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Financial Policy of Government Support for Semiconductors Industry Globally and in Russia under Sanctions

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ABSTRACT

The **relevance** of this study is determined by the need to develop the domestic semiconductors industry in Russia, taking into account the negative effects both internal and external. The **purpose** of this paper is to test the hypothesis of the positive impact of the methods used by the state of financial support of domestic companies to acquire advanced technologies in a specific area in the context of a lack of funding and the significant lag of the national semiconductor industry in the world's leading countries. The **target** of this study is the analysis of possible tools of state support, including subsidies and grants, and methods of their application for the creation of competitive industry of domestic semiconductor production. The key **methods** used in this study include the collection and processing of statistical data, their comparative analysis, as well as the elaboration of the regulatory framework on tax regulation in this sector of the economy. The main **methods** applied in this study are data collection and processing, comparative analysis, and the development of a regulatory framework for tax regulation in this sector of the economy. The authors analyzed the semiconductors industry in the world, including the production of microprocessors and other semiconductor components. The situation in countries such as China, USA, Japan, Europe, Taiwan, India and Russia is discussed in more detail. The main problems with semiconductor industry development in Russia have been revealed. Additionally, researchers have evaluated and outlined fields of federal budget spendings in the industry in the period of years 2022 and 2025. The **scientific novelty** of this paper is to identify the relationship between the measures of state tax incentives provided to the radio-electronic industry and macroeconomic indicators. Based on that authors have developed evaluation criteria of the relevance and efficiency of fiscal preferences for the analyzed industry which is considered as **the result** of research. It **concluded** that the state's initiatives to promote the radio-electronics industry might provide Russia a chance to catch up to the world's leading countries in this industry.

Keywords: import substitution; semiconductors; government support; subsidies; federal budget spendings; tax support; investments; competitiveness; sanctions; national economy

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INTRODICTION

At the present time, the development of the microelectronics market in both the global and individual economies has been a top priority in the competition for countries to achieve a competitive advantage. China continues to develop domestic microelectronics production; India is trying to surpass China as the world's biggest producer; and the US and China are trying to divide their areas of influence in Taiwan.

Given the fact that the microelectronics market is growing by an average of 26% annually (compared with the annual growth of the energy market, which is twice as low),[1] the world's leading economies are interested in developing full-cycle manufacturing, including semiconductors, in their territory or in countries that are more controlled by these economies. In this regard, the US provides financial incentives to manufacturers who are prepared to close their manufacturing facilities in China and Russia and relocate them to other countries.

[1] Global reorganization of the semiconductor industry. URL: https://www.it-world.ru/it-news/market/186649.html (accessed on 20.11.2022).

Over the last 30 years, the semiconductor market has changed considerably. About 50% of the world's export market for microprocessors is controlled by the largest Asian manufacturers, namely China, South Korea and Taiwan. Previously, almost 40% of the world's semiconductors were manufactured in the US and the other 40% — in Europe. Western markets are growing to depend on Asian countries for the supply of these types of products, which increases Asian countries' position on the global map.

Russia, with the smallest share of the world's market in microprocessor production (0.7% of the total market) [1], was in a difficult situation due to the sanctions imposed, given the high dependence of the market on supplies of any kind of component from other countries. However, Russia has an opportunity to obtain a competitive advantage in the microprocessor production cycle, including cheap natural resources such as oil and gas, as well as rare metals such as silicon, which are essential in such manufacture [2].

The task of this study is to analyse possible tools of government support, including subsidies and grants, as well as methods of their use in order to create a competitive industry for domestic microelectronics production.

The object of this study is the semiconductor sector, including the production of microprocessors, and the subject is the methods of government support for its development.

As a hypothesis, an argument has been provided for the positive impact of state support for domestic companies to acquire breakthrough technologies in the context of a lack of funding and a significant lag in the national semiconductor industry in comparison to the world's leading countries.

LITERATURE REVIEW

Microprocessor development and production can be identified as so-called "subversive innovations", which were first analyzed by American scientists C. Christensen and others in terms of changing the market's value ratio, in connection with which old products gradually lose their competitiveness, thereby contributing to the substitution and replacement of some leaders with others [3]. These same issues are relevant in terms of emerging innovations within the framework of digitization and explosive use of big data systems [4].

Research in the semiconductor industry, particularly microprocessors, demonstrates the need for analyzing the competitiveness of existing production cycles by country. Chinese scientists H. Li et al. [5] analysed the microprocessor industry in terms of the effectiveness of innovative approaches to organizing the production cycle of the final product at the lowest possible cost. The DEA (Data Envelopment Analysis) three-factor mathematical model is used for this purpose to compare all internal and external factors affecting product production. This model was also used by Taiwanese scientists [6] to analyze the competitiveness of microprocessor production in Taiwan compared to the leading competitive markets in the world. American scientist C.P. Bown [7] examined the semiconductor industry in the US compared to the Chinese market in the context of the trade war. In many ways, he used the methodology and results presented by S. Goodman et al. [8], who studied the impact of the trade war between South Korea and Japan on the future development of the two nations' semiconductor industries.

A special effort should be made to study the influence of government support on the growth of certain industries in order to bring them up to international competitiveness. Thus, scientists D. Soogwan and B. Kim [9] showed that the state funding of small and medium-sized enterprises in the field of various technologies in South Korea contributed to the even development of the regions of the country, which directly positively affected the economic situation in

the country. Taiwanese economists [10] also noted that state subsidies under Taiwan's industrial and technical complex upgrading program allowed the region to become a leader in semiconductors.

As regards the Russian experience of government support of the domestic industry and the prospects of its development, it should be emphasized the national projects implemented in Russia, which are aimed at the implementation of technical initiatives in the field of semiconductors. Research on state financing of various sectors of the economy, including semiconductors, was conducted by L. G. Sokolova, A. Gnidchenko, O. A. Romanova and others [11–13]. The state and possibilities of development of the Russian semiconductor industry under the conditions of state support were studied by D. Sirotin [14].

In regard to this, the issue of point-of-contact government support for existing domestic enterprises for breakthrough technologies in order to ensure Russia's long-term economic development is important.

