# Structural Model of Institutional Support for the High-Tech Industry

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**Summary**
The article aims at developing a structural model of institutional support for the high-tech industry and focuses on achieving national sustainable development goals. The main role in the model is played by such an instrument of state policy as development institutions. Methods are as follows: systemic and structural analysis; the logical interpretation of economic phenomena and processes; the generalization of the collected information and analytical materials. The article's authors have developed a comprehensive-targeted approach for constructing a structural model of institutional support for the high-tech industry. They also formed a structural model of institutional regulation that combines the national goals of sustainable development and the key means of achieving them into a single structure with due regard to cause-and-effect relationships. In their opinion, the results of development institutions as specialized organizations depend on system-wide institutional parameters (institutional environment). The constructed model is interpreted as exemplified by a certain country (Russia), where the reform of development institutions is being implemented. The model allows identifying a gap that could undermine positive results of the reform, including an underestimation of the impact of system-wide institutional parameters on development institutions. The study results might be of practical interest from the standpoint of information and analytical support for managerial decisions. An integrated approach to constructing a model of institutional regulation will help to avoid errors associated with the incompleteness of the decision-making base. In particular, this concerns assessing the prospects for reforming development institutions in a given country and identifying reasons behind the unsatisfactory results of such a reform.

***Keywords:***
*sustainable development goals, development institutions, reforming development institutions, institutional environment, high-tech industry.*

## 1. Introduction

In modern conditions, much attention is paid to the issues of ensuring sustainable socio-economic development. The goals of sustainable development are clearly formulated in the UN documents of 2015 [1]. This list contains 17 interrelated goals that set the agenda for UN member countries until 2030.
The list of sustainable development goals sets guidelines for countries in determining their national vector. At the country level, data from this list is reflected in strategic documents. For example, the Russian national goals are set in Presidential Decrees [2].

From the standpoint of ensuring sustainable development, an urgent task is to develop public policy models that implement the set goals at the national level. A toolkit of state regulation comprises development institutions, which are the focus of this research. The list of development institutions might include different financial and non-financial organizations: development corporations, development banks, innovation infrastructure organizations, etc. (for example, the Russian litigation [3-5]). Various authors consider the role of development institutions in achieving sustainable growth goals.
A number of studies highlight the role of development institutions as exemplified by development banks. In [6,7], it is shown that multilateral, national, and regional development banks aim at making a significant contribution to the achievement of long-term sustainable development goals. Unlike commercial financial institutions focused on short-term projects and profit making, development banks initially focus on long-term development projects. It is worth mentioning that development institutions can play the role of catalysts for private investment [8,9].
Based on a group of countries [10,11] or a group of regions within a country [12], some surveys study the quantitative dependences of economic indicators on the quality of state institutions. In [10], an emphasis is laid on the indicator of output per worker.

We should mention [13] that dwells on development institutions and such system-wide conditions as taxation, antimonopoly regulation, business conditions, etc. Within the framework of the institutional approach, these can be interpreted as system-wide institutional parameters regulated by the state. A positive aspect is that the impact of these factors on the innovation process is considered. At the same time, there is a limitation: the developed block diagram does not reflect the influence of system-wide conditions on the activities of development institutions. To eliminate it, it is necessary to adjust the block diagram, which is taken into account in this study.

To implement sustainable development goals, the high-tech industry can play a significant factor role [14] regarded as an object of institutional regulation. This role is described in a number of scientific publications.

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In [15-17], the high-tech industry is interpreted as a driver and marker of sustainable growth.

We should pay attention to the Economic Complexity Index (ECI) developed by a group of researchers [18]. The ECI shows that the dynamic stability of the economy correlates with its complexity. Under the ECI, the economy is considered complex if a country exports many types of technological products. Countries that export a variety of high-tech goods, including electronics, automobiles, and chemicals, are more likely to achieve sustainable growth [19,20]. Competitive advantages in sustainable development are connected with the fact that few countries can export a variety of high-tech products since their production requires more skills and technical know-how [21]. Furthermore, goods of high technological complexity are more resistant to economic shocks [22].

