but also the way of measuring its performance, given that sales, conversions, and the number of leads have been the key performance indicators for decades. However, to become a successful financial brand in the new era, the focus should be on user reviews and feedback, the image of the technology and service seller, and the financial architecture.

Fintech is being implemented in various sectors of the financial industry. In terms of the classification of the financial technology tree, they can be found in the following categories of financial services: digital banking, financing of fintech platforms (crowdfunding and crowdinvesting), robotic consultations, e-money, digital payment services, insurance technologies, and financial activities related to crypto-assets, etc. [4, 5].

The main goals of the development of financial technologies in accordance with the state program "Digital Economy of the Russian Federation" are[1]:

- promoting the development of competition in the financial market;
- increasing the availability, quality, and range of financial services;
- reduction of risks and costs in the financial sector;
- ensuring security and sustainability in the use of financial technologies;

[1] The national program "Digital Economy of the Russian Federation", approved by the minutes of the meeting of the Presidium of the Council under the President of the Russian Federation for Strategic Development and National Projects No. 7 dated 04.06.2019 (accessed on 26.12.2020).

• increasing the level of competitiveness of Russian technologies.

The Bank of Russia is working to achieve these goals together with financial market participants, fintech companies, and interested government agencies.

TRENDS OF THE FINANCIAL INFORMATION AND COMMUNICATION TECHNOLOGIES MARKET

Today the world is moving to the sixth technological order, the contours of which have already begun to take shape in the developed countries, primarily in the USA, Japan, and China, and are characterized by a focus on development and the application of "high technology" and artificial intelligence.[2]

The economic depression and crisis that have been developing in the world since 2012, according to experts, can be overcome only through the modernization of business processes and the widespread introduction of multifunctional technologies that form the sixth technological order[3] [6].

Russia still lags far behind the world leaders in terms of volume, variety of use of scientific, technical, and intellectual potential, but rather intensively introduces them into the production process, specifically in the financial and banking sectors. However, a 2017 study by PwC, a global network of firms delivering consulting and auditing services, showed that despite constant investments in information technology, including financial ones, many companies in Russia are far behind.

The situation is similar in global practice. Thus, in connection with the reduction of global uncertainty, companies are doubling their investments in information and telecommunication technologies, and the software market will be the fastest-growing (*Table 1*) [7].

The main attention today is paid to the technologies of data search and analysis [7, 8]. This applies to both data security and cloud usage. This was noted by 73% of respondents in the world (65% in Russia) [9]. At the same time, considering the data of the Analytical Report "Barriers to the Development of the Digital Economy in the Constituent Entities of the Russian Federation",[4] the lack of educational programs in the field of the digital economy is a key problem in most regions of Russia.

The key barriers to the digital economy include problems in the field of legal regulation (17.3%), difficulties with the financial support of regional budgets (16.9%), lack of financial technologies (16.0%), difficulties in the development of information infrastructure (13.9%), in the implementation of projects based on "end-to-end" digital technologies (6.0%), the unbalance of information and administrative barriers (11.1%).[5]

The fintech market today occupies a leading position in the dynamics of investments, the number of transactions, the reach of users, etc.[6] In 2019, only 18% of customers visited their bank to conduct transactions, the rest used online banking.

Today it is becoming increasingly clear that financial technology is much more than just online banking. The leading indicator characterizing the development of the global financial technologies market is the

[2] Kablov E. The sixth technological order. Science and life. 2010;4. URL: https://www.nkj.ru/archive/articles/17800/ (accessed on 26.12.2020).

[3] Netscribes Global Fintech Market (2018–2023). Mumbai (India): Netscribes Pvt Ltd. 2019. URL: https://www.marketresearchhub.com/report/global-fintech-market-2018–2023-report.html (accessed on 26.12.2020).

[4] Analytical report "Barriers to the development of the digital economy in the constituent entities of the Russian Federation.". URL: http://ac.gov.ru/files/publication/a/ 25838.pdf (accessed on 26.12.2020).

[5] Ibid.

[6] Regions and innovation: Collaborating across borders. Paris: OECD; 2013. 235 p. (OECD Reviews of Regional Innovation). DOI: 10.1787/ 9789264205307-en. URL: https://read.oecd-ilibrary.org/urban-rural-and-regional-development/regions-and-innovation-collaborating-across-borders_9789264205307-en#page3 (accessed on 26.12.2020).

Table 1

The volume of investments in IT technologies in the world, billion US dollars

	The volume of investments, 2019	Specific gravity, %	Growth rate in 2019, %	The volume of investments, 2020	Specific gravity, %	Growth rate in 2020, %	Growth rate in 2021 (forecast)	Specific gravity, %	Growth rate in 2021, %
Data processing systems	205	5.49	–2.7	208	5.38	1.9	212	5.29	1.5
Enterprise application software	456	12.20	8.5	503	13.01	10.5	556	13.9	10.5
Electronic devices	682	18.25	–4.3	688	17.80	0.8	685	17.1	-0.3
IT services	1030	548.6	3.6	1081	27.97	5	1140	28.5	5.5
Communication services	1364	36.50	–1.1	1384	35.81	1.5	1413	35.3	2.1
Total costs	3737	100	0.5	3865	100	3.4	4007	100	3.7

Source: Gartner report (January, 2020). URL: https://www.gartner.com/en/newsroom/press-releases/2020–01–15 (accessed on 25.12.2020).

level of their penetration into the regions. Russia's place in the global fintech market is shown in *Fig. 1* [10]. According to the results of various research projects, the level of penetration of financial technologies in Russia is from 40 to 80%. The leaders are largest urban cities — Moscow, St. Petersburg and Kazan. In these conditions, the new market is actively gaining volume, as evidenced by the penetration index. Despite lagging behind world leaders, it is developing at the level of 80%. According to Deloitte estimates, the volume of the financial services market in Russia in 2018 amounted to 54 billion rubles, in 2019–60 billion rubles (an increase of 11%), and in 2020 it was planned to increase by 8% — up to 65 billion rubles.[7] The slowdown in growth is due to the instability of the Russian financial market in comparison with the markets of the USA, the UK, Singapore, etc. And Russian financial institutions, for example, banks, independently introduce financial technologies and buy promising startups or form strategic partnerships (for example, Sberbank, VTB, Tinkoff, AK Bars, etc.).

Back in 2016, fintech was a completely new concept, and the leaders were

[7] Sedykh I.A. Market of innovative financial technologies and services — 2019URL: https://dcenter.hse.ru/data/2019/12/09/1523584041/%D0%A0%D1%8B%D0%BD%D0%BE%D0%BA%20%D1%84%D0%B8%D0%BD%D0%B0%D0%BD%D1%81%D0%BE%D0%B2%D1%8B%D1%85%20%D1%82%D0%B5%D1%85%D0%BD%D0%BE%D0%BB%D0%BE%D0%B3%D0%B8%D0%B9–2019.pdf (accessed on 26.12.2020).

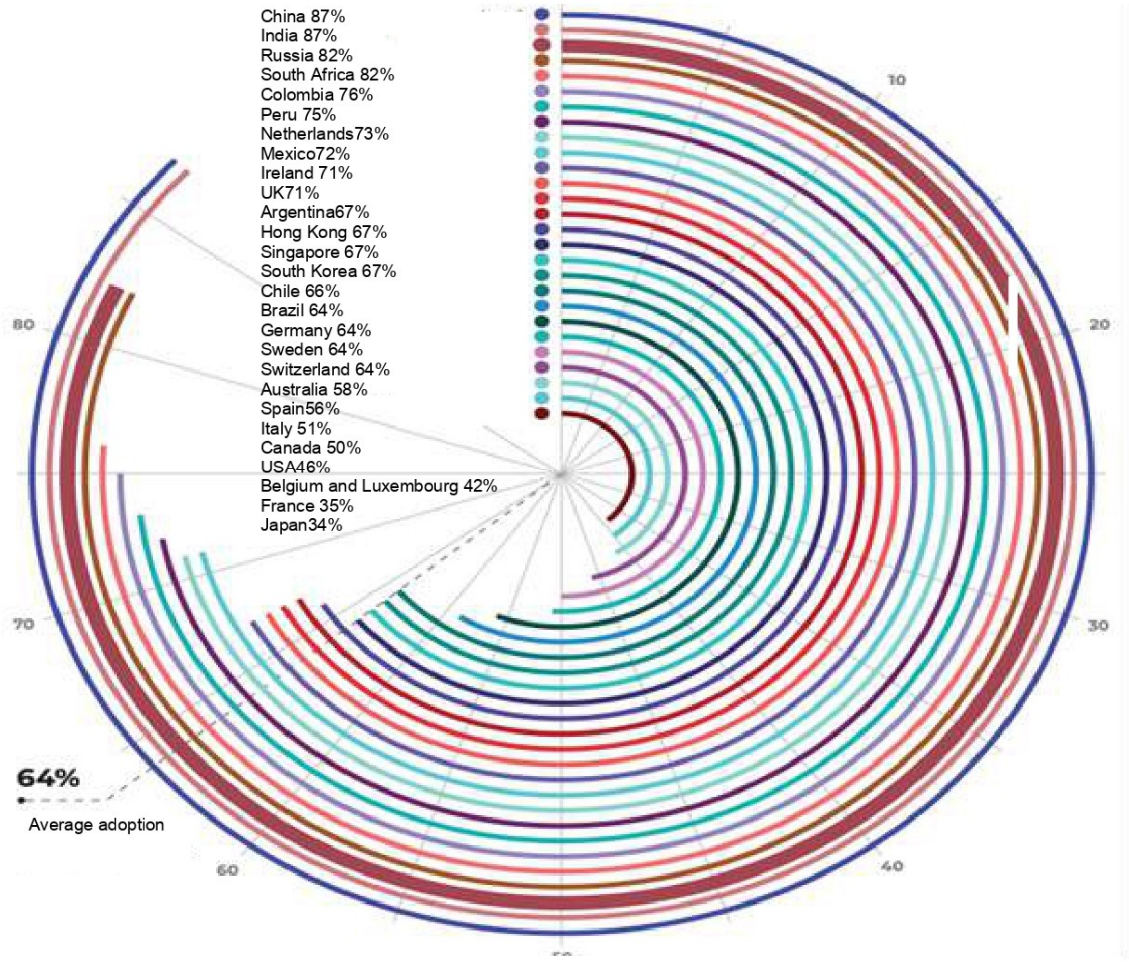

Fig. 1. **Russia's place in the global FinTech market and indicators of "technological" penetration**

Source: Global Fintech adoption index 2019. URL: https://www.ey.com/en_gl/ey-global-fintech-adoption-index (accessed on 26.12.2020).

mainly fintech startups. Many of them lacked two significant elements of the ecosystem: financial institutions and, more importantly, regulators. *Table 2* presents a grouping of financial technologies that allow transforming traditional banking into digital, based on fintech, as well as expanding the capabilities of credit institutions, gradually transforming them into ecosystems.

Regarding fintech, we meant exactly new technologies in the field of finance, namely blockchain, robotic consulting, mobile payments, and P2P lending (*Table 2*). This definition has undergone changes over the past five years. Today fintech is defined as innovative financial technologies that can be used to gain a competitive advantage, namely [10][8]:

- artificial intelligence, big data, and cloud technologies enable the teams with the best technological resources to outperform those without them;
- blockchain may have serious implications for the operation of financial institutions in the future. The technology has not yet matured and needs to overcome the obstacles to developing a sustainable

[8] Developing Skills for Innovative Growth in the Russian Federation. Report No. ACS 1549. The World Bank. June 10. 2013. URL: http://documents.worldbank.org/curated/en/460821468107067600 (accessed on 25.12.2020).

Table 2

Grouping of financial services and digital banking technologies

Financial services	Deposits and loans	Raising capital	Asset management	Payments and settlements	Insurance
FinTech activities	Digital banking Crowdfunding	Robo-advisers Intelligent formation of financial balances	Asset crowdfunding	E-money Digital payments and services	InsurTech Business models

Source: compiled by the authors (accessed on 25.12.2020).

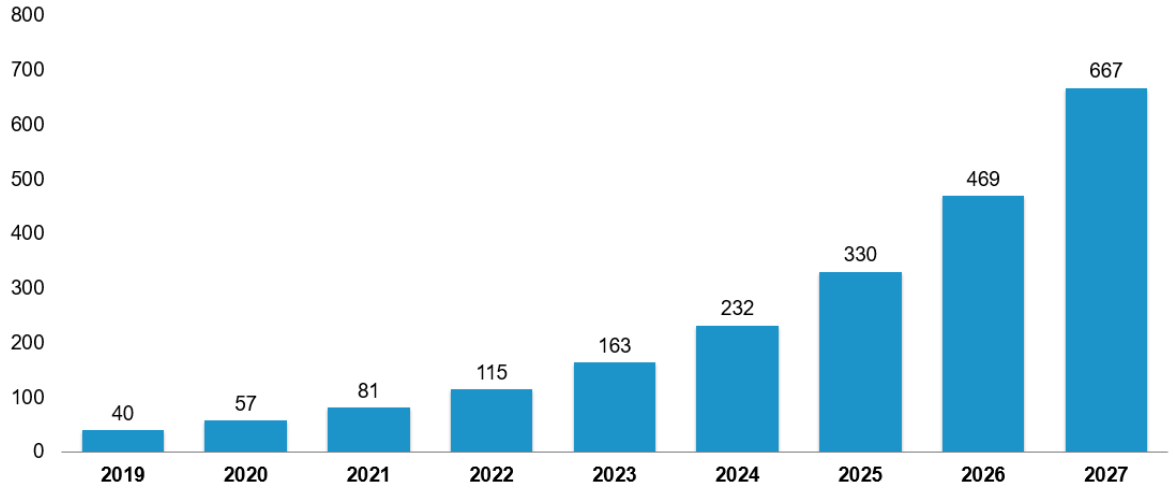

Fig. 2. **The size of the global artificial intelligence market, billion US dollars**

Source: Industries of the future. Investing in big data. URL: https://bcs-express.ru/novosti-i-analitika/industrii-budushchego-investitsii-v-iskusstvennyi-intellekt (accessed on 25.12.2020).

business model and gaining regulatory approval.

China leads the Asia-Pacific region in fintech development, with a focus on the new technologies mentioned above; in many other Asia-Pacific markets, fintech is still defined by alternative lending, mobile payments, robotic consulting, etc. [11]. According to research by Google Trends, the current interest in fintech around the world is 10 times higher than three years ago. So how will financial technology evolve? Will they replace or improve the financial services industry?

STAGES OF THE FINTECH IMPLEMENTATION IN THE BANKING AND FINANCE SECTOR

Over the past two years, CFA Institute has negotiated with many financial institutions, fintech entrepreneurs, regulators, researchers, technology companies, and venture capital investors in the Asia Pacific region. We believe that clear patterns emerge in the growth of fintech, both in terms of popular areas of activity and stages of development, which include the following.

Early stage: years before financial technology [12]. Financial institutions have

always invested heavily in the development of information technology (IT), associated with the acquisition of equipment, software, such as Fiserv and Oracle, attracting additional IT services and specialists in addition to their own teams.

The most difficult situation in banking IT. The regulatory and security burden made it extremely difficult to update information systems in a financial institution. Often, management had to sacrifice user-friendliness, fearing that installing a new system could cause compatibility and security issues for the bank's entire IT system.

Stage 1: formation. This stage is associated with the competition between IT financial service providers. Peer-to-peer lending, mobile payments, and robotic consultation were the three most active areas worldwide during the fintech development phase. The US was by far the leader in this phase, and many pioneers entered the fintech business even before the term fintech existed. PayPal, Betterment, Wealthfront, and Lending Club are the world's pioneers of fintech (*Fig. 2*).

Overall, the major financial markets in the Asia-Pacific region (APAC) entered Stage 1 around 2015–2016 [13]. China has clearly been a leader in the region, and current fintech leaders like CreditEase, Lufax, and Ant Financial (AliPay) opened their doors to service mostly around the same time as the US fintech pioneers. Russia entered the financial technology market only in 2017.

Typical emerging companies: fintech startups and venture capital firms. In most markets, successful fintech startups prefer to work with unserved or poorly served clients. For example, CreditEase lends primarily to borrowers that banks do not lend; AliPay only entered the market due to the lack of payment services that was an obstacle to the growth of its parent e-commerce company Alibaba.

Stage 2: building partnership. This stage is associated with the active interaction of leading players from both the financial services sector and the high-tech industry. ChinaAMC, a 2017 deal between a Chinese venture capital fund and Microsoft, and a similar deal between Bank of China and Tencent are notable examples of partnership. In early 2018, a joint venture between Amazon, Berkshire, and JPMorgan was created. Typical Stage 2 companies are leaders in financial services and technology.

Stage 3: sustainable development. Compared to the rapid changes observed during the formation stage, stage 3 is relatively stable. The positions of key players in the market will remain unchanged as the pace of development of technological and financial markets slows down. Most of the remaining market share will be held by successful Stage 1 companies. However, since Stage 2 companies entered the game, the competitive environment has become much more complex. In addition to the deterrent costs associated with customer acquisition and tight regulation, it is much more difficult to gain the trust of your customers so that they allow you to access the money.

Early-stage companies are likely to be largely liquidated if they resist change and stick to legacy systems. A plausible scenario is that over time, customers will move their businesses to successful Stage 2 and Stage 1 companies, with the result that firms using legacy systems will eventually become unprofitable. This trend will intensify as clients from the more tech-savvy younger generation become the main client base for high-tech financial services.

Typical Stage 3 companies: A small number of successful Stage 2 companies will dominate the market, while more successful Stage 1 companies will capture the remaining market share. While collaboration is key at this stage, there is a real risk of long-term disruption. Fintech players around the world will actively partner with shareholders and customers to actively implement the company's strategies, which will increase

their chances of success in the three stages of fintech development.

FINTECH DEVELOPMENT PROSPECTS IN THE BANKING SECTOR

The modern development of banking involves the modification of business models and the search for a suitable development strategy to revolutionize fintech-based business [14]. However, since banking can be very traditional, tech companies need to focus on integrating innovation and applying scenarios to succeed in the financial sector.

Over the past decade, artificial intelligence (AI) technologies have had a huge impact on the banking sector, they are disruptive innovations [14]. From a technical point of view, the use of artificial intelligence can be divided into two categories: basic AI and industry AI. Basic AI can be integrated into application systems such as face recognition, speech recognition, etc. Industrial AI is finding more applications in business, for example, for combating fraud, for robotic consulting, etc. Currently, the main technology of artificial intelligence is data-driven machine intelligence. The difference between the two categories is mainly about which takes over the data management or which uses the data to create AI models.

Depending on the level of technical development of the company, we have identified three phases of using artificial intelligence [15]:

1) business automation;

2) big data analysis;

3) comprehensive intelligent decision making.

The first phase is business automation, that is, banks revolutionize their products and processes and replace repetitive work with artificial intelligence [16]. At the first phase, it is possible to continuously improve the efficiency of banking activities (for example, through the use of smart contracts and robo-advisers). In addition, the introduction of basic artificial intelligence applications such as mobile bank biometrics, smart meters, and other scenarios can solve the key problem of customer verification and the implementation of various business processes. Big data analysis is the next phase in the development of artificial intelligence. Technological innovation will bring more use cases, which in turn are supported and driven by big data. In fact, research and the use of big data in banks began before the use of artificial intelligence. The current focus is on integrating basic AI and industry AI to improve customer experience.

The combination of big data and basic AI can enhance the intelligence of system products and business processes. However, key technologies must evolve independently, including customer and product profiling, behavior analysis, personalized recommendation engines, etc.

The third phase in the development of AI is the implementation of intelligent solutions across all channels, seamless connection of customer identification, predicting behavior and other channels, updating dynamic optimization based on customer response. The bank must reach an internal consensus and build an effective collaboration mechanism from business process creation to system development, from product design to marketing support, from simple data analysis to data mining.

In recent years, big data has been widely used in many areas of banking, from financial reporting to data mining models for transactions and products.

These use cases and modeling are the three main areas for banks to apply big data analytics. In fact, one can start developing a data-driven product in any of three ways. For example, a transformation into a business that uses big data applications can start by analyzing the data that is used in traditional banking. Determining the direction of use of internal and external big data in a bank can be relevant to risk management

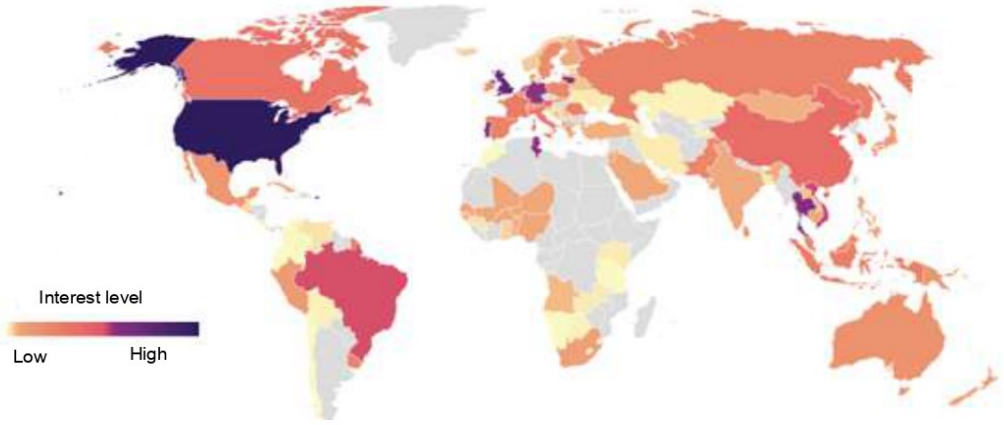

Fig. 3. **The activity of the world's Central banks in the study of blockchain technology**
Source: MINDSMITH Analysis, 2021. URL: https://mindsmith.io/blockchain-central-banks/ (accessed on 26.12.2020).

and marketing. Finally, businesses need innovative models and technologies to address new challenges. According to the 80/20 rule, most big data applications must be derived from business intelligence and do not necessarily require "huge" data and "esoteric" technologies, which is a serious problem in practice [17].

Cloud technology is the use of the Internet to access applications, data, or services that are stored or run on a remote server. Cloud computing typically exists at one of three tiers: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Digital infrastructure provides performance enhancements to underlying resources, while PaaS serves as the primary platform for hosting applications. Infrastructure development is constrained by many objective conditions in the bank, including technical failures, computer hardware, software, and other problems. By looking at the banking technology platform from a fintech perspective, besides the standard development middleware, we are trying to make it a platform for the other three core technologies (ABD). Based on the deep development of open source technology, the bank can create a platform with independent intellectual property rights. For small and medium-sized financial institutions, it is more cost-effective to use a PaaS platform than to invest in innovative applications.

Finally, the software layer directly provides an application corresponding to business scenarios [18]. These can be cloud banking services such as cloud payments or fintech cloud services, risk management, marketing, operations, and other smart products.

Blockchain is one of the most controversial, but highly demanded technologies [19]. Two factors are limiting the widespread adoption of blockchain:

1. The technology is not mature enough. Its performance, privacy concerns, operation and service are substandard for corporate use.

2. The business model is not ready. In a multi-center scenario, it is difficult for different parties to reach a consensus.

However, this certainly does not mean that the blockchain is not good enough, but rather that there are not enough good projects in the blockchain space. Blockchain 1.0 is a digital currency represented by Bitcoin; blockchain 2.0 is a smart contract platform represented by Ethereum; blockchain 3.0 is moving forward in the fields of cryptography, consensus algorithms, cross-chain

combining, performance optimization, etc. (*Fig. 3*).

In addition, the development of fiat digital currency could be a breakthrough for the blockchain. Although there is no direct connection between them, it can be expected that the emergence of fiat digital currency will open up great potential for the development of existing blockchain applications, as evidenced by the data in *Fig. 3*. In our opinion, only 10% of countries have actively introduced this technology into the business processes of national economies, therefore they have great development opportunities.

Finally, compared to artificial intelligence, big data, and cloud computing, blockchain applications are completely technology-driven. In our opinion, the use of such a "clean" technology is worth the effort.

Therefore, banks can develop a global perspective only by building their new business model based on the use of the entire range of financial technologies.

CONCLUSIONS

Thus, the change in the architecture of the financial sector is primarily associated with advanced financial technologies, thanks to which banks and financial institutions create their ecosystems. The transition from a traditional system of offering financial services to a digital one provides great opportunities for both large financial companies and fintech startups to work with banks or financial institutions. As more and more key financial infrastructure projects are launched, there will be more players who will be interested in adopting digital financial technologies. And this is the prospect of the next five years.

Artificial intelligence will be fundamental to improving core banking processes and transforming the banking industry. This will improve its performance by simplifying and streamlining traditionally lengthy and extensive operations and improving fraud detection. One example is an anti-money laundering machine learning solution jointly developed by OCBC Bank and fintech ThetaRay. This significantly reduced the volume of transactions verified by anti-money laundering analysts and increased the accuracy of detecting suspicious transactions by more than four times.

In addition to improving operational efficiency, artificial intelligence also enables the creation of new or more personalized offerings, anticipating customer needs and changing the way of interaction with them, making it more natural and smoother. One example is the voice-enabled OCBC mobile banking application. And such a "bank of the future" will provide customers with natural, convenient, and personalized banking services.

To take advantage of all the opportunities that the digital economy can bring, financial institutions and government agencies must increase and improve their digital services, such as:

- digital identity systems that allow citizens to have access to public, commercial and financial digital services;
- data protection regimes that distribute rights and obligations for access and exchange of consumer data;
- cybersecurity strategies that help reduce cybersecurity, mitigate risks, and effectively respond to and recover from cyber-attacks;
- open banking initiatives, which allow banks to share customer data subject to consent with third parties, and innovation promotion initiatives, which enable innovation in digital financial services that are interesting and profitable for the market.

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Pension Insurance in Russia: Current State and Transformation Opportunities

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ABSTRACT

The article examines and analyzes the essence of pension relations in modern Russia. The aim of the article is to study and test the hypothesis that an important factor in ensuring the effectiveness of the Russian pension system is a clear definition of the essence of economic relations in it, as well as adequate legal and organizational formalization of these relations. The scientific novelty of the study lies in the analysis of the validity and adequacy of applying (from terminological to organizational and practical levels) the classical insurance principles in the organization of the pension system, as well as the possibilities of increasing the efficiency of this system on the basis of the insurance sector. The research methodology is based on the analysis of the genesis and current state of the Russian pension system. The results of the study indicate that the structure of the Russian pension system requires serious reorganization, in particular, a clear distinction between the insurance (pension insurance) and non-insurance (pension provision) segments. The authors substantiated that pension insurance should be based on the classical principles of life insurance, and insurers who have an appropriate license obtained under the Law "On the organization of insurance business in the Russian Federation" should be involved in the implementation of this insurance. At the same time, non-state pension funds must either be transformed into life insurers, or acquire new functionality within the framework of pension provision (the non-insurance part of the pension system). The practical implementation of the research results and related recommendations will allow, according to the authors, to organically structure the insurance and non-insurance segments of the Russian pension system and increase its efficiency. The authors conclude that the construction of pension insurance on the basis of the classical principles of life insurance will make it possible to fully use the accumulated global and domestic experience of using life insurance as a reliable instrument for financing pensions. At the same time, it is necessary to extend to pension relations the norms of regulation of the insurance market and state insurance supervision, which have proven their effectiveness.

Keywords: pension; pension savings; pension provision; pension reserves; pension system; pension insurance; life insurance; financial investments; pension financing instrument

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INTRODUCTION

Due to the aging of the population, the pension issue has become an urgent national problem. The pension system of the Russian Federation is the subject of heated disputes not only of individual political groups, various economic discussions but also of broad strata of the population. The relevance of the topic under consideration is confirmed by constant discussions about the effectiveness of the pension system of the Russian Federation by such scientists as V.D. Roik, A.K. Solov'ev, A.L. Safronov, E. Sh. Gontmakher, M.E. Dmitriev and others. At the moment, the focus of attention of scientists and practitioners remains the problem that the principles and tools used for the implementation of pension relations do not always allow gradually and consistently achieve the set goals [1–4]. A majority of current and future pensioners is, to one degree or another, dissatisfied with the amount of the assigned and future pension [5–7].

Moreover, repeated sharp reversals within the framework of reforming the pension system in Russia, individual volitional actions of the authorities (for example, freezing pension savings) led to a significant decrease in public confidence in long-term financial investments within pension savings [8, 9].

The authors analyzed various, sometimes opposite points of view expressed in Russian and foreign sources, speeches of domestic and foreign experts on the reasons for the shortcomings of the Russian pension system and ways to overcome them [8, 10]. Based on the analysis, a hypothesis has been put forward that an important factor in ensuring the effectiveness of the Russian pension system is a clear definition of the essence of economic relations existing within the pension system, its main elements, as well as adequate legal regulation and the organizational design of these relationships.

Considering the fact that pension insurance (more precisely, mandatory pension insurance) is the most important part of the Russian pension system, to test the hypothesis put forward, it seems relevant to solve the following tasks:

- analyze whether modern mandatory pension insurance in the Russian Federation is included in the system of insurance relations and whether it complies with the essence and basic principles of insurance;
- analyze what goals and objectives of the pension system can potentially be achieved with the help of pension insurance; what principles should underlie the organization of pension insurance;
- determine the composition and structure of pension insurance organizations, their goals, objectives, and functions;
- analyze the content of pension insurance products.