INTERNATIONAL MARKET OF MICROPROCESSORS

To date, the microprocessor market is one of the key markets in terms of the country's further technological breakthrough. By the end of 2022, the annual market volume of microprocessors is estimated at approximately 400–500 bln US dollars.

The global market for microprocessors is growing rapidly in terms of revenue (*Fig. 1*). The main demand is for computer technology (31%), communications equipment, including smartphones (32%), industrial equipment (12%), car manufacturing, where the role of semiconductors is rapidly growing and becoming a key competitive advantage for some car manufacturers over others (12%) and household equipment (12%). Separately, according to global statistics, the military-industrial complex accounts for only 1% of the public sector's revenue. Most Russian companies in this sector of the economy are involved in the manufacture of their products for the military industrial complex (further —MIC).

Semiconductor production is mainly located in Taiwan, South Korea and Japan (see *Table*). The shares of the US and China in the world market are almost equal, which is explained by the tough sanction's rhetoric between the two countries.

Fig. 2 shows that South Korea and Japan have the most advanced technologies (less than 20 nanometers) in the production of microprocessors with 56 and 51% respectively. Taiwan (64%) and China (55%) lead in the medium range (more than 28 nanometers), whereas the least-wanted microprocessors of previous generations are still largely produced in Europe (49%).

Seriously determine the possible positions of Russia in the market of microprocessor production, given the sanctions imposed against the Russian economy, as well as the industry's considerable lag in the last 30 years due to Russia's unsuccessful integration into the international division of labour.

The Russian Federation's government released a document titled "Foundations of the Russian Federation's state policy in the field of development of electronic industry for the period up to 2030",[2] which provides the basis for the development of the semiconductor sector. The document identifies key challenges to successful development, including in the field of microprocessors. This should include:

Russia's technology lags in world standards by 10–15 years;

- difficulty with the development of technological processes for the production of microprocessors on thin plates (less than 180 nanometers);
- lack of production equipment and capacities;

[2] Electronics starts with a clean slate. URL: https://www.kommersant.ru/doc/5558844 (accessed on 23.11.2022).

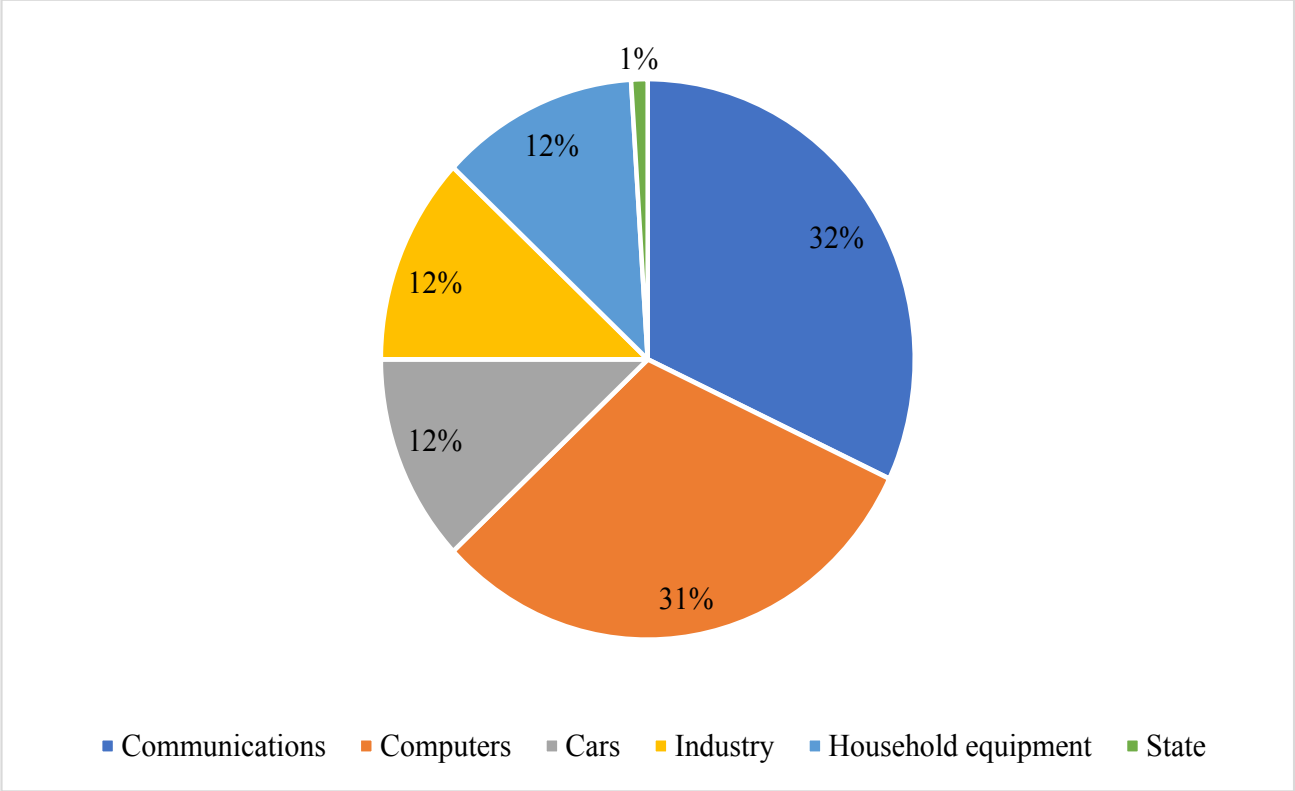


Fig. 1. **The Global Market of Semiconductors (Revenue) by Final Consumer, %, Year 2020**

Source: URL: https://www.trendforce.com/presscenter/news/20210531–10809.html (accessed on 21.11.2022).

- high dependence of the architecture and design of products on foreign technologies and materials;
- low investment attractiveness;
- inability to provide the domestic market with the necessary electronics [15, 16].

Moreover, the cost of production of components in Russia is so high that it cannot compete with other analogues of products, for example, of Asian origin [17].

Another challenge for the sustainable development of this industry within the framework of the national economy is the search and selection of the necessary personnel, including scientists, engineers and other specialists, who could use in their work not only existing technologies, but also engage in their own developments for their subsequent introduction in the production process [18, 19].