After analyzing scientific sources, we can draw the following conclusions:

– The goals of sustainable development elaborated in UN documents set guidelines for countries when choosing a national target vector;

– A major contribution to the achievement of national goals of sustainable development can be made by such an instrument of state policy as development institutions;

– The high-tech industry can play a significant role in the implementation of sustainable development goals.

To elaborate on this vector of research, the article aims at developing a structural model of institutional support for the high-tech industry focused on achieving national sustainable development goals. In this regard, the main role is played by such a tool of state policy as development institutions. At the same time, the performance of development institutions as specialized organizations depends on system-wide institutional parameters. Keeping this in mind, the model also includes system-wide institutional parameters regulated by the state.

To attain this objective, it is necessary to solve the following tasks:

– To develop a comprehensive-targeted approach to constructing a model of institutional support;

– To form a structural model of institutional regulation as a set of interrelated subsystems with inputs, outputs, feedback, and the external environment on the basis of the developed approach;

– To interpret the formed structural model as exemplified by a particular country (Russia) and identify gaps in the reform of development institutions.

## 2. Methods

The article uses the following methods: systemic and structural analysis; the logical interpretation of economic phenomena and processes; the generalization of the collected information and analytical materials.

The methodological basis of the complex-target approach intended for constructing a structural model comprises the following provisions.

*Provision 1*. The model of institutional support for the high-tech industry is a set of interrelated subsystems with inputs, outputs, feedback, and the external environment. The model includes both controlling and controlled subsystems.

*Provision 2*. When evaluating the results of the model, the national goals of sustainable development should be given priority. These goals should be adapted to the needs of development institutions, the high-tech industry, and other subsystems of the model.

For example, the targeted approach is used for evaluating the role of multilateral development banks which are a type of development institution. As noted above, they intend to make a significant contribution to the achievement of long-term sustainable development goals.

*Provision 3*. When identifying the subsystems of the model, we focus on an integrated approach to assessing the activities of development institutions. In this regard, we need to highlight [23] that reviews the methods used in public administration. An integrated approach is promising in assessing development institutions [24,25].

Within an integrated approach, we identify the subsystems of the model, first of all, according to the type of manifestation of institutional results in value-added chains. The possible types of the activities of development institutions are as follows: the development institution itself; supported projects or economic entities; meso- and macro-level of the economic system. This refers to the objective of development institutions, i.e. to serve as catalysts for the manifestation, transfer, and summation of positive economic effects along value-added chains. The result should be the achievement of the goals of national economic systems.

The approach to development institutions according to manifestation types, in fact, was reflected in a number of works. For example, [26] addresses two types of manifestation: the development institutions themselves and the regional or national level of the economic system. The authors of [27] emphasized another type of manifestation of results: companies supported by development institutions.

*Provision 4*. The structural model includes two subsystems of institutional regulation: (1) development institutions as specialized organizations and (2) institutional environment, i.e. system-wide institutional parameters. When including the institutional environment into the model, we take into account that system-wide institutional parameters affect the performance of development institutions and the companies

they support. All this should be reflected in the definition of subsystem connections.

## 3. Results

The result of applying the complex-targeted approach described above is a structural model of institutional support for the high-tech industry (Fig. 1). The model includes six structural blocks that form a cause-and-effect relationship with feedback. These blocks are as follows: national sustainable development goals (Block 1); the state regulation of development institutions and the institutional environment (Block 2); development institutions (Block 3); system-wide institutional parameters, or the institutional environment (Block 4); the results of institutional support for the high-tech industry (Block 5); state monitoring of the results of institutional regulation (Block 6). The arrows show the main directions of influence among all the structural blocks.