MATERIALS AND METHODS

It is advisable to start testing the hypothesis put forward with an analysis of the genesis of the modern pension system in Russia. It was formed on the basis of the USSR pension system, which was fully functioning at the expense of state funds and seemed non-viable in a developing market. With all the scope of ideas, it can be assumed that at the beginning of the post-Soviet reforms, the authors did not have a clear plan for their implementation. As an argument in favor of this point of view, one can cite the Constitution of the Russian Federation, which reflected the comprehensive view of the authors of the reforms on the fundamental foundations of the political and socio-economic structure of the country.[1]

Consideration of the essence and content of economic relations within the pension system of Russia is carried out on the basis of the normative acts that form this system. To begin with, we note that there is no direct mention of the national pension system in the Constitution of the Russian Federation,

[1] Constitution of the Russian Federation: adopted on June 12, 1993. Moscow: Jurist; 2012. p. 48.

pensions are meant only as an integral part of social security guaranteed to everyone "by age, in case of illness, disability, loss of a breadwinner (survivors' pension), for raising children and in other cases established by law" (Article 39 of the Constitution of the Russian Federation). The mention in paragraph 2 of the same article of state pensions, on the one hand, postulates the existence of such pensions in the country, at the same time, oddly enough, in modern pension legislation, this concept is not used enough. In addition, a fair question arises about the content of the concept of "state pension", as well as the possibility of the existence of the concept of "non-state pension" and the procedure for establishing such a pension.

The essence of the transformation of the Soviet pension system, first of all, was the creation of a mechanism for the payment of pensions to workers in the non-state sector of the economy. The Law "On State Pensions", adopted at the end of 1990, established that the source of funding for such pensions should be contributions from employers. Among other things, the official website of the PFR summarizes: "Thus, the government hoped to emphasize the idea of solidarity between people of different ages in order to guarantee decent aging for people".[2] It is unambiguously argued that the principles of distribution (principles of solidarity) were used, on which the majority of pension systems in the world were created and function.

The same law, in our opinion, creates preconditions for future terminological errors and methodological confusion, which to a large extent still determine the current difficulties and problems of the Russian pension system.

The contributions that employers must pay to the Russian pension fund are defined as *insurance* contributions. It should be noted that in common speech, the concept of "insurance" and the adjective "insured" derived from it has a variety of meanings. At the same time, in scientific literature, normative acts, the use of the term "insurance" in the overwhelming majority of cases means the use of methods to protect subjects from damage as a result of accidental unforeseen events using methods and, most often, insurance contracts.[3] Analyzing the nature of contributions to the Russian Pension Fund, the authors proceed from this understanding.

To date, an integral system of insurance law has developed in Russia, which adequately reflects the economic essence and theoretical foundations of insurance. In accordance with it, insurance is understood as a set of economic relations aimed at protecting the property interests of insured persons by reimbursing their losses in the event of insured events at the expense of specialized monetary funds formed by the insurer. In this case, insurers can be either organization licensed to carry out insurance activities (in accordance with the Law "On the organization of insurance business"), or organizations that are granted this right by a special law (certain types of social insurance, deposit insurance, export insurance, etc.).

At the same time, in all these cases, the basic theoretical principles of insurance are preserved and implemented, which include the following:

- protection against insurance risks — perceived, accidental and probable dangers in the event of which insurance is carried out;
- reimbursement of potential losses that the insured person may incur in the event of the occurrence of insurance risks;
- organization of closed and joint financial distribution of these losses through the use of specialized funds generated from insurance premiums (contributions) paid by policyholders, reinsurance opportunities, as well as from the insurer's own funds.

[2] URL: https://pfrf.ru/fag/etapy-reformirovaniya-pensionnoj-sistemy.html (accessed on 04.05.2020).

[3] See, for example, the Great Encyclopedic Dictionary. URL: https://rus-big-enc-dict.slovaronline.com (accessed on 25.03.2020).

Table 1

The structure of the pension system of the Russian Federation

Russian pension system				
	State pension provision (SPP)	**Mandatory pension insurance (MPI)**		**Non-state pension provision**
Types of pensions	Civil servant pension, social pension	Insurance pensions	Cumulative pension	Additional pension under a pension agreement
Basic normative act	Federal Law of December 15, 2001, No. 166-FZ "On State Pension Provision in the Russian Federation"	Federal Law of December 15, 2001, No. 167-FZ "On Mandatory Pension Insurance in the Russian Federation"; Federal Law of December 28, 2013, No. 400-FZ "On Insurance Pensions"	Federal Law of December 15, 2001, No. 167-FZ "On Mandatory Pension Insurance in the Russian Federation"; Federal Law dated 28.12.2013, No. 424-FZ "On funded pension"	Federal Law of 07.05.1998, No. 75-FZ "On Non-State Pension Funds"
Subjects	Federal Agencies of Executive Authorities (FAEA), Pension Fund of Russia (PFR), pension recipients	Insurer (PFR), policyholders (employers); insured (recipients of pensions)	Insurers (PFR, Non-State Pension Fund (NPF)); policyholders (employers); insured (recipients of pensions)	Fund (NPF); contributors (payers of contributions); participants (recipients of pensions)
Sources of funding	State budget	Insurance premiums of those currently employed by the MPI	Contributions of policyholders (including co-financing). Pension savings of the insured	Contributions of contributors. Pension reserves

Source: compiled by the authors.

The hypothesis put forward by the authors involves testing the extent to which the pension system, originally defined as an element of **social insurance**, implements the principles discussed above.

The further development of the pension system in Russia is analyzed from these positions. In particular, in 1999, the Law "On the Basics of Mandatory Social Insurance",[4] was adopted, which, as one of the insured events, provides for reaching the retirement age and includes the following types of insurance coverage:

- old-age pension;
- disability pension;
- survivors' pension.

This was followed in 2001 by the Law on Labor Pensions,[5] according to which labor pensions were paid in connection with the onset of incapacity for work due to old age or disability, as well as in case of loss of income as a result of the loss of the breadwinner. At the same time, the old-age labor pension consisted of two parts: insurance and funded.

Subsequently, the pension system as a whole and its individual elements were

[4] On the basics of mandatory social insurance: Federal Law of June 16, 1999, No. 165-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_4059/ (accessed on 11.03.2019).

[5] On labor pensions in the Russian Federation: Federal Law of December 17, 2001, No. 173-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34443/ (accessed on 15.06.2019).

finalized in terms of defining the essence of pension relations, methods, and tools for their implementation. At the same time, at all stages of reforming the pension system, the fact that if not the entire system, then a significant part of it is based on insurance principles, was not questioned [3, 11].

RESULTS AND DISCUSSION

The analysis shows that after numerous reforms and various kinds of "adjustments" (successful and not very successful), the modern pension system in Russia consists of three blocks,[6] within which pension relations arise, the composition of the modern pension system is schematically reflected in the *Table. 1*.

We consider each of these blocks in terms of its insurance relationship.

1. State pension provision.

At the moment, in our opinion, an integral and internally consistent system of state pension provision has been formed.[7] This applies to certain categories of citizens to whom the state guarantees the payment of pensions.

The source of state pension provision is primarily state budget funds, and the amount of pensions is determined by special state decisions. The state also determines the procedure for the assignment, formation, and payment of state pensions.

Currently, the right to receive a state pension have:

- civil servants and military personnel of the federal government (long service pension);
- disabled people (social pension);
- certain categories of citizens (certain types of pensions for old age, disability, and loss of a breadwinner).

State pensions in one form or another exists in most countries and will undoubtedly remain in our country. At the same time, the volume of pension relations of this type will be limited mainly to civil servants, as well as to those persons who, due to objective reasons, cannot claim other types of pensions [12–14]. It should be noted that the terminology in this case accurately reflects the economic essence and content of the emerging relations. The state allocates funds and provides them to certain categories of pensioners. At the same time, the principles of insurance are not used in this case, therefore, further state pension provision remains outside the scope of our study.

2. Mandatory pension insurance.

As already noted, fundamental economic reforms in the country required the formation of a new model of the pension system for employees of non-governmental organizations and enterprises at the expense of employers' contributions. These premiums were originally defined as insurance. Subsequently, pensions were included in the compulsory social insurance coverage (1997),[8] and already in the 21st century the system of mandatory pension insurance (hereinafter referred to as MPI) was finally formed, which now covers most of the pensioners[9] [15]. Data on the number of pensioners receiving various types of pensions are shown in *Table 2* and *Fig. 1*.

Hereafter, we will consider the content of relations on mandatory pension insurance, their compliance with the basic principles of insurance discussed above. We start with the goal of mandatory pension insurance. This goal is to compensate for the loss of wages and to make other insurance payments as a result of the loss of a breadwinner by people with disabilities.

[6] The names of the blocks of the pension system are given in accordance with how they are defined in the current legislation.

[7] On state pension provision in the Russian Federation: Federal Law of December 15, 2001, No. 166-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34419/ (accessed on 22.06.2019).

[8] On the basics of mandatory social insurance: Federal Law of June 16, 1999, No. 165-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_4059/ (accessed on 11.03.2019).

[9] On mandatory pension insurance in the Russian Federation: Federal Law of December 15, 2001, No. 167-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34447/ (accessed on 18.07.2019). On labor pensions in the Russian Federation: Federal Law of December 17, 2001 No. 173-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34443/ (accessed on 15.06.2019).

Table 2

Number of pensioners by type of pension, thousand people

	2012	2013	2014	2015	2016	2017	2018	2019
Total number of pensioners	42 367	42 837	43 327	43 797	45 182	45 709	46 070	46 480
of them receiving pensions:								
old-age pension	32 982	33 451	33 950	34 442	35 555	36 004	36 336	36 710
disability pension	2689	2590	2511	2418	2365	2280	2202	2137
survivors' pension (for each disabled family member)	1591	1562	1541	1527	1608	1628	1636	1632
victims of radiation and technological disasters and their family members	284	298	302	312	332	382	422	443
federal public servant	56	62	67	66	71	68	74	77
length of service	1913	1964	2009	2044	2142	2212	2243	2292
test pilot	1	1	1	1	1	1	1	1
social	2851	2909	2946	3007	3108	3134	3156	3188

Source: compiled by the author based on the Federal State Statistics Service data.

This goal reflects the socio-economic orientation of the Russian state, as well as the social significance of labor, as a result of which the material base of future pensions is created. Moreover, this goal can be achieved both through the use of insurance and other (non-insurance) instruments.

We will begin the analysis of the essence of relations on mandatory pension insurance with the subject composition of these relations. The law concerns the subjects of mandatory pension insurance of policyholders, insurers and insured persons.[10] The list of subjects is quite traditional for insurance economic relations, but attention should be paid to a number of significant nuances. The insurer performing the MPI is the Pension Fund of the Russian Federation. As noted above, the insurer can indeed be determined by law, and this practice is found in many types of mandatory insurance, primarily those that are of great social importance (compulsory health insurance; compulsory state social insurance against industrial accidents; deposit insurance, etc.).

The role and importance of the Pension Fund of Russia (PFR) as an insurer is emphasized by the fact that the state bears subsidiary responsibility for the obligations of the PFR to the insured.

[10] On mandatory pension insurance in the Russian Federation: Federal Law of December 15, 2001, No. 167-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34447/ (accessed on 18.07.2019).

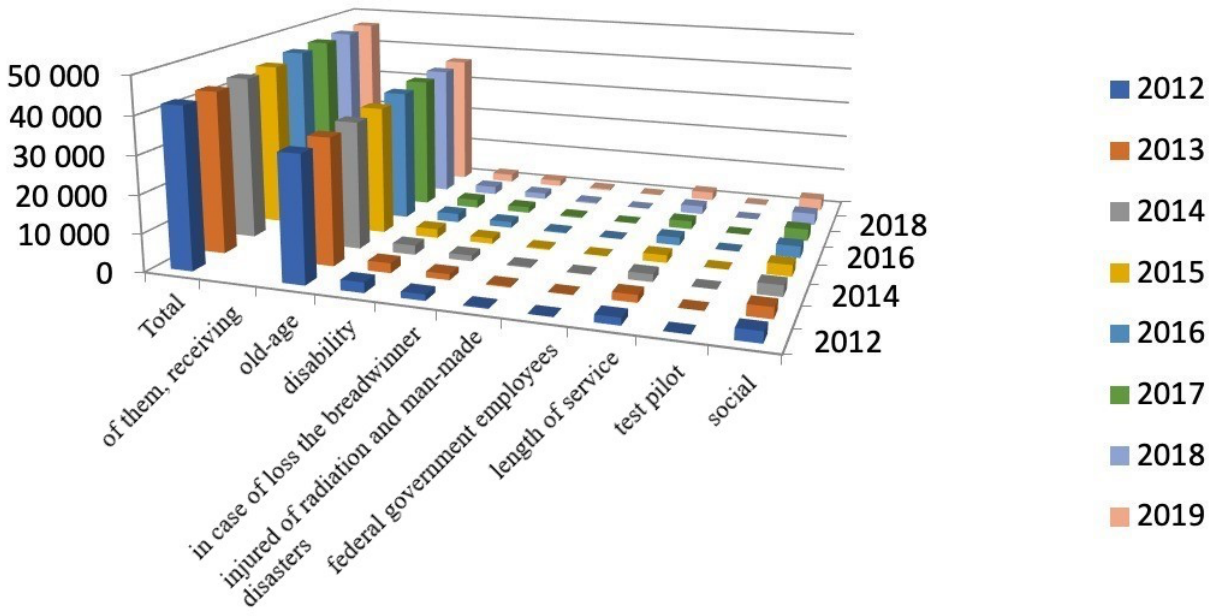

Fig. 1. **Dynamics of the number of pensioners in the Russian Federation**

Source: compiled by the author based on Rosstat data. URL: https://rosinfostat.ru/pensii/#i-3 (accessed on 20.08.2020).

Along with this, non-state pension funds (NPF) can act as insurers for MPI in some cases. The ratio of PFR and NPF as insurers is shown in *Fig. 2*.

In our opinion, this concept requires additional research. In our country, insurers are either organizations licensed to carry out insurance activities by types of insurance activities provided for by the Law "On the organization of insurance business", or specially created organizations by types of insurance carried out based on special laws.

These two models exist autonomously and practically do not overlap with each other. In this regard, it is not at all obvious that it is necessary to work within the framework of one type of insurance for two different categories of insurers (PFR and NPF). In addition, it is doubtful that the fact of the NPF obtaining the status of an MPI insurer is based only on the decision of the insured to refuse to receive a funded pension from the Pension Fund of the Russian Federation and transfer his pension savings to the NPF. Data on the transfer of the insured are presented in *Fig. 3*.

The economic nature of NPFs is also not entirely clear. They can participate in the MPI only under the following conditions:

- availability of an MPI license from the Bank of Russia;
- participation in the system of guaranteeing the rights of insured persons.

Classically, pension insurance is a type of life insurance, this is how it developed in most countries on the basis of the principles of endowment insurance. The modern Russian insurance business suggests the possibility of concluding pension insurance contracts within the framework of a license for the right to carry out life insurance. At the same time, NPFs and their license for MPI have nothing to do with the above activities. Moreover, the activities of NPFs also presuppose the possibility of concluding contracts of non-state pension provision, which is not related to insurance under the law [10]. This combination directly contradicts the provisions of the Law "On the organization of insurance business", which considers the activities of insurers as exceptional.[11]

[11] On the organization of insurance business in the Russian Federation: Federal Law of 27.11.1992, No. 4015–1-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_1307/ (accessed on 10.05.2019).

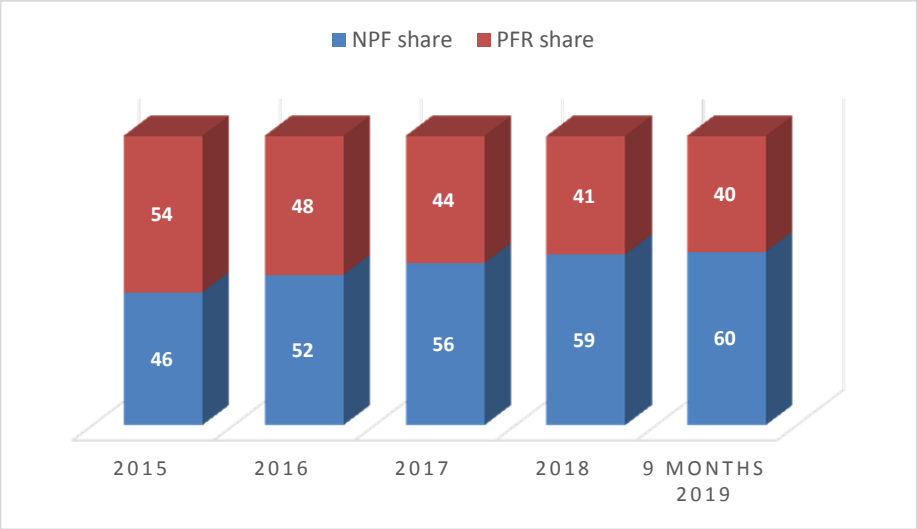

Fig. 2. **Structure of pension savings, %**

Source: compiled by the authors based on the Bank of Russia data. URL: https://cbr.ru/collection/collection/file/25628/rewiew_npf_19q3.pdf (accessed on 06.07.2020).

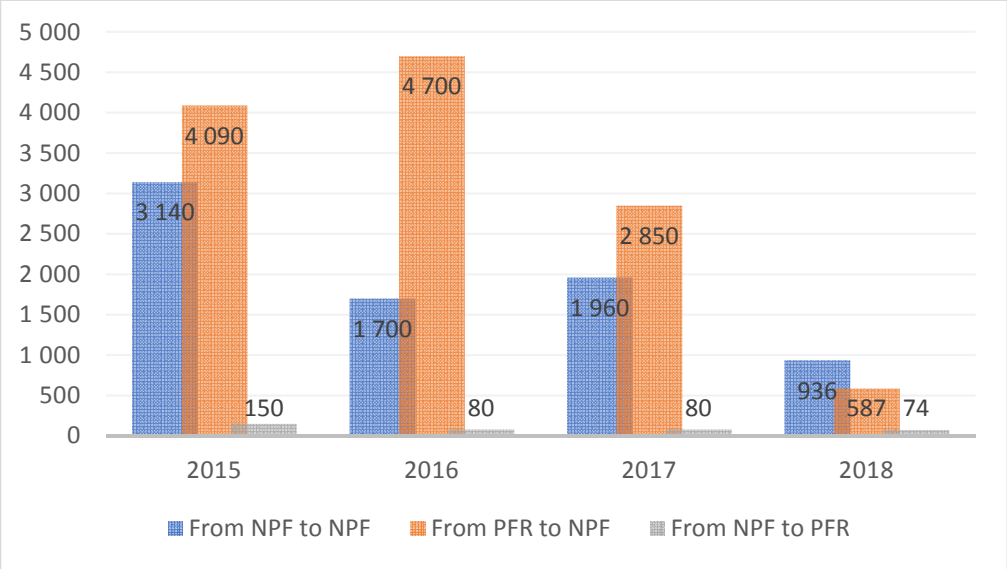

Fig. 3. **Structure of transfers of pension savings, thousand people**

Source: compiled by the authors based on the Russian Pension Fund data.* URL: http://www.pfrf.ru/files/id/press_center/godovoi_otchet/Pension-fund-Annual-report-2018.pdf / (accessed on 02.07.2020).

* Russian Pension Fund. Annual report 2018.01.12.2018. URL: http://www.pfrf.ru/files/id/press_center/godovoi_otchet/Pension-fund-Annual-report-2018.pdf (accessed on 02.07.2020).

Its specificity is both in the functionality and in the status of policyholders and insured persons in the MPIs. The first is that employers pay premiums; in most cases they are policyholders, and insured persons do not pay insurance premiums, i.e. do not have the status of policyholders. Moreover, according to the law, they are the beneficiaries. In general, such a system of relations corresponds to the principles and customs of business turnover prevailing in insurance. But deviations from the basic principles of insurance that exist in the MPI system lead to certain distortions in the relationships of subjects. The most characteristic of them is the legislative endowment of the insurer

with the right of MPI to represent the interests of the insured persons before the policyholders (employers).[12] From the point of view of traditional insurance, the insurer represents one side of the contract, and the policyholder (insured, beneficiary) — the other. This is a normal trade and economic expression of insurance relations, and the structure of relations between the insurer, the policyholder and the insured person postulated by law looks at least strange.

Secondly, it does not seem logical to justify the obligation of this insurance. The compulsory form of insurance implies a statutory obligation for certain categories of persons to conclude an insurance contract on certain conditions. Taking this into account, the concept of "mandatory insurance for compulsory pension insurance" seems somewhat strange.[13] And it is provided for by Art. 29 of the same law and other normative acts voluntarily entering into legal relations on mandatory pension insurance as a whole look like an oxymoron. There is a strong impression that the concept of "mandatory" in relation to today's pension insurance was adopted not on the basis of an established understanding of the principles of a mandatory form of insurance, but from other, largely random considerations.

As already noted, the basic concepts of insurance arising from its principles are "insurance risk", "insured event", "losses as a result of the occurrence of an insured event". The use of these concepts in modern MPI is also of research interest. In accordance with Art. 8 of the Law "On Mandatory Pension Insurance in the Russian Federation":

- insurance risk — loss of earnings due to the occurrence of an insured event;
- insured event — reaching retirement age; the onset of disability, loss of the breadwinner.

This interpretation, in our opinion, contradicts at least two fundamental principles of the theory and practice of insurance. First, it is generally recognized and enshrined in legislative acts that insurance risk is only an assumed event with signs of chance and probability, in which case an insurance contract is concluded. In turn, an insured event is a realized insured risk subject to the additional conditions necessary for the insurance payment. In other words, the insured event is the result of the realization of the insurance risk, arises from it, and is its consequence.

In the modern Russian MPI, in this sense, everything is turned upside down. From the above formulations of the law, it follows that the insurance risk (loss of earnings) is the result of the occurrence of an insured event (the onset of retirement age, etc.), which is unreasonable from the point of view of insurance. At a minimum, the content of these provisions of the law should be changed by changing the content of the concepts in places:

- insurance risk — the expected achievement of retirement age; the onset of disability or loss of a breadwinner, in which case survivors' pension insurance is provided;
- insured event — loss of earnings as a result of realization of the insured risk.

Second, the revised definition of insurance risk is still not satisfactory. The theory and practice of insurance require that events taken as an insured risk have signs of chance and probability, and also carry a threat of unforeseen costs for the insured.

From this point of view, if the legitimacy of the definition of disability and the fact of loss of the breadwinner as an insurance risk is not in doubt, then with reaching the retirement age the situation is somewhat different. The fact is that the death of the insured person is not an insured event, and therefore the fact of his survival until the onset of retirement age is not accidental, but, most likely, a certain event takes place. In this case, it is more correct to talk about the survival

[12] On mandatory pension insurance in the Russian Federation: Federal Law of 15.12.2001, No. 167-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34447/ (accessed on 18.07.2019).

[13] See above.

Table 3

Main indicators of the budget execution of the Pension Fund of Russia, RUB million

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Income	3,222,649	4,610,084	5,255,643	5,890,364	6,388,390	6,159,065	7,126,634	762,5247	8,260,076	8,269,641
among it:										
taxes, insurance premiums	1,273,364	1,929,016	2,833,863	3,040,391	3,480,589	3,712,721	3,879,872	4,144,948	4,495,935	4,963,609
from the federal budge	1,946,726	2,648,397	2,384,201	2,819,513	2,846,589	2,413,018	3,091,683	3,355,303	3,680,392	3,232,322
Expenditure	3,008,660	4,249,235	4,922,109	5,451,219	6,378,549	6,190,128	7,670,270	7,829,672	8,319,455	8,428,692
among it:										
to finance payments to the population — pensions, benefits	2,872,257	4,013,179	4,419,227	4,897,289	5,671,313	5,798,943	6,322,415	6,677,467	7,024,963	7,419,375
of which to monthly payment	263,583	293,639	311,939	325,428	352,708	341,422	358,755	383,361	396,012	404,961
mandatory pension insurance	2,374,496	3,381,118	3,756,816	4,166,610	4,852,121	4,980,071	5,785,958	6,054,926	6,382,192	6,753,411
provision of maternity (family) capital	41,971	97,625	171,208	212,315	237,419	270,734	328,580	365,250	311,773	302,133
to finance the costs of maintaining the executive body of the Fund	61,792	68,304	84,599	92,798	95,694	99,360	104,774	107,246	110,969	115,492

Source: compiled by the authors based on the Rosstat data.* URL: https://rosstat.gov.ru/free_doc/new_site/finans/gfin_tab1.htm (accessed on 27.07.2020).

* Execution of the budgets of state extra-budgetary funds. Rosstat. 06.06.2019. URL: https://rosstat.gov.ru/free_doc/new_site/finans/gfin_tab1.htm (accessed on 27.07.2020).

risk (longevity risk) traditionally accepted in life insurance, when the supposed risk event is not the fact of death itself, but the time of its occurrence. With this in mind, it is necessary to clarify the definition of insured events and some other provisions on pension insurance.

Then, we will consider the payment of insurance coverage under the current mandatory pension insurance. It was noted above that the wording "mandatory insurance for mandatory pension insurance" is contradictory, therefore, without returning to this problem, we will consider the main types of insurance coverage. This includes:

- insurance pensions;
- funded pensions;
- various payments (fixed, urgent, lump sum, etc.).

Since the various benefits provided by law are similar in nature to insurance or funded pensions in different specific conditions and circumstances, it is sufficient for this study to consider the nature and content of insurance and funded pensions.

We start with insurance pensions, which today constitute the overwhelming majority of insurance coverage in the MPI. The place and role of insurance pensions in the pension system of the Russian Federation characterize the main indicators of the PFR budget execution (*Table 3*).

The origins of these, as well as other types of pensions, lie in the Soviet system of state pensions. With the evolution of this system, old age (disability, loss of breadwinner) pensions, formed from

employers' contributions, have emerged. Then they were transformed into the insurance part of the labor pension and, finally, acquired the current type of insurance pensions in the MPI.[14] In the process of the genesis of insurance pensions, some definitions, the organization of individual processes and the subject composition changed, while the nature and basis of relations did not fundamentally change.

At the beginning of the analysis, we once again note, at least, the incorrectness of the wording inherent in the current provisions on mandatory pension insurance, which has already been repeatedly mentioned above. It is logical that within the framework of mandatory pension insurance, all types of payments to the insured should be of an insurance nature. Therefore, defining "insurance pensions" only as a part, albeit very significant, of insurance coverage does not seem correct. In addition, the opposite reasoning is also possible: since in addition to insurance pensions, there are other types of insurance coverage (funded pension, etc.), are they insurance in nature or are they something else?

We move from terminology to an analysis of the essence of insurance pensions and related relationships. Insurance pensions refer to that part of the pension system that is based on a solidarity (distribution) relationship. This is directly confirmed in Art. 3 of Federal Law No. 167-FZ of December 15, 2001,[15] according to which payments of insurance coverage not related to a funded pension are financed from the "solidary part of the rate of insurance premiums".

It should be noted that the overwhelming majority of national pension systems were built and developed on the basis of solidarity relations. In particular, the first such system emerged at the end of the 19th century in Germany, it was figuratively called the "contract of generations". Until now, most of the existing pension systems in different countries largely include a solidarity component [16–18].

The meaning of the relationship of solidarity boils down to the fact that part of the income of the working population, directly or indirectly (through employers), is sent to the administrator of the pension system to be converted into pensions of the non-working population [19]. The following essential features are inherent in solidarity pension relations:

- payments of pensions are made at the expense of current receipts;
- pensioners do not participate in the formation of their own pension;
- the amount of pensions is set by the state taking into account the emerging financial condition of the pay-as-you-go pension system and the demographic situation;
- the pension of today's working population will depend on the contributions of future generations and is not related to the current level of income of the population, which is confirmed by the analytical materials of the state statistics bodies (*Fig. 4*).

The pension system is significantly influenced by changes in the demographic situation associated with an increase in the proportion of the non-working population[16] [20]. The quantitative characteristics of this trend are shown in *Fig. 5*.

In these conditions, pay-as-you-go pension system remain an important element that largely ensures the stability of pension systems in various countries. At the same time, on the one hand, the budget of the pay-as-you-go pension system is increasingly

[14] On insurance pensions: Federal Law of December 28, 2013, No. 400-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_156525/ (accessed on 18.06.2019).

[15] On mandatory pension insurance in the Russian Federation: Federal Law of December 15, 2001, No. 167-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34447/ (accessed on 18.07.2019).

[16] Pensions at a Glance 2019 OECD and G20 indicators. OECD iLibrary. 27.11.2019. URL: https://www.oecd-ilibrary.org/docserver/b6d3dcfc-en.pdf?expires=1606056556&id=id&accname=guest&checksum=4BEBDE 3EEB 15AD 4601DBE 400714E 4643 (accessed on 20.09.2020).

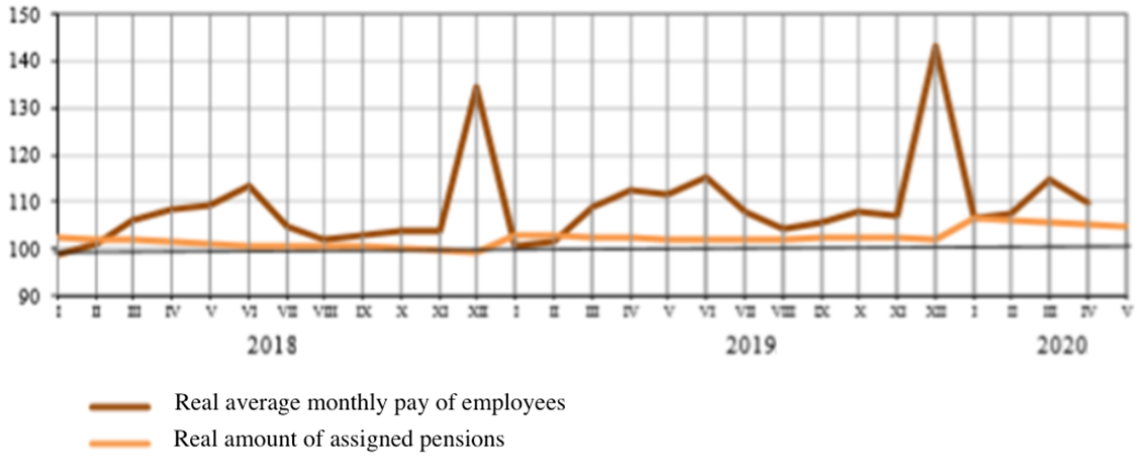

Fig. 4. **The ratio of wages and pensions**

Source: compiled by the authors based on the Rosstat data. URL: https://rosstat.gov.ru/storage/mediabank/L1jhYjK9/osn-06–2020.pdf (accessed on 27.07.2020).