This requires significant investment in the development of the semiconductor industry, including the manufacture of microprocessors.

REGULATION OF THE DEVELOPMENT OF RADIOELECTRONICS IN THE RUSSIAN FEDERATION

The authors of the study used data of the Federal Tax Service of Russia (further — FTS) and Rosstat on the type of economic activity associated with the production of computers, electronic and optical products (OKVED 20). In July 2019, Government Decree from 10 July 2019 No. 878 "On measures to stimulate the production of radio-electronic products in the territory of the Russian Federation in the implementation of procurement of goods, works, services for the provision of state and municipal needs, on amendments to Government Decision from 16 September 2016 No. 925 and recognition of certain acts of the Government of the Russia" was decided to form the Unified Register of Russian Radio-electronic Products. The same document approved the rules for the establishment and maintenance of this register. The register of radio-electronic products published by the

Table

The Global Production of Semiconductors by Regions, Number of Units Produced per Month

Region, country	Industrial power (number of produced units)	The share of world market, %
Taiwan	4126	21.8
South Korea	4033	21.3
Japan	3168	16.8
North America	2426	12.8
China	2361	12.5
Europe	1138	6
Rest of the world	1646	8.7
Total	18897	100

Source: IC Insights Report. URL: https://www.techinsights.com/the-mcclean-report-research-bulletin (accessed on 22.11.2022).

Ministry of Industry and Trade of the Russian Federation. The first performances were done in October 2019. The inclusion of the names of products in this register is a condition of the participation of the companies themselves in state and municipal tenders.

There is another register, approved by the same amendment of the Government, established to ensure infrastructure security of the Russian Federation. This document provides the names and codes of the Russian national product classification, which are based on the economic activities of goods, and on which limits are applied when purchasing for state and municipal purposes if they are of foreign origin.

The constraints imposed by the requirement to register both radio-electronic products and their manufacturers limit the number of possible receivers of tax benefits and governmental subsidies. Russian tax legislation provides for organizations producing radio-electronic products, benefits on payment of income tax and insurance contributions to extrabudgetary funds. So corporate income tax is reduced from 20% to 3%,[3] and insurance contributions — from 30 to 7.6%.[4] Profits tax benefit is urgent until the end of 2024.

From 2023 to stimulate investment in capital, a new benefit in the form of an increase coefficient to the depreciation rate not higher than 3[5] is introduced, provided that this equipment is available in a single Register of Russian Radio-electronic Products. This benefit encourages buyers to acquire the main assets of domestic production.

The reduced rates of insurance premiums should reduce the taxpayer's costs of wages, which are taken into account in taxation. The demand for the benefit can be judged by changes in the amounts of funds credited

[3] Para. 1.16 art. 284 Tax Code of the Russian Federation. URL: https://www.consultant.ru/document/cons_doc_LAW_28165/eb9180fc785448d58fe76ef323fb67d1832b9363/ (accessed on 22.09.2023).

[4] Para. 18 pp. 1, para. 8 p. 2 art. 427 Tax Code of the Russian Federation. URL: https://www.consultant.ru/document/cons_doc_LAW_28165/c5c16c86f95c5db63601047b1c0a5942bd77c824/ (accessed on 22.09.2023).

[5] Para. 5 pp. 2 art. 259.3 Tax Code of the Russian Federation. URL: https://www.consultant.ru/document/cons_doc_LAW_28165/ad6e31e62418ce6768a1215342837d033553217e/ (accessed on 22.09.2023).

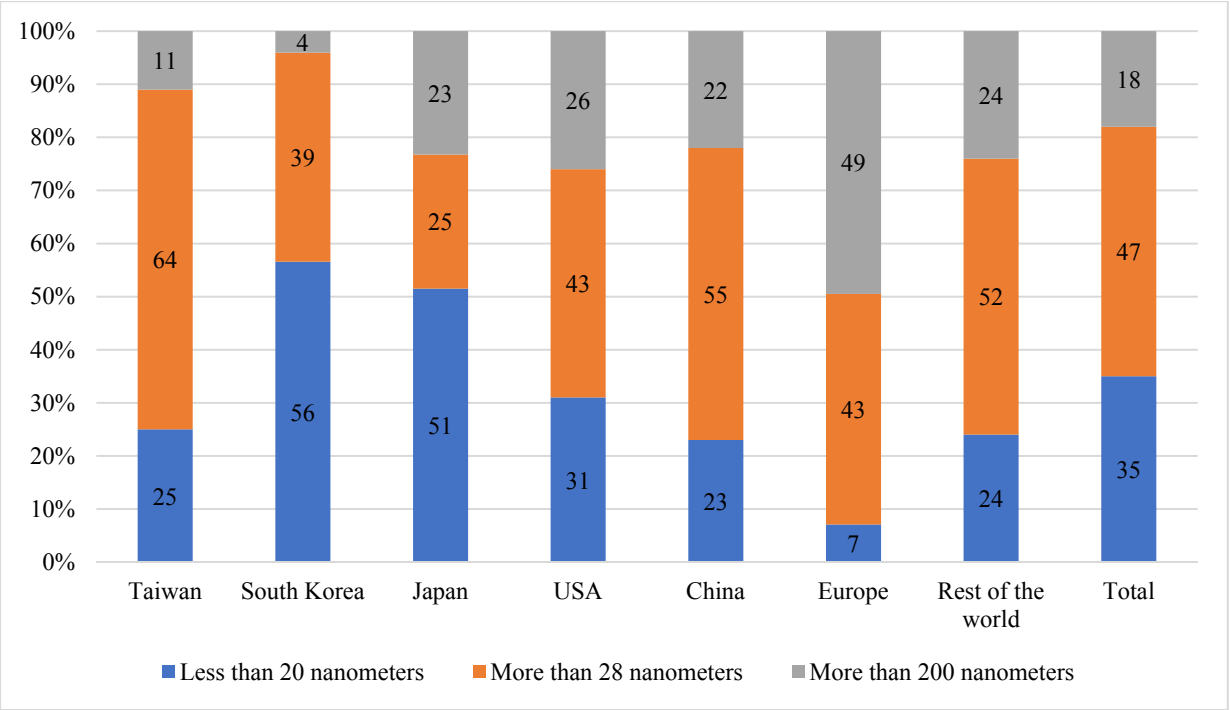


Fig. 2. **The Allocation of Global Production of Semiconductors by Project Norms, %**

Source: IC Insights Report. URL: https://www.techinsights.com/the-mcclean-report-research-bulletin (accessed on 19.11.2022).