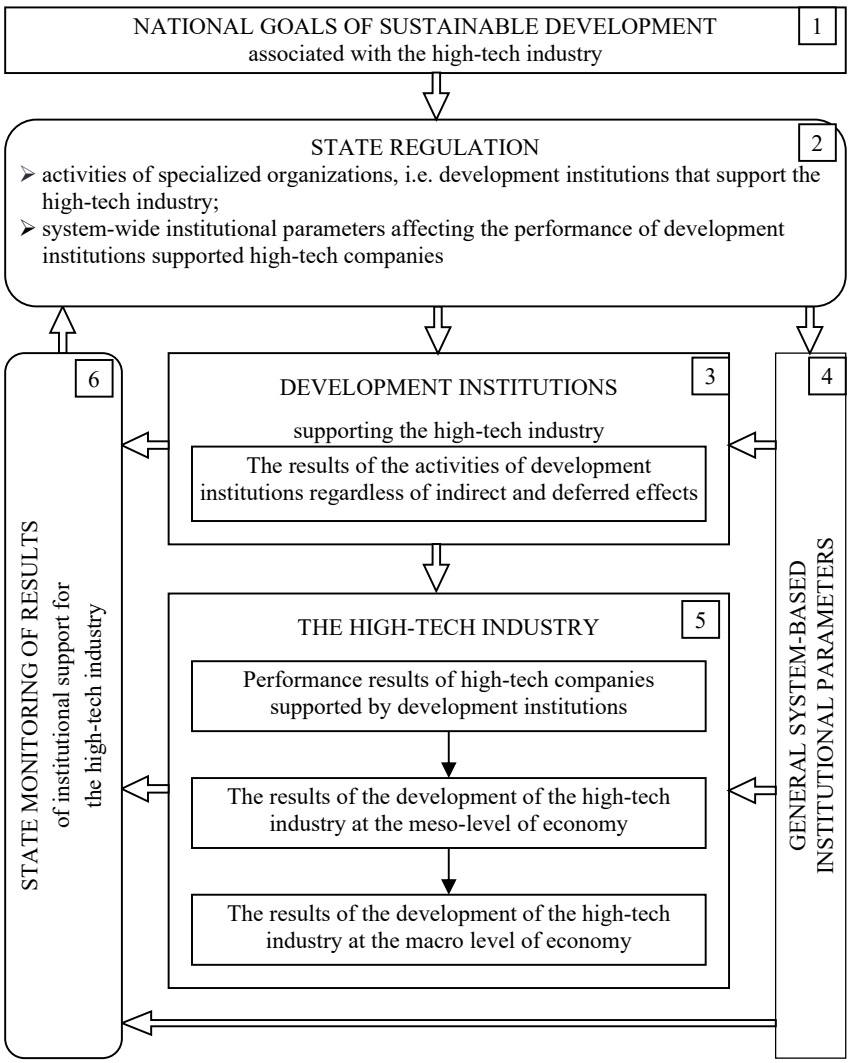


Fig. 1. The structural model of institutional support for the high-tech industry
*Source: compiled by the authors*

Let us dwell on structural blocks of the model under consideration with due regard to their connections.

*Block 1*. The initial link in the cause-and-effect relationship of the model is the block "national sustainable development goals" that are relevant for the country under consideration.

They should be specified in relation to the high-tech industry, i.e. the object of institutional support in the model. Block 1 sets targets for the next block: the "state regulation" of development institutions and the institutional environment". At the same time, state regulation should ensure the cross-cutting nature of the initial goals in the model.

*Block 2.* At the output of the "state regulation" block comprising development institutions and the institutional environment, there are two directions of regulatory impacts. The first direction is the direct impact of the state on Block 3 "development institutions", which largely controls the model. It is possible to use a wide range of impacts: the creation and elimination of development institutions; supporting and stimulating the effective work of established development institutions; their reformation or merger, etc.

The second direction is the indirect impact of the state on development institutions and the high-tech industry. The role of an intermediate link capable of transmitting regulatory signals of the state is assigned to Block 4 "system-wide institutional parameters".

Located at the beginning of the cause-and-effect relationship, Block 2 plays a major role in relation to subsequent structural blocks. Its non-optimality will entail negative manifestations in the regulated blocks.

*Block 3.* The structural block covers "development institutions" that support the high-tech industry in all or part of their activities. These include development banks (for example, [8]) and innovation infrastructure (for example, [5]).

*Block 4.* The structural block includes "system-wide institutional parameters". This relates to the institutional environment considered in relation to the activities of development institutions (Block 3) and companies in the high-tech industry (Block 5). This covers system-wide institutional parameters, which play the most significant role in Block 3 and Block 5. When selecting parameters for Block 4 in a particular country, one should take into account their national specifics and significance.

