

IRSTI 82.15.17

M.M. Petrova¹, Y.A. Akhmedyarov²

¹*«St. Cyril and St. Methodius» University of Veliko Tarnovo, Veliko Tarnovo, Bulgaria*

²*L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan*

(E-mail: m.petrova@ts.uni-vt.bg, ahmediarov_e_a@mail.ru)

Foreign experience in supporting innovation

Abstract. The article analyzed the foreign experience of supporting innovation. The authors of the article were to consider the main financial, managerial and organizational-legal mechanisms used by leading countries in the field of innovative development to stimulate innovation. A list of the most frequently used measures to support and stimulate innovation is given. The scientific article outlines the role of the state in enhancing innovation in the leading economies of the world. With the help of the rank correlation coefficient of E. Spearman, the relationship between the share of GDP spent on research and development and its place in the Global Innovation Index developed by Cornell University, INSEAD Business School and the World Intellectual Property Organization was investigated. The result of the study of this relationship was that there is a direct moderate relationship between these two indicators.

Keywords: innovation, innovation activity, government support, international experience, financing, technopark, business incubator, rank correlation coefficient.

DOI: <https://doi.org/10.32523/2079-620X-2019-4-123-132>

Introduction. Activation of innovative activity is impossible without studying foreign experience of innovative activity. All changes in the innovation process management system in foreign countries are based on the introduction of new organizational forms of innovation management [1, 2]. A review of the literature shows that economically developed countries have accumulated extensive experience in organizing the innovation process over the past decades. The study of accumulated experience seems appropriate, since it will help in ensuring the absorption of innovations in domestic practice.

The main task of this research is to study the foreign experience of supporting innovative activities of enterprises by using various mechanisms of financial, managerial and organizational legal nature.

The practice of economically developed countries shows that sustainable economic growth in the modern world and conditions is associated with the level of introduction of new technologies and developments into production. According to some expert estimates, due to the introduction of innovations in these countries, GDP growth is achieved from 50 to 70%.

The role of the state in economically developed countries in terms of innovation stimulating is through the creation of regulatory, economic, financial, and organizational conditions. Purposeful regulation of innovation processes consists in their activation in all spheres and is carried out using direct and indirect impact methods. To a greater degree, stimulation of innovation activity is carried out by the state in the form of financial support through the placement of government orders on the market. Along with this, innovative firms are provided with tax and other benefits [3].

In developed countries, high innovation activity is manifested in a combination of product and process innovations in the high-tech sector, while in the manufacturing industry, product innovations are most prevalent [4].

Research method. The information in this scientific article is based on the works of domestic and foreign economic scientists, which were published in periodicals and posted on web-sites.

The source of the data was the publications of such organizations as: National Research University, Cornell University, INSEAD School of Business and World Intellectual Property

Organization.

In the process of conducting scientific research, dialectical methods of general scientific character and specific methods in economic research were used.

In the process of research, various methods were used: monographic, economic and statistical, expert assessments, as well as abstract-logical and comparative.

The purpose of the article. The purpose of writing this scientific article is studying the peculiarities of foreign experience of enhancing innovation.

Results and discussion. The leading position in the US innovative development was provided by state financial support for high-tech, technically advanced industries and industries that are of national importance and ensure the preservation of comparative advantages compared with other countries. Achieving the goal is carried out through state control of industries and sectors of industry of national importance and affecting the situation in them, most often using indirect methods of stimulation. One of the indirect methods of tax incentives is carried out both at the federal level and at the state level. A good example of providing tax incentives to enterprises engaged in innovative activities in the form of an investment tax credit showed that every dollar spent increases US economic activity by two dollars.

The peculiarities of the US innovation system include the emergence of institutions independent of the state (technology parks and venture funds) and the high activity of small innovative companies. At the same time, the active emergence of small innovative companies was due to the availability of funds through venture capital and special state programs.

The German experience in innovation support is based on financial support from the federal budget within the framework of targeted programs of the Federal Ministry of Education, Science, Research and Technology. Financial support is obtained for research and development that is of national importance for the country as a whole and aimed at raising domestic science and technology in certain areas to the world level. Priority is given to research and development that is long-term in nature, accompanied by high risk and requiring large expenditures in the financing of which private capital also participates, in particular inter-sectoral developments in the field of critical technologies.