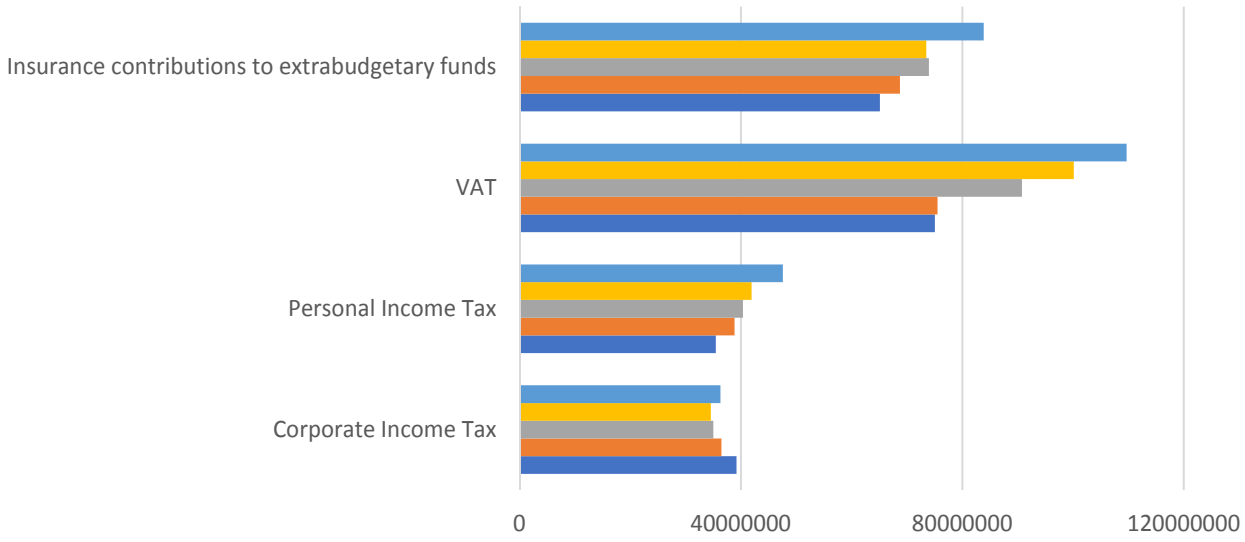
to extrabudgetary funds. They should fall significantly when preference is used. This is supported by data from Russia's FTS (*Fig. 3*). In 2020 there was a decrease of 1% in the deductions to extrabudgetary funds compared to 2019. The further increase in insurance premiums was attributable, according to the authors, to an increase in the average wage of employees engaged in the production of computers, electronic and optical products (*Fig. 4*).

If beneficiary organizations use the release funds to expand staff or to increase wages, there will be an increase in personal income tax (further — PIT) revenues from this category of taxpayers who act as tax agents to their employees. It can be identified using Rosstat (*Fig. 4*), and FTS of Russia (*Fig. 3*). The wages of workers engaged in the production of computers, electronics and optics are traditionally higher than the average for all economic activities, but at the same time in 2021 it showed a higher rate of growth.

The same trend is observed with PIT revenues to the consolidated budget of the Russian Federation (*Fig. 3*). Thus, in 2021, PIT revenue growth compared to the previous year was 13.5%, while in the previous periods from 2018 to 2020 this indicator was 9.5, 3.9 and 3.8% respectively.

Average nominal gross salary in average for all economic activities in 2021 increased by 11.5% compared to 2020, while in organizations engaged in the production of computers, electronic and optical products growth was 14% (*Fig. 4*). During the survey period from 2017 to 2018, this was the first case of exceeding the industry indicator above the average for all activities. Thus, in the period from 2018 to 2020, the growth of the total monthly average was 11.6, 9.5 and 7.2% respectively. These data always exceeded those in the industry surveyed, which were 9.7, 4.8 and 4.9% in the same period, respectively.

Corporate income tax benefits leave more money at the taxpayer's disposal after payment of this fiscal payment. In granting such preferences, the State is interested that these funds should be directed primarily towards investment in equity capital. However,



	Corporate Income Tax	Personal Income Tax	VAT	Insurance contributions to extrabudgetary funds
2021	36285048	47573429	109690205	83852775
2020	34566198	41907076	100128555	73492604
2019	35010160	40358900	90774556	73966919
2018	36460843	38837519	75508420	68715570
2017	39204750	35443215	75053103	65098035

Fig. 3. **Tax Revenues to the Consolidated Budget of the Russian Federation from Organizations Engaged in the Production of Computers, Electronic and Optical Products (Thous. Rubles)**

Source: Data from the Federal Tax Service of Russia according to form 1-NOM. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/ (accessed on 22.09.2023).

Rosstat data indicate a fall in the physical volume index of investments for the type of economic activity under investigation (*Fig. 5*). At the same time, average indicators of economic activity are significantly better, and not all year's show a decline compared to the previous period. However, the sharp decline in equity investment has been paused after the implementation of income tax benefits in 2020 [20].

RUSSIAN GOVERNMENT SUBSIDY FOR RADIO ELECTRONICS

State stimulation of the radio-electronics industry in the Russian Federation is not limited to tax benefits. The state programme "Development of electronic and radio-electronic industry"[6] provides for the allocation of subsidies to domestic producers of radio electronics. As early as November 2020 by the Order of the Government of the Russian Federation[7] from the reserve fund was allocated 300 000 thous. rubles. The indicator of efficiency of expenditure of these funds was the increase in the share of domestic radio electronic products in the

[6] State programme of the Russian Federation "Development of electronic and radio-electronic industry for 2013–2025" (approved by the Order of the Government of the Russian Federation from 15.12.2012 No. 2396. URL: http://government.ru/rugovclassifier/837/events/ (accessed on 21.02.2023).