*Block 5.* The structural block reflects the object of institutional support in the model "high-tech industry". At the entrance to the block, there are two types of regulatory impacts: support from development institutions and the impact of system-wide institutional parameters regulated by the state.

*Block 6.* A necessary element of the regulatory system is the structural block "state monitoring of results". In accordance with the type of their manifestation, information from three blocks comes into this one. Let us dwell on various types of manifestation of the results under supervision.

The first type of manifestation of the results refers to Block 3. This refers to the results of the activities of development institutions regardless of indirect and deferred effects. In other words, development institutions are regarded, in fact, as economic entities. The results are as follows: the compliance of the development institution's strategic documents with the targets of the state economic policy; the ratio of input resources (primarily received budgetary funds) and direct output products (investments, supported projects, etc.). This neglects subsequent effects that depend not only on development institutions but also on the activities of other economic entities, including recipients of support.

The following types of result manifestations under supervision belong to Block 5. They are as follows: the results of the activities of high-tech companies supported by development institutions, as well as the results of the development of the high-tech industry at the meso- and macro-levels of the economic system.

Another type of manifestation of the results to be monitored refers to Block 4. We mean the results of state regulation of system-wide institutional parameters that are a priority for the country in question.

It is worth mentioning that some parameters can be estimated on the basis of international indices. Within the framework of the Global Innovation Index (GII) [28], groups of system-wide institutional parameters (political environment, regulatory environment, business environment) are evaluated in the context of innovation, which is important for the development of the high-tech industry. The assessment highlights the strengths and weaknesses of the institutional environment in various countries.

## 4. Discussion

Let us discuss the developed structural model of institutional support for the high-tech industry as exemplified by a specific country, in particular Russia. Development institutions are currently being reformed, which we will focus on when discussing the structural blocks of the model. The reform affects a number of innovative development institutions [4]. Their area of responsibility includes the support of high-tech projects.

*Block 1* (as exemplified by Russia). Discussing the block "national sustainable development goals" as exemplified by Russia, the following aspects should be noted.

The national sustainable development goals that are relevant for Russia are set in the Presidential Decree [2]. For Russia, these goals should be adapted to the high-tech industry, i.e. the object of institutional support in the structural model we have developed.

Directly related to the high-tech industry is the group of goals "Decent, efficient work and successful entrepreneurship" [2]. In essence, it reflects Block 8 "Decent work and economic growth" from the UN List [1]. In this group, we have identified three key goals affecting exports, investment, and GDP. In relation to the high-tech industry, they can be formulated as follows:

– Growth in exports of high-tech products;
– Growth of investments in fixed assets of high-tech companies;
– GDP growth due to high-tech products.

If we consider the structural model in Russia, then state regulation should ensure the cross-cutting nature of the formulated goals.

*Block 2 (as exemplified by Russia).* Discussing the block "state regulation", including the reform of development institutions carried out in modern Russia, it is necessary to note the following facts.

When implementing the reform of development institutions, Russia uses three priority areas of regulatory impacts [3].

The first direction is the formation of a large investment block on the basis of the state development corporation "Bank for Development and Foreign Economic Affairs of the Russian Federation". Twelve development institutions are transferred under its management, including the State Specialized Russian Export-Import Bank, the Joint Stock Company "Russian Agency for Insurance of Export Credits and Investments", the Federal State Autonomous Institution "Russian Fund for Technological Development".

The second direction is the elimination of some development institutions, whose functions are redistributed between the executive authorities and the Bank for Development and Foreign Economic Affairs of the Russian Federation. Six organizations are closed down. Among them are joint-stock companies "Fund for the Development of the Far East and the Arctic", "Rosinfokominvest", and "Special Economic Zones".

The third direction is the modernization of development institutions. This includes 12 organizations, including joint-stock companies "Russian Venture Company" and "Russian Bank for Support of Small- and Medium-Sized Enterprises", as well as the Russian Science Foundation.

From a managerial perspective, the listed areas of reform relate, in fact, to the group of direct regulatory impacts of the state on Block 3 "development institutions". The reform priorities do not mention a group of indirect state impacts on Block 3 through Block 4 "system-wide institutional parameters".