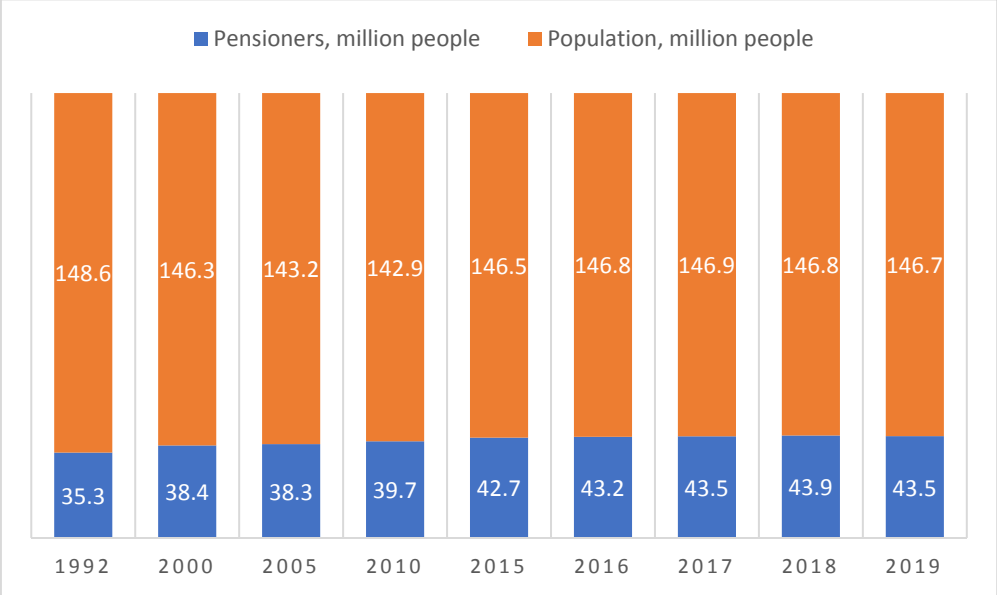

Fig. 5. **The share of pensioners in the total population of the Russian Federation**

Source: compiled by the authors based on the Rosstat data. URL: https://rosstat.gov.ru/storage/mediabank/L1jhYjK9/osn-06–2020.pdf (accessed on 27.07.2020).

experiencing a chronic shortage of funds and requires constant additional transfers from the budget [21–23]. This provision is convincingly confirmed by the data on the execution of the PFR budget (*Table 3*). On the other hand, the accumulative model of the pension system, which will be discussed below, is becoming increasingly important.

At the same time, as shown, pension relations of solidarity in their essence cannot be characterized as insurance ones, since they do not contain the basic elements inherent in these relations, which were considered earlier. Firstly, there are no risks — assumed, random, probable events, the occurrence of which can lead to unforeseen losses for the insured. Secondly, when the policyholders (persons associated with them) are not directly related to the formation of the financial base of insurance and specialized monetary funds are not created to compensate for losses, the possibility of using the main instrument for

providing insurance protection — financial breakdown of losses between policyholders is objectively excluded.

Taking this into account, it can be stated that there is a lack of connection with insurance of insurance pensions in the modern Russian interpretation. The only formal basis for such terminology may be the financing of these pensions through insurance premiums, or rather the joint part of insurance premiums. This argument is also very formal and unsubstantiated, since any funds allocated to finance a pay-as-you-go pension, from a scientific point of view, cannot be qualified as "insurance", i.e. aimed at providing insurance coverage.

Then, we turn to the consideration of the second main part of modern mandatory pension insurance-funded pension. For the first time, the use of accumulative principles for the formation of pensions in the Russian Federation was proposed in 1997 by the Ministry of Labor and Social Development of Russia in the draft concept of pension reform. After extensive discussions, it was decided to develop a mixed pension system in the Russian Federation, in which the pay-as-you-go and accumulative models are combined.

Initially, the funded pension model was based on the following principles: calculation of the pension amount based on the amount of individual pension savings; approval of the principles of accumulative financing; considering the planned life expectancy of pensioners (longevity risks) [24]. Subsequently, the funded part of the labor pension turned into a funded pension as one of the types of compulsory insurance coverage in the mandatory pension insurance system;[17] a system for investing pension savings has been created; the rights of insured persons are guaranteed when forming and investing pension savings; a program of state co-financing of the funded part of the labor pension was launched.[18] On the other hand, it should be noted that various opportunistic decisions of the authorities, such as a moratorium on the funded part of pensions or the possibility of refusing to further fund the funded pension, had a negative impact on the state and image of the accumulative pension model. In addition, the latest proposals of the authorities on a guaranteed pension plan (formerly — individual pension capital), its place and role in the funded part of the pension system also require more accurate substantial identification.

Despite these difficulties and a certain discrediting of the funded model of pension provision, the principles on which it was created remain unchanged, undergoing only minor changes [25, 26]. These principles are fully applicable to pension insurance within the framework of classic life insurance.[19] The policyholder (employer) pays insurance premiums individually for each insured person, these premiums are accumulated by the insurer. In this case, the amount of the funded pension is set based on the amount of pension savings and the expected payment period, which is determined based on the projection of the life expectancy of the insured, built using actuarial methods. Thus, the funded pension considers the insurance risk of longevity, in which an accident is not the very fact of the death of the insured, but the expected moment of its occurrence. Due to the different life expectancies in retirement (the real period of pension payments), different insured people have a financial distribution between them of the burden of paying pensions (compensation for losses as a result

[17] The above concepts are used in the sense in which they are interpreted in regulatory acts.

[18] On investment of funds to finance the funded part of the labor pension of the Russian Federation: Federal Law No. 111-FZ dated 24.07.2002. URL: http://www.consultant.ru/document/cons_doc_LAW_37863/ (accessed on 15.06.2019). On funded pension: Federal Law dated 28.12.2013, No. 424-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_156541/ (accessed on 10.07.2019).

[19] On the organization of insurance business in the Russian Federation: Federal Law of 27.11.1992, No. 4015–1-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_1307/ (accessed on 10.05.2019).

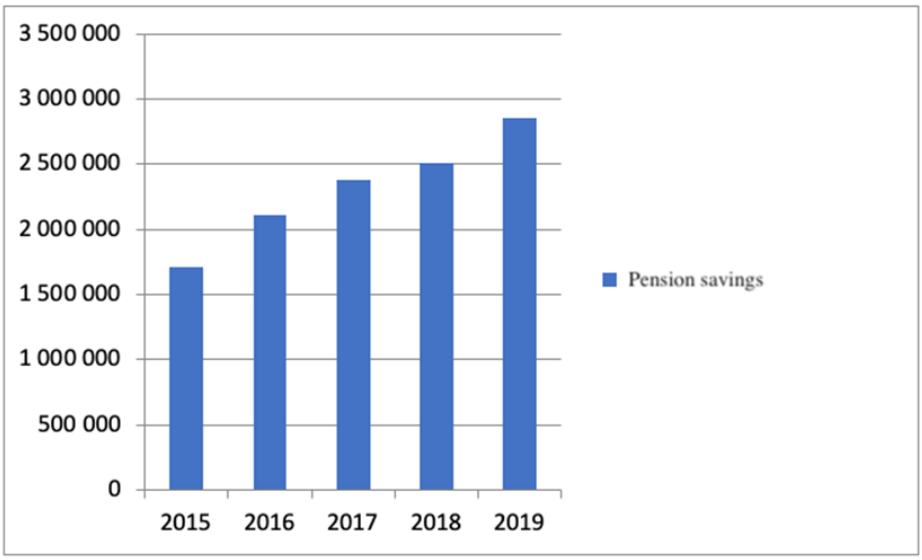

Fig. 6. **Dynamics of pension savings in non-state pension funds, RUB million**

Source: compiled by the authors based on the Bank of Russia data. URL: https://cbr.ru/collection/collection/file/25628/rewiew_npf_19q3.pdf (accessed on 06.07.2020).

of lost earnings). Thus, there are good reasons to characterize the funded pension model as an insurance model based on the principles of insurance protection. Requirements for PFR to carry out a mandatory annual actuarial assessment of compulsory pension insurance activities (and they are engaged only in the funded model) also confirm the insurance nature of these activities, since this is a traditional requirement for insurers.[20]

At the same time, it should be noted that while maintaining the general insurance nature, the specific implementation of the funded model of pensions in our country contains some contradictions, both terminological and substantive. Above, attention is paid to the inconsistency of the subject composition of these insurance relations, in particular the definition of the insurer. The insurer can be either an organization specially created by the state (the Pension Fund of Russia) or non-state pension funds (NPF) with an appropriate license. Moreover, the transition of the status of an insurer from the PFR to one of the NPF and in the opposite direction is not based on specific objective reasons and circumstances, but on the subjective decision of an individual insured person, which at least looks strange and does not correspond to economic practice. The data on the transfer of the insured summarized by the authors were previously shown in *Fig. 3*.

In addition, a license to carry out activities of NPFs for mandatory pension insurance is an independent type of license and, although issued by the Bank of Russia, has nothing to do with licenses for carrying out various types of insurance activities for insurers — constituent entities of the insurance business.

Thus, it can be concluded that in the modern Russian pension system, NPFs are engaged in mandatory pension insurance, which is not a type of insurance activity, while NPFs are insurers, not being subjects of the insurance business. That is, insurance in the field of pension relations in our country has formed as a completely separate type of activity, which, although terminologically close to other types of insurance activities, does not currently have any connections and intersections with them. At the same time, the regulations governing this type of activity, its internal structure have serious internal contradictions.

[20] On actuarial activity in the Russian Federation: Federal Law dated 02.11.2013, No. 293-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_153907/ (accessed on 15.06.2019).

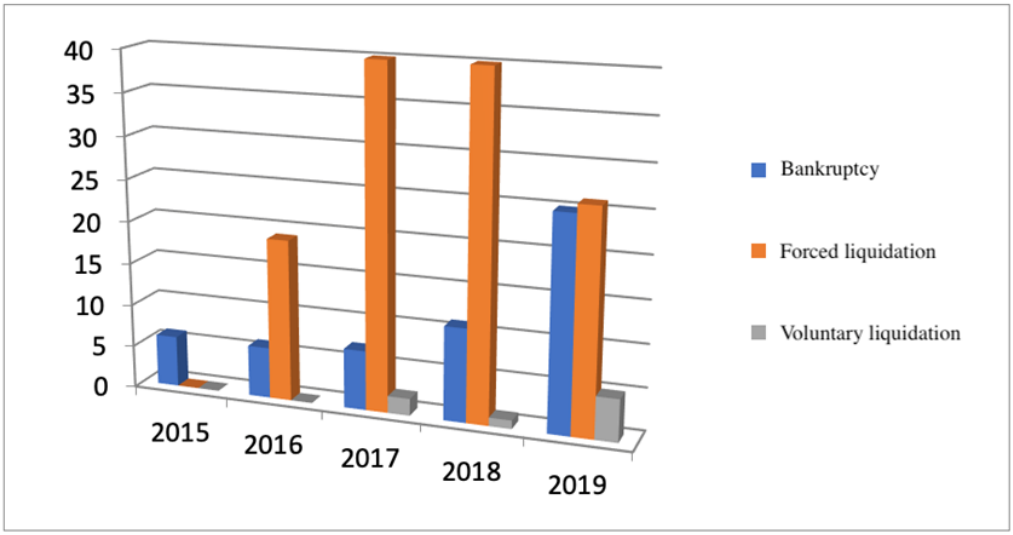

Fig. 7. **Liquidation statistics of non-state pension funds**

Source: compiled by the authors based on the Bank of Russia data. URL: https://cbr.ru/collection/collection/file/25628/rewiew_npf_19q3.pdf (accessed on 06.07.2020).

Since it is difficult to find precedents for such a specific essence of pension insurance in the past, theoretical, methodological, organizational and legal difficulties and contradictions are practically inevitable on this path of pioneers. It would be logical to follow this path only if there are strong arguments in favor of the fact that the traditional principles of life insurance cannot be applied to the organization of pension insurance. To date, the authors are not aware of any serious research on this topic. Moreover, the most efficient pension systems in different countries successfully include pension insurance based on traditional life insurance.

Attention should be paid to the financial mechanism of the activity of NPFs on mandatory pension insurance. It is based on the pension savings of insured persons; the dynamics of pension savings in NPFs is shown in *Fig. 6*.

It should be noted that the concept of "pension savings" is used in a large number of laws and regulations governing various aspects of funded pension. All documents contain a unified description of pension savings as funds recorded in the individual accounts of insured persons and formed from insurance premiums. At the same time, the definitions of the specific composition and characteristics of pension savings in different documents differ greatly. But much more important is the modern interpretation of the nature of pension savings. In particular, not being the property of the insured persons, they, in fact, cannot be characterized as their accumulation. At the same time, the traditional insurance financing mechanism is not being applied. Let us recall its content: the insurer forms insurance reserves, reflecting its obligations under insurance contracts, the performance of which is ensured by the assets in which the insurance reserves are located, and by the insurer's own funds. This mechanism confirms its effectiveness in the insurance markets both in the Russian Federation and abroad [27]; however, this and other traditional insurance instruments are not used in MPI. Currently, there is a tough and unambiguous interpretation, according to which "pension savings are the property of the Russian Federation".[21] Since the Russian Federation is legally neither a subject nor a participant in mandatory pension insurance, it is not very clear on what basis it has the right to own pension savings. One of the few rational

[21] On investment of funds to finance the funded part of the labor pension of the Russian Federation: Federal Law No. 111-FZ dated 24.07.2002. URL: http://www.consultant.ru/document/cons_doc_LAW_37863/ (accessed on 15.06.2019).

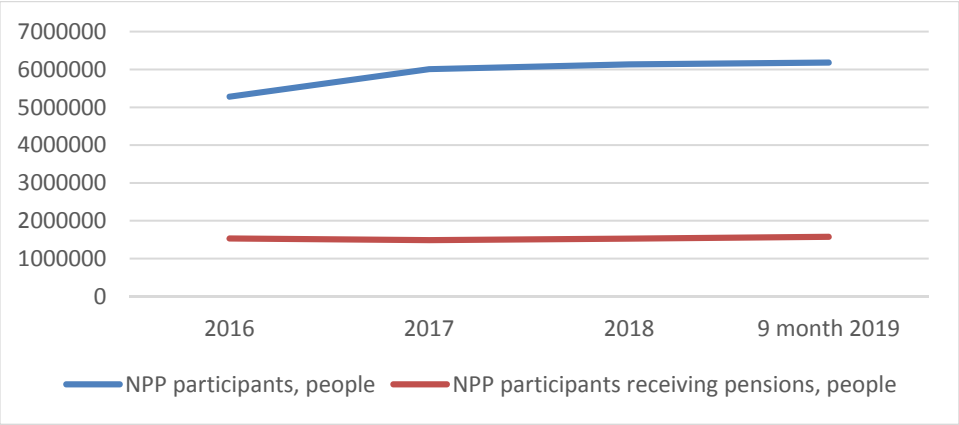

Fig. 8. **Dynamics of the number of participants in non-state pension provision**

Source: compiled by the authors based on the Bank of Russia data. URL: https://cbr.ru/collection/collection/file/25628/rewiew_npf_19q3.pdf (accessed on 06.07.2020).

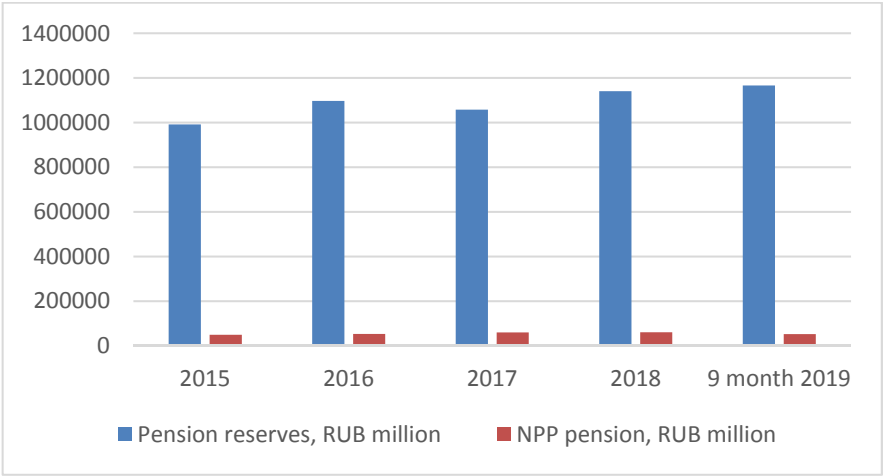

Fig. 9. **Dynamics of payments and obligations of non-state pension provision**

Source: compiled by the authors based on the Bank of Russia data. URL: https://cbr.ru/collection/collection/file/25628/rewiew_npf_19q3.pdf (accessed on 06.07.2020).

arguments in favor of the current situation may be to ensure the safety of pension savings. However, the political decisions of the state to freeze the funded part of the pension, the possibility of abandoning the funded pension, as well as numerous cases of NPF insolvency (*Fig. 7*), which led to the loss of pension savings, are seriously questioned the validity of the current situation with the ownership of pension savings.

It should be noted that at the moment in Russia there are various measures of state supervision over the activities of NPFs, as well as guarantees of the rights of insured persons in the MPI system when forming and investing pension savings. This situation is close to traditional insurance, which is characterized by strict measures of state supervision over the activities of insurance organizations, over their compliance with the requirements of insurance legislation and established standards (insurance supervision). At the same time, existing significant differences can be identified. Insurance supervision is primarily aimed at ensuring the observance of the rights and interests of insured persons, in particular, in the following areas:

- the adequacy of the assessment of the obligations of the insurer in the formation of insurance reserves;

- provision of insurance liabilities with assets in accordance with the requirements of supervision;
- compliance of the amount of capital (own funds) of the insurer with the assumed obligations;
- timeliness and completeness of insurance payments in accordance with insurance contracts.

The main direction of supervision over the activities of NPFs in the field of funded pensions is the formation of pension savings, as well as ensuring their safety and growth as a result of the placement. The completeness and timeliness of the payment of the funded pension after the grounds for this have arisen is considered as a matter of course, and does not require special measures of control and supervision.

Finally, one should pay attention to the direct contradiction with the insurance legislation, which the current MPI enters into. We mean mandatory liability insurance for specialized depositories and management companies.[22] Although such insurance is undoubtedly important and necessary to protect the rights of the insured, at present it completely contradicts the basic principles of insurance law established by the Civil Code of the Russian Federation and the Law "On the organization of insurance business", which allow the introduction of mandatory insurance only based on a special federal law about this type of insurance.

3. Non-state pension provision

Non-state pension provision (NPP) is the third element of the modern pension system of the Russian Federation, within the framework of which the formation and payment of an additional pension are carried out at the expense of voluntary contributions from both individuals and legal entities. The main parameters of the current state of NPP are shown in *Fig. 8, 9*.

The procedure for legal registration of NPPs significantly differs from state pensions and public pension schemes, in respect of which basic laws were first adopted,[23] and then, on their basis, specific laws and other normative acts.

With NPPs, a completely different situation is developing: there is no basic law, and all the main provisions of NPPs are disclosed in the Law "On Non-State Pension Funds".[24] Such a legal structure seems rather strange, since, according to this law, NPFs are only one of the subjects of NPPs, and there are also participants in these relations. In addition, the role and importance of NPFs are made absolute, and NPPs, being a separate element of the pension system, are unreasonably reduced to one of the private areas of NPFs' activities.

In addition, today there is no unambiguous interpretation of the essence and nature of the contract of non-state pension provision and the relations arising in connection with it. The law contains only framework and formal characteristics:

- subjects — NPF, depositors, participants;
- obligations of the contributor — to pay pension contributions to the fund;
- obligations of the fund (NPF) — to pay the participant a non-state pension.

Most likely, the definition of "non-state pension" in this case is not entirely successful and does not allow defining the essence of the phenomenon. Moreover, such uncertainty allows different specialists to characterize the agreement with the NPP both as a specific pension agreement and as an analog of an agreement on a bank account, there are other,

[22] On investment of funds to finance the funded part of the labor pension of the Russian Federation: Federal Law No. 111-FZ dated 24.07.2002. URL: http://www.consultant.ru/document/cons_doc_LAW_37863/ (accessed on 15.06.2019).

[23] On state pension provision in the Russian Federation: Federal Law of December 15, 2001, No. 166-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34419/ (accessed on 22.06.2019). On mandatory pension insurance in the Russian Federation: Federal Law of December 15, 2001, No. 167-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_34447/ (accessed on 18.07.2019).

[24] On non-state pension funds: Federal Law of 07.05.1998, No. 75-FZ. URL: http://www.consultant.ru/document/cons_doc_LAW_18626/ (accessed on 12.04.2019).

Table 4

Comparative analysis of Non-state pension provision and Mandatory pension insurance

Law "On Non-State Pension Funds"		
Parameter	**MPI**	**NPP**
Subjects	Insured / Policyholders	Participants / Depositors
Types of agreements	Mandatory pension insurance agreement	Pension agreement
Bases of agreement	Insurance rules	Pension rules Pension schemes
Means of payment security	Pension savings	Pension reserves
Method of using the financial base	Pension savings investment	Placement of pension reserves
Means of ensuring financial stability	Fund reserve for mandatory pension insurance	Fund insurance reserve

Source: compiled by the authors.

more exotic points of view.[25] The uncertainty of the essence of NPPs is also manifested in the fact that when analyzing new pension products in the form of individual pension capital, and then a guaranteed pension plan, various secondary characteristics are discussed in sufficient detail without defining the economic essence of new pension products. At the very least, it is still unclear whether these products will be sold through NPPs or whether they will be classified under other, possibly new, elements of the pension system.

It is possible to try to define the views of the legislator on the essence of NPPs indirectly. In particular, within the framework of the Law "On Non-State Pension Funds", NPPs are constantly opposed to MPI, confirmation of this is given in *Table. 4*.

Table 4 clearly demonstrates a tendency towards a separation of NPP from MPI and, possibly, from insurance in general. This conclusion can be made on the basis that the place that the policyholder and the insured occupy in the MPI belongs to the depositors and participants of the NPP, and the NPF itself plays the role of not an insurer, but a fund. Pension schemes are used instead of mandatory pension insurance contracts on the basis of which pension contracts are concluded, and pension rules are opposed to insurance rules. Hence, it can be concluded that the legislator, without clearly defining the essence of non-state pension provision, makes it clear that it does not apply to mandatory pension insurance, and possibly to insurance in general.

At the same time, there are obvious contradictions here, as before. In particular, when the legislator deliberately opposes NPP and MPI within the framework of non-state pension provision, we can observe the peculiarities inherent in insurance relations and the insurance business. In particular, future pension liabilities are recorded in pension reserves, which are allocated to assets in accordance with the regulations of the supervisor. We have already noted that this model is successfully applied in the insurance business. In our case, NPFs providing non-state pension provision are not insurers, but they form pension reserves and place them in the manner established by the

[25] Life insurance development strategy and pension reform. Insurance today. 08.11.2012. 08.11.2012. URL: http://www.insur-info.ru/printable/interviews/835/ (accessed on 10.03.2020).

supervisory authority, which is typical for the insurance business. And, conversely, acting as insurers in mandatory pension insurance, NPFs form pension savings of insured persons, invest them in various assets, which have no application in other types of insurance, in particular in life insurance. Moreover, the content and procedure for the implementation of the two processes — the investment of pension savings and placement of pension reserves — practically do not differ in content but are fundamentally separated and opposed to each other.

We have already mentioned above that in Russia, as in most countries, insurance is considered an exclusive field of activity, i.e. insurers may only engage in it or activities directly related to it. Taking this into account, the permission of NPFs to engage in both mandatory pension insurance (being an insurer) and at the same time non-state pension provision (acting as a fund) allows us to draw the following conclusions:

- the legislator considers it possible with respect to NPFs to violate the generally accepted principles of insurance (in terms of the exclusivity of this activity), which, in our opinion, requires additional justification;
- non-state pension provision, at least, is an activity very close to insurance, which further complicates the question of its economic essence.

Finally, the legislation presupposes the need for an annual mandatory actuarial assessment of the performance of NPFs, both from the point of view of the MPI and from the point of view of NPP. As a reminder, in accordance with the scientific point of view, the provisions of regulatory acts, and established business practice, actuarial activity is understood as the analysis and assessment of risks or financial obligations arising from them. The requirement for a mandatory actuarial valuation applies primarily to insurance organizations and mutual insurance companies, which further complicates the understanding of the economic essence of non-state pension insurance.

CONCLUSIONS

The performed analysis confirms the hypothesis put forward that a serious problem hindering the effective functioning and development of the pension system of the Russian Federation is not always an accurate and adequate definition of the essence, subjects, and objects of relations that form this system. The absence of clearly defined basic concepts leads in many cases to the fact that the applied principles and tools for the implementation of pension relations do not allow gradually and internally consistently to achieve the set goals. Particular attention should be paid to pension insurance, in which four large groups of relations are currently distinguished:

- relations that are formally referred to as pension insurance, but in their essence are not insurance (pension insurance);
- relationships that are insurance, but require a more precise application of the principles of insurance (funded pension);
- synthesized relations in which insurance and non-insurance principles are artificially mixed (non-state pension provision);
- insurance relations that are not formally included in the pension system, but actually exist and therefore should be considered by it (voluntary pension insurance and some other types of voluntary insurance).

In this regard, it seems appropriate to consider the following proposals.

1. Make a clear distinction between insurance (pension insurance) and non-insurance (pension provision) blocks of the pension system. In particular, the state pension provision can be preserved in its current form or with minimal modifications that are not of a fundamental nature. It would be logical to assume that the pension system, along with the state one, should include non-state pension provision, which, in our opinion, should be fundamentally different from the

non-state pension provision that exists today. The modernized non-state pension provision should include all types of pensions formed on pay-as-you-go principles. This formulation seems to be quite accurate for the following reasons:

- since pensions for pensioners are created by working generations (through their employers), it can be classified as pension provision;
- since the source of these pensions is not state funds, but funds of working generations (directly or indirectly), this pension provision can be classified as non-state.

The theory and normative base of non-state pension provision must be radically revised.[26] The concepts of "insurance pension", "insurance premiums" and other "insurance" characteristics should be removed and replaced. Contributions at the same time should be separated from insurance pension contributions. The subject composition and structure of relations in non-state pension provision, primarily the operator and administrator of the NPP, must be reconsidered.

Leaving the development of the above and other basic issues of the updated non-state provision to specialists in the field of social security, we consider it expedient to pay attention to the following fact. It seems beyond doubt that the basis of the renewed non-state pension provision will be the current insurance old-age pensions,[27] since in the foreseeable future there is no visible alternative to the pay-as-you-go principle of forming this pension. At the same time, pensions for disability, loss of a breadwinner, as well as various types of preferential or early pensions can be based on pay-as-you-go principles (in this case, they must be preserved within the framework of non-state pension provision) or can be transferred to insurance principles and become part of a pension insurance, or employer's liability insurance (see below).

2. It is proposed to significantly change the content of modern pension insurance, building it exclusively on traditional insurance principles. Pension insurance should be nothing more than a kind of life insurance provided for in paragraph 1 of Art. 32.9 of the Law "On the organization of insurance business in the Russian Federation" [23–25, 28–30].

The insured risk, in this case, will be the expected life expectancy of the insured after reaching the retirement age, and the insured event will be the fact of his living up to this age. We consider it expedient to combine mandatory and voluntary forms of pension insurance. At the same time, mandatory pension insurance should ensure the minimum amount of funded pension provided for by social standards.[28] Considering the obligatory nature of the conclusion of pension insurance contracts, it is possible by law to provide for a simplified scheme for the conclusion and execution of such contracts. The introduction of mandatory pension insurance in accordance with the rules of insurance law will require the adoption of a special law. This law should define its basic conditions, including the content of the mandatory pension insurance agreement, as well as the procedure for its conclusion and execution. A separate issue is the definition of the insurer. In this regard, the following options seem to be the most preferred:

- creation by the state of a special legal entity for the implementation of mandatory pension insurance, in this case, it will be necessary to form a regulatory framework for the activities of this legal entity;
- provide for a license for mandatory pension insurance, grant the right to carry out mandatory pension insurance to insurance organizations that have received the specified license (similar to Compulsory Motor Third Party Liability (OSAGO));

[26] This task is outside the scope of this study and should be addressed by social security professionals.

[27] Naturally, having lost the characteristic "insurance".

[28] At present, a modern funded pension can be adopted as such a minimum pension.

• organize mandatory pension insurance by the method of mutual insurance, relying on world experience and Russian historical traditions (for this, it is necessary to significantly revise and supplement the regulatory framework, starting with the abolition of the unjustified, in our opinion, ban on the use of mutual insurance in personal insurance).

Since mandatory pension insurance is proposed to be understood as a set minimum, most of the funded pension should be formed within the framework of voluntary pension insurance. This insurance will not differ from the mandatory one, except for the sum insured (pension amount) and some other quantitative indicators. It is on voluntary pension insurance that modern non-state pension provision should be developed, as well as projects for individual pension capital and a guaranteed pension plan.

A voluntary pension insurance contract is concluded based on a voluntary expression of the will of a future pensioner or his employer (corporate pension insurance). Contributions (insurance contributions) can be paid by both future retirees and their employers, in addition, the state can decide to co-finance insurance contributions for voluntary pension insurance. Insurers must be licensed insurance companies (for life insurance). The financial mechanism existing today in life insurance, as well as the organization of state supervision, can be fully applied in pension insurance.

At the same time, at the first stage, the most optimal scheme of work appears to have arisen within the framework of the Chilean model of pension insurance.[29] During the period of active working life, future pensioners with the help of specialized organizations (such organizations can be modern NPFs) accumulate for future retirement. At the same time, these savings remain the property of the future pensioner, they can be withdrawn by him or transferred to his heirs in case of death. On the eve of the onset of retirement age, the NPF helps the future pensioner to conclude a pension insurance (annuity insurance) agreement with a lump sum payment of the insurance premium on the most favorable terms. Pension savings are used to pay insurance premiums [31, 32]. To implement this model, a system for regulating the activities of NPFs (or other specialized organizations) and state supervision over them should be created. This system should operate outside the framework of insurance supervision and insurance relationships; the existing experience in regulating the activities of NPFs may be used to create it.