So, back in the 1980s, in Germany there were made attempts to create and implement a state strategy for industrial development and innovation. In 2002, the concept of innovation policy was adopted, in which the priorities were the formation of an innovation culture, the creation of framework conditions that promote innovation, and the embodiment of research results into innovations. In 2006, the Strategy for Innovation and Technological Development was developed, which included new priorities in the technological sphere, taking into account global trends in the development of science and technology. The strategy identified 17 key sectors of priority importance for the economy for each of which development strategies were developed. In addition, as part of the implementation of this strategy, a number of projects were initiated on the cooperation of science and business and the development of clusters that are developing new technologies.

The peculiarity of the mechanism of financing national science and priority innovation and scientific-technical projects in Germany is the use of the institutional method of financing, that is, the state directs budget funds to organizations that conduct research directly. State financial support in Germany is provided in the form of grants, loans and tax incentives, assistance in the formation of equity, as well as state guarantees, preferential terms for the use of land [5, 6].

The main milestone of innovative development in Israel dates back to 1991, when the State Commission for Scientific and Technological Development was established. This commission identified the most appropriate form of stimulating the economy in the form of creating science parks and technology parks and identified priority areas: computer programming, biotechnology, medical equipment, environmental protection methods, fresh water production

methods, information and communication technologies. On this basis, the Government adopted a comprehensive program to stimulate innovative development, taking into account both the state of the global market and the specific features of Israel. Initially, technological business incubators were financed by the state, and in 2001 an economic analysis of their activities was conducted and it was concluded that attracting private capital should increase their productivity. Today, private financing of technological incubators is twice as much as the state. A network of consulting services has emerged and began to develop rapidly, designed to help young entrepreneurs navigate the demands of the modern market, develop business plans and find suitable strategic partners.

On the one hand, private business incubators lead scientists and engineers to potential investors and to real producers of finished products. On the other hand, they help investors to find the most promising areas of capital investment with the goal of ultimately obtaining maximum profit. Since the state is actively involved in the initial stages of research and development, the risk of unsuccessful investments is significantly reduced for private investors.

The militarization of the Israeli economy in the field of weapons improvement is an important catalyst for the technical progress of the country as a whole. On the one hand, many development projects commissioned by the military department, then find their application in the field of national economy. On the other hand, work at the forefront of technological progress, even if its main goal is to solve some military-technical problems, contributes to maintaining a high level of civilian production [7, 8].

In Japan, as well as in Germany, the state develops strategies and programs for innovative development. Fundamental research is carried out by state scientific institutions and is distinguished by a low level of implementation, while applied scientific research is most often conducted by research laboratories of large corporations. Since venture financing in the country has not been developed, the source of funds is government loans and resources of state banks. In addition, state and public financial corporations and agencies are engaged in lending innovation, but, unlike state banks, they need to obtain permission from the Japanese government of innovation project crediting.

In the 1980s, the Japanese government launched a large-scale technopolis creation program. In the framework of the "Technopolis" program, 20 technopolises of the prefectures of the country were created, which were lagging behind in economic development. On the territory of the technopolises, there were credit and tax incentives, firms were allowed to apply the accelerated depreciation method, and the state jointly participated in research laboratories and small firms. In addition, private capital was actively attracted to the technopark zone, and it was the place where university science and production were connected.

One of the fastest growing economies in the world is the economy of China. At the end of 2018, the share of China's GDP was 16.45% in world GDP, assenting only to US GDP. The peak of innovation development fell on the 11th five-year plan (2006-2010) with an active role and support of the state.

The active innovation policy, launched in the 1980s, was implemented by China through the implementation of targeted programs, more aimed at the development of foreign technologies. The innovation activity of enterprises was intensified locally in special economic zones, industrial parks, trade and economic development zones, etc. The "Fakel" program, adopted in 1988, provided for the construction of technology parks.

At present, there are 57 zones in China for the development of new and high state-level technologies. The rapid growth of technology parks was accompanied by the attraction of foreign investments. Favorable conditions have been created for potential investors: a reduced income tax rate; long term of cooperation agreements; freedom of transfer of funds by non-residents; exemption from income tax in case of reinvestment of incomes into the economy of free economic zones.