[7] Order of the Government of the Russian Federation from 07.11.2020 No. 2893. URL: http://www.publication.pravo.gov.ru/Document/View/0001202011110012 (accessed on 21.02.2023).

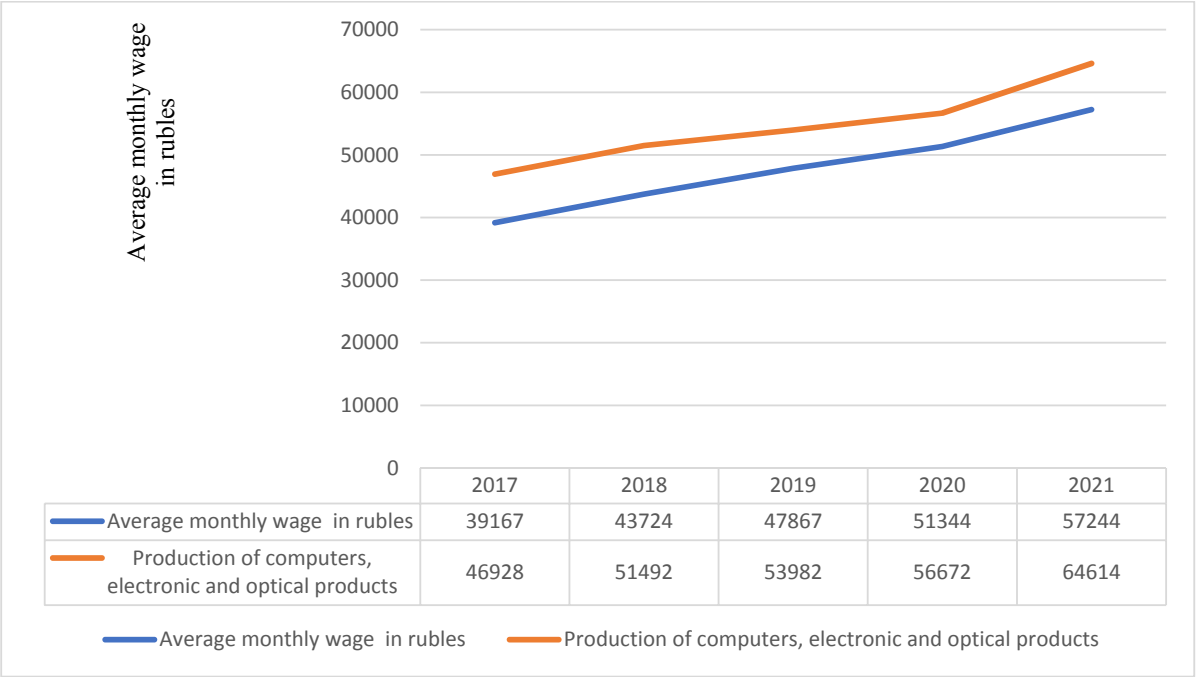


Fig. 4. **Average Monthly Nominal Accrued Wages of Employees (in Rubles)**

Source: Rosstat data URL: https://rosstat.gov.ru/labor_market_employment_salaries (accessed on 21.02.2023).

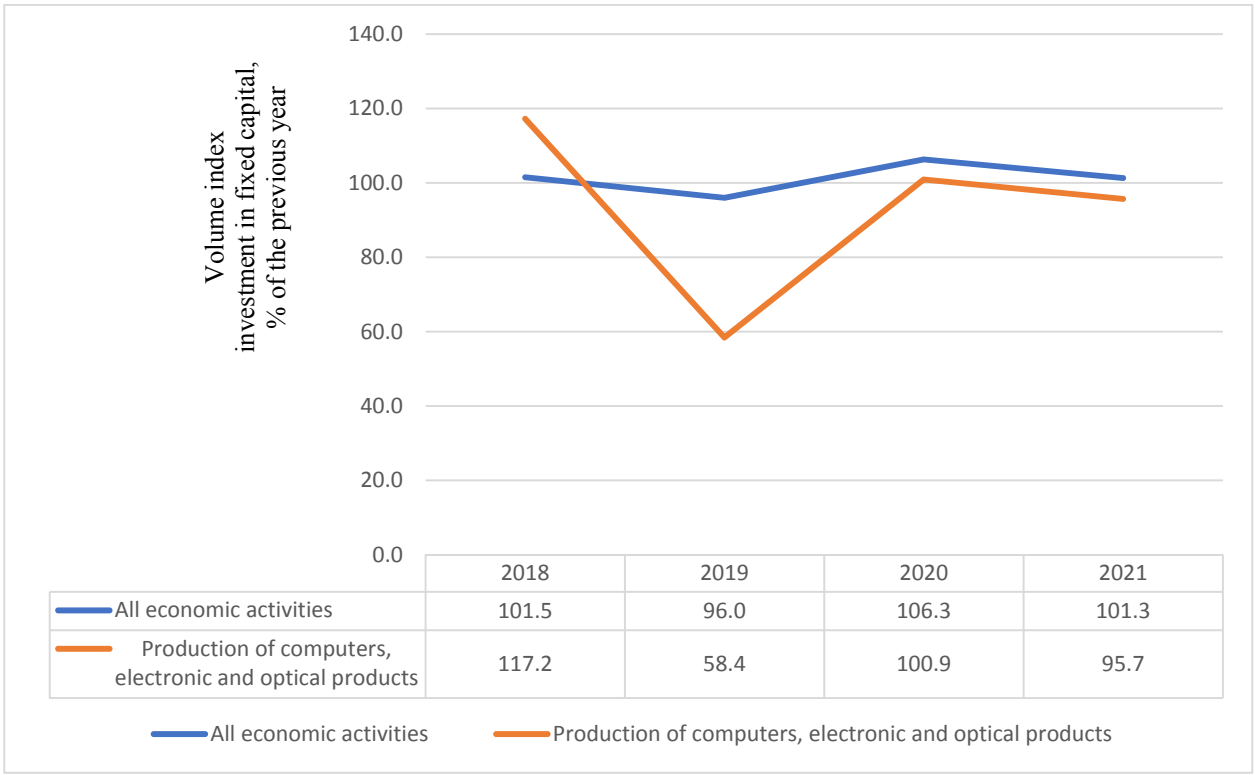


Fig. 5. **Index of the Physical Volume of Investments in Fixed Assets Aimed at Reconstruction and Modernization (in Comparable Prices, in % to the Previous Year)**

Source: Rosstat data. URL: https://rosstat.gov.ru/folder/11189 (accessed on 21.02.2023).