*Block 3 (as exemplified by Russia).* Discussing the block "development institutions" within the framework of the reform implemented in modern Russia, we can draw certain conclusions.

An essential reason for reforming the Russian development institutions was their lack of effectiveness and weak focus on achieving national goals. At the government level [29], the reform of development institutions should aim at increasing the efficiency of work and reorientation to achieve the relevant national goals set in the Decree of the President of the Russian Federation [2].

In order to reorient the Russian development institutions towards effective work and achievement of national goals, a special document was introduced into the legal field by the order of the Government of the Russian Federation [30]. The document contains guidelines on the formation of key performance indicators (KPIs) of development institutions in order to encourage the management team. To provide the required motivation, the KPIs include a group of indicators aimed at achieving national goals.

*Block 4 (as exemplified by Russia).* Discussing the block "system-wide institutional parameters" in the context of the Russian reform of development institutions, we have revealed the following circumstances.

Some works examine the influence of the institutional environment on the performance of development institutions, including in Russia. It is shown that weaknesses in the institutional environment can hinder the effective operation of specialized organizations, namely development institutions (for example, [31,32]).

The relevance of this problem for Russia is evidenced by the international indices Global Competitiveness Index (GCI) [33] and Global Innovation Index [28]. In the report [28], the Russian institutional environment (rank 67) is emphasized as the weakest point among the seven components of the GII in 2021. The weakest points of the Russian institutional environment are as follows: Rule of law (rank 109) and Regulatory quality (rank 100).

As noted above, the priorities of the Russian reform do not move towards the state's influence on development institutions through changes in system-wide institutional parameters. At this stage of the reform, the task of purposefully identifying and eliminating weaknesses in the institutional environment that can hinder the effective functioning of development institutions has not been set. At the same time, the underestimated influence of the institutional environment on development institutions can lead to an incorrect assessment of the situation and, as a result, to inefficient decisions made within the framework of the reform.

*Block 5* (as exemplified by Russia). Discussing the block "high-tech industry" as exemplified by Russia, we focus on the results of achieving the national goal, namely "growth in exports of high-tech products."

Table 1 shows the dynamics of Russia's exports of high-tech products in comparison with some leading countries from different regions of the world.

Table 1. The export of high-tech products from Russia and leading countries (billion, current USD)

| Year / Country | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|
| China | 594.5 | 654.2 | 731.8 | 715.8 | 757.7 |
| Germany | 205.1 | 195.2 | 209.7 | 208.1 | 182.4 |
| Korea, Rep. | 135.9 | 166.7 | 192.8 | 153.5 | 164.0 |
| Singapore | 134.9 | 146.8 | 154.9 | 150.0 | 160.5 |
| United States | 173.9 | 154.5 | 153.8 | 153.9 | 141.5 |

| | | | | | |
|---|---|---|---|---|---|
| Japan | 99.1 | 106.2 | 110.7 | 103.9 | 102.8 |
| Vietnam | 55.2 | 74.1 | 82.6 | 90.4 | 101.5 |
| Malaysia | 63.2 | 74.1 | 90.4 | 86.5 | 92.1 |
| France | 108.7 | 108.8 | 117.6 | 120.5 | 87.1 |
| Netherlands | 71.0 | 77.7 | 85.5 | 87.0 | 87.1 |
| Mexico | 62.4 | 69.6 | 74.8 | 75.2 | 71.0 |
| Russian Federation | 11.2 | 10.4 | 10.1 | 10.8 | 6.6 |

*Source*: based on the data [34].

Based on the data in Table 1, we can draw certain conclusions in relation to the results of achieving the goal of "increasing exports of high-tech products" in Russia.
In the considered time interval, the export of high-tech products in Russia was significantly less than in the leading countries. In 2020, its volume amounted to 6.6 billion dollars in value terms. For comparison: 757.7 billion dollars in China, 182.4 billion dollars in Germany, and 160.5 billion dollars in Singapore. In other words, Russia lagged behind the leading countries by more than one order of magnitude. At the same time, there has been no steady growth in exports of Russian high-tech products over the past five years. The dynamic export of Russian high-tech products does not meet the target indicator set by the President of the Russian Federation.
*Block 6 (as exemplified by Russia).* Discussing the block "state monitoring of results" as exemplified by the Russian reform of development institutions, we should note the following aspects.