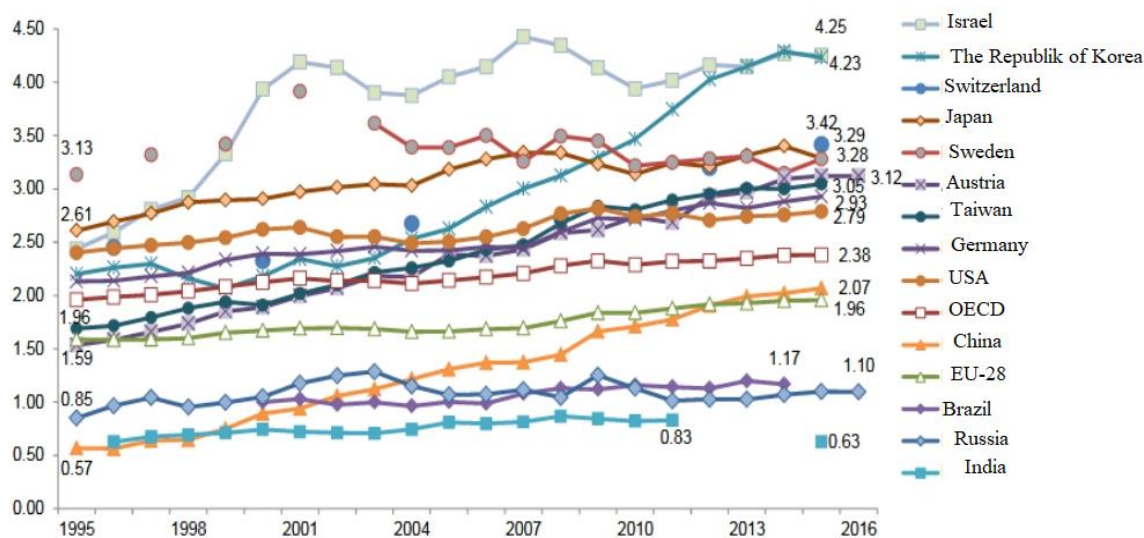
Today, China demonstrates to the world the efficiency of its industrial policy, implemented on the basis of a centralized system of planned macroeconomic regulation, and pursues a policy of accelerated development of the economy of the fifth technological order.

In addition to the listed activities, China pays great attention to the personnel potential of science. In the world of scientific publications, China ranks second. The scientific potential is increased by attracting foreign specialists (480 thousand specialists in 2009) and training and retraining of national personnel abroad. There is a policy of returning Chinese scientists from abroad to the country, they are provided with research grants, which are used to create business incubators and technoparks at universities. The result of such policy is that 60% of academics in China are repatriates. Such rapid growth of innovative technologies in China is provided by state support, the main measures of which are government subsidies and concessional loans [9].

Studying the experience of successful innovation development of the Republic of Korea allows us to identify a number of determining factors. First of all, it is the leading role of the state in the innovation process. The basis for creating an innovation system was a public-private partnership with the leading role of the state. Also, an important role in the commercialization of innovative technologies is played by chaebols, which represent a special form of financial-industrial groups in the form of a conglomerate. By the way, it was the chaebols who determined the economic situation and the active economic growth of the Republic of Korea after a long stagnation. In addition, the experience of innovative development of the Republic of Korea is characterized by the use of various sources of technology transfer; the growth of investments in higher education, science and social capital; the formation of regional industrial clusters; promoting the development of entrepreneurship and creative economy [10].

Government support for innovation results in an increase in the number and proportion of enterprises with innovative activity. So, the share of innovation-active enterprises is about 50% in the United States, while Germany (79.3%), Sweden (60%), Finland (58%) [11,12,13].

In general, world practice shows that the development of innovation is associated with the state of fundamental and applied science, as well as the level of innovation commercialization [14]. The indicator characterizing the degree of state participation in the scientific and technical progress is the amount of science funding. The share of GDP directed to research and development in some countries leading by this indicator is illustrated in Line graph 1.



Line graph 1. Dynamics of domestic research and development costs in the percentage of GDP

Note: made by the author on the basis of data [15].

Thus, the share of GDP in research and development: amounted to over 4% in Israel and the Republic of Korea, over 3% in Switzerland, Japan, Sweden and Austria. The European Union recommends that all member countries increase the level of investment in science to 2.5% of GDP. Recent studies on the clustering of countries, the share of GDP expenditure allocated to R & D shows that there is a tendency for a number of countries (Norway, Slovenia, China, Ireland, the Czech Republic, Turkey, Greece, Poland and Bulgaria) to move from one group to another. Such rates of increase in spending on science create certain prerequisites for enhancing innovation in the countries noted [16].