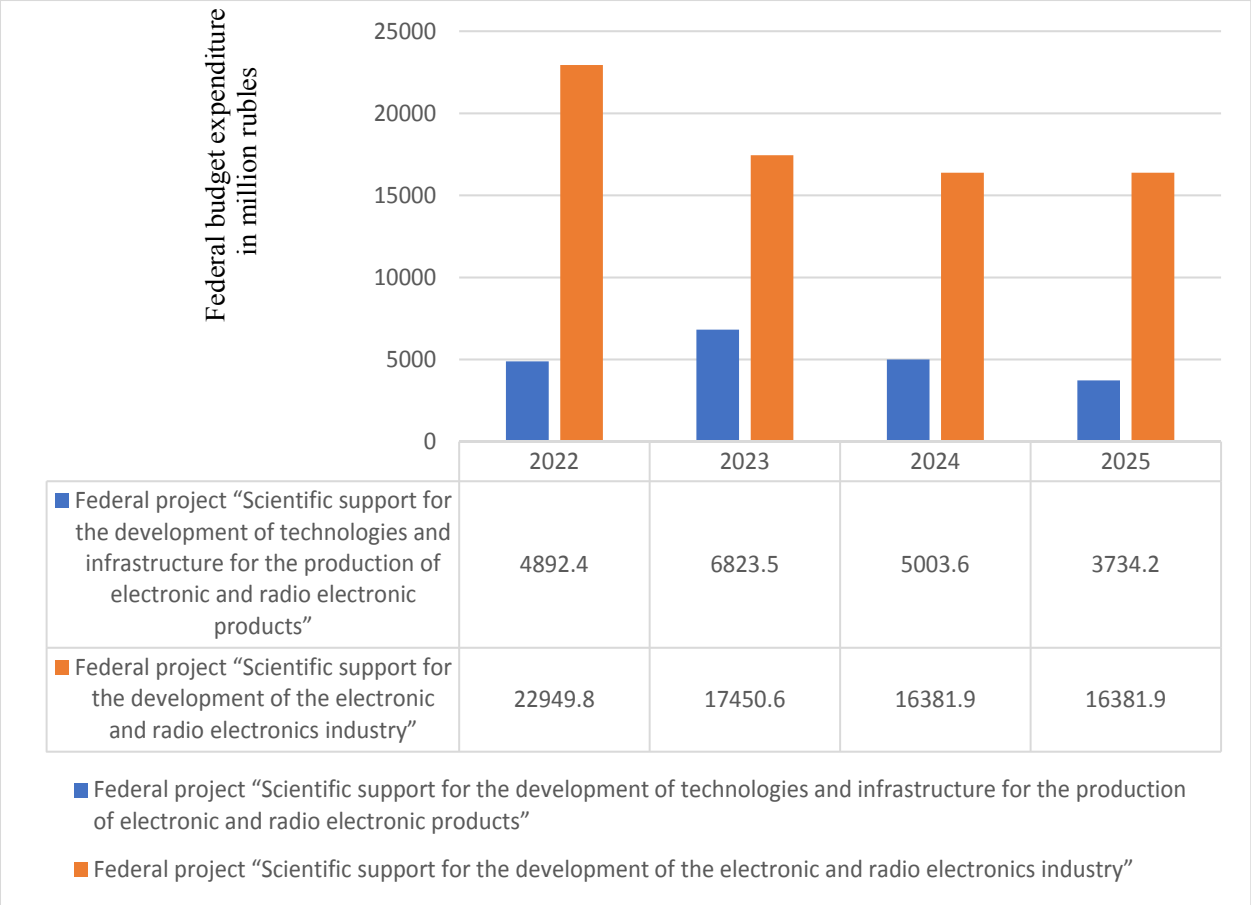


Fig. 6. **Federal Budget Expenditures in 2022–2025 for the Implementation of the State Program "Scientific and Technological Development of the Russian Federation" in Million Rubles**

Source: Explanatory note to the draft federal law "On the federal budget for 2023 and for the planning period of 2024 and 2025". URL: http://council.gov.ru/media/files/Qulh2hVvqtqSKTWVRmOkAeLYvJClXJvi.pdf (accessed on 21.02.2023).

total volume of semiconductors sold on the domestic market. The economic mechanism of subsidies of this kind is to compensate the costs of Russian semiconductors producers for the production of domestic products, the cost of which is higher than that of foreign competitors.

Rules of distribution of subsidies from the federal budget to domestic producers of radio electronics approved by the Government of the Russian Federation Decree from 24.07.2021 No. 1252. According to this document, allocated funds are to be spent to compensate up to 90% of the cost of establishing an electronic component database. Government support is provided on the basis of competitive selection. This document imposes a number of restrictions on potential recipients of federal budget support. Thus, the project for which the state subsidy is granted should be completed within five years. A list of expenses that can be covered by the budgetary resources available is also provided. Wages, R&D, and investment in basic assets are all examples.