With the development of voluntary pension insurance, another model may be formed, when a future pensioner at the beginning of his working life concludes a mixed life insurance contract with an insurer with the condition of the annuity payment. The insurance contract must be valid until the retirement age of the insured, the insured events will be either the death of the insured or his survival until the expiration of the contract. Thus, upon reaching the retirement age (expiration of the insurance contract), the insured begins to receive annuity payments (monthly pensions). In the event of the death of the insured before the expiry of the insurance contract, the insurer pays the insurance benefit either to the heirs of the insured or to persons appointed by him. The amount of this compensation is also determined in advance by the insured person.

Changing the principles of implementing pension relations, approving and implementing the principles of insurance in them provides the participants in these relations with considerable freedom in choosing possible strategies of behavior, and their future well-being largely depends on independently made decisions. In these conditions, the role and importance of financial literacy significantly increase, since individual decisions about the method of

[29] This particular model has been chosen as a reference in most countries of Eastern Europe.

Table 5

Proposals for the transformation of the pension system of the Russian Federation

Pension system of Russia			
	State pension provision	**Non-state pension provision**	**Mandatory pension insurance**
Types of pensions	Civil servant pension, social pension	All pensions included in the pay-as-you-go model	All pensions of the funded model generated by life insurance
Basic normative act	Federal Law of December 15, 2001, No. 166-FZ "On State Pension Provision in the Russian Federation"	The development of a new regulatory framework is required, in particular the basic law	The current system of insurance law
Subjects	Federal Agencies of Executive Authorities (FAEA), Pension Fund of Russia (PFR), pension recipients	Administrator (PFR); payers of contributions; recipients of pensions	Licensed life insurers. Policyholders, insured persons
Funding sources	State budget	Pension contributions of current employees (directly or through employers)	Insurance premiums. Possible co-financing from the employer, the state
Correlation with the current pension system	No changes	Formation of a new social security sector	Combining the pension system and the insurance system (life insurance)

Source: compiled by the authors.

forming a pension, the amount of insurance premiums, and insurance amounts in pension insurance are of particular importance. At the same time, it is necessary to change the goals of activities to ensure the financial literacy of participants in pension relations. If today this activity is mainly aimed at analyzing ways of behaving in the existing pension system, adapting to its requirements and specifics, then in the future, the main attention should be focused on the principles and tools for forming a future pension. Accordingly, the objects of increasing financial literacy are also changing significantly: at present, these are primarily pensioners and people of pre-retirement age; in the future, the main goal should be young people starting active labor activity [33, 34].

As the modernized pension system develops, some types of pensions, currently formed on a pay-as-you-go basis, can be transferred to the insurance part of the system. This need may be caused by constant financial pressure on the payment of pay-as-you-go pensions associated with a change in the demographic situation

in the direction of a constant increase in the proportion of pensioners in relation to the working population. Thus, the payment of pensions for disability, loss of a breadwinner, many types of preferential and early pensions can be carried out within the framework of personal insurance; loss of income insurance, and employer liability insurance. The above suggestions are summarized in *Table. 5*.

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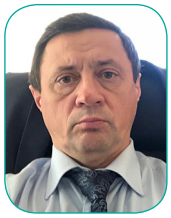

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Ermolaeva A.S. — analyzed the literature sources related to the research, specified the results, interpreted and described the results, wrote the conclusions, compiled the bibliography, designed the paper according to the requirements of the journal.
Raba P.G. — analyzed the research problem, formulated the aim of the study, specified the results, collected and processed the data obtained.

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The Budgetary and Insurance Model of Healthcare Funding in Russia

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ABSTRACT

This paper **aims** to investigate the essence and method of building a financial model of healthcare in Russia. The author applies **methods** such as analysis and synthesis, statistical data processing, systemic and structural approaches. This article is an analysis of the basics of building a budgetary and insurance model: cost allocation (various types of medical care, individual costs) by funding sources; system of inter-budgetary relations; the structure of expenditures of the budgetary system of the Russian Federation on healthcare in 2019. The study presents the financial model of the compulsory medical insurance (CMI) system and defines the role of insurance and private medical organizations in the CMI system. The mechanism of financing state (public) healthcare institutions is shown. The procedure for financing medical organizations according to the territorial program is considered (as illustrated by the example of the Irkutsk region). The article analyzes the methodology for calculating the cost of the territorial program and identifies the problems associated with it. The author pays special attention to organizations that do not carry out activities in the field of compulsory medical insurance, outlining the specifics of financing and legal regulation, and arguing the reasons for excluding a number of diseases from the compulsory medical insurance program. The paper examines the content of the new law on the CHI reform, which provides for direct financing from the budget of the Federal CHI Fund of federal institutions providing specialized medical care. The author highlights the main problems of the building of the budgetary and insurance healthcare funding model such as congestion, inconsistency, cost intensity. The author **concluded** that it is necessary to revise the organization of the healthcare system and mechanisms for its financial support. The outstripping growth in healthcare costs, on the one hand, and inadequate funding of medical institutions, on the other, lead to a constant search for a compromise between equity and cost-effectiveness. Based on this, the author substantiated the goals and determined the **directions** for further research, such as reducing transaction costs, changing the motivation of participants, identifying cost growth factors and the possibility of eliminating them.
Keywords: healthcare financing; inter-budgetary transfers; state guarantees program; free healthcare; compulsory medical insurance; predominantly single-channel financing; fragmented funding

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INTRODUCTION

The national health care system ensures the implementation of the right of citizens to free health care. There are numerous scientific publications devoted to financing health care in Russia: this topic is versatile, controversial, and socially significant, the discussed range of problems affects the wider society.

At present, the Russian Federation (hereinafter referred to as the "RF") operates a mixed model of financing public health care based on the compulsory medical insurance system (hereinafter referred to as "CMI"), which is conventionally called budgetary insurance.

Over the past 30 years, scientists, doctors, politicians, and officials have been arguing about the most effective model for financing health care: from returning to the state budget to improving insurance. In 2020, a law on the reform of compulsory medical insurance was adopted, which determines the relevance of the topic.

Scientific publications, as a rule, consider one or another aspect of health care financing with authors setting out their vision of the situation and proposing possible transformations, criticizing the issues that are in their field of their vision. But this does not allow compiling a holistic picture of the financing of the industry, which makes it difficult to have a meaningful and productive public discussion in this area.

The paper aims to study the essence and method of constructing a financial model of public health in the Russian Federation. The objectives are to form a comprehensive understanding of the mechanisms for the formation and distribution of financial resources of public health; identify the problems of financing the industry; determine the goals and directions of further research. The "routine" period 2015–2019 is considered (before exacerbation of the epidemiological situation).

Such studies are necessary to find ways of further (post-crisis) development of Russian healthcare. When analyzing the effectiveness of the health care system, it is important to have a clear understanding of the logic of the origin of the system, its development, generic qualities, factors of influence, the response of the system [1].

CHI SYSTEM INTEGRATED INTO PUBLIC HEALTH SYSTEM

According to the legislation of the RF[1] everyone has the right to receive health care in accordance with the program of state's guarantees for the provision of free medical care to citizens (hereinafter referred to as "State Guarantee Programs").

The program of state guarantees establishes a list of types of medical care (diseases and conditions), the provision of which is carried out free of charge and is formed based on medical statistics characterizing the level and structure of morbidity of the population in Russia, considering the characteristics of the sex and age composition.

In accordance with this, territorial programs of state guarantees are adopted in the constituent entities of the Russian Federation, which are developed considering the structure of morbidity in a given region (hereinafter referred to as "Territorial Programs TP").

The key point (in understanding the way of building a budget insurance model) is the difference between the State Guarantee Program and the basic CMI program as its component (*Fig. 1*). Accordingly, the territorial compulsory health insurance program (hereinafter referred to as "TPCMI") is an integral part of the territorial program.

Insured persons are entitled to free health care[2]:

- in the "home" region (in which the compulsory medical insurance policy was issued) — in the amount established by TPCMI;
- in another region of the Russian Federation — in the amount established by the basic CMI program.

[1] Federal Law No. 323-FZ of November 21, 2011 (as amended on December 8, 2020) "On the basics of protecting the health of citizens in the Russian Federation", Art. 19.

[2] Federal Law No. 326-FZ of November 29, 2010, (as amended on December 8, 2020) "On Compulsory Medical Insurance in the Russian Federation", Art. 16.

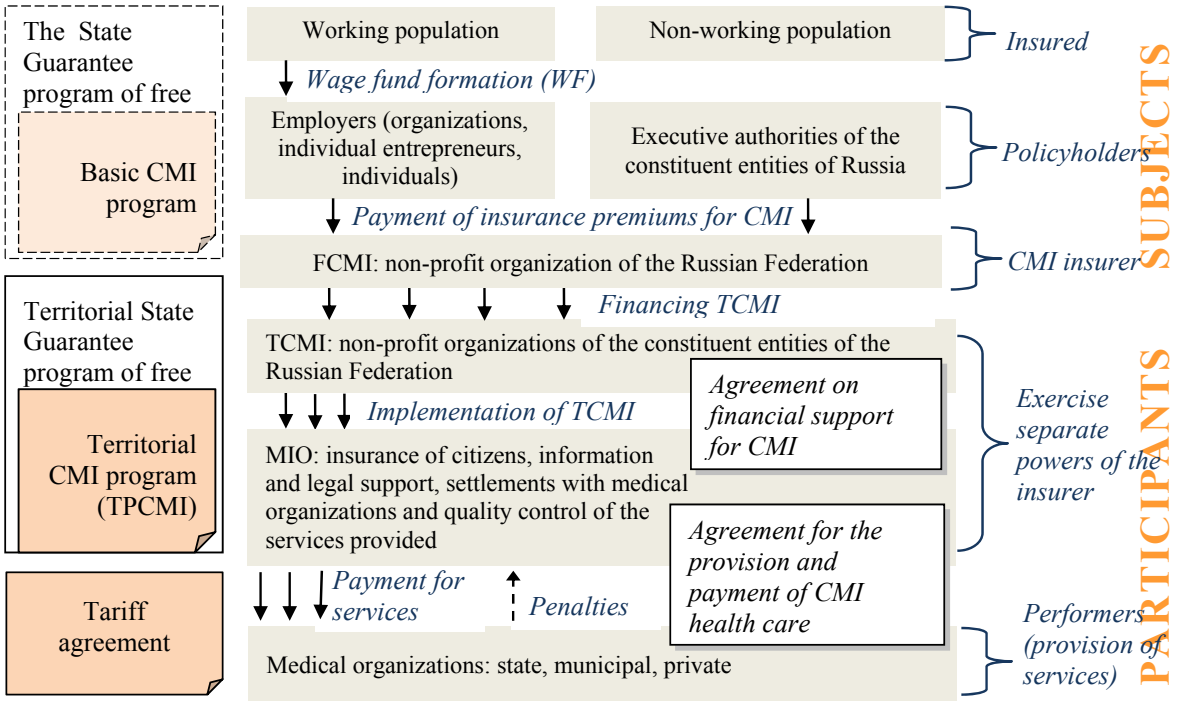

Fig. 1. **Financial model of the compulsory medical insurance (CMI) system**

Source: developed and compiled by the author based on the Federal Law of November 29, 2010 No. 326-FZ "On compulsory medical insurance in the Russian Federation" (latest version). URL: http://www.consultant.ru/document/cons_doc_LAW_107289/ (accessed on 25.01.2021).

In this case, the insured persons are (326-FZ, art. 10): citizens of the Russian Federation, foreign citizens, stateless persons, refugees, i.e. the entire population of the country. This is the essence of compulsory medical insurance.

However, the State Guarantee Program is a broader document than the basic CMI program: this is the meaning of the definition used, which defines the public health financing model as budgetary and insurance (not just insurance).

An essential characteristic of the CMI system, as part of the state health care system, is the participation in it of non-governmental (commercial) organizations: medical insurance organizations (hereinafter referred to as "MIO") permanently and medical organizations (hereinafter referred to as "MO") on a contractual basis (*Fig. 1*).

The basic difference between state (social) insurance and commercial insurance is that the insurer (which initiates the conclusion of an insurance contract, bears financial risks, and provides insurance compensation) is a state non-budgetary fund (Federal fund of CMI, hereinafter referred to as "FCMI"), and not an insurance company (*Fig. 1*).

Health insurance organizations make settlements with MOs (for payment for medical care provided to insured persons) on the basis of earmarked funds (*Fig. 2*) provided by the budgets of territorial CMI funds (hereinafter referred to as "TCMI").

The main trend in the CMI sector is the reduction in the number of insurance organizations: the largest companies remain on the market. Since 2010, the number of health care organizations has decreased by almost 3 times: from 98 to 34 organizations.[3]

For example, during 2016, 6 organizations ceased their activities: one of them had its license revoked, the rest were reorganized by joining other MIOs.[4]

[3] CMI system in the Russian Federation. URL: http://www.ffoms.gov.ru/system-oms/ (accessed on 25.01.2021).

[4] Bulletin of the Accounts Chamber of the Russian Federation. No. 3 (231) 2017. URL: https://ach.gov.ru/statements/byulleten-schetnoj-palaty-3-mart-2017-g-892 (accessed on 05.03.2021).

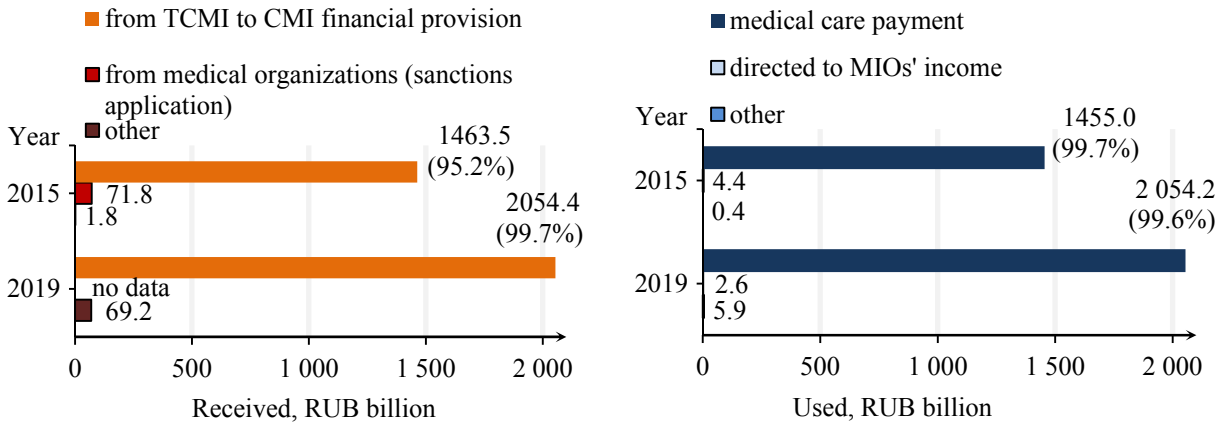

Fig. 2. **Main indicators of MIOs in terms of CMI in 2015 and 2019**

Source: Russian Statistical Yearbook 2018. Moscow: Rosstat; 2018. 694 p.; Russian Statistical Yearbook 2020. Moscow: Rosstat; 2020. 700 p.

According to the FCMI, since 2010, the legislative requirements for the activities of the medical insurance organizations, including financial ones, have been constantly tightened.[5] Since 2017, the requirements for the minimum size of the authorized capital of MIOs have been increased by 2 times (up to 120 million rubles).[6] As a result, the most financially stable insurance companies remain in the CMI sector, capable of performing all the functions assigned to them.

Private MOs are included in the unified CMI register based on a notification sent to the TCMI. At the same time, the TCMI does not have the right to refuse an organization (individual entrepreneur) to be included in the register (326-FZ, art. 15, p. 2).

According to FCMI,[7] the share of private medical organizations in the CMI system in Russia increased from 2.2% (253 organizations) in 2007 to 35.9% (3309 organizations) in 2020. According to practitioners, the involvement of private medical organizations contributes to the improvement of the quality of health care, since it allows the treatment process to be provided with modern equipment and medical technologies [2]. But in this regard, the question arises: will the CMI system have enough financial resources for all?

SOURCES OF FUNDING

Sources of funding are one of the main factors in the formation and development of the health care system [3]. If public health care in Russia is provided to the extent established by the State Guarantee Program, then the sources of funding for the Program must be considered.

The distribution of costs (various types of medical care, individual costs, etc.) by funding sources underlies the construction of a budgetary and insurance model of health care funding (*Fig. 3*).

At the same time, by "funding health care" we mean financing medical institutions that provide free medical care to the population of the country.

The sources of funding for the State Guarantee Program are:

- CMI funds: FCMI budget (TCMI budgets);
- federal budget funds;
- funds from the budgets of the constituent entities of the Russian Federation (local bud-

[5] Insurance medical organizations will inform insured citizens about the need to undergo a medical examination in 2018. URL: www.ffoms.gov.ru/news/ffoms/strakhovye-meditsinskie-organizatsii-proinformiruyut-zastrakhovannykh-grazhdan-o-neobkhodimosti-proy/ (accessed on 05.03.2021).

[6] Law of the Russian Federation of November 27, 1992, No. 4015–1 (as amended on December 30, 2020) "On the organization of insurance business in the Russian Federation", Art. 25.

[7] The FCMI assessed the level of private medicine. URL: https://ria.ru/20200724/1574843699.html (accessed on 25.01.2021).

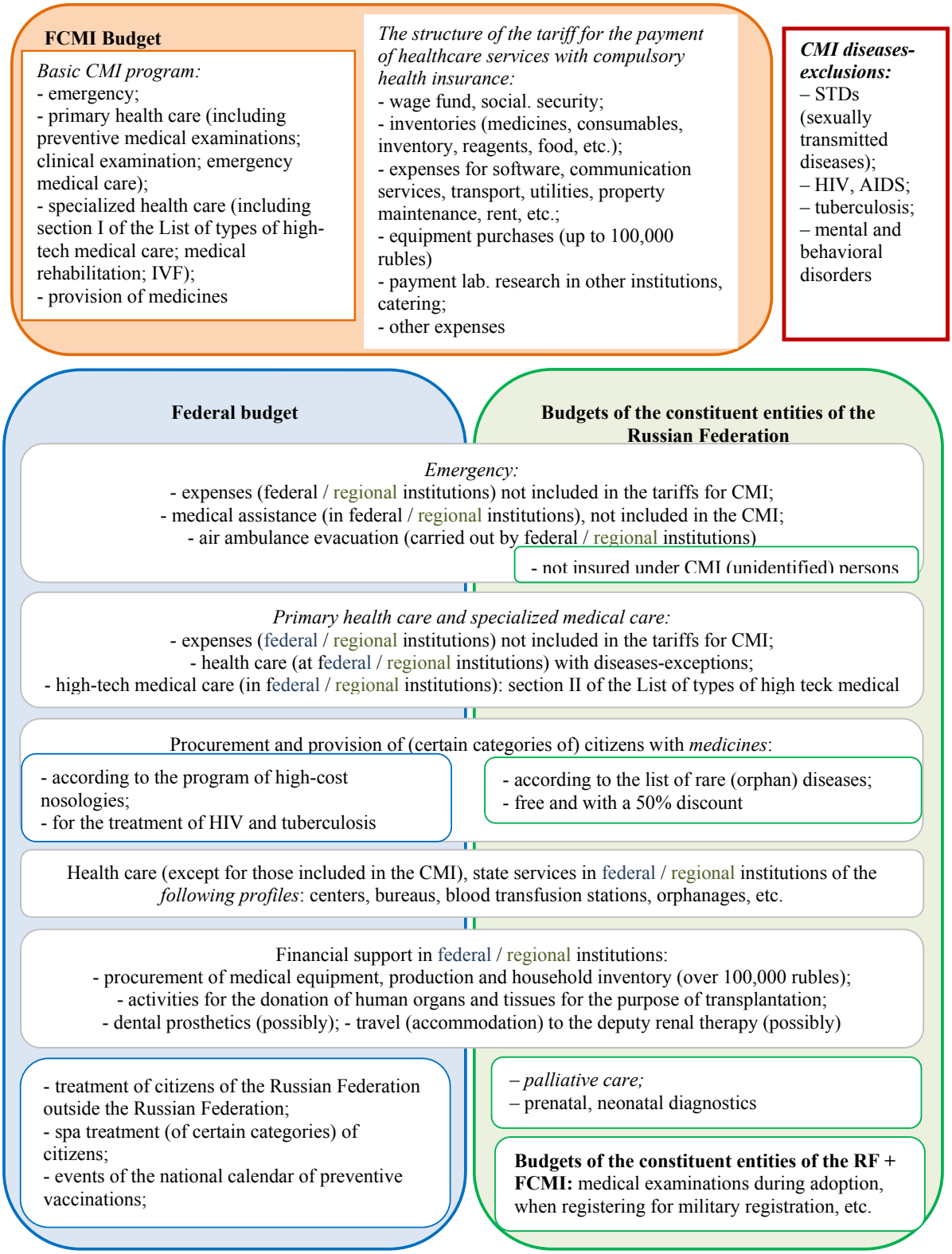

Fig. 3. **Budgetary and insurance model: cost allocation (types of medical care, individual costs) by funding sources**

Source: developed and compiled by the author based on the Resolution of the Government of the Russian Federation of December 10, 2018, No. 1506 "The Program of state guarantees for access to free-of-charge medical aid for Russian citizens for 2019 and for the planned period 2020–2021" (latest version). URL: http://www.consultant.ru/document/cons_doc_LAW_313205/ (accessed on 25.01.2021).

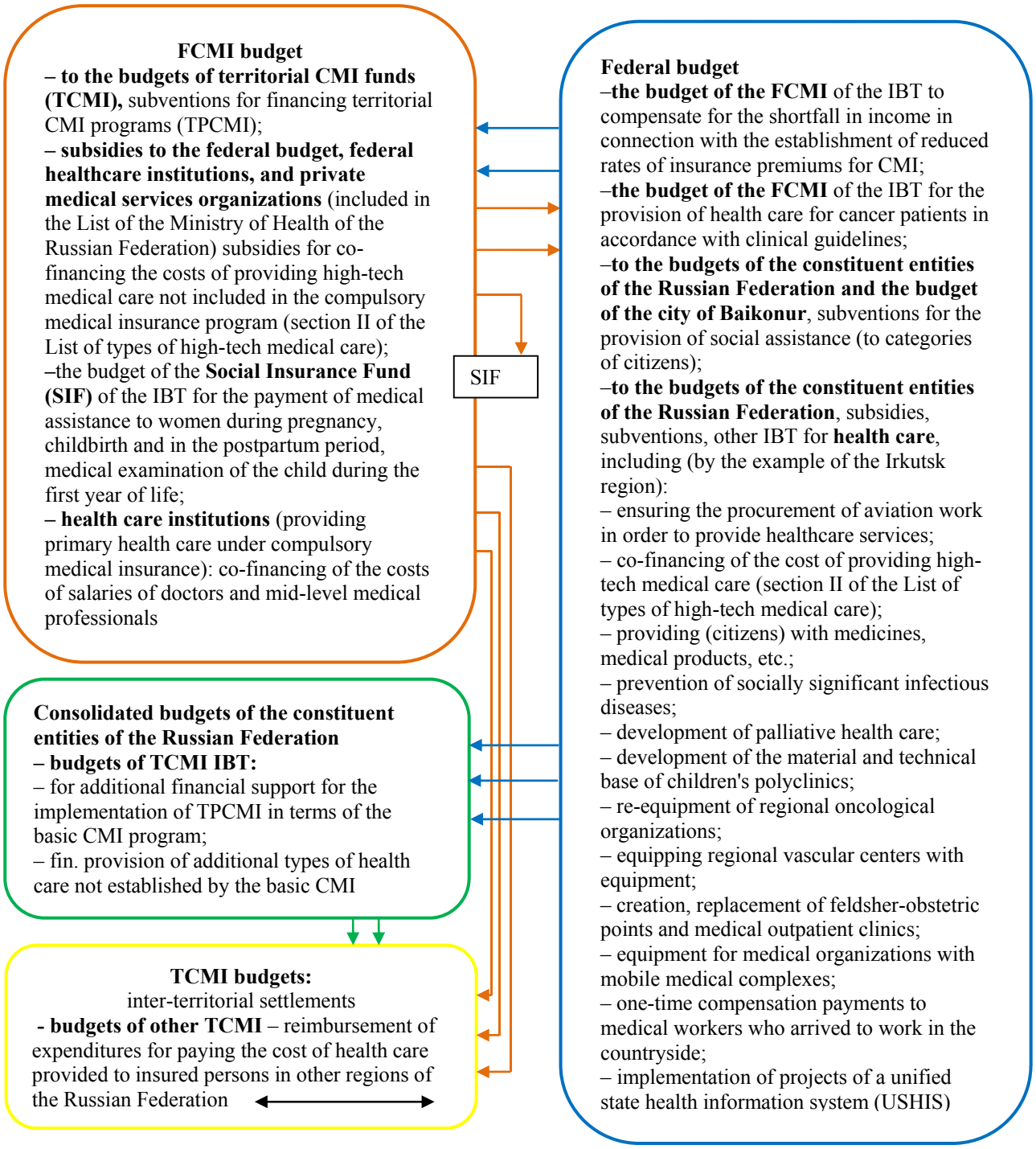

Fig. 4. **Budgetary and insurance model: inter-budget relations system**

Source: developed and compiled by the author based on the Reporting on budget execution (2019) of Federal Treasury of the Russian Federation. URL: https://roskazna.gov.ru/ispolnenie-byudzhetov/ (accessed on 25.01.2021).

gets — in the event of the transfer of appropriate powers).

Thus, the budgetary and insurance model of healthcare funding in the Russian Federation includes:

1. Budget financing (in whole or in part of certain expenses):

- certain types of medical care, drug provision;
- certain types of activities, events.

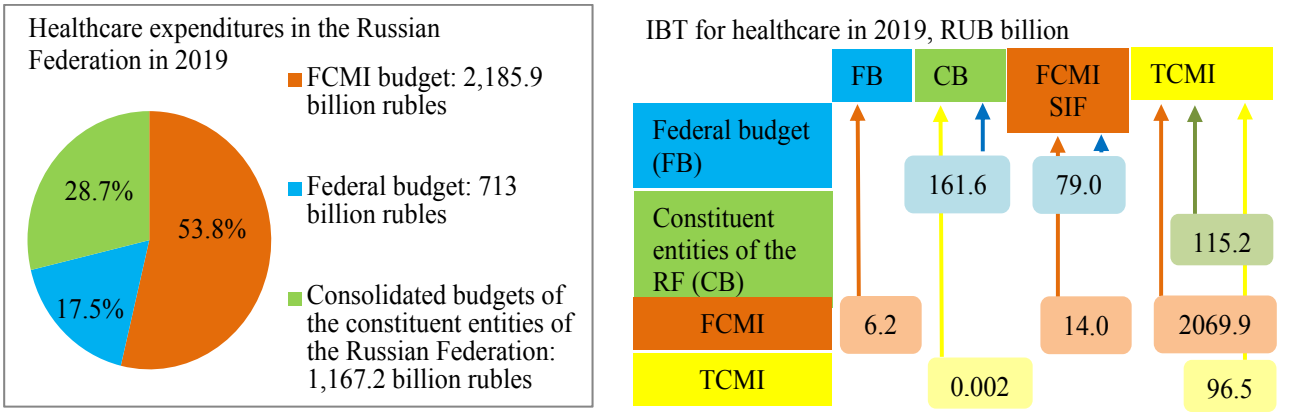

Fig. 5. **Healthcare expenditures, inter-governmental transfers in 2019**

Source: developed and compiled by the author based on the Reporting on budget execution (2019) data of Federal Treasury of the Russian Federation. URL: https://roskazna.gov.ru/ispolnenie-byudzhetov/ (accessed on 25.01.2021).

2. Extrabudgetary funding:

- according to the compulsory medical insurance system;
- the possibility of receiving income from the provision of paid services (from property, other business activities).

The allocation of MOs expenditures to the respective budgets is a complex system. On its basis, a no less complex system of inter-budgetary relations has been built (*Fig. 4*), in which a lot of inter-budgetary transfers (hereinafter referred to as "IBT") are carried out.

With the introduction in 2013 of predominantly single-channel financing of health care at the expense of compulsory medical insurance funds [4], the budget of the compulsory medical insurance fund is currently the main source of funding health care in the Russian Federation (*Fig. 5*).

Revenues budgeting of the FCMI (see *Fig. 1*) is mainly due to insurance contributions for the CMI of the working population (65% in 2019): employers deduct 5.1% of the wage fund (hereinafter referred to as "WF").

Payers of insurance premiums for the non-working population are (authorized) executive authorities of the constituent entities of the Russian Federation (see *Fig. 1*): in fact, these are calculations within the budgetary system of the Russian Federation.

We elaborate on the issue of the obligation to pay insurance premiums for the compulsory medical insurance of the working population in more detail. Formally, it is entrusted to employers (acting as insurers of working citizens), who, in turn, in one way or another transfer it to employees. In fact, according to the author, we discuss the targeted taxation of the working population.

As you know, insurance contributions have replaced the unified social tax (hereinafter referred to as "UST"), i.e. they also have a tax origin. Since 2010, "compulsory payments intended to mobilize funds for the realization of the right of citizens to state pension and social security (insurance) and medical care" (Tax Code of the Russian Federation, Art. 234, repealed), were transformed into "compulsory payments for compulsory pension, social, medical insurance in order to financially ensure the implementation of the rights of insured persons" (Tax Code of the Russian Federation, Art. 8), which allows us to say that their essence has not changed from this. Until now, many accountants use the term "UST", implying insurance premiums.[8]

It is indicative that since 2017, the administration of insurance premiums has come under the jurisdiction of the Federal Tax Service of Russia (with the exception of contributions from industrial accidents and occupational diseases paid to the SIF). Moreover, at the

[8] Insurance premiums in 2021. URL: https://www.kontur-extern.ru/info/esn-strahovye-vznosy (accessed on 25.03.2021).