With regard to the Russian reform, Block 6 aims at providing information support for decisions on reforming development institutions. This block receives information from three subsystems of the model (blocks 3-5) that should reflect the reform results. In Block 5, its results manifested at different levels of the economic system should be monitored: within the framework of supported high-tech projects and companies; at meso- and macro levels.
If we interpret the developed model in relation to the Russian reform of development institutions, then we can propose a comprehensive approach to monitoring the reform results in contrast to the current situation. A significant addition is the inclusion of the results of the development of the institutional environment in the information base for decision-making on reforming development institutions. The relevance of taking into account system-wide institutional parameters was discussed above.

An integrated approach is necessary to avoid reform errors associated with the incompleteness of the decision-making base.

## 5. Conclusion

1. The analysis of scientific literature demonstrates that development institutions and the high-tech industry in general can play a significant role in achieving the goals of sustainable development of national economies. This stimulates the development of public policy models that use the institutional support of the high-tech industry to achieve national sustainable development goals.

2. A comprehensive-targeted approach has been developed for constructing a structural model of institutional support for the high-tech industry. We have formed a structural model of institutional regulation that combines the national goals of sustainable development and the key means of achieving them into a single structure with due regard to cause-and-effect relationships. We also believe that the performance of development institutions as specialized organizations depends on system-wide institutional parameters (institutional environment).

3. The constructed model is interpreted as exemplified by a certain country (Russia), where development institutions are being reformed. The model allows identifying a gap that could undermine positive results of the reform, including an underestimation of the impact of system-wide institutional parameters on development institutions.

4. The study results might be of practical interest from the standpoint of information and analytical support for managerial decisions. An integrated approach to constructing a model of institutional regulation will help to avoid errors associated with the incompleteness of the decision-making base. In particular, this concerns assessing the prospects for reforming development institutions in a given country and identifying reasons behind the unsatisfactory results of such a reform. A possible direction for further research is to develop a system of key indicators for monitoring the results of institutional support for the high-tech industry within the framework of the developed model.

## References

[1] United Nations: *The 17 Sustainable Development Goals.* United Nations Member States (2015). https://sdgs.un.org/goals (access date: February 25, 2022).
[2] President of the Russian Federation: *Ukaz Prezidenta Rossiiskoi Federatsii ot 21 iyulya 2020 g. No. 474 "O natsionalnykh tselyakh razvitiya Rossiiskoi Federatsii na period do 2030 goda"* [Decree of the President of the Russian Federation of July 21, 2020 No. 474 "On national goals of the development of the Russian Federation for the period until 2030"]. Official Internet Resources of the President of Russia (2020). http://www.kremlin.ru/events/president/news/63728
[3] Government of the Russian Federation: *Rasporyazhenie Pravitelstva RF ot 30 dekabrya 2020 g. No. 3710-r "Ob*

*institutakh razvitiya"* [Executive Order of the Government of the Russian Federation of December 30, 2020 No. 3710-r "On development institutions"]. Official Internet portal of legal information (2021). http://publication.pravo.gov.ru/Document/View/0001202101090037

[4] Government of the Russian Federation: *Rasporyazhenie Pravitelstva RF ot 5 fevralya 2021 g. No. 241-r "Ob utverzhdenii perechnya federalnykh institutov innovatsionnogo razvitiya"* [Executive Order of the Government of the Russian Federation of February 5, 2021 No. 241-r "On establishing the list of federal innovation development institutions"]. Official Internet portal of legal information (2021). http://publication.pravo.gov.ru/Document/View/0001202102080043?index=0&rangeSize=1

[5] Obolenskaya, L. V.: *Innovatsionnaya infrastruktura kak kompleksnyi institut razvitiya* [Innovation infrastructure as a complex development institution]. Mezhdunarodnyi nauchno-prakticheskii zhurnal "Ekonomika. Nalogi. Pravo" 2, 14–20 (2015).