Subsequently, the Government of the Russian Federation from 27.09.2021 No. 1619 "On approval of the Rules of granting subsidies from the federal budget to Russian companies for financial support of part of the costs associated with the introduction of Russian products of the radio-electronic industry" approved the rules of compensation from the Federal Budget of expenses already associated

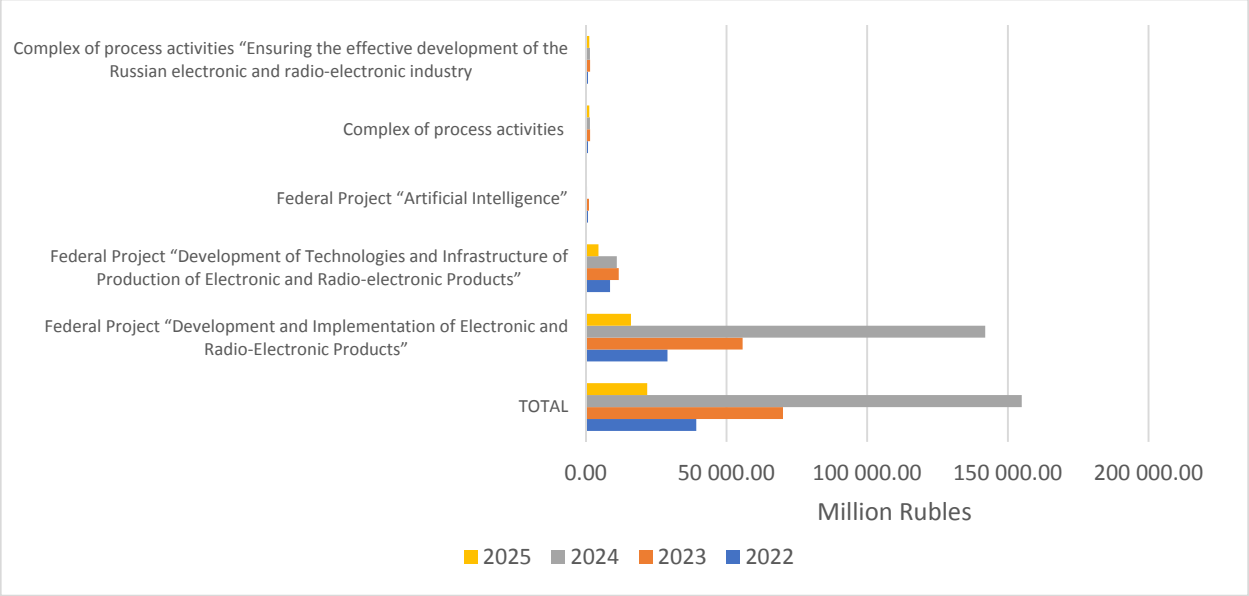


Fig. 7. **Federal Budget Expenditures in 2022–2025 for the Implementation of the State Program "Development of the Electronic and Radio-Electronic Industry" in Mln Rubles**

Source: Explanatory note to the draft federal law "On the federal budget for 2023 and for the planning period of 2024 and 2025". URL: http://council.gov.ru/media/files/Qulh2hVvqtqSKTWVRmOkAeLYvJClXJvi.pdf (accessed on 21.12.2022).

to the implementation of domestic products of radio-electronic industry.

Analysis of the planned expenditure of the federal budget for 2023–2025 allows to make a conclusion about the change in the amount of funds to be allocated in comparison with 2022 for the scientific support of the development of electronic and radio-electronic industry within the framework of the state programme "Scientific and technological development of the Russian Federation" (*Fig. 6*).

But the state programme "Development of electronic and radio-electronic industry" budget appropriations are planned to increase (*Fig. 7*). The main example of this programme is funding for the federal project "Development and implementation of electronic and radio-electronic products". The share of this project in the federal budget expenditure for the development of the radio-electronics industry is 73.88, 79.49, 91.6 and 73.47% in 2022, 2023, 2024 and 2025 respectively.

The federal budget in the departmental structure of expenditure provides for the allocation to the Ministry of Industry and Trade of the Russian Federation for the State Programme of Russia "Development of electronic and radio-electronic industry" in 2023–1 135 292.2 thous. rubles, and in 2024–478 592.8 thous. rubles.[8]

Indicators of the effectiveness of the implementation of the state program "Development of electronic and radio-electronic industry" are the increase in the share of production of domestic electronics industry both in the domestic and world markets with the increase of the volume of the production of such products in monetary equivalent. In addition, the growth in labor productivity and the number of jobs in the industry, as well as the amount of investment in production funds, are taken into account.

CONCLUSION

Based on a review of the international radio-electronics industry, it was discovered that:

[8] Appendix 12 to the Federal Law from 05.12.2022 No. 466 "On the federal budget for 2023 and the planned period of 2024 and 2025". URL: http://www.consultant.ru/document/cons_doc_LAW_433298/ (accessed on 05.01.2023)

• the development of the radio electronics market is a key challenge for most of the world's leading economies, given the sustained growth of the market from year to year by more than 20%;

• Russian radio electronics sector has a number of key problems that prevent successful developments in this sector, namely: Russia's technology lags 10–15 years behind the world level, difficulties with the development of technological processes for the production of microprocessors on thin plates (below 180 nanometers), lack of production equipment and capacities, high dependence of architecture and product design on foreign technologies and materials, low investment attractiveness, inability to provide the domestic market with the necessary electronics, lack of personnel, as well as high cost of production of the final product itself.

According to the results of the analysis of tax benefits for the radio-electronic industry, as well as the statistics of FTS of Russia and Rosstat, the interrelationships and patterns between the measures provided by the state tax benefit of this industry and macroeconomic indicators have been identified. As a result of this condition, the following criteria for assessing the demand and effectiveness of fiscal preferences for the activity under examination have been developed, which can serve as universal indicators of the efficacy of tax benefits for any category of taxpayers:

• a positive change in the rate of wage growth in the industry;

• a decrease in the rates of growth of deductions to extrabudgetary funds compared to the rates for the growth of the wage fund, the amount of which can be estimated by the paid PIT;

• an increase in the number of employees in the industry;

• a growth in the revenue of enterprises of the industry, which is indirectly evidenced by the increase in VAT revenues;

• a positive dynamic of the index of physical volume of investments in capital, which exceeds the rate of growth of this indicator for all types of economic activity;

• a decrease in the share of imports of preferential products.

It concluded that if the mechanisms indicated above are implemented for the purpose of future development and preservation of the domestic radio electronics sector, Russia has every chance of overcoming the significant lag of the economy's industry from other leading economies across the world.