Table 1

Main characteristics of the autonomous, budgetary and governmental institutions (AI, BI, GI)

Feature	Characteristic	Application		
		AI	BI	GI
Type of organization	A non-profit organization created by the founder	+	+	–
	Government agency	–	–	+
Purpose	Provision of public services (performance of work, performance of government functions)	+	+	+
Normative legal regulation	"On Autonomous Institutions" dated 03.11.2006 No. 174-FZ	+	–	–
	"On non-profit organizations" dated 12.01.1996 No. 7-FZ, art. 9.2	–	+	–
	Budget Code of the Russian Federation of July 31, 1998, No. 145-FZ, Art. 161	–	–	+
Management	Presence of the supervisory board as a supervisory authority	+	–	–
State assignment for the provision of services	The founder forms and approves	+	+	–
	Can be formed, but not required	–	–	+
Financial support of activities	Compulsory medical insurance funds (in the field of health care)	+	+/–	–
	Regional budget funds: subsidies	+	+	–
	Regional budget funds: budget estimates	–	–	+
	Income from the provision of paid services (the possibility of obtaining)	+	+	+
Income generating activities	Self-management of the received income	+	+	–
	Crediting the income received to the (corresponding) budget	–	–	+
Disposal of property without the consent of the owner	Real estate: at the expense of the owner / own funds	–/+	–	–
	Particularly valuable movable property: at the expense of the owner / own funds	–/+	–/+	–
	The rest of the property (on the basis of operational management)	+	+	–
Control	Control over the activities is carried out by the founder	+	+	+
Reporting	Since 2012 it has been placed in the public domain (on the website bus.gov.ru)	+	+	+

Source: compiled by the author based on the Federal Laws (listed in the *Table*).

same time, initiatives were discussed to abolish insurance premiums and return the UST,[9] which remained at the development stage.

Employers were also payers of the UST (as well as insurance contributions), but in essence, they performed, rather, the functions of tax agents (i.e., intermediaries). When certain authors in their works propose to establish differentiated rates of insurance premiums for compulsory medical insurance —

[9] The government is thinking about returning the unified social tax. URL: https://www.forbes.ru/news/310791-pravitelstvo-zadumalos-o-vozvrashchenii-edinogo-sotsnaloga (accessed on 25.03.2021).

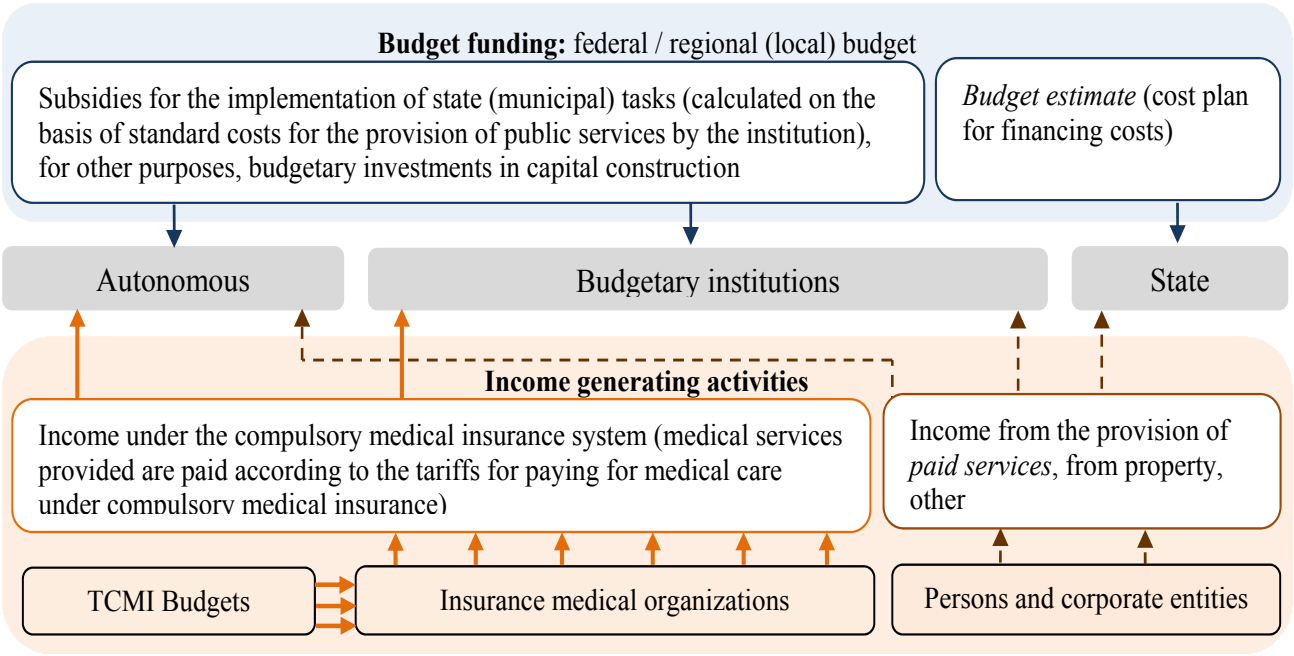

Fig. 6. **Financing mechanism of governmental (public) medical organizations**

Source: developed and compiled by the author based on the Federal Law of November 3, 2006, No. 174-FZ "On autonomous institutions" (latest version). URL: http://www.consultant.ru/document/cons_doc_LAW_63635/ (accessed on 25.01.2021); Federal Law of January 12, 1996, No. 7-FZ "On non-profit organizations" (latest version). URL: http://www.consultant.ru/document/cons_doc_LAW_8824/ (accessed on 25.01.2021); Federal Law of July 31, 1998, No. 145-FZ "Budgetary Code of the Russian Federation" (latest version). URL: http://www.consultant.ru/document/cons_doc_LAW_19702/ (accessed on 25.01.2021).

depending on the level of income [5], they mean the income of employees (not employers), the degree of solvency of the population (and not business entities). According to the author, individuals (and not legal entities) should be recognized as payers of insurance premiums, similar to the rules for levying personal income tax (PIT).

Thus, the author shares the opinion that the real (actual) source of funding for health care is the able-bodied, working population, those who create these funds by their own labor [6]. All kinds of budgets are just channels that transmit funds from consumers of medical services (population) to providers (MO), thus forming a very ramified structure.

FINANCING MECHANISM OF STATE (MUNICIPAL) MOs

The focus of attention is the state (municipal) MOs since they act as guarantors of the constitutional right of Russian citizens to free medical care.[10]

According to their organizational and legal form, all the state (municipal) MOs are subdivided into three types: autonomous, budgetary, and state institutions (*Table 1*).

Based on this, within the framework of the budgetary and insurance model, there are three possible ways of financing (*Fig. 6*) state (municipal) municipalities:

1. Compulsory health insurance funds + budget subsidies (+ paid services).
2. Budget subsidies (+ paid services).
3. Budget estimate (+ paid services).

As a result of the budget reform[11] the rights of autonomous and budgetary institutions for

[10] The Constitution of the Russian Federation, adopted on 12.12.1993 (as amended on 01.07.2020), Art. 41.

[11] Federal Law of 08.05.2010 No. 83-FZ (as amended on 15.10.2020) "On Amendments to Certain Legislative Acts of the Russian Federation in Connection with the Improvement of the Legal Status of State (Municipal) Institutions", Art. 5.

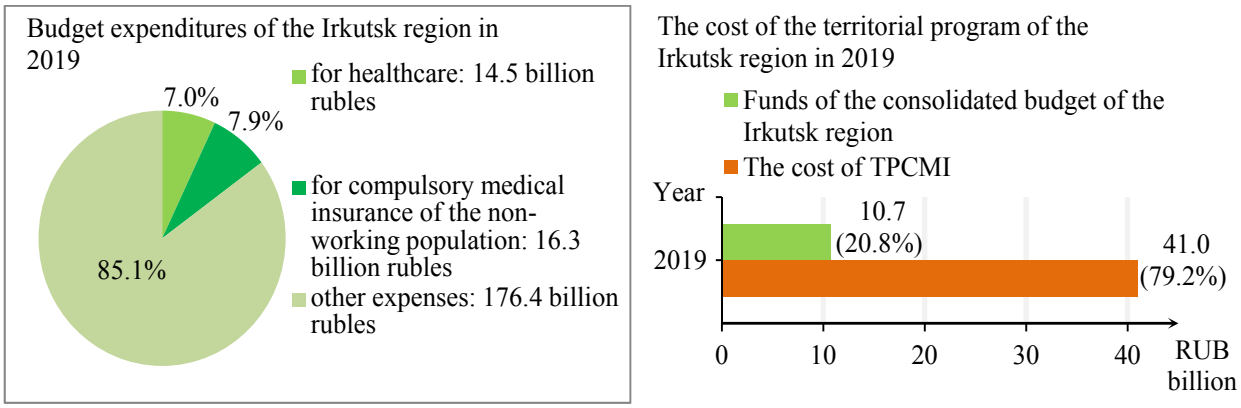

Fig. 7. **Healthcare expenditures of the Irkutsk region in 2019**

Source: Law of the Irkutsk region of October 12, 2020, No. 83-OZ "On execution of the regional budget in 2019" (latest version). URL: http://www.openbudget.gfu.ru/ispolnenie-budgeta/law/ (accessed on 25.01.2021); Resolution of the Government of the Irkutsk region of December 26, 2018, No. 965-pp "The territorial program of state guarantees for access to free-of-charge medical aid for citizens in Irkutsk region for 2019 and for the planned period 2020–2021" (latest version). URL: http://www.irkoms.ru/mo/cat/normativnyie-pravovyie-dokumienty-irkutskoi-oblasti-i-inyie-dokumienty (accessed on 25.01.2021).

financial management have been expanded: extra-budgetary revenues are transferred to the independent disposal of institutions.[12] At the same time, in the health sector, extra-budgetary revenues include both compulsory medical insurance funds and revenues from the provision of paid services.

The presence of three different channels for the receipt of funds distinguishes the healthcare sector (from other industries) and determines the uniqueness of the system of its financing.

Consider the composition of the participants in the territorial program. As an example (hereinafter), the territorial program of the Irkutsk region for 2019 is considered.

The budget expenditures of the Irkutsk region in 2019 on health care and insurance of the non-working population amounted to almost 15% of all expenditures (*Fig. 7*).

The cost of the territorial program of the Irkutsk region in 2019 was almost 80% formed at the expense of the compulsory medical insurance funds (*Fig. 7*).

The per capita funding standard is 20,768.7 rubles, of which:

- 4481.0 rubles — at the expense of the budget (per 1 resident);
- 16 287.7 rubles — at the expense of compulsory medical insurance (for 1 insured person).

In the territorial program of the Irkutsk region in 2019, 160 organizations participated, of which 76.9% are state-owned and 23.1% are private (*Table 2*). At the same time, 85.4% of state MOs are financed under the compulsory medical insurance system: they carry out activities in accordance with obligations to the insurer under compulsory medical insurance and state order.

In the context of predominantly single-channel financing, most of the state MOs working in the CMI system are financed according to a mixed model, but with a predominance of CMI funds (*Fig. 6*).

At the same time, the ratio of funding sources can vary — from full-fledged two-channel financing (if the income from paid services is not considered) to one-channel in its pure form or almost so. We consider these cases and the procedure for financing the MO under the territorial program as a whole (*Table 3*).

Due to the change in the forms of the territorial program annexes in 2019, the data are given for 2018 (*Table 3*).

[12] Federal Law of 30.11.1994 No. 51-FZ (as amended on 08.12.2020) "Civil Code of the Russian Federation (Part One)", Art. 298.

Table 2

List of participants in the territorial program of the Irkutsk region in 2019

Organizational and legal forms	Types of organizations
Participants of the territorial compulsory medical insurance program of the state health care system: 105 organizations	
FSBHI (federal state budgetary healthcare institution); FSHI (federal state healthcare institution); FSBSI (federal state budgetary scientific institution); FSBEI HE (federal state budgetary educational institution of higher education); FSBEI APE (additional professional education), FSAI (federal state autonomous institution); RSBHI (regional state budgetary healthcare institution); RSAHI (regional state autonomous healthcare institution); RSBISS (regional state budgetary institution of social services)	Outpatient clinic, medical unit, hospital, dispensary, ambulance, hospital, health center, center, bureau, university, institute, academy
Participants of the territorial compulsory medical insurance program of the private health care system: 37 organizations	
OOO (limited liability company); AO (joint-stock company), ZAO (closed AO); ANO (autonomous non-profit organization); Private institution, private healthcare institution	Outpatient clinic, medical unit, clinic, hospital, health center, resort, center, airport
Medical organizations that do not carry out activities in the field of compulsory medical insurance: 18 organizations	
RSBHIZ (regional state budgetary healthcare institution); RSGHI (regional state government health institution)	Hospital, dispensary, hospice, blood transfusion station, center, office, orphanage

Source: compiled by the author based on the Resolution of the Government of the Irkutsk region of December 26, 2018, No. 965-pp " The territorial program of state guarantees for access to free-of-charge medical aid for citizens in Irkutsk region for 2019 and for the planned period 2020–2021" (latest version). URL: http://www.irkoms.ru/mo/cat/normativnyie-pravovyie-dokumienty-irkutskoi-oblasti-i-inyie-dokumienty (accessed on 25.01.2021).

An example of two-channel financing is the activity of an institution of such a profile as a dermatovenerologic dispensary (*Table 3*), which provides medical care for dermatological diseases and sexually transmitted diseases (exclusions from the compulsory medical insurance, *Fig. 3*).

Among the participants in the territorial program of the Irkutsk region in 2018, the state health care system, the geriatric center, and the medical-sanitary unit (*Table 3*) provided services only at the expense of the compulsory medical insurance funds (like all private municipalities, which, by definition, are not financed from the budget).

Table 3 shows the cases where the degree of state participation in the financing of the services provided is minimized.

At the expense of the budget, 1 type of medical care is co-financed [outpatient clinics, perinatal centers, hospital (1), children's hospital], 2 types [hospital (2), city hospital], 3 types (district hospital), while the share of budget funds does not exceed 1–2%. In physical terms, these are very small volumes of medical care: from several tens, hundreds to 1.4 thousand units (*Table 3*).

UNDER STATE CONTROL: BUDGET SEGMENT

The segment of institutions that do not carry out activities in the field of compulsory medical insurance occupies a special place in the budgetary and insurance model of health care financing.

Table 3

Planned volumes of medical care in 2018 (some examples)

Type (profile) of activity (all RSBHI, RSAHI)	Hospitalizationcases (share, %)		Outpatient care (calls, visits): (share, %)					Patients treated in day hospitals (share, %)	
			call	visit	call	visit	Emergency		
	Budget	CMI	Budget-funded		CMI-funded			Budget	CMI
Regional dermatovenerologic dispensary	1950 (59.0)	1354 (41.0)	50032 (59.3)	50260 (61.9)	34400 (40.7)	30900 (38.1)	–	116 (6.3)	1713 (93.7)
Regional senior centre	–	980	–	–	10380	5500	1735	–	84
Medical and sanitary part	–	–	–	–	45050	36895	11765	–	3200
City clinic (1)	–	–	130 (0.2)	995 (1.6)	72614 (99.8)	61740 (98.4)	12233	–	2871
City clinic (2)	–	–	334 (0.4)	1358 (0.9)	78138 (99.6)	142451 (99.1)	22004	–	3137
Perinatal center (1)	30 (0.5)	6535 (99.5)	–	–	10400	37348	–	–	1234
Perinatal center (2)	98 (0.7)	14004 (99.3)	–	–	8476	24900	2600	–	1255
City hospital (1)	240 (1.3)	18508 (98.7)	–	–	109313	193900	55095	–	3763
City hospital (2)	37 (0.6)	6167 (99.4)	–	120 (0.1)	68702	90053 (99.9)	20832	–	1700
City children's hospital	311 (1.5)	19900 (98.5)	–	–	3250	–	59000	–	1750
City hospital	89 (1.9)	4677 (98.1)	1254 (1.3)	242 (0.3)	97654 (98.7)	91405 (99.7)	26911	–	3238
District hospital	12 (1.6)	747 (98.4)	40 (0.9)	132 (1.4)	4279 (99.1)	9540 (98.6)	800	Ambulance calls	
								20 (2.1)	920 (97.9)

Source: compiled and calculated by the author based on the Resolution of the Government of the Irkutsk region of December 28, 2017, No. 882-pp "The territorial program of state guarantees for access to free-of-charge medical aid for citizens in Irkutsk region for 2018 and for the planned period 2019–2020" (latest version). URL: http://www.irkoms.ru/mo/cat/normativnyie-pravovyie-dokumienty-irkutskoi-oblasti-i-inyie-dokumienty (accessed on 25.01.2021).

Table 4

Characteristics of health care institutions that do not work in the CMI sector

Type of medical organization	Activity	Organizational and legal form
Hospital, dispensary: 3 org.	Psychiatric and drug addiction medical care	RSGHI, RSBHIZ
Hospital, dispensary: 3 org.	Medical care for tuberculosis patients	RSBHIZ
Hospital, hospice: 2 org.	Palliative medical care	RSBHIZ
Center: 2 org.	AIDS prevention and control; preventive measures	RSBHIZ
Bureau: 1 org.	Forensic medical examination	RSBHIZ
Blood transfusion station:1 org.	Procurement of donor blood and its components	RSBHIZ
Children's home: 5 org.	Child care (children without parental care)	RSGHI
Dispensary (medical and physical education): 1 org.	Medical care in sports, physical culture, rehabilitation	RSBHIZ

Source: see *Table 2*.

We consider their composition using the example of participants in the territorial program of the Irkutsk region in 2019 (*Table 4*).

In accordance with the State Guarantee Program (*Fig. 3*), the regional budget funds are financed (*Table 4*):

- medical care for diseases-exclusions from the compulsory medical insurance program;
- palliative care;
- medical care, public services in AIDS prevention and control centers, medical prevention centers, forensic medical examination bureaus, blood transfusion stations, children's homes, medical and physical dispensaries, etc. (with the exception of types of medical care provided at the expense of compulsory medical insurance).

By their organizational and legal form, most of the institutions are budget-funded (*Table. 4*).

Clinical psychiatric hospitals and orphanages were transformed into state-owned hospitals in accordance with the requirements of the legislation of the Russian Federation.[13]

We consider the procedure for financing these institutions (*Table 5*).

All types of medical care provided by these institutions in 2018 were financed from the regional budget (*Table 5*).

An exception is an activity of a medical and physical dispensary (*Table 5*), where 0.03% of the volume of medical care (in terms of the types included in the basic CMI program) is planned at the expense of CMI funds (considering that treatment is a complete case treatment with a frequency of visits of at least 2).

Let us consider what caused the exclusion of certain diseases from the CMI program (*Fig. 3*).

Diseases not included in the compulsory medical insurance program are included in the List of socially significant diseases and diseases that pose a danger to others,[14] due to the high level of disability and mortality of the population, a decrease in the life expectancy of patients

[13] Federal Law of 08.05.2010 No. 83-FZ (as amended on 15.10.2020) "On Amendments to Certain Legislative Acts of the Russian Federation in Connection with the Improvement of the Legal Status of State (Municipal) Institutions", Art. 31.

[14] Resolution of the Government of the Russian Federation of 01.12.2004 No. 715 (as amended on 31.01.2020) "On approval of the list of socially significant diseases and the list of diseases that pose a danger to others".

Table 5

Planned volumes of medical care in 2018 (non-CMI)

Type (profile) of activity	Impatient days	Hospitalization cases	Outpatient care:			Treated in a day hospital, budget-funded
			call	visit	call	
	budget-funded		budget-funded		CMI-funded	
Mental hospital	–	4102	–	–	–	646
Mental hospital	–	974	–	–	–	–
Psychoneurological dispensary	–	7020	35 233	109 331	–	2783
Tuberculosis hospital	–	3484	39 934	163 965	–	326
Tuberculosis hospital	–	330	–	–	–	–
Tuberculosis dispensary	–	542	1706	2854	–	61
Hospital (hospice)	31 500	–	–	1343	–	–
Hospice	5331	–	–	284	–	–
AIDS Center	–	–	–	84 576	–	–
Medical exercises dispensary.	–	–	–	78 871	10	–

Source: compiled by the author based on *Table 3*.

(along with hypertension, diabetes mellitus, cancer, etc.)

The provision of medical care for these diseases is regulated by separate federal laws (*Table 6*).

In addition, in 2020, an inter-sectoral Federal Law "On Biological Safety" was adopted, according to which the main biological threats include: tuberculosis, HIV infection, viral hepatitis.[15]

Thus, the exclusion of certain types of medical care from the CMI program is dictated by the need to implement the following measures:

1. Implementation of the most complete state control over the system of medical care to prevent the critical level of the spread of dangerous pathologies in society.

2. Ensuring compliance with the legality of certain types of medical activities in the form of establishing a state monopoly on them.

3. Reducing the risks associated with the activities of medical institutions in the compulsory health insurance system.

What these risks are is a separate question. However, the non-inclusion of socially significant diseases in the compulsory health insurance program directly indicates the presence of such risks.

As for the provision of palliative care, this is an important issue that has not only a medical, but also a social, social, moral dimension.[16]

The need to create a new direction in medicine — palliative care — was announced by the World Health Organization (hereinafter referred to as "WHO") in 1982 [7].

[15] Federal Law dated 30.12.2020 No. 492-FZ "On biological safety".

[16] Message of the President of the Russian Federation to the Federal Assembly of 02.20.2019.

Table 6

Government regulation of certain types of medical care

Type of medical care	Federal Law	Funding / Organization Information
Medical care for HIV-infected, AIDS patients	From 30.03.1995 No. 38-FZ "On the prevention of the spread in the Russian Federation of a disease caused by the human immunodeficiency virus (HIV infection)", Art. 4	Events (in subordinate MOs) are financed from the federal budget, the budgets of the constituent entities of the Russian Federation, municipal entities (Art. 6)
Medical care for patients with tuberculosis	From 18.06.2001, No. 77-FZ "On the prevention of the spread of tuberculosis in the Russian Federation", Art. 7	Assistance is provided by licensed anti-tuberculosis medical institutions (Article 8); a system for aiding in specialized federal and regional MOs has been organized (Articles 4, 5)
Psychiatric care	Law of the Russian Federation of 02.07.1992 No. 3185–1 "On psychiatric care and guarantees of the rights of citizens during its provision", Art. 16	Assistance (in subordinate MOs) is financed from the federal budget, the budgets of the constituent entities of the Russian Federation (Art. 17)
Drug treatment	From 08.01.1998 No. 3-FZ "On drugs and psychotropic substances", Art. 54	Treatment of patients (treatment of mental and behavioral disorders caused by the use of psychoactive substances) is carried out only in the state (municipal) MOs (Art. 55)
Donation of human organs and tissues and their transplantation (new bill published)	From 21.11.2011 No. 323-FZ "On the basics of protecting the health of citizens in the Russian Federation", Art. 47; Law of the Russian Federation of December 22, 1992, No. 4180–1 "On transplantation of human organs and tissues."	Fence, procurement, organ, and tissue transplantation are carried out in the state and municipal MOs (Law of the Russian Federation No. 4180–1, Art. 4), the list of which is approved by order of the Ministry of Health of Russia and the Russian Academy of Sciences
Palliative care	From 21.11.2011 No. 323-FZ "On the basics of protecting the health of citizens in the Russian Federation", Art. 36	MO sends a request to the constituent entity of the Russian Federation for the provision of social services. service to the patient (regulation on the organization of the provision of palliative medical care, clause 18, approved by orders of the Ministry of Health of Russia No. 345n, Ministry of Labor of Russia No. 372n of 05.31.2019)

Source: compiled by the author.

CALCULATING THE COST OF THE TERRITORIAL PROGRAM

The cost of the territorial program (and the cost of TPCMI) is calculated as the sum of the products of the volumes (of various types) of medical care and the financial costs of their provision (this is how the per capita funding standard is approved) with subsequent multiplication by the number of permanent/insured population of the constituent entity of the Russian Federation.

The key powers in the formation of the territorial program are the distribution of the volume of medical care between the MO; setting tariffs for paying for medical care under compulsory medical insurance.

The main problem in the formation of territorial programs is balancing:

- the financial capabilities of the constituent entity of the Russian Federation (which are limited by the size of the subvention provided to the TCMI budget from the FCMI budget, and by the level of regional budget revenues);
- the financial needs of the territorial network of MOs (which includes both state organizations, by default, and private, upon notification).

Based on the total amount of subventions (set in the budget), the FCMI calculates the subventions for each region based on indicators[17] such as:

- standard of financial support for the main compulsory medical insurance program;
- the number of the insured population;
- the coefficient of differentiation (for a given constituent entity of the Russian Federation), the coefficient of adjustment for the share of participation of federal MOs (innovations).

First of all, based on the size of the subvention from the budget of the FCMI, the regions calculate the amount of funding for the MO. In this case, the formula for calculating the cost of the territorial program can be represented in the form of the equation:

$$Sub + B = \sum_{i=1}^{n} (Vol_{ai} * Exp_a + Vol_{bi} * Exp_b + Vol_{ci} * Exp_c),$$

where $Sub + B$ — subvention and the approved amount of budgetary funds, rubles;

a, b, c — types of medical care;

Exp_a, Exp_b, Exp_c — standards of financial expenses per unit volume of medical care, rubles;

Vol_{ai}, Vol_{bi}, Vol_{ci} — volumes of medical care for the i-th MO, unit;

n — number of MOs.

The program of state guarantees sets average standards (volumes of medical care and financial costs). According to this, but considering regional characteristics, territorial (differentiated) standards are established in territorial programs: for 1 resident, for 1 insured per year.

When multiplying the volume standards by the population of the region, the total (planned) volumes of medical care are obtained, which are then distributed among medical institutions.

Therefore, the only variable in this formula that can be changed (while maintaining the overall value) isVol_i, that is, the volume of medical care for each specific MO.

The basis for the formation of the territorial program[18] is the population's need for medical care (determined according to medical statistics). Thus, in TPCMI, the volumes of medical services are distributed between medical institutions, based on the needs of the insured for medical care and the population attached to outpatient medical institutions.[19] At the same time, exceeding the established volumes entails the application of sanctions to MOs.

However, the payment for medical care under compulsory medical insurance — the calculation of the cost of medical services and the setting of tariffs — involves the use of coefficients that allow taking into account the differences in the amount of expenses of the medical organization.[20] These include (except for the coefficients reflecting the cost intensity of treatment cases): the coefficient of differentiation, established for individual territories at the federal level, and correction coefficients established at the regional level, including the coefficient of the level (sublevel) of medical services and the coefficient of the specificity of medical care.

There is a three-level system for organizing medical care in Russia, in addition to this,

[17] Resolution of the Government of the Russian Federation of 05.05.2012 No. 462 (as revised on 08.10.2020) "On the procedure for the distribution, provision, and spending of subventions from the FCMI budget to the TCMI budgets for the implementation of the powers of the Russian Federation in the field of CMI transferred to the state authorities of the constituent entities of the Russian Federation.".

[18] Letter of the Ministry of Health of Russia dated December 31, 2020, No. 11–7 / I / 2–20700 "On the direction of clarifications on the formation and economic justification of territorial programs of state guarantees of free provision of medical care to citizens for 2021 and the planning period of 2022 and 2023".

[19] Tariff agreement for payment of medical care for compulsory medical insurance in the Irkutsk region. 30.12.2020.

[20] Letter of the Ministry of Health of Russia dated 12.30.2020 No. 11–7 / I / 2–20691, MHIF No. 00–10–26–2–04 / 11–51 "On methodological recommendations on methods of paying for medical care at the expense of compulsory health insurance funds".

sublevels (no more than 5) can be allocated for each level, also with the establishment of coefficients.

Specificity coefficients (the management coefficient was previously used) can be applied to specific diagnosis-related groups of diseases (DRG) or set considering such criteria as population density, transport accessibility, climatic and geographical features of regions, achievement of target indicators, etc. When calculating the coefficients of specificity for medical organizations that provide outpatient care and have an attached population, age and gender differentiation coefficients (set depending on the structure of the population) are considered.

Thus, the tariffs for the provision of medical care under compulsory medical insurance are differentiated depending on the characteristics of the medical organization.

While the distribution of the volume of medical care in the territorial program does not take into account the specifics of MO (see *the formula for calculating the cost of the program*), which can only be adjusted by redistributing the volume of services.

However, firstly, as a result of such an adjustment, the needs of the population in medical care are distorted; secondly, such a method (of establishing volumes) cannot be considered economically justified at all.

Therefore, the adopted method of distributing the volume of medical care (i.e., the amount of funding for medical organizations) is not accurate, since it does not take into account the difference in the cost of providing medical services by different medical organizations.

In addition, other factors, such as the need for personnel, the state of the material and technical base, buildings and structures, etc., can influence the real size of the expenses of the MOs.

The method used for calculating the amount of funding for medical organizations is focused on "results management" (payment for the number of services rendered), and not on "cost management" (financing the costs of maintaining a network of institutions). However, given the fact that health outcomes management is a complex non-linear process [8], this approach does not always work correctly. It seems that in order to calculate the amount of financing for medical organizations, the cost accounting method should also be used (if not as the main one, then as a complementary one).

Thus, in order to develop measures to ensure the financial balance of the territorial program, at least several conditions are necessary.

First, it is required to accurately establish the size of the deficit (surplus) of funds. To do this, it is necessary to define the "financial needs of the territorial network of MOs" as the amount of funds sufficient for the proper functioning of each MO that is part of the network.

Second, the territorial network itself should be formed. The Ministry of Health of Russia recommends, within the framework of the territorial program, the distribution of medical facilities by levels. Also, according to the author, it is advisable to separate state (municipal) and private municipalities. The FCMI has already announced plans to change the principle of including private medical organizations in the CMI system from notification to declarative.[21]

CMI REFORM: AMENDMENTS TO THE BASIC LAW

The main legislative innovation in 2020 was the introduction of amendments to the law on compulsory medical insurance,[22] which modify the financing mechanism of federal municipalities.