[6] UNCTAD: *The role of development banks in promoting growth and sustainable development in the South*. United Nations, New York; Geneva (2017). https://unctad.org/system/files/official-document/gdsecidc2016d1_en.pdf (access date: February 6, 2022).

[7] Faure, R., Prizzon, A., Rogerson, A., Hefer, E.: *Multilateral development banks: A short guide*. Overseas Development Institute, London (2015).

[8] Shelepov, A. V.: *The role of the NDB and AIIB in catalyzing private infrastructure financing*. Vestnik RUDN. International Relations 18(3), 656–672 (2018) https://doi.org/10.22363/2313-0660-2018-18-3-656-672

[9] World Bank: *An integrated World Bank Group approach. Leveraging the private sector in IDA countries*. The Development Finance Vice Presidency of the World Bank (2017). https://thedocs.worldbank.org/en/doc/13e6f3de51bddb165a47908e3f62727a-0410012017/original/ida-private-sector-april-2017.pdf (access date: February 11, 2022).

[10] Cavalcanti, T., Novo, Á.: *Institutions and economic development: How strong is the relation*. Empirical Economics 30, 263–276 (2005) https://doi.org/10.1007/s00181-004-0217-5

[11] Law, S. H., Lim, T. C., Ismail, N. W.: *Institutions and economic development: A Granger causality analysis of panel data evidence*. Economic Systems 37(4), 610–624 (2013) https://doi.org/10.1016/j.ecosys.2013.05.005

[12] Di Liberto, A., Sideri, M.: *Past dominations, current institutions and the Italian regional economic performance*. European Journal of Political Economy 38, 12–41 (2015) https://doi.org/10.1016/j.ejpoleco.2014.12.006

[13] Karmyshev, Yu. A.: *Sistemnye problemy funktsionirovaniya i vzaimodeistviya institutov diversifikatsii i innovatsionnogo razvitiya v formiruyushcheisya natsionalnoi innovatsionnoi sisteme Rossii* [The system problems of functioning and interaction of diversification and innovation development institutions in the national innovation system of Russia under formation]. Vestnik Tambovskogo universiteta. Seriya: Gumanitarnye nauki 8(112). 48–58 (2012).

[14] *Glossary: High-tech classification of manufacturing industries*. Eurostat Statistics Explained (2022). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:High-tech_classification_of_manufacturing_industries (access date: February 25, 2022).

[15] Shirokova, E. Yu.: *Tendentsii razvitiya vysokotekhnologichnogo sektora ekonomiki v Rossii* [Trends in the development of the high-tech industry of the Russian economy]. Zhurnal ekonomicheskikh issledovanii 7(3), 22–38 (2021).

[16] Gil, P., Afonso, O., Brito, P.: *Economic growth, the high-tech sector, and the high skilled: Theory and quantitative implications*. Structural Change and Economic Dynamics 51, 89–105 (2019) https://doi.org/10.1016/j.strueco.2019.07.003

[17] Khan, J., Labonte, O.: *Urban tech sector growth drives economic resilience*. Economic Development Journal 16(2), 54–62 (2017).

[18] Hausmann, R., Hidalgo, C., Bustos, S., Coscia, M., Simoes, A., Yildirim, M.: *The atlas of economic complexity: Mapping paths to prosperity*. The MIT Press, Cambridge 2014 https://doi.org/10.7551/mitpress/9647.001.0001

[19] Hidalgo, C. A.: *Economic complexity theory and applications*. Nature Reviews Physics 3, 92–113 (2021) https://doi.org/10.1038/s42254-020-00275-1

[20] Vu, T. V.: *Does institutional quality foster economic complexity? The fundamental drivers of productive capabilities*. Empirical Economics (2022) https://doi.org/10.1007/s00181-021-02175-4

[21] Bashir, M. F., Ma, B., Hussain, H., Shahbaz, M., Koca, K., Shahzadi, I.: *Evaluating environmental commitments to COP21 and the role of economic complexity, renewable energy, financial development, urbanization, and energy innovation: Empirical evidence from the RCEP countries*. Renewable Energy 184, 541–550 (2022) https://doi.org/10.1016/j.renene.2021.11.102