REFERENCES

1. Abdikeev N. M. Importozameshchenie v vysokotekhnologichnykh otraslyakh promyshlennosti v usloviyakh vneshnikh sanktsii. *Upravlencheskie nauki*. 2022; 12(3):53–69. URL: https://cyberleninka.ru/article/n/importozameschenie-v-vysokotehnologichnyh-otraslyah-promyshlennosti-v-usloviyah-vneshnih-sanktsiy
2. Tebekin A. V. Analiz problem i perspektiv realizatsii planov importozameshcheniya v otraslyakh promyshlennosti. *TDR*. 2022; (2):159–165. URL: https://cyberleninka.ru/article/n/analiz-problem-i-perspektiv-realizatsii-planov-importozamescheniya-v-otraslyah-promyshlennosti (дата обращения: 08.01.2023).
3. Christensen C., McDonalnd R., Altman E., Palmer J., Disruptive Innovation: An Intellectual History and Directions for Future Research. *Journal of Management Studies. Special Issue: Managing in the Age of Disruptions*. 2018;55(7):1043–1078. https://doi.org/10.1111/joms.12349
4. Hopp C., Antons D., Kaminski J., Salge T. Disruptive Innovation: Conceptual Foundations, Empirical Evidence, and Research Opportunities in the Digital Age. *Product Innovation Management*. 2018;35(3): 446–457. DOI: 10.1111/jpim.12448

5. Li H., He H., Shan J., Cai J. Innovation efficiency of semiconductor industry in China: A new framework based on generalized three-stage DEA analysis. *Socio-Economic Planning Sciences*. 2019; 66:136–148. https://doi.org/10.1016/j.seps.2018.07.007.
6. Lin F.; Lin S.-W.; Lu W.-M. Sustainability Assessment of Taiwan's Semiconductor Industry: A New Hybrid Model Using Combined Analytic Hierarchy Process and Two-Stage Additive Network Data Envelopment Analysis. *Sustainability*. 2018; 10:1–16. https://doi.org/10.3390/su10114070
7. Bown C.P. How the United States Marched the Semiconductor Industry into its Trade War with China. *East Asian Economic Review*. 2020;24(4):349–388. https://dx.doi.org/10.11644/KIEP.EAER.2020.24.4.384
8. Goodman S., Kim D., VerWey J. The South Korea — Japan Trade Dispute in Context: Semiconductor Manufacturing, Chemicals, and Concentrated Supply Chains. *Office of Industries*. 2019; 62:68.
9. Soogwan D., Kim B. Government support for SME innovations in the regional industries: The case of government financial support program in South Korea. *Research Policy.* 2014;43(9):1557–1569. https://doi.org/10.1016/j.respol.2014.05.001.
10. Hsu C., Chiang H. The government strategy for the upgrading of industrial technology in Taiwan. *Technovation.* 2001;21(2):123–132. https://doi.org/10.1016/S 0166–4972(00)00029–8.
11. Sokolova L.G. Teoreticheskie aspekty formirovaniya promyshlennoi politiki Rossii. *Problemy sotsial'no-ehkonomicheskogo razvitiya Sibiri*. 2019;3:49–56.
12. Gnidchenko A., Mogilat A., Mikheeva O., Salnikov V. Foreign Technology Transfer: An Assessment of Russia's Economic Dependence on High-Tech Imports. *Foresight and STI Governance.* 2016;10(1);53–67. DOI: 10.17323/1995–459x.2016.1.53.67
13. Romanova O.A. Teoreticheskie, institutsional'nye i ehticheskie osnovaniya realizatsii sovremennoi promyshlennoi politiki. *Ehkonomika regiona*. 2019;1(15):13–28. DOI: 10.17059/2019–1–2
14. Sirotin D. Sostoyanie i vozmozhnosti razvitiya rossiiskoi mikroehlektronnoi otrasli. *Ehkonomicheskoe vozrozhdenie Rossii.* 2021;3(69):105–122.
15. Belousova N.N., Plis N.I. Sostoyanie del s proizvodstvom grazhdanskoi produktsii krupnogo predpriyatiya OPK radioehlektronnoi promyshlennosti: problemnye voprosy, trebuyushchie resheniya. *EHSGI*. 2022;2(34):19–28. URL: https://cyberleninka.ru/article/n/sostoyanie-del-s-proizvodstvom-grazhdanskoy-produktsii-krupnogo-predpriyatiya-opk-radioelektronnoy-promyshlennosti-problemnye.
16. Komkov N.I. Sostoyanie i perspektivy razvitiya otechestvennykh promyshlennykh kompanii. *Problemy prognozirovaniya*. 2020;2(179):113–127.
17. Zolotareva O.A., Darda E.S., Tikhomirova A.V. Gumanitarno-tekhnologicheskaya revolyutsiya: otsenka sostoyaniya gotovnosti perekhoda v novyi tekhnologicheskii uklad. *Vestnik NGUEHU*. 2021;4:55–66. URL: https://cyberleninka.ru/article/n/gumanitarno-tehnologicheskaya-revolyutsiya-otsenka-sostoyaniya-gotovnosti-perehoda-v-novyy-tehnologicheskiy-uklad.
18. Kuznetsova S.B. Chetvertaya promyshlennaya revolyutsiya kak rezul'tat innovatsionno-tekhnologicheskogo razvitiya proizvodstvennykh sistem. *Sovremennye nauchnye issledovaniya i innovatsii*. 2016;3:339–351. URL: http://web.snauka.ru/issues/2016/03/65792.
19. Silakova L.V., Grigor'ev E.A. Analiz innovatsionnogo razvitiya Rossii: sostoyanie, problemy, perspektivy. *Ehkonomika i ehkologicheskii menedzhment*. 2021;2:86–96. URL: https://cyberleninka.ru/article/n/analiz-innovatsionnogo-razvitiya-rossii-sostoyanie-problemy-perspektivy.
20. Dezhina I., Nafikova T., Gareev T., Ponomarev A. Tax Incentives for Supporting competitiveness of telecommunication Manufacturers. *Forsait*. 2020;2:51–62. URL: https://cyberleninka.ru/article/n/tax-incentives-for-supporting-competitiveness-of-telecommunication-manufacturers.

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