From 2021, the activities of federal medical organizations providing specialized medical care (including high-tech) under the CMI program will be financed directly from the Compulsory Medical Insurance Fund, bypassing both the TCMI and the MIO.

[21] FFCMI: In 2020, 148.5 billion rubles are planned for the operation of private clinics in the CMI. URL: https://vademec.ru/news/2020/07/24/ffoms-v-2020-godu-na-rabotu-chastnykh-klinik-v-oms-zaplanirovano-148–5-mlrd-rubley/ (accessed on 26.02.2020).

[22] Federal Law No. 430-FZ of 08.12.2020. "On Amendments to the Federal Law "On Compulsory Medical Insurance in the Russian Federation".

At the same time, the procedure for distributing the volume of medical care and determining tariffs is established by the Government of the Russian Federation as part of the basic compulsory medical insurance program. The responsibility for monitoring medical care is transferred to the FCMI.

Payment for medical care will be carried out on the basis of a new form of contract: for the provision and payment of medical care within the framework of the basic compulsory medical insurance program (concluded between the federal MOs and the Compulsory Medical Insurance Fund).

At the same time, the federal MOs has the right to provide medical assistance under TPCMI — if the volume of health care is established for it.

Certain changes affect the activities of TCMI and MIO.

In particular, medical care provided to an insured person in another region of the Russian Federation will be paid for (and controlled) by the TCMI, and not by the medical insurance company.

The MIO retains the responsibility for monitoring medical care (including the conduct of a medical and economic examination, examination of the quality of medical care), while the obligation to conduct medical and economic control is assigned to the TCMI (it has the right to carry out any control measures, including repeatedly).

In addition, the new law provides for a reduction in the amount of funds allocated for the management of cases under compulsory medical insurance: from 1–2 to 0.8–1.1% of the amount of funds received by the health insurance organization (according to differentiated per capita standards). Initially, it was planned to cut the amount of remuneration of the insurance company by half, but due to the basic disagreement with the ongoing reform on the part of insurance companies, the value of the standard was adjusted.

During the discussion of the draft law, representatives of the Accounts Chamber of the Russian Federation, the Ministry of Finance of Russia, and the Bank of Russia also expressed concern about the departure from insurance principles in the CMI system [9].

As noted by the auditors of the Accounts Chamber of the Russian Federation,[23] the new law will require the adoption of a significant number of bylaws, including due to the heterogeneity of the changes introduced.

Today in Russia there are several dozen federal MOs providing specialized assistance. The adopted amendments are intended to solve the problem of underfunding of their activities within the framework of TPCMI. Due to a lack of funds, federal institutions were allocated insufficient volumes of medical care at tariffs that did not reimburse their actual costs [10]. According to experts, a change in the funding mechanism will be able to guarantee the stability of medical organizations and confidence that their capacities will work for the benefit of patients [11].

FINANCIAL MODEL DESIGN AND THE PROBLEMS OF ITS FUNCTIONING

The dual nature of the financial model of public health is manifested in the presence of external (income) and internal (expenditure) parties [12].

The subject of this study was the "external block", which includes mechanisms for the formation and distribution of financial resources by the state intended to ensure the protection of public health.

Mechanisms for the use of financial resources ("internal block"), including the organization of the health care system as a whole and the activities of the health care system in it (formation of reports for the provision of medical services and methods of payment, disposal of income, accounting and justification of costs), as well as methods of establishing tariffs for compulsory medical insurance, the calculation of subsidies and the amount of estimated financing are outside the scope of this article.

[23] The Accounts Chamber has prepared an opinion on amendments to the law on CMI. URL: https://ach.gov.ru/expertise/schetnaya-palata-podgotovila-zaklyuchenie-na-popravki-v-zakon-ob-oms (accessed on 25.01.2021).

The existing model of health care financing has developed as a result of gradual transformations, primarily due to the development of the CMI system [13]. The nature of the construction of the budgetary insurance model rather testifies to the empirical path of its formation, to the absence of scientific support for the process of reforming financial relations [12].

At the heart of building a budgetary insurance model, if we briefly summarize the results of the study, is the compulsory medical insurance program as the core and a long list of exceptions in the periphery: certain types of medical care and drug provision, activities, activities, and individual costs [14].

Diseases (from the list of socially significant and posing a danger to others) and activities (requiring state supervision) that are not included in the CMI program stand apart.

At its core, the CMI system, which is responsible for the insurance component of the combined model [15], is not insurance in the generally accepted sense. Commercial insurance involves the insurer's assessment of the insurance risk, probable losses, and profits, as well as the possibility of establishing individual insurance conditions (volumes of insurance obligations, amounts of premiums, and payments) depending on the characteristics of the insured and the solvency of the policyholder.

The CMI does not pursue the goal of making a profit (FCMI is a non-profit organization), it provides uniform rules for the provision of (free) medical care and uniform insurance premium rates for the entire population. Payment of insurance premiums for the non-working population is carried out at the expense of budget funds [16]. This makes it possible to ensure the universality and free of charge of Russian health care, since compulsory medical insurance, by definition, is a type of social insurance.

For the period 2015–2019 healthcare expenditures of the consolidated budget of the Russian Federation and the budgets of the State non-budgetary fund[24] increased by almost 1/3, or by 32.5% (from 2861.0 to 3789.7 billion rubles).

At the same time, the problem of underfunding the activities of health care institutions persists. Thus, the report of the specialists of the Higher School of Economics points to the difficult economic situation of many municipalities, the growing financial problems of the industry. The authors see the main reasons for this in the declining volume of financing for health care and the rise in prices for medicines, medical equipment, and consumables caused by the weakening of the ruble [10].

The problems of funding health care are concentrated not so much in the formation of funds but their distribution and use. Even an increase in the volume of financing for the industry — without changing its organizational and economic system — may not provide the expected results.

In order to increase the volume of financing for the industry, it would be necessary to increase the rate of the insurance premium. However, an increase in the social burden on the payroll in the Russian economy is undesirable, since this may entail an underestimation of the official size of wages and the number of employed [17].

What is causing the rise in costs? Is it only inflationary processes?

According to American authors, the provision of medical services on a free basis leads to excess demand for them and, as a consequence, an increase in health care costs [18]. However, there is reason to believe that in Russia most of the population still does not go to a doctor unnecessarily. Considering the fact that accounting is carried out in electronic form [19], it is possible to conduct an appropriate study.

[24] Reporting of the Treasury of Russia on budget execution. URL: https://roskazna.gov.ru/ispolnenie-byudzhetov/ (accessed on 25.01.2021).

If there "medical care for all" is a dream unattainable for many [20], here it is a tradition, a custom. And it should not be forgotten that the "free" of Russian health care is provided at the expense of the payers of insurance premiums, which are not subject to repayment [21].

At the same time, in Russia, neither the state, nor business, nor society shows the proper interest in investing in the quality of life of the population [22]. Therefore, the most acceptable way for Russia is to reform the health care system in its traditional way. Copying foreign experience in the social sphere, at best, only leads to imitation of forms and methods of work [23].

Thus, the introduction of the principles of commercial insurance in the CMI can lead to a decrease in the volume of social guarantees, discrimination of patients in relation to medical care, and a weakening of the country's ability to withstand global challenges. Strategic risks to the health of the population require mandatory state control of key processes in the medical industry [3].

The growing demand for healthcare services in Russia is largely determined by objective factors such as demographic changes and the associated burden of disease [3].

However, it is more appropriate to speak not about excess demand, but about limited volumes of medical care. When forming the cost of territorial programs, the volumes of medical services are balanced with the available financial resources, which, on the one hand, causes the "queuing phenomenon" [3], and on the other hand, the underfunding of (part of) healthcare institutions.

The CMI system is based on a fee payment method, i.e. proclaimed the transition from providing health care institutions with financial resources to earning them, depending on the volume and quality of services provided [6]. The problem of distribution of financial resources (volumes of medical care) within the framework of territorial programs is directly related to the concept of equity. The question is: on what grounds should the "search for compromise solutions" [12] between equity and economic efficiency be carried out?

But in addition to the objective reasons for the growth of health care costs (such as the state of health of the population, inflationary component), there are others. The problem with Russian healthcare is that expenditures are growing at a faster pace (compared to income). One gets the impression that no matter how much money is added, there will still be little, which levels the FCMI's achievements in collecting insurance premiums [1]. Obviously, the reasons for this phenomenon lie in the system itself.

CONCLUSIONS

The problems of funding health care are concentrated not so much in the formation of funds but their distribution and use. Even an increase in the volume of financing for the industry — without changing its organizational and economic system — may not provide the expected results.

Based on the foregoing, three main problems can be identified when building a budgetary and insurance model for financing health care and, in accordance with this, determine the goals and directions of further research:

1. Congestion. A polystructural and asymmetric financial model unnecessarily complicates financial flows. This includes both settlements in the CMI system and between budgets of all levels in the process of co-financing health care costs. All this creates significant non-production costs (transaction costs).

Among the reasons for the global financial crisis of 2007–2008 is called the "burden" of transaction costs, which fell primarily on the financial sector of the economy [24]. To reduce transaction costs, which tend to increase in the presence of a "gray" economy, corruption, and other illegitimate relations in the country [25], the organization of the health care system and the mechanism of its financial support must be considered. Among the many factors

causing problems in the health care system, the organization is critical [26].

According to the author, at the first stage, it would be necessary to abandon the excessive fragmentation of the financing of the MOs. In particular, it is irrational to finance 1–2% of the (homogeneous) services provided by the institution at the expense of budget funds (*Table 3*) or, conversely, at the expense of compulsory medical insurance funds (*Table 5*). It is necessary to delimit the powers of financing a medical organization so that from one source not 95–99% of medical services within one institution are financed, but 100%.

Fragmented funding and administration have been identified by WHO as one of the main reasons for the inefficient use of health system resources.[25]

According to the author, the prospects for ensuring the consolidation of funding sources for the state (municipal) MOs lie in the structuring of the territorial network of MOs: the allocation of subsystems of institutions. In principle, the reform of the health financing mechanism in accordance with the changes introduced by the new law is being carried out in this direction.

2. Inconsistency. We are discussing a potential conflict between the main goal of public health (ensuring the provision of medical care to the population in terms of free, accessibility, and quality) and its commercial component (financial incentives for activities).

To minimize the existing contradictions, it is necessary to analyze the motivation of all participants in the health care system and, based on this, adjust their functional roles and financial relations. It is necessary to consider the following principles: the unity of the goal of health care; economy, fairness and transparency in the use of resources; accountability of actors and governing bodies of the health system at different levels.

One of the most illustrative examples of distorted motivation is that MIOs (for detecting violations) receive a certain percentage of the amounts paid by the MOs as a result of the application of sanctions to them (326-FZ, Art. 28). In fact, there is a "monetization of violations" (MIOs are interested in the presence of violations, and not in the absence).

Moreover, from the point of view of motivation, it is doubtful not only the method of remuneration for the performance of functions to control the quality of medical care, but also this measure itself (application of penalties) as such.

One cannot but agree that the goal of health care reform should be the continuous improvement of the quality of medical care.[26] But the mechanism of applying sanctions against the MOs does not, in itself, contribute to qualitative transformations; it is necessary to envisage other measures stimulating real changes in this area.

Rather, control is a discipline tool. And if the use of monetary fines is still necessary, then again, one should use the coefficients of differentiation, which are set depending on the level of income of the medical organization (including from paid services).

3. Cost intensity. In the health care system, incomes "do not keep pace" with expenditures. It is necessary to identify the intra-system factors of the outstripping growth of costs and the possibility of their elimination. To solve this most important problem, it seems that joint efforts of the professional and scientific community are needed.

Neither the ministries and departments nor the chambers of control and accountability set the goals (objectives, subject) of their monitoring and expert and analytical activities in relation to state (municipal) MOs, in a context that assumes a non-standard approach without being limited by any framework. Science not only fixes the connections and dependencies of economic processes but also reveals their deep, "invisible" unscientific view of nature [27].

[25] World health report. Financing of health systems. The road to universal health coverage. WHO, 2010. URL: https://www.un.org/ru/development/surveys/docs/whr2010.pdf (accessed on 28.02.2021).

[26] The Ljubljana Charter on Reforming Health Care in Europe. URL: https://www.euro.who.int/ru/publications/policy-documents/the-ljubljana-charter-on-reforming-health-care,-1996 (accessed on 28.02.2021).

At present, a methodological basis has not been formed for conducting a comprehensive analysis of the financial and economic activities of health care institutions, which would fully consider the industry specifics in modern conditions (and the set research task is even more multifaceted). Therefore, despite the steps taken in this direction, there remains a high need for conducting such studies based on healthcare institutions of various types and levels.

Health systems are losing money, according to the WHO report. At the same time, most countries do not use the available resources to the full due to irrational or inappropriate spending of funds, poor management of factors of production.

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Methodological Approach to the Organization of Monitoring of Cash Flow Volatility

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ABSTRACT

The study presents the author's approach to monitoring the volatility of cash flows. **The relevance of the study** is due to the fact that a high increase in volatility can have a negative impact on the stability of individual economic entities; therefore, central banks are faced with the task of organizing a system for monitoring cash flow volatility, as well as developing approaches to their regulation. **The purpose of the study** is to develop a methodological approach to organizing the monitoring of cash flow volatility. Statistical **methods**, including fractal analysis, are used in the study. The study determines the approach to classifying different levels of cash flow volatility. Three main types of cash flow — moderate, transient, and turbulent, — are defined. The study confirmed two hypotheses. First, it is proven that the volatility of cash flows is more the result of behavioural factors than institutional ones. Second, it is established that the turbulent type of cash flow occurs in more rare cases than the moderate or transient types. It is shown that the volatility of the cash flow is the result of behavioral reactions of economic entities to fluctuations in economic activity. Institutional factors determine the limits of cash flow volatility, but fluctuations within these limits are the result of the reaction of economic actors to changes in the external environment. The turbulent type of cash flows occurs during the period of simultaneous actions of all economic entities. Based on the three-sigma rule, a methodological approach to determine confidence intervals classifying cash flows by the type of movement was suggested. **It is concluded** that since the turbulent type of cash flows has the greatest negative impact on the stability of the economy, it should be of significant interest for monitoring and subsequent regulation by the Bank of Russia. **A promising direction for further research** may be the development by the Bank of Russia of a specialized refinancing instrument to compensate for the shortage of funds due to the increased level of cash flow volatility.

Keywords: cash flows; volatility; behavior; lending; risks; uncertainty; monitoring

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INTRODUCTION

This research suggests an original approach to the organisation of monitoring the volatility of cash flows. The volatility of cash flows reflects the intensity of interaction between economic entities over time. The rate of cash flow determines the volume of cash flow volatility and its fluctuations. The frequency of volatility measurement, related to the institutional conditions for making a payment, determines the volatility of cash flows. These institutional conditions include the rules of the payment system, level of continuity of its functioning [1], and adequacy of financial assets [2]. The volatility of cash flows encourages economic entities to engage in suboptimal actions, in terms of increased information asymmetry [3]. The behavioural actions of the entities may lead to financial losses, or even to default. The economic entities do not have time to adapt to the changes in cash flow, so they perform suboptimal actions that we can observe at the macroeconomic level [4]. As a result, central banks face the task of carrying out the monitoring of the cash flows' volatility, as well as developing regulating mechanisms aimed at reducing the potential negative impact.

To monitor cash flows, the Bank of Russia launched the "Monitoring of Industry Financial Flows" in 2020, but the methodology for organising this system is still under development. For example, the problem of determining the "normal" level of volatility is not fully solved. Fluctuations in the volatility are limited by structural conditions,

creating possible limits, including budget constraints [5]. It is not fully clear, what, to a greater extent, affects the volatility of cash flows, i.e., the institutional structure of the economy or the behavioural reactions of economic entities affecting the occurrence of fluctuations. The answers to these questions are also important for assessing the current state of the economy, building a strategic planning system, etc.

This study suggests that the increased volatility of cash flows is the result of changes in sentiment on the part of economic entities performing economic transactions. Economic entities demonstrate three main types of behaviour: active, adaptive, and reactive [6]. A significant increase in the volatility is the result of initiating actions on the part of entities with an active type of behaviour, as well as supporting actions on the part of entities with an adaptive and reactive type of behaviour. It is necessary to determine the factors influencing the economic entities' decision to make financial transactions and reduce the potential negative impact of excessive volatility.

The presented research consists of four sections. Firstly, a literature review is conducted, revealing the occurrence of cash flows' volatility. The second section includes an empirical approach to determining the types of cash flow. The third section performs the empirical analysis on the example of the indicator of the volume of bank loans. The fourth section examines the main factors leading to the emergence of a turbulent type of cash flow.

LITERATURE REVIEW

The volatility of cash flows reflects the degree of change in the volume of transactions performed over a certain period of time. The volume of volatility varies, depending on the type of cash flow. In accordance with the Order of the Ministry of Finance of the Russian Federation, dated 02.02.2011, No. 11n "On Approval of the Accounting Regulations 'Statement of Cash Flows' (PBU 23/2011)", it is possible to distinguish three categories of cash flows: cash flows from current operations, cash flows from financial operations, and cash flows from investment operations. This classification of cash flows reflects the fact that there are institutional differences in the reasons for the formation of the cash flows, as well as in the mechanism for fulfilling obligations. The volatility of cash flows will differ, depending on the parameters of the external and internal environment. It affects the decisions and reasons for the direction and volume of funds by economic entities. When determining the factors of cash flow volatility, it is advisable to take into account the purpose of its formation, as well as the motivation of all stakeholders. Changes in cash flows, in some cases, are accounted for, using financial indicators, reflecting the sustainability of economic entities [7]. When assessing cash flows, it is possible to take into account the indicators of balances, reflecting the results of cash flows.

The volatility is the result of the economic actions of entities with different types of behaviour. It is possible to distinguish entities with an active type of behaviour, entities with an adaptive type of behaviour, as well as entities with a reactive type of behaviour [8]. During a period of economic growth, all entities can profit from their economic operations. However, entities with an active type of behaviour are better at taking into account the change in the economic situation [9]. They observe changes in the economic situation, have the financial resources to make significant economic transactions. At a certain point in time, entities with an active type of behaviour take actions aimed at changing the external environment in order to generate additional income. Entities with an adaptive type of behaviour, observing the beginning changes in the economy, make a decision to implement adaptive actions. The actions of entities with an adaptive type of behaviour lead to increased volatility of cash flows. In the future, the volatility of cash flows may increase, or decline. A decrease in the volatility occurs if the impact of entities with an active type of behaviour has not had a significant impact on the critical mass of entities with an adaptive type of behaviour. The entities with the adaptive type of behaviour did not believe in the change in the economic situation, associated with the actions of the entities with the

active type. They have not started to make economic transactions, and the volatility has returned to normal parameters. In the second case, entities with adaptive behaviour support entities with active behaviour. They start to invest more cash, which leads to a significant increase in the volatility of cash flows. Subsequently, economic transactions are started by entities with a reactive type of behaviour. The volume of funds invested by entities with a reactive type of behaviour determines the further increase in the volatility. The volatility is the result of the simultaneous actions of all three categories of entities. Fluctuations in cash flows depend on the individual reactions of economic entities. It is possible to put forward the following hypothesis:

Hypothesis 1. Behavioural factors play a stronger role producing volatility in cash flows than institutional factors.

The role of institutional factors is quite high, but they create boundaries within which fluctuations in cash flows occur. These boundaries can only change if the institutional structure of the economy changes [10]. Behavioural factors determine the different responses of economic entities to changes in the external environment. The share of entities as well as the amount of free cash available to them determines the possible size of fluctuations in cash flows [11]. It is advisable to define three types of cash flows: moderate, transitional and turbulent (*Table 1*).

A moderate type of cash flow occurs in a situation where all categories of economic entities perform *standard operations*. Each of the categories of economic entities receives a profit. As a result, transactions are carried out evenly and the volatility of cash flows is at an acceptable level. When performing actions by entities with an active type of behaviour, as well as supporting actions of entities with an adaptive type of behaviour, there is an increase in volatility. This type of cash flow can be characterised as "transitional". Economic actions are performed by two categories of entities. After, the volatility of cash flows can increase, due to additional cash injections from entities with an adaptive type of behaviour. The most dangerous is the turbulent type of cash flow. It occurs in a situation where the actions of entities with an active and adaptive type of behaviour are supported by entities with a reactive type of behaviour. In terms of information asymmetry, entities with a reactive type of behaviour commit subsequent actions, creating additional economic losses. This type of cash flow can be characterised as "turbulent" because the speed and volume of transactions increases and some economic transactions lead to significant losses. Taking into account the fact that the turbulent type of movement is the result of simultaneous actions of all categories of economic entities, it is possible to put forward the following hypothesis:

Hypothesis 2. The turbulent type of cash flow occurs rarer than moderate or transitional types.

It should be noted that, although the turbulent type of cash flow is the rarest, it poses the greatest threat to the sustainable activities of economic entities with a reactive type of behaviour. In the conditions of increasing volatility, economic entities with a reactive approach do not have time to adapt to the emerging changes. Entities with a reactive type of behaviour, due to increasing information asymmetry, perform suboptimal actions leading to financial losses. A change in the mood of economic entities can also be the result of a change in the information background [12]. Thus, it is necessary to determine the factors influencing the formation of a turbulent type of cash flow. To test the hypothesis, it seems appropriate to conduct an empirical analysis.

DATA DESCRIPTION AND RESEARCH METHODOLOGY

To analyse the mechanisms of the occurrence of cash flow volatility, as well as the level of volatility, the study uses the indicator: "Loans granted, taking into account the revaluation and adjustment of the value of the provided (placed) funds — total" (the lending indicator). The data for calculating the indicator were taken from the website of the Bank of Russia, for the period from 01.02.2008 to 01.08.2020 on a monthly basis. The choice of this indicator is due to the fact that loans have a direct impact on the sustainability of economic development. It is the loan cash flow that is the key source of liquidity for making

Table 1

Types of cash flows

Types of movement	Description
Moderate	It is the result of uniform actions of all three categories of entities. The volatility of cash flows is persistent
Transitional	It is the result of actions of entities with an active type of behaviour, as well as supporting actions on the part of entities with an adaptive type of behaviour. It is characterised by an increased level of volatility
Turbulent	It is the result of the actions of entities with adaptive and reactive behaviours. It is characterised by excessive levels of cash flow volatility, creating additional imbalances in economic interaction

Source: compiled by the author.

economic transactions in Russia. According to the Association of Russian Banks on 01.04.2019, the volume of loans to non-financial organisations reached 48.9 trillion rubles [13]. In this regard, there is a question: What determines the volatility of cash flow — the decisions of economic entities or the institutional characteristics associated with taking out a loan (for example, the parameters of monetary policy [14])?

To test the hypothesis about the degree of influence of behavioural and institutional factors on the level of cash flow volatility, it is advisable to use fractal analysis (*Table 2*). The use of fractal analysis allows us to determine the characteristic of a time series. It is possible to distinguish between a persistent process and a anti-persistent process. A persistent process assumes that the previous values determine the current values. Accordingly, if the cash flow is a persistent process, it is possible to conclude that it is more influenced by institutional factors. If the time series represented a cash flow as a anti-persistent process, then the cash flow is more dependent on the behavioural responses of economic entities. The latter is due to the fact that the anti-persistent process is determined by the current values. To define the type of time series, it is advisable to calculate the Hurst index using the ordinary least squares [15]. The Hurst index (H) is calculated using the following formula, based on the application of the ordinary least squares:

$$Ln(R/S) = ln(c) + H * ln(m),$$

where R/S is the average value of the normalised span, H is the Hurst index, m is the number of observations in a group (the time series is divided into groups with a certain number of observations), and c is a constant. The calculation of these indicators is based on the methodology of R/S analysis [16]. If H is less than 0.5, then the time series is an anti-persistent process.

The second important issue is the calculation of confidence intervals for determining the moderate, transitional and turbulent types of cash flow. When determining confidence intervals, it is necessary to classify indicators of cash flow volatility. Here it is possible to use the three-sigma rule, assuming the calculation of averages and standard deviations.

EMPIRICAL ASSESSMENT

The role of behavioural factors in the formation of cash flow volatility

It is advisable to use fractal analysis to determine the dominant factors affecting the volatility of cash flows. For this purpose, the increments of the lending indicator were calculated. During the fractal analysis, a sample was taken from 01.01.2009 to 01.08.2020. Subsequently, the entire time series was divided into 6 groups with an equal number of observations. The resulting series was transformed into a logarithmic series, the accumulated deviations were calculated etc. As a result, we obtained values allowing us to estimate the Hurst index (*Table 2*).

The estimation of the Hurst index enabled us to obtain a target value for the lending growth indicator of 0.389. This value of the Hurst index allows us to classify the series as an anti-persistent process. The volatility of the cash flow is largely determined by the individual assessments of

Table 2

Calculation of the values required to estimate the Hurst index

Name of indicators	1	2	3	4	5	6
m (number of observations in the group)	10	14	20	28	35	70
R/S (the average value of the normalised span)	2.269408	2.7189	3.098122	3.52119	3.577471	5.026532
ln(m)	2.302585	2.639057	2.995732	3.332205	3.555348	4.248495
ln(R/S)	0.819519	1.000227	1.130796	1.258799	1.274656	1.61473

Source: compiled by the author.

economic entities, taking into account the current situation.

In fact, it is possible to conclude that the volatility of the cash flow depends more on behavioural factors than on institutional ones. When analysing fluctuations in cash flows, it is necessary to take into account this group of parameters. The hypothesis that the volatility of cash flows is more the result of behavioural factors than institutional ones is confirmed. The regulation of the volatility of cash flows should be aimed at compensating for possible losses associated with the rash actions of entities with a reactive type of behaviour. However, the use of these tools is advisable at a certain point in time. There is a question about how to determine the boundaries of confidence intervals allowing us to classify the cash flows.

Empirical estimation of confidence intervals for classification of cash flow types

The fractal analysis demonstrated that the volatility of cash flows is largely determined by behavioural factors, connected with the current situation in the economy. The change in the types of cash flow depends on the volume of funds and the number of entities involved in economic transactions. It is legitimate to assume that the moderate type of cash flow will be the most common since it does not imply the existence of simultaneous actions of a group of economic entities. The turbulent type of cash flow will be the least common because it occurs in a situation of simultaneous transactions by entities with a reactive type of behaviour. This situation is only possible during periods of panic actions of the specified category of entities. It is quite rare.

The classification of cash flow is possible by calculating the confidence intervals. The three-sigma rule assumes that a deviation of values above three standard deviations must be considered to be anomalous [17]. Since turbulent cash flow occurs periodically, it is possible to assume that it occurs in the range of two standard deviations. The transition type of cash flow will occur in the ranges from one to two standard deviations. The moderate type of cash flow was in the range of one standard deviation. These characteristics were calculated for the lending indicator. To calculate the confidence intervals, the values of standard deviations were calculated, as well as the average values (*Table 3*).

The three-sigma rule assumes that 95.44% of observations are within the average (plus/minus) of two standard deviations. In turn, within one standard deviation, 68.26% of the values, it is possible to assume that values that are within one standard deviation will characterise a moderate type of cash flow. Values that are in the range of one to two standard deviations are transitional. All meanings that are higher should be considered as turbulent (*Fig. 1*). To calculate the intervals, we used the data from 01.02.2008 to 01.08.2020.

As a result of the calculations, the following intervals were obtained:

1) If the growth values of the lending indicator fall in the range from — 0.74% to 2.9%, then this type of cash flow is moderate;

2) If the values of the lending indicator fall in the range of — 2.56% to — 0.74% inclusive and from 2.9% inclusive to 4.7%, then this type of cash flow is transitional;

Table 3

Values of indicators for calculating confidence intervals

Indicator	Meaning
Average value	1.079701
Standard deviation	1.815662
The average values, minus and plus standard deviation	–0.735961154 (minus the standard deviation) 2.895364 (plus standard deviation)
The average values, minus and plus two standard deviations	–2.551623561 (minus two standard deviations) 4.711026 (plus two standard deviations)

Source: compiled by the author.

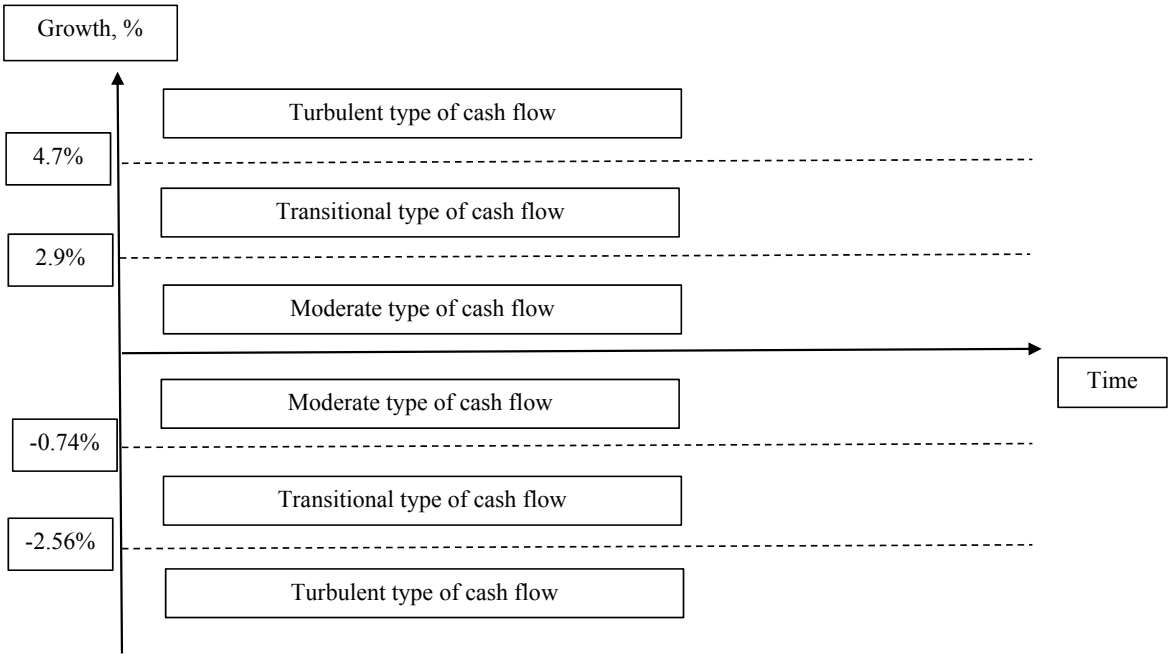

Fig. 1. **Values of confidence intervals for determining the types of cash flow**

Source: compiled by the author.