[22] Barbero, J., de Lucio, J., Rodriguez-Crespo, E.: *Effects of COVID-19 on trade flows: Measuring their impact through government policy responses*. PloS One 16(10), e0258356 (2021) https://doi.org/10.1371/journal.pone.0258356

[23] Kuzenkova, V. M.: *Sovremennye podkhody k otsenke effektivnosti institutov razvitiya* [Modern approaches to the evaluation of development institution efficiency]. Ekonomicheskaya nauka sovremennoi Rossii 3, 19–33 (2020) https://doi.org/10.33293/1609-1442-2020-3(90)-19-33

[24] Woetzel, J., Garemo, N., Mischke, J., Hjerpe, M., Palter, R.: *Bridging global infrastructure gaps*. McKinsey Global Institute (2016). http://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/bridging-global-infrastructure-gaps (access date: February 11, 2022).

[25] International Monetary Fund: *Making public investments more efficient*. International Monetary Fund, Washington (2015). http://www.imf.org/external/np/pp/eng/2015/061115.pdf (access date: February 11, 2022).

[26] Sidorova, E. N., Trynov, A. V.: *Rol institutov razvitiya v narashchivanii investitsionnykh resursov staropromyshlennykh territorii* [The role of development institutions in growing investment resources of old industrial

territories]. News of the Ural State Mining University 1(53), 162–170 (2019) https://doi.org/10.21440/2307-2091-2019-1-162-170

[27] Sokolov, I., Khudko, E., Tischenko, T., Kireeva, A., Moguchev, N.: *Development of approaches to the formation of an integrated system for assessing the effectiveness of development institutions*. Working Papers 031912, Russian Presidential Academy of National Economy and Public Administration (2019) http://dx.doi.org/10.2139/ssrn.3347649

[28] Dutta, S., Lanvin, B., Rivera León, L., Wunsch-Vincent, S. (eds.): *The Global Innovation Index 2021. Tracking innovation through the COVID-19 crisis*. World Intellectual Property Organization [WIPO] (2021). https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2021.pdf (access date: February 11, 2022).

[29] Askerova, T.: *Mishustin rasskazal ob optimizatsii institutov razvitiya* [Mishustin told about the optimization of development institutions]. Parlamentskaya gazeta (2020). https://www.pnp.ru/politics/kabmin-optimiziruet-sistemu-institutov-razvitiya.html (access date: May 20, 2021).

[30] Government of the Russian Federation: *Rasporyazhenie Pravitelstva RF ot 28.12.2020 g. No. 3579-r "Ob utverzhdenii metodicheskikh rekomendatsii po formirovaniyu i primeneniyu klyuchevykh pokazatelei effektivnosti deyatelnosti aktsionernykh obshchestv, aktsii kotorykh nakhodyatsya v sobstvennosti Rossiiskoi Federatsii, i otdelnykh nekommercheskikh organizatsii v tselyakh opredeleniya razmera voznagrazhdeniya ikh rukovodyashchego sostava"* [Order of the Government of the Russian Federation of December 28, 2020 No. 3579-r "On approving the methodological recommendations for forming and using the key performance indicators of joint stock companies, whose shares are owned by the Russian Federation, and some non-commercial organizations in order to define the amount of remuneration for their management"]. Official Internet portal of legal information (2020). http://publication.pravo.gov.ru/Document/View/0001202012290099

[31] Sablin, K. S.: *Rol institutsionalnoi sredy v formirovanii institutov razvitiya* [The role of institutional environment in forming development institutions]. Journal of Institutional Studies 4(2), 32–41 (2012).

[32] Grozova, O. S.: *K voprosu o klassifikatsii institutov razvitiya i institutsionalnykh riskov innovatsionnoi deyatelnosti* [On the classification of development institutions and institutional risks of innovation activity]. Sovremennye problemy nauki i obrazovaniya 4, 200–210 (2012).

[33] Schwab, K. (ed.): *The Global Competitiveness Report 2019*. Geneva, World Economic Forum (2019). https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf (access date: February 20, 2022).

[34] The World Bank: *World Development Indicators*. The World Bank Group (2022). https://databank.worldbank.org/reports.aspx?source=2&series=TX.VAL.TECH.CD&country (access date: February 11, 2022).