3) If the values of the lending indicator fall in the range up to — 2.56% inclusive and from 4.7% inclusive, then the type of cash flow is classified as turbulent.

It was found that the turbulent type of cash flow occurs only in 6% of cases. The moderate type occurs in 71.3% of cases (*Table 4*). Thus, the assumption about the distribution of critical values of cash flow volatility has been confirmed. It is possible to use the proposed approach to classify the volatility of cash flows as moderate, transitional and turbulent.

It should be noted that the turbulent type of cash flow can cause the greatest harm. In times of crisis, it is the subjects with a reactive type of behaviour, performing catch-up actions, which bear the greatest losses. This type of entity, during the period of increasing volatility, cannot unambiguously assess the incoming information. The Bank of Russia faces the task of organising the monitoring of cash flows, as well as developing tools to reduce the potential negative impact from the increased level of volatility. To achieve this, it is necessary to determine the factors leading to the transition to a turbulent type of cash flow.

FACTORS DETERMINING THE OCCURRENCE OF A TURBULENT TYPE

The volume of volatility in the economy is determined by two main parameters, i.e., the speed of operations, as well as the size of the performed operations. Depending on the

Table 4

Distribution of the number of months, depending on the type of lending cash flow

	Number of months	Share, %
Moderate type	107	71.3
Transitional type	34	22.7
Turbulent type	9	6
Total	150	100

Source: compiled by the author.

specific situation, the degree of influence of behavioural and institutional factors affects the two parameters in different ways. The turbulent type of cash flow occurs in case of a significant increase in the speed and volume of transactions. This increase is largely due to the impact of the following key factors: the smooth functioning of payment systems; the amount of available funds, i.e. budget constraints that the entities have; the expectations of the entities; the distribution of entities by type of behaviour and the system of institutional regulation (*Table 5*).

Smooth functioning of payment systems. Disruption of the smooth functioning of payment systems limits the ability to make a payment. The amount of money to transfer may accumulate, leading to jumps in the volume of performed transactions. As a result, the probability of a turbulent type of cash flow increases. This aspect is most often associated with a group of institutional factors, rather than behavioural ones.

The amount of available funds. Free cash determines the potential economic impact that the entities can have when the transaction is necessary. The entire set of available funds cannot be promptly withdrawn from circulation. In this regard, the key role for volatility is played by the volume of free cash.

The expectations of stakeholders. A significant change in the expectations of economic entities may trigger their simultaneous actions. The existing opportunities for rapid transfer of funds create significant risks for economic entities, as the time between receiving information and making the transaction, especially in the context of the development of digital technologies, is reduced.

Distribution of entities by type of behaviour. The appearance of a turbulent type of movement is associated with the simultaneous actions of entities with a reactive type of behaviour [18]. If entities with a reactive type of behaviour do not have the ability to perform operations, then the turbulent type will not occur. The latter can occur in a situation of high-income diversification of economic entities. Entities with an active type of behaviour will initiate an increase in volatility. This is the main source of money redistribution. It should be noted that the usage of digital technologies does not always reduce the institutional boundaries. Due to the imperfection of organizational process, the effect of "digital bureaucracy" may occur, reducing the ability of entities to perform economic operations.[1]

The system of institutional regulation. The existing institutional constraints are the boundaries for entities. The occurrence of a turbulent type may be limited by the rules for making a payment, the rules for withdrawing funds (for example, deposits), ownership questions [19] etc. In the case of significant restrictions, the entities will not be able to quickly increase the amount of available funds. Moreover, mandatory compliance with financial and regulatory requirements also reduces the amount of available free funds [20]. As a result, it reduces volatility.

Monitoring the above factors will create a comprehensive system for controlling the volatility of cash flows. Taking into account the existing experience of the Bank of Russia, it is possible to use the available data in the national payment system when organising monitoring.

[1] "Digital bureaucracy" is the creation of additional electronic procedural barriers to obtaining public services through the use of state information systems (or state digital platforms).

Table 5

Classification of key factors affecting the transition to a turbulent type of cash flow

Main factors	Description
Smooth functioning of payment systems	To make payments, the entities must have the technological ability to make it. The probability of a turbulent type depends on the characteristics of the payment system, the periods of the operating day, etc
Amount of available funds	The probability of a turbulent type depends on the amount of funds available to entities with a reactive type of behaviour. The lack of funds will not allow the entities to make economic transactions, which will limit the level of volatility
Expectations of entities	Changing expectations of economic entities encourages them to perform suboptimal actions. A sharp change in expectations contributes to the onset of a turbulent type of cash flow. Expectations of economic entities are related to the availability of incoming information
The distribution of entities by the types of behaviour	The volatility of cash flows is the result of the actions of entities with different types of behaviour. The greatest influence is exerted by the actions of entities with a reactive type of behaviour. The distribution of entities and the amount of funds available to each group directly affects the transition to a turbulent type
The system of institutional regulation	It creates institutional conditions or boundaries limiting potential fluctuations in the cash flows. An example of such restrictions is the limits on cash withdrawal on payment cards

Source: compiled by the author.

CONCLUSION

The presented research defines an approach to classifying different levels of cash flow volatility. It is possible to distinguish three main types of cash flow: moderate, transitional, and turbulent. The turbulent type of cash flow causes the greatest harm to economic sustainability and is associated with the insufficient speed of adaptation of economic entities to the changes in the financial market. The research proves two hypotheses:

Hypothesis 1. Behavioural factors play a stronger role producing volatility in cash flows than institutional factors.

Hypothesis 2. The turbulent type of cash flow occurs rarer than moderate or transitional types.

It was found that the volatility is more determined by behavioural factors than by institutional ones. Institutional factors determine the limit of volatility of cash flows, but fluctuations within these limits are the result of the reactions of the entities to the changes. The turbulent type occurs during the period of simultaneous economic operations by all entities. Therefore, it is the rarest.

To regulate the volatility of cash flows, the Bank of Russia should try to minimize the potential consequences associated with suboptimal actions of entities. It is possible to develop a mechanism compensating for the lack of funds for a certain period of time meeting highly efficient monetary policy requirements [21]. The time period should be sufficient to obtain additional available funds and meet the obligations. This mechanism can be represented by a specialised refinancing instrument, the development of which should be the object of another study.

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The Results of the 20-Year Economic Cooperation of the Shanghai Cooperation Organization and its Development Prospects

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ABSTRACT

The Shanghai Cooperation Organization is generally considered a security organization. But many of its member countries are in favor of strengthening cooperation in the economic field, and a whole series of decisions on economic cooperation was adopted on their proposal. The **purpose** of the article is to summarize the results, positive experiences and negative lessons of economic cooperation over the past 20 years in the field of trade, investment and finance within the framework of the SCO and to look into the future. In this direction of research based on the dialectic of materialism, the article uses positive and normative economic analysis, the paradigm of institutionalism, statistical and other **methods**. Asserting that economic cooperation for the sake of common prosperity and the building of a "Community of Economic Interests" is an essential component of the "Community of the Common Destiny of Mankind", and that the SCO is an essential platform for the joint coordination and promotion of the concept of "One Belt and One Road" and the common distribution of their fruits, and for the promotion of mutually beneficial economic cooperation. The article **concludes** that, on this platform, the Chinese and Russian initiatives "One Belt and One Road" and "Greater Eurasian Partnership" work closely together to develop infrastructure interconnections, trade facilitation and regional economic integration, resulting in the formation of the Eurasian Economic Partnership for the sake of common prosperity in the SCO region. The article also shows the challenges and difficulties that the SCO faces in its development.

Keywords: SCO; economic cooperation; One Belt and One Road; Great Eurasian Partnership

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INTRODUCTION

Since its inception, the SCO has emphasized that "the development of economic relations is a very important task in the work of the SCO"[1] and has explicitly included in ***the Charter of Shanghai Cooperation Organization*** the long-term goal of SCO economic cooperation "to promote trade and investment facilitation with a view to gradually achieve the free flow of goods, capital, services, and technology".[2] In 2009, the Heads of Government of the SCO member states issued ***the Joint Initiative of the SCO Member States on Strengthening Multilateral Economic Cooperation, Addressing the Global Financial and Economic Crisis and Ensuring Sustainable Economic Development***, and the SCO economic cooperation entered a phase of quality improvement and upgrading, extending the areas of cooperation to finance. In September 2019, a new version of ***the Multilateral Economic and Trade Cooperation Programme*** for 2035 was formulated and adopted at the meeting of the Ministers of Economy and Trade of SCO member states, launching a new journey of economic cooperation and setting new basic goals [1].

In order to successfully achieve the tasks and objectives of political, security, and economic cooperation set out in ***the Declaration on the Establishment of the Shanghai Cooperation Organisation*** and ***the Charter of the Shanghai Cooperation Organisation***, the SCO completed the framework of its institutional structure

[1] Declaration of Heads of Government of the SCO Member States (7 June 2002), Shanghai Cooperation Organization Secretariat. URL: http://chn.sectsco.org/documents/ (accessed on 02.04.2021).

[2] Charter of the Shanghai Cooperation Organization (7 June 2002), Shanghai Cooperation Organization Secretariat. URL: http://chn.sectsco.org/documents/ (accessed on 02.04.2021).

in the initial years. In the field of economic cooperation, the SCO Industrialists Committee, the CUP, the Regional Economic Cooperation Website, and the Energy Club have been established, and the aspiration to establish an SCO Development Bank, a Development Fund, and a Special Account has also been raised. China has established relatively comprehensive cooperation mechanisms with the SCO, such as the China-SCO International Exchange and Training Base for Judicial Cooperation and the China-SCO Legal Services Committee (Shanghai University of Political Science and Law), the China-SCO Local Economic and Trade Cooperation Demonstration Zone (Qingdao), and the China-SCO Agricultural Technology Exchange and Training Demonstration Base (Yangling, Shanxi). In addition, China has unilaterally funded economic cooperation promotion funds and preferential loan facilities, such as the China-Eurasia Economic Cooperation Fund. SCO member states also share directly in the financing schemes of financial institutions such as the Silk Road Fund, the BRICS New Development Bank, and the Asian Infrastructure Investment Bank [2].

SCO ECONOMIC AND TRADE COOPERATION HAS MADE GREAT STRIDES

On the basis of the above-mentioned institutional development, driven by the common will of the member states to strengthen economic cooperation and promote shared economic development and prosperity, as well as the joint efforts of the governments of the member states and the promotion of various mechanisms, the mutual economic cooperation among the SCO member states has achieved fruitful results in the fields of trade, investment, and finance. The total economic volume of the SCO was only US$ 1.5 trillion in 2000 before its establishment, doubled to US$ 3 trillion in 2005, doubled again to US$ 7.8 trillion in 2010, doubled again to US$ 17 trillion in 2017, and approached US$ 20 trillion in 2019. The SCO economy volume has increased 13 times in 20 years. The total foreign trade of the SCO member states, which was less than US$ 650 billion in 2000, surpassed US$ 1 trillion in 2003 and again surpassed US$ 3 trillion in 2010, reaching US$ 6.6 trillion in 2019, a tenfold increase in 20 years.[3] Total foreign direct investment attracted by these countries rose rapidly from less than US$ 50 billion to US$ 231.56 billion in 2019, reaching nearly five times the level in 2000. We know that most of the SCO member states are transition economies and developing countries, lacking the adequate financial resources needed to promote economic development. However, since the establishment of the SCO, their capital has also started to "go out". Their total outward FDI was only US$ 4 billion in 2000 and was done mainly by Russia (US$ 3 billion) and China (US$ 900 million), surpassing US$ 10 billion in 2003, quickly surpassing US$ 100 billion in 2008 and US$ 200 billion in 2016. As a result of the Trump administration's disengagement from globalization, unilateralism and the wielding of the "trade war" and sanctions stick against the world, outward investment from SCO member states has been on a downward trend, falling back to 2012 and 2013 levels of less than $ 150 billion in 2019.[4]

Rapid Rise in the Scale of Mutual Trade between Member Countries

Mutual trade is a key element of SCO's economic cooperation. China's rapid economic development over 40 years of reform and opening up has made it the second largest economy in the world and has created a unique manufacturing capacity, making it a veritable "world factory". Other member states have benefited from their abundant energy and raw materials, hooking themselves up to the "Orient Express" and complementing each other's strengths, despite the secrecy of some countries about their dependence on energy and raw material exports. Since the establishment of the SCO, the scale of mutual trade between member states has risen considerably, as shown in *Figure 1* [3].

In 2000, the year before the establishment of the SCO, the total mutual trade among the six member states was only US$ 30.33 billion, as shown in *Table 1*. According to the international trade balance theory, the principle that the total imports of the six member states are equal to their total exports, the net trade value was only US$ 15.16 billion. Of these, Russia's trade with other SCO member states was US$ 12.86 billion, China's US$ 8.97 billion and Kazakhstan's US$ 560 million, and their shares of mutual trade in the SCO were 42.4%, 29.6%, and 18.4% respectively,

[3] World bank, Data [DB/OL]. URL: https://data.worldbank.org.cn/country (accessed on 02.04.2021).

[4] United Nations conference on Trade and Development. UNCTADSTAT [DB/OL]. URL: https://unctadstat.unctad.org/EN/BulkDownload.html (accessed on 02.04.2021).

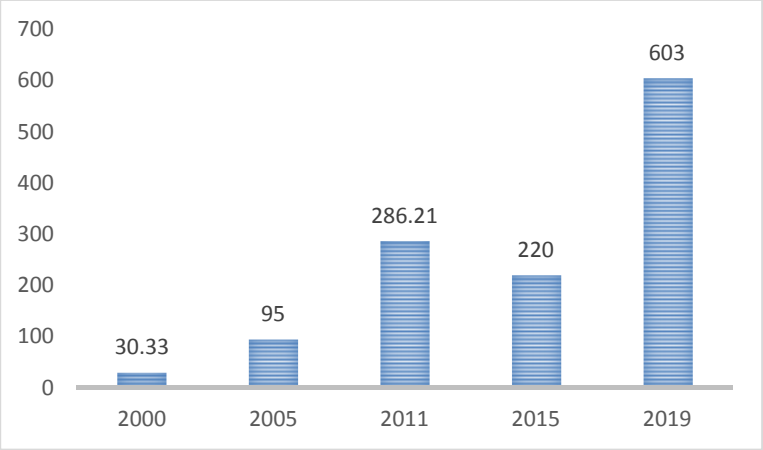

Fig. 1. **Dynamics of the volume of mutual trade between the SCO member states. Billion US dollars**

Source: UN Comtrade Database. URL: https://comtrade.un.org (accessed on 02.04.2021).

with Uzbekistan, Kyrgyzstan, and Tajikistan totaling less than US$ 300 million, or less than 10%.

The total mutual trade of the six member states reached US$ 219.53 billion in 2015, more than seven times the level in 2000, and net trade also exceeded US$ 100 billion. As shown in *Table 2*, trade between member countries and other SCO member states rose significantly, with China rising as much as 8.6 times to US$ 86.67 billion and its share of trade rising by almost 10 percentage points to 39.5% from 2000. Russia's trade rose 5.4 times to US$ 82.99 billion, with its share of trade falling from 42.4% to 37.8%. Kazakhstan's trade volume rose 4.7 times to US$ 31.77 billion, with its share of trade declining from 18.4% to 14.5%. The total trade volume of the other three countries also increased fourfold to US$ 14.65 billion, with the share of trade decreasing from nearly 10% to 6.6%.

India and Pakistan officially joined the SCO in 2017, increasing the number of member states from six to eight, and accordingly, the scale of mutual trade among SCO member states has further expanded. Taking the data for 2019 as an example, as shown in *Table 3*, the total mutual trade of the eight member states reached US$ 602.94 billion, reaching nearly 20 times that of 2000, and the net value of trade also reached US$ 301.47 billion. As shown in *Table 3,* the scale of trade between member countries and other SCO member states rose further, with China's trade scale exceeding 28 times that of 2000 to US$ 252.75 billion and its trade share rising by a further 2.4 percentage points to 41.9%. Russia's trade volume exceeded 11 times that of 2000 to US$ 145.96 billion, with its share of trade falling further to 24.2%, nearly half that of 2000. Kazakhstan's trade also rose to 8.5 times its 2000 size to US$ 47.26 billion, with its trade share halving again to just 7.8% from 2015. The total trade volume of Uzbekistan, Kyrgyzstan, and Tajikistan also expanded to 10.7 times its 2000 size to $ 31.3 billion, with the trade share dropping slightly by 1.4 percentage points from 2015. The results show that only China's share of mutual trade increased among the original six SCO countries, while the other five countries all experienced declines of varying degrees. This is mainly due to the entry of India and Pakistan crowding out the trade of these member states. India's share of trade in the SCO reached 17.5% in 2019, right up there with Russia. Pakistan's trade share of 3.3% is also significantly larger than that of Uzbekistan, Kyrgyzstan, and Tajikistan [4].

Figure 2 shows that after the establishment of the SCO in 2001, the scale of trade between China and SCO member states rose rapidly in a ladder. the first ladder trade grew at a high rate from 2001 to 2008, with an average annual growth rate of 31.8%, including a growth rate of nearly 50% in 2007. Trade increased from US$ 12 billion to US$ 86.9 billion, a 6.2-fold increase. However, the second eight years were strongly influenced by external shocks, with an average annual growth rate of only 3.6%. After falling to US$ 61.54 billion in 2009 as a result of the global financial crisis, trade quickly resumed rapid growth, doubling again to US$ 129.82 billion in 2014. The impact of the Ukraine crisis and Western sanctions against Russia led to a decline of almost 30% in 2015 and a slight increase of 1.9% in 2016. During this period, trade exceeded US$ 100 billion in 2011, the 10th anniversary of the SCO, 11.6 times more than in 2000. With the accession of India and Pakistan, China's trade with SCO member states more than doubled in 2017 from 2016 to $ 217.6 billion. It grew steadily by 17.2% to $ 255 billion in 2018. With the world financial crisis and global recession looming, this indicator grew marginally

Table 1

The volume of mutual trade turnover between the SCO member states in 2000, million US dollars

		Import						Total exports
		China	Russia	Kazakhstan	Uzbekistan	Kyrgyzstan	Tajikistan	
Export	China	/	2 233	599	39	110	7	2 988
	Russia	5 248	/	2 247	274	103	56	7 928
	Kazakhstan	672	1 710	/	133	57	53	2 626
	Uzbekistan	12	663	70	/	74	185	1 006
	Kyrgyzstan	44	65	33	89	/	7	239
	Tajikistan	10	259	6	98	3	/	375
Total imports		6	4 931	2 956	634	347	0.3	15 163
Consolidated trade turnover with other SCO member states		8 975	12 859	5 582	1 640	587	683	30 327
Specific gravity, %		29.6	42.4	18.4	5.5	1.9	2.2	100

Source: UN Comtrade Database. URL: https://comtrade.un.org (accessed on 02.04.2021).

by 1.5% in 2019, but still reached 26.5 times the level 20 years ago in 2000, before the establishment of the SCO. China became the first or second largest trading partner of most SCO member states [5].

Significant Increase in Reciprocal Investments

Most of the SCO member states are developing countries and countries with economies in transition, and attracting foreign investment to address the financial and technological gaps in domestic socio-economic development is a common task for them [6]. *Figure 3* shows that since the establishment of the SCO, the capacity and scale of foreign investment has increased significantly, with China, Russia, and India, in particular, becoming the main attractors of foreign investment to the SCO member states. With the rapid expansion of the SCO economy, capital began to "go global" in search of more favorable investment locations, and outward investment from member states increased rapidly, as shown in *Figure 4*. The total outward investment from 2001 to 2008 was US$ 176.4 billion. China's outward investment expanded rapidly from 2008 onwards, with a cumulative outward investment of US$ 1,410 billion over the 20-year period from 2000–2018. Led by China and Russia, total outward investment from the SCO historically exceeded US$ 200 billion in 2016, before gradually falling back to US$ 150 billion in 2019 due to the changing world economic situation.

Mutual investment among SCO member states is also climbing rapidly. However, as mentioned earlier, most of the SCO member states are developing countries, and those with outward investment capacity are mainly China, Russia, India, and Kazakhstan, the four countries with the largest economies [7]. Since the establishment of the SCO, Chinese direct investment in SCO member states has increased rapidly. In terms of flows, net investment increased from less than US$ 100 million at the beginning of the SCO to US$ 1 billion in 2008, and reached record levels of US$ 4.13 and US$ 4.73 billion in 2012 and 2017 respectively[5]. Figure 5 shows that China's investment stock in other SCO member states correspondingly increased from less than US$ 100 million at the start of the organization to US$ 5 billion in 2010 and US$ 37.5 billion in 2018, before declining slightly to US$ 35.2 billion in 2019. In particular, Chinese investment in the region has increased rapidly with the "Belt and Road" cooperation project [8]. By the end of 2018, China's investment in SCO member countries totaled more than US$ 86.2 billion, covering many fields such as agriculture, manufacturing and infrastructure[6]. The total scale of construction works contracted by

[5] Report on Development of Chian's Outward Investment. URL: http://fec.mofcom.gov.cn/article/tzhzcj/tzhz/ (accessed on 27.05.2019).

[6] Accumulated investments from China to the SCO member states exceeded 86.2 billion US dollars [OL]. URL: https://www.investgo.cn/article/yw/zctz/201905/450901.html (accessed on 27.05.2019).

Table 2

The volume of mutual trade turnover between the SCO member states in 2015, million US dollars

		Import						Total exports
		China	Russia	Kazakhstan	Uzbekistan	Kyrgyzstan	Tajikistan	
Export	China	/	34757	8441	2229	4282	1795	51504
	Russia	28335	/	10302	2221	1289	759	42906
	Kazakhstan	5480	4547	/	942	518	418	11906
	Uzbekistan	1267	576	726	/	59	5	2633
	Kyrgyzstan	36	157	228	95	/	24	540
	Tajikistan	52	46	165	6	8	/	277
Total imports		35170	40083	19861	5494	6157	3002	109767
Consolidated trade turnover with other SCO member states		86674	82989	31767	8127	6697	3279	219534
Specific gravity, %		39.5	37.8	14.5	3.7	3.0	1.5	100

Source: UN Comtrade Database. URL: https://comtrade.un.org (accessed on 02.04.2021).

Table 3

The volume of mutual trade turnover between the SCO member states in 2019, million US dollars

		Import								Total exports
		China	Russia	Kazakhstan	Uzbekistan	Kyrgyzstan	Tajikistan	India	Pakistan	
Export	China	/	49484	12807	5044	6312	1612	74924	16183	166368
	Russia	57321	/	14287	3908	1559	953	7308	169	85506
	Kazakhstan	7823	5602	/	1981	604	653	1573	2	18239
	Uzbekistan	1763	2035	1206	/	634	190	10	94	5931
	Kyrgyzstan	81	281	347	139	/	57	3	2	911
	Tajikistan	84	37	103	144	10	/	0.3	0.1	380
	India	17279	2871	194	193	29	25	/	1186	21777
	Pakistan	2037	141	83	22	2	8	66	/	2360
Total imports		86389	60452	29027	11433	9152	3498	83885	17636	301472
Consolidated trade turnover with other SCO member states		252757	145958	47265	17365	10062	3878	105662	19996	602945
Specific gravity, %		41.9	24.2	7.8	2.9	1.7	0.7	17.5	3.3	100

Source: UN Comtrade Database. URL: https://comtrade.un.org (accessed on 02.04.2021).

Chinese companies in the region's countries increased from less than US$ 300 million in 2001 to US$ 3.81 billion in 2010 alone, and reached US$ 19 billion in 2017 and 2018, before declining slightly to US$ 18.35 billion in 2019.[7]

Although the other SCO member states have smaller economies relative to China and are short of capital, they are also actively investing in China [9]. As shown in *Figure 6*, China actually utilized US$ 30.8 million in direct investment from SCO member states in 2001, of which Russia accounted for US$ 29.76 million, or 96.6%. 2004 saw a three-fold jump to US$ 130 million. the direct investment brought in by India after India and Pakistan joined the SCO in 2017 brought SCO direct investment in China to a record level of nearly US$ 200 million. 20 In total, China has actually utilized US$ 1.33 billion of direct investment from SCO member states over the past 20 years. Russia and India dominate

[7] National Bureau of Statistics. URL: http://data.stats.gov.cn/easyquery.htm?cn=C01 (accessed on 27.05.2019).

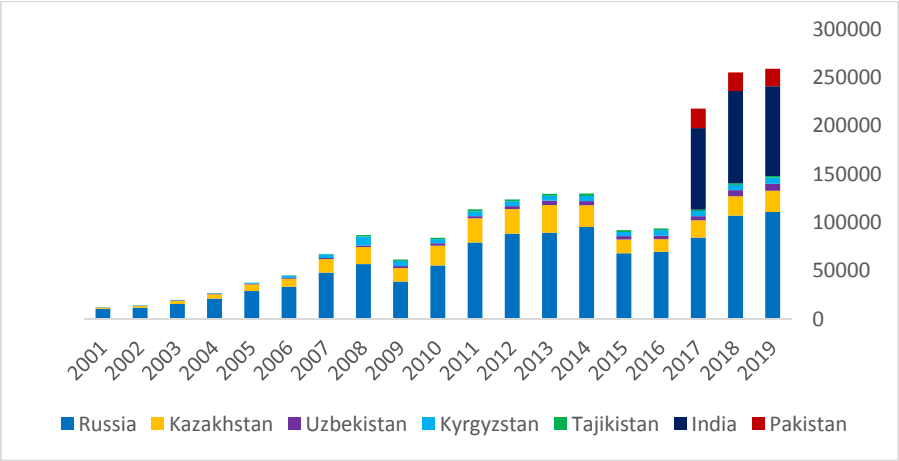

Fig. 2. **Dynamics of China's trade turnover with the SCO member states. Million US dollars**

Source: National Bureau of Statistics. URL: http://data.stats.gov.cn/easyquery.htm?cn=C 01 (accessed on 02.04.2021).

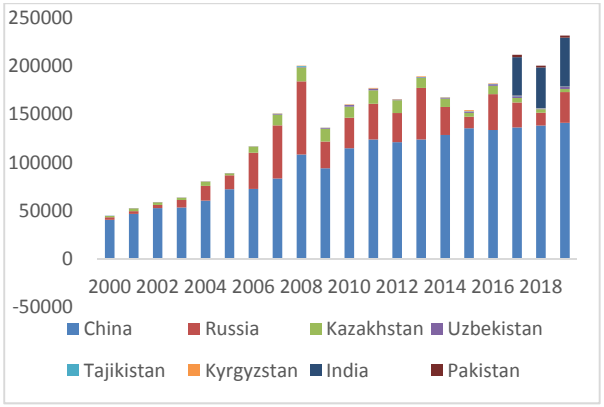

Fig. 3. **Dynamics of the volume of attracted FDI, million US dollars**

Source: United Nations conference on Trade and Development. UNCTADSTAT[DB/OL]. URL: https://unctadstat.unctad.org/EN/BulkDownload.htm (accessed on 02.04.2021).

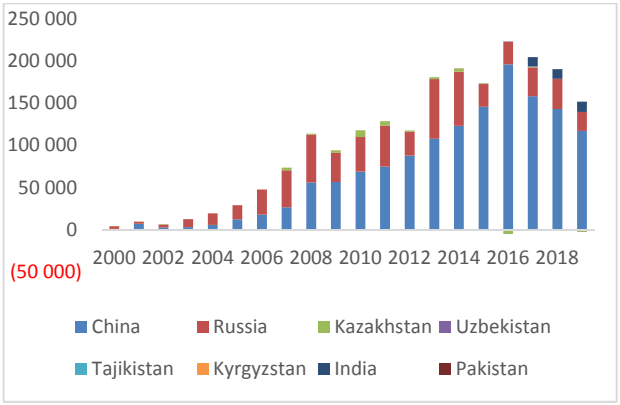

Fig. 4. **Dynamics of direct investment from the SCO member states abroad. Million US dollars**

Source: United Nations conference on Trade and Development. UNCTADSTAT[DB/OL]. URL: https://unctadstat.unctad.org/EN/BulkDownload.html (accessed on 02.04.2021).

direct investment in China, but Indian investment in China declined significantly after 2018, from US$ 150 million in 2017 to US$ 25 million in 2019. Figure 7 shows that the annual stock of Russian investment in SCO member states has remained at an annual average of around US$ 4 billion, and that the main target countries for investment are the Central Asian countries in its traditional sphere of influence, with Kazakhstan in particular accounting for around 70% of total Russian investment in SCO member states [10].

India's direct investment in SCO member states is mainly in Russia, in addition to China. In particular, India's interest in energy in Russia and Central Asia has grown in recent years, and in view of this India's direct investment flows to Russia have reached an annual average of US$ 10 million since joining the SCO, with the stock of Indian direct investment in Russia reaching US$ 710 million by the end of 2019. India's energy investments in Central Asia have also started to grow from scratch, increasing year on year [11].

Increasingly close financial cooperation

Following the outbreak of the global financial crisis in 2008, the SCO Heads of Government Meeting issued the Joint Initiative of the SCO Member States on Strengthening Multilateral Economic Cooperation, Responding to the Global Financial and Economic Crisis and Ensuring Sustainable Economic Development, marking the expansion of SCO economic cooperation into the financial sector [4].

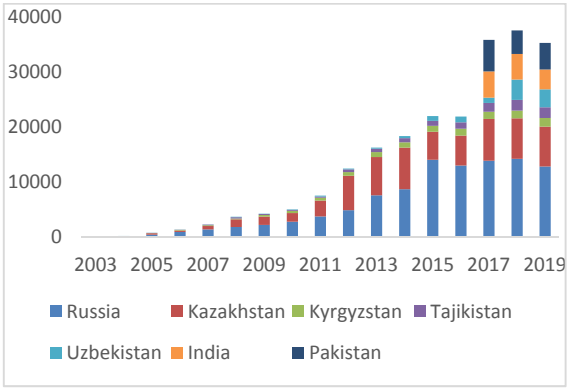

Fig. 5. **Dynamics stock of direct investment from China to the SCO member states. Million US dollars**

Source: National Bureau of Statistics. URL: http://data.stats.gov.cn/easyquery.htm?cn=C 01 (accessed on 02.04.2021).

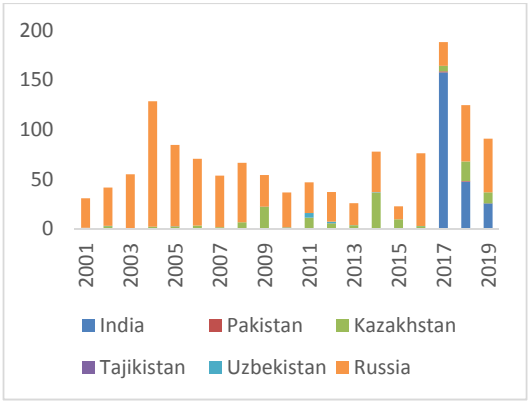

Fig. 6. **Dynamics of actually used by China direct investments from the SCO member states. Million US dollars**

Source: National Bureau of Statistics. URL: http://data.stats.gov.cn/easyquery.htm?cn=C 01 (accessed on 02.04.2021).

In 2011, the Prime Ministers of the SCO member states called for the establishment of a special account and development bank as soon as possible, in addition to the establishment of the Union of Banks in 2005, as a mechanism for financing project cooperation within the SCO framework. In 2012, the SCO Heads of Government called for "deepening financial cooperation" and "studying the holding of meetings between finance ministers and bank governors". The subsequent meeting of SCO finance ministers and bank governors issued the ***Joint Statement*** on the global financial crisis and financial cooperation, which called for "expanding the scope of local currency settlement among member states"[8]. In 2014 the Council of the Union signed the ***Plan of Measures on Strengthening Financial Cooperation and Promoting Regional Development***. The use of local currency settlements in the field of trade and investment is being actively explored within the SCO framework, and the member states are preparing a roadmap to complete the transition to local currency settlements and gradually form a new system of mutual settlements among SCO member states, said SCO Secretary General Vladimir Norov in 2019[9].

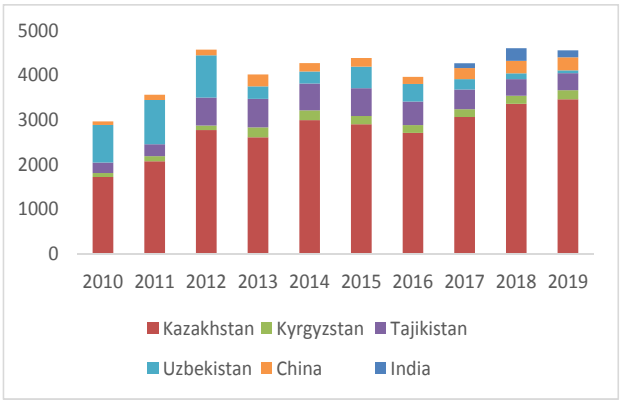

Fig. 7. **Dynamics of direct investment from Russia to the SCO member states. Million US dollars**

Source: Bank of Russia. URL: https://cbr.ru/statistics/macro_itm/svs/ (accessed on 02.04.2021).

After the financial crisis, China took the initiative to actively promote and expand the scale of currency swaps and local currency settlements with SCO member countries. In 2011, the central banks of Russia, China, and Kazakhstan signed new bilateral local currency settlement agreements respectively, extending local currency settlement from border trade to general trade and expanding the geographical scope. In 2014, bilateral local currency swap agreements of RMB 150 billion and RMB 7 billion were renewed between China and Russia and China and Kazakhstan respectively. In 2015, the Governor of the Central Bank of China and Russia signed the ***Memorandum of Understanding on Cooperation between the People's Bank of China and the Central Bank of the***

[8] Joint Communiqué of the Meeting of the Council of Heads of Government (Prime Ministers) of the Member States of the Shanghai Cooperation Organization [EB/OL]. URL: http://chn.sectsco.org/documents/. (accessed on 05.12.2012) (In Chinese).

[9] SCO Secretary General: The SCO member states will plan a roadmap for settlement in national currencies and the construction of 212 logistics centers [OL]. 21st Century Business Herald. URL: http://static.nfapp.southcn.com/content/201907/05/c2394821.html?group_id=1 (accessed on 07.06.2019).

Russian Federation, and in 2016, the two sides signed a memorandum of cooperation on the establishment of RMB clearing arrangements in Russia, which greatly promoted the use of RMB for cross-border transactions by enterprises and financial institutions of both countries, as well as bilateral trade and investment facilitation [12]. As of 2016, the scale of bilateral local currency swaps between China and SCO member countries had reached RMB 160 billion. In July 2018, Kazakhstan's PetroChina (Aktibin) Oil and Gas Company Limited and Xinjiang Alashankou Hanlin Trading Company Limited achieved a settlement of 26,600 tones of Sulphur imports worth RMB 4,262,400. In 2019, the central banks of China and Russia signed a transition to a government-to-government agreement on local currency settlement, which will increase the proportion of local currency settlement in bilateral trade from the current 10% to 50%. At the same time, the two sides are planning to establish a payment gateway, or international payment system, between the Chinese Cross-Border Interbank Payment System (CIPS) and the Russian Financial Information Transfer System (SPFS), gradually replacing the US SWIFT system [13]. Russia has also significantly increased the share of the RMB in its foreign exchange reserves. This share jumped from 5% to 15% from 2015 to early 2019. As of 30 June 2019, the RMB share was 13.2%[10].

China has unilaterally provided preferential loans to SCO member states. In the first decade of the SCO, China has pledged to provide more than US$ 12 billion in preferential loans to other member states, and in 2012 Hu Jintao announced that China has decided to provide another US$ 10 billion in loans to other member states. In 2014 and 2018, President Xi Jinping announced twice that China has decided to provide US$ 5 billion in loans to SCO member states and to launch the China-Eurasia Economic Cooperation Fund with an eventual size of US$ 5 billion, and to establish a special loan of RMB 30 billion equivalent within the framework of the SCO CUP. From 2007 to 2019, Russian companies and financial institutions other than banks received loans from China totaling US$ 79.62 billion, especially in the three years of 2009 when Russia was hit by the global financial crisis and 2014 and 2015 when it was subjected to full Western sanctions due to the Ukraine crisis, when an annual average of US$ 17 billion was provided[11]. In terms of Kazakhstan's debt to China, total debt as at 1 October 2020 totaled US$ 10.31 billion, of which US$ 1.23 billion was to banks and US$ 5.85 billion to other sector enterprises, with a further US$ 3.22 billion in intercompany debt[12]. The balance of loans provided by China Exim Bank to Tajikistan as at year-end 2018 was US$ 1.2 billion, representing 64% of Tajikistan's total external bilateral borrowings[13]. As of June 2018, China's national development central bank had disbursed a cumulative total of over US$ 100 billion in loans to SCO member countries, with a current loan balance of US$ 41.34 billion and RMB 16.37 billion in SCO member countries. In addition, since 2001, China Credit Insurance has supported Chinese enterprises to export and invest more than US$ 179.64 billion to other SCO member countries, paying out nearly US$ 358 million in compensation and underwriting 420 projects [14].

NEW OPPORTUNITIES FOR SCO ECONOMIC COOPERATION: BUILDING A EURASIAN ECONOMIC PARTNERSHIP

On the occasion of the 20th anniversary of the SCO, the Chinese President has given it the solemn mission of taking the lead in building a "Community of human destiny" and Russian President Vladimir Putin has given it the new mission of "Greater Eurasian Partnership", and the leaders of China and Russia also see the SCO as the most important platform for consultation, contribution and shared benefits for the "Belt and Road". In 2019, the SCO member states signed a new version of the ***Multilateral Economic and Trade Cooperation Programme*** for 2035, starting a new journey of economic cooperation.

Chinese Leaders' Initiative to Build a Community of Human Destiny at SCO

The 18th National Congress of the Communist Party of China (CPC) officially declared to the world that we should advocate a sense of community of human destiny. In 2018, the SCO formally established the concept of building a community of human destiny,

[10] Hu Xiaoguang, Russian expert: the internationalization of the renminbi in Russia will continue. URL: http://www.chinatradenews.com.cn/content/202011/20/c121658.html. (accessed on 20.11.2020).

[11] Bank of Russia. URL: http://cbr.ru/statistics/macro_itm/svs/ (accessed on 24.02.2020).

[12] National Bank of Kazakhstan. URL: https://www.nationalbank.kz/ru/news/vneshniy-dolg (accessed on 24.02.2020).

[13] Ministry of Finance of the Republic of Tajikistan, State Debt Report for 2018 [EB/OL]. URL: http://minfin.tj/downloads/otchet_2018vd.pdf. (accessed on 24.02.2020).

promoting the building of a new type of international relations based on mutual respect, fairness, justice, and win-win cooperation, and establishing the common concept of building a community of human destiny [15]. The concept of a community of human destiny calls for developing an open world economy, sharing opportunities and benefits and achieving mutual benefits in the process of opening up; developing global connectivity so that all countries in the world can achieve linked growth and common prosperity; developing global free trade and investment, promoting trade and investment liberalization and facilitation in the process of opening up, and standing out against protectionism, and promote economic globalization in a more open, inclusive, balanced and win-win direction. The idea of a community of human destiny in economic cooperation is fully reflected in the "Shanghai Spirit" practiced by the SCO, and in particular in the purposes and principles of ***the Declaration on the Establishment of the Shanghai Cooperation Organization*** and ***the SCO Charter*** [16].

SCO is an Important Platform for Strategic Alignment and Cooperation between the Belt and Road and its Member States

In 2013, Premier Li Keqiang made it clear for the first time that all member states are on the Silk Road Economic Belt [17]. SCO supports the construction of the Belt and Road. The joint declaration issued by the heads of government of the SCO member states at their meeting in Astana in 2014 welcomed for the first time the initiative of the People's Republic of China to build a Silk Road Economic Belt. In 2015, ***the Ufa Declaration*** of the SCO for the first time expressed support for the initiative of the People's Republic of China on the construction of the Silk Road Economic Belt. In December of the same year, Premier Li Keqiang proposed to make the SCO a platform for cooperation on security, production capacity, connectivity, finance, regional trade, and social and livelihood issues in the construction of the Silk Road Economic Belt. The Heads of Government of the SCO issued ***the Joint Statement on Regional Economic Cooperation***, considering the initiative to be in line with the development objectives of the SCO [18].

SCO member states are actively seeking strategic alignment with the Belt and Road. The Belt and Road initiative has received positive responses from SCO member states, observer states, and dialogue partner countries, which have signed cooperation documents with China on the construction of the Belt and Road and formulated their own long-term development strategies to dovetail with it. In 2014 and 2015 respectively, Kazakhstan issued its "Development Strategy 2050", the "Bright Road" new economic policy and the second "Five-Year Plan for Industrial Development and Innovation". Uzbekistan issued the ***Strategy of Action for Further Development*** and the economic restructuring plan to develop transport infrastructure and move away from the energy development model, while Tajikistan and Kyrgyzstan have also developed the "Development Strategy for 2030" and the "Development Strategy for 2040", respectively. The China-Kazakhstan cooperation in production capacity has become a model of cooperation in contributing the Belt and Road together.

The SCO can be an important platform for docking cooperation between the Belt and Road and the Eurasian Economic Union, and the role of the SCO as a platform for strategic docking cooperation between the two projects was clearly emphasized in ***the Joint Declaration on Docking Cooperation between the Construction of the Silk Road Economic Belt and the Eurasian Economic Union*** signed by China and Russia in 2015. ***The Joint Declaration of the 20th Regular Meeting*** of the Chinese and Russian Prime Ministers in December of the same year clearly stated that the two sides consider the SCO as the most effective platform for realizing the docking of the construction of the Silk Road Economic Belt and the construction of the Eurasian Economic Union.

Russia's Initiative to Build a "Greater Eurasian Partnership" through SCO

In 2016, Russian President Vladimir Putin officially launched the initiative to build the Greater Eurasian Partnership at the opening of the Petersburg International Economic Forum. According to S. Karaganov, the architect of the "Greater Eurasian Community", the "Greater Eurasian Partnership" will achieve common prosperity through the gradual formation of a free trade area encompassing the entire continent, the development of a consensual Greater Eurasian transport strategy, the establishment of a stable financial system [19]. The partnership will be based on the development of a continent-wide free

trade zone, a consensual Eurasian transport strategy, a stable financial order, local currency settlement of cross-border trade and investment, an independent payment system, and a Eurasian mutual assistance organization[14]. This is similar to China's Belt and Road initiative and its strategy of implementing a high-quality, globally oriented free trade area, which together constitute the main elements of the Eurasian Economic Partnership [20]. The partnership will be based on the basic principles of respect for sovereignty and territorial integrity and the maintenance of peace and stability; respect for political pluralism and rejection of interference in internal affairs; economic openness and mutual benefit; political stability and conflict prevention; cultural diversity and dialogue among civilizations. This is in line with China's advocacy of "building a new type of international relations" and "community of human destiny" [21].

Russia sees the SCO as an institutional model for the Greater Eurasian Partnership [22]. On the one hand, it promoted the expansion of the SCO in 2017, with India and Pakistan becoming full members, and Iran and Mongolia joining the organization in the near future [23]. The Valdai Club, which has a significant influence on Russian foreign policy, stated as early as 2015 that "the Greater Eurasian Community can function as an organization through SCO" and that "the rapid development of SCO can become a central mechanism for the creation of a Greater Eurasian Community"[15]. The official website of the Russian SCO Presidency further specifies it as "promoting synergy of national development strategies and the potential of multilateral integration projects, establishing SCO as an important pillar for building a broad, equal and mutually beneficial space for cooperation in the Eurasian region and guaranteeing reliable under the idea of 'Greater Eurasian Partnership"[16]. ***The Moscow Declaration of the Council of Heads of State of the SCO***, signed in November 2020, states that the member states take note of the initiative of the Russian Federation to establish the Greater Eurasian Partnership with the participation of the SCO, the Eurasian Economic Union, ASEAN countries and other relevant countries and multilateral mechanisms [24].

New Version of the Multilateral Economic and Trade Cooperation Framework Starts a New Journey of Economic Cooperation

In view of the fact that the ***Programme of Multilateral Economic and Trade Cooperation among SCO Member States***, which was drawn up in 2003 with a view to 2020, has almost expired, a new version of the ***Programme of Multilateral Economic and Trade Cooperation for 2035*** was drawn up and adopted by the SCO Ministers of Trade and Economic Cooperation in September 2019 [25].

The new version of the ***Multilateral Economic and Trade Cooperation Programme*** sets new basic objectives: in the short term (until 2025) "to develop and implement plans and projects in areas representing mutual interests of the member states, using modern innovative and 'green' technologies"; in the medium term (until 2030) "plans to guarantee the growth and transformation of the economies of the countries through the development of stable and transparent rules and procedures in the field of trade and investment within the framework of the SCO, to promote the development of services and e-commerce industries", "to continue to study methods of trade facilitation in the region, to develop and implement ***the SCO Charter***; in the long term (until 2035) to improve global competitiveness and ensure the digital transformation of the national economies of SCO member states through the adoption of digital technologies and the creation of favorable conditions for the gradual realization of the free movement of goods, capital, services and technologies provided for in ***the SCO Charter***.

The new version of ***the Multilateral Economic and Trade Cooperation Programme*** sets out a broader range of priorities for cooperation, including trade and investment, banking and finance, transport and logistics, industry, agriculture, energy, customs, innovation, information and communication technologies, spatial development, cross-regional collaboration, tourism, ecology, education and other areas representing mutual interests.

In order to achieve the goals set out in the new version of t***he Multilateral Economic and Trade Cooperation Programme*** in each of these areas of cooperation, 88

[14] Karaganov S. From the Turn to the East to Greater Eurasia: Global Context. International Life, 5. 2017. C. 13–24; Karaganov S., From East to West, or Big Eurasia [N]. Rossiyskaya Gazeta. Federal Issue No. 7109, 24.10.2016, p. Power.

[15] Karaganov S., A Euro-Asian way out of the European crisis[J]. Russia in Global Politics. No 3, 2015. C. 2–6; Karaganov S., Bordachev T. et al, To the Great Ocean — 3: Creating Central Eurasia [R]. Moscow, June 2015. p. 14.

[16] Priorities of Russia's presidency of the SCO in 2019–2020 [EB/OL]. URL: https://sco-russia2020.ru/.(accessed on 20.04.2020).

specific tasks have also been proposed. These include thorough trade and investment facilitation, direct interbank settlement and expansion of local currency settlement, studying the possibility of establishing the SCO Development Bank and the SCO Development Fund (special account), building multimodal transport corridors, cooperation in production capacity and building industrial parks, and carrying out work on opposing international and regional trade protectionism and upholding an open, transparent, inclusive and non-discriminatory multilateral trading system based on the principles and rules of the WTO. The achievement of the objectives of the new version of the MEA will contribute to sustainable and inclusive economic growth in the region and to the achievement of the goals set out in the 2030 Agenda for Sustainable Development.

FTA Construction as a Long-term Goal of SCO Economic Cooperation

The huge differences in economic strength and volume, economic structure and layout, level and stage of development, as well as political and economic systems, ethnic and racial composition, and religious belief policies among the SCO member states have seriously hindered the formation of institutional arrangements for economic cooperation in the SCO, and not only the lowest stage of the economic integration process, a free trade area, could not be agreed upon, but also trade and investment facilitation agreements have been delayed for a long time. The average tariff rate of SCO member states in 2018 was 7.6%, with the simple average applied rate for all products at 4.9% in Russia, 4.6% in Kazakhstan, 13.6% in Uzbekistan (2015), 3.9% in Kyrgyzstan, 5.1% in Tajikistan (2017), and 9% and 12.6% in India and Pakistan respectively, with China lying at the average level. The overall SCO tariff level is higher than the world average of 7% and much higher than the EU's 1%[17]. The main concern of the member states is that cheap goods from the "world factory" will impact their national industries and threaten their economic security [26, 27].

Although the SCO member states are all developing countries and belong to the "South-South cooperation" model, their differences and complementarities determine the need for economic cooperation, and promoting the process of economic integration, trade and investment facilitation and free trade within the organization will promote the growth and development of all SCO member states. Development, especially for countries in the relatively less developed regions of Central and South Asia, will gain more opportunities for development. The author and his PhD students, Beibei Hu and Di Wu, calculated the complementarity index of trade among the SCO member states, and the results were all above the critical point of 0.5, with China's complementarity index with all member states except India being greater than 1, especially with Uzbekistan at 2.13. The authors' analysis of the economic growth and the trade diversion and creation effects of the SCO FTA after its establishment, using the GTAP model, shows that the FTA can increase the GDP growth of each member country by 0.1 percentage points, with China, Russia and India increasing by 0.25, 0.17 and 0.1 percentage points respectively, while weakening the growth of other countries. The FTA will also increase the exports and imports of the SCO member countries to varying degrees, and the increase will be significantly larger than the decrease in non-member countries, with Kyrgyzstan's exports and imports increasing by the highest rate of 4.4% and 4.1% respectively[18]. See *Table 4* for more details.

The signing of the RCEP and the ***China-EU Investment Agreement***, in which China will participate by the end of 2020, will be as significant as China's accession to the WTO, marking the initial formation of the largest common economic space between the Asia-Pacific economic sphere and the world's largest economies in the Eurasian region as the engine of the world economy. In addition, China is actively seeking to join the CPTPP, a free trade common economic space that will then span further across the Pacific Ocean. If free trade is achieved within the SCO framework, this common economic space will be integrated with the EU and become the largest free trade area in the world. To this end, the ***Joint Statement*** signed by China and Russia in 2016 stated that "China and Russia advocate the establishment of a comprehensive Eurasian partnership. 2017 saw the signing of the ***The Joint Statement on Further Deepening of the Comprehensive***

[17] World Bank. URL: https://data.worldbank.org.cn (accessed on 20.04.2020).

[18] HU Beibei, WU Di, and LI Xin. On the Feasibility and Economical Effect of a Free Trade Area for the Shanghai Cooperation Organization. Global Review. Vol. 10 No. 3 May/June 2018. pp. 50–69.

Table 4

The impact of the SCO FTA on the macroeconomics of the SCO member states

	Change of GDP, %	Change of Import, %	Change of Export, %	Change of Welfare, Million US dollars
China	0.25	0.59	0.69	1389.3
Russia	0.17	0.96	1.55	520.9
Kazakhstan	–0.01	0.87	1.38	23.5
Kyrgyzstan	–0.02	4.42	4.07	15.4
Tajikistan Uzbekistan	0.09	1.13	1.71	5.5
India	0.09	2.14	2.11	451.9
Pakistan	–0.01	3.72	2.87	81.1
NAFTA	–0.02	–0.03	–0.03	–268.0
EU	–0.03	–0.04	–0.04	–796.6
Other countries of the world	–0.04	–0.05	–0.07	–9.9

Source: HU Beibei, WU Di, and LI Xin. On the Feasibility and Economical Effect of a Free Trade Area for the Shanghai Cooperation Organization. Global Review. Vol. 10 no.3 May/June 2018. p. 62.

Strategic Partnership for Cooperation signed by the two sides in 2017 further defined the Comprehensive Eurasian Partnership as the Eurasian Economic Partnership. China's Belt and Road and Russia's Greater Eurasian Partnership share the same goal of promoting regional integration.

NEW CHALLENGES FOR SCO TO ACCOMPLISH ITS NEW MISSION

While fulfilling its new mission, the SCO is also faced with a series of new issues and challenges.

World Economy in Crisis due to Unprecedented Changes of the Century

The gradual decline of Western hegemony led by the United States and the strong rise of emerging economies led by China are the unstoppable wheels of history. The United States has raised the banner of unilateralism and trade protectionism, which on the one hand has led to the continuous war in the Middle East and North Africa, the influx of immigrants to Europe, and the rise of populism in Western countries; on the other hand, it has made China and Russia its competitors and wielded tariffs and sanctions against them respectively, resulting in the loss of momentum in global economic development and the global spread of the COVID 19 epidemic, which triggered a serious recession in the world economy and caused adverse effects on other SCO member states. All signs indicate that the US under Biden will still pursue a strategy of simultaneous containment of China and Russia. On the one hand, it will further use sanctions in the financial and energy sectors as a grip to cut Russia's ties with the external economy; on the other hand, it will draw in India to join the Indo-Pacific strategy the "quadruplets", the "five-eyed alliance" and the anti-China coalition, withdrawing from ***the INF Treaty*** to strengthen its military deployment in the Asia-Pacific region, and plotting to split China from Taiwan, Hong Kong and the South China Sea to Xinjiang and Tibet; on the other hand, imposing technological blockades and sanctions on Chinese enterprises. This is an attempt to "decouple" the economies of the world's two largest economies. This must have serious implications for the other SCO member states [4].

In response, Chinese President Xi Jinping warned at the World Economic Forum in Davos that humanity is suffering from the most serious economic recession since the end of the Second World War, and that if we take the divergent path of confrontation, whether we engage in a cold war, a hot war, or a trade war or a technology war, it will ultimately harm the interests of all countries and sacrifice the well-being of people. He called on the world to abandon ideological prejudices and join hands to tackle global challenges by pursuing the path of peaceful coexistence and mutual benefit and build an open world economy, firmly uphold the multilateral trading system, refrain from discriminatory and exclusive standards, rules and systems, and refrain from high barriers that divide

trade, investment and technology. The international community should be governed according to rules and consensus reached by all countries together, and not by one or a few countries calling the shots. Russian President Vladimir Putin also issued a stern warning that the current international situation is very similar to that of the 1930s, when the failure to properly address certain issues led to the Second World War. If we sit back and do nothing, the situation today will slide into the unpredictable and uncontrollable. There is a risk of a disruption of world development, of all against all, of attempts to resolve sharpened contradictions by finding internal and external enemies, etc. The social and values crisis has turned to negative demographic consequences, and the whole of humanity will thus face the loss of an entire civilizational and cultural bedrock. We are already feeling the rising tone of foreign politics and propaganda, and can expect an intensification of practical actions including the use of trade barriers, illegal sanctions and restrictions in the financial, technological and information fields to pressure those who do not listen and do not obey. This game without rules very realistically raises the risk of unilateral use of force.

Structural Differences in the Economies of SCO Member States Slow down the Integration Process

When the SCO was first established to define the objectives of economic cooperation, the then Chinese Premier Wen Jiabao initiated the gradual establishment of a free trade area of the Shanghai Cooperation Organization", but was opposed by other member states and had to settle for the second best, the ***Declaration on the Establishment of the Shanghai Cooperation Organization***, the ***Charter of the Shanghai Cooperation Organization*** and the ***Programme of Multilateral Economic and Trade Cooperation of the Shanghai Cooperation Organization*** agreed to start with trade and investment facilitation, and then Chinese Premier Wen Jiabao signed the ***Memorandum of Understanding between the Governments of SCO Member States on the Basic Objectives and Directions of Regional Economic Cooperation and the Launching of the Trade and Investment Facilitation Process***. China's initiative to launch a feasibility study on the organization's FTA again in 2018 has yet to receive a positive response from other member states. The process of trade and investment facilitation negotiations has also been unusually slow, with Presidents Hu Jintao and Xi Jinping repeatedly calling for promoting regional economic integration and trade and investment facilitation and greater steps towards trade and investment facilitation and liberalization. However, it was only in 2018 that the heads of SCO member states issued a Joint Declaration on Trade Facilitation at the Qingdao Summit. The new version of the Outline on Economic and Trade Cooperation postpones the goal of trade and investment facilitation and the free flow of goods, capital, technology, and services until 2035 [29].

In addition, as early as 2004, the Heads of State of the SCO member states unanimously decided to initiate the establishment of a development fund for the organization. In 2005, the SCO member states signed ***the SCO Interbank Cooperation (Consortium) Agreement***, but the establishment of the Development Fund was delayed. In 2011, in the face of the global financial crisis, the Prime Ministers of SCO member states issued the ***Joint Statement on the Economic Situation about the World and the SCO Region***, calling for the establishment of a special account and development bank as soon as possible as a mechanism for financing project cooperation within the SCO framework. However, there is no sign of it. The new version of the ***Economic and Trade Cooperation Programme for 2035*** is only studying the possibility of establishing an SCO Development Bank and an SCO Development Fund (Special Account).

The scale of trade and investment in the SCO region is severely constrained by the inability of SCO member states to agree on a free trade area, trade and investment facilitation, and the construction of the SCO Development Fund and Development Bank. The existing scale is seriously lagging behind the level of SCO cooperation in the political and security fields. The scale of trade and investment between China and SCO member states is basically on a par with that of Africa, lagging far behind that of ASEAN and Latin America. The reason for this is that, apart from geopolitical factors, the interests and aspirations of the member states in various aspects such as politics, culture and religion are very different from each other, and their economic structures and scales, levels and stages of development are very different. With such huge differences, it is difficult to seek common ground while reserving differences, and the principle of consensus

hinders economic cooperation in a multilateral framework. As a result, it is difficult to establish uniform institutional norms for economic cooperation among the SCO member states, and therefore institutional arrangements for free trade and trade and investment facilitation are stagnant, and economic cooperation is limited to the bilateral level among member states [30].

It is Russia that plays a key role here. China and Russia are the axes of the SCO, with China seeking to use its economic advantages to promote economic cooperation and Russia seeking to use its security advantages to become a provider of security in the region. Russia has spared no effort to integrate into the world economic system, such as building a "Greater Europe" with the EU as a common economic space and joining the WTO and OECD. Under the conditions of a total economic blockade imposed by the West, Russia feels a sense of anxiety and loss in the face of the signing of the RCEP, but does not want to be included in "China's free trade zone" and become a "raw material subordinate" and "market subordinate" to China. In this respect, the Central Asian countries are "strikingly similar" to Russia. It is for this reason that the Eurasian Economic Union and the Silk Road Economic Belt are "dovetailing" in an attempt to use the resources of the Belt and Road to strengthen their dominant Eurasian Economic Union [31].

Rapid Expansion of SCO will Significantly Reduce the Efficiency of Cooperation

Russia's dream of integrating into "Greater Europe" was shattered and as a result of NATO's expansion to the east, Russia had to break out "to the east" with the Eurasian Economic Union and open up a "Greater Eurasia" strategic space. The "Greater Eurasia" strategic space is to transform Russia from a Eurasian bridge into the heart of the rising "Greater Eurasia" and to use the "non-Western Greater Eurasia" as a geopolitical bloc to confront the US and the West. To this end, Russia sees the expanded SCO as the institutional platform for "Greater Eurasia" and in 2017 successfully brought India and Pakistan, with their difficult contradictions, into the SCO, with Iran and Mongolia becoming full members in the near future., In accordance with Russia's wishes, Belarus, Armenia, Azerbaijan, Afghanistan, and Syria should also join the SCO [32]. Thus, on the one hand, an enlarged SCO enhances the geopolitical attributes and the possibility of a bipolar pattern of confrontation with the West, thus reducing the necessity and possibility of economic cooperation. On the other hand, the widening differences between the member states and the limitations of the "consensus" principle have significantly reduced the efficiency of economic cooperation in the SCO. In particular, the irreconcilable contradictions and conflicts between India and Pakistan, as well as the competition between India and China for great power status and territorial disputes have severely restricted cooperation in various fields within the framework of the SCO. To make matters worse, India has joined the quadruple Indo-Pacific strategy, a "mini-NATO" in the Asia-Pacific region to contain the rise of China, thus playing a divisive role in the SCO.

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