One of the indicators characterizing the level and pace of innovative development of the countries of the world is the Global Innovation Index (GII), which ranks 126 countries by 80 parameters. This annual ranking is compiled and published by experts from Cornell University, INSEAD Business School and the World Intellectual Property Organization. According to the rating compiled on the basis of the results of 2018, the results are presented in Table 1.

Table 1

Rating by GII in 2016-2018

№	Country	Place in the GII rating				
		2016	2017	2017 to 2016	2018	2018 to 2017
1	Israel	21	17	+4	11	+6
2	The Republic of Korea	11	11	-	12	-1
3	Switzerland	1	1	-	1	-
4	Japan	16	14	+2	13	+1
5	Sweden	2	2	-	3	-1
6	Austria	20	20	-	21	-1
7	Germany	10	9	+1	9	-
8	USA	4	4	-	6	-2
9	China	25	22	+3	17	+5
10	Brazil	69	69	-	64	+5

Note: compiled by the author on the basis of data [17].

Table 1 shows the leaders of the rating and major participants in the world economy. In dynamics, Israel shows the best result, improving its positions in 2017, 2018 by 4 and 6 points, respectively.

Investigating the relationship between the share of GDP aimed at research and development and a place in the Global Innovation Index, we turn to E. Spearman's rank correlation coefficient [18]. This indicator is calculated not by the primary data, but by the ranks (sequence numbers) that are assigned to all values of the studied traits, arranged in ascending order. If the values of the attribute coincide, then the average rank is determined by dividing the sum of the ranks by the number of matching values.

Table 2

Auxiliary table for calculating the rank correlation coefficient

№	Country	Percentage of GDP for research and development x	Place in rating GII y	Ranks		Rank difference d	Rank difference square d^2
				on x	on y		
1	Israel	4,25	11	1	5	-4	1
2	The Republic of Korea	4,23	12	2	6	-4	2
3	Switzerland	3,42	1	3	1	2	3
4	Japan	3,29	13	4	7	-3	4
5	Sweden	3,28	3	5	2	3	5
6	Austria	3,12	21	6	9	-3	6
7	Germany	2,93	9	7	4	3	7
8	USA	2,79	6	8	3	5	8
9	China	2,07	17	9	8	1	9
10	Brazil	1,17	64	10	10	0	10
Totally							98

Rank correlation coefficient is determined by the formula:

$$\rho = 1 - \frac{6 \sum d^2}{n(n^2 - 1)} \quad (1)$$

where d^2 - squared difference for each unit $d=x-y$.

Substitute the values from the auxiliary table into the formula:

$$\rho = 1 - \frac{6 * 98}{10(100 - 1)} = 0,41$$

Rank correlation coefficient was 0.41, which indicates a direct moderate relationship between the share of GDP directed to research and development and a place in the Global Innovation Index. Hence the conclusion that the amount of spending on science determines the level of innovative development in the country and to some extent determines its place in the global ranking.

Conclusion. The reviewed experience of stimulating innovation in the leading economies of the world has shown that its stimulation occurs with the participation of the state, in the form of various mechanisms developed and involved. The methods by which innovation is stimulated vary from country to country. The choice of such methods depends on the economic, political and other conditions of a country's development. By encouraging innovation, governments increase the efficiency of national innovation systems and create favorable conditions for enterprises to participate in science and technology. Studying the positive experience of innovative development of economically developed countries should not lead to the idea of blindly copying it, because any national economy has its own specific features.

Thus, the study of foreign experience in support of innovative activities has shown that

government support is directly related to the level of innovative development of the country and is necessary, primarily in terms of financial support for innovative programs and projects, the formation of innovative infrastructure, training personnel for the innovative sphere and the formation of perfect regulatory framework.

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М.М. Петрова¹, Е.А. Ахмедьяров²

¹Әулие Кирилл мен Мефодий атындағы Великотырнов университет, Велико Търново, Болгария

²Л.Н. Гумилев атындағы Еуразия ұлттық университет, Нұр-Сұлтан, Қазақстан

Инновациялық қызметті қолдаудың шетелдік тәжірибесі

Аңдатпа. Мақалада инновациялық қызметті қолдаудың шетелдік тәжірибесіне сараптама жасалды. Мақала авторлары инновациялық қызметті ынталандыру үшін жетекші елдердің инновациялық даму саласында қолданатын негізгі қаржылық, басқарушылық және ұйымдастырушылық - құқықтық қозғаушы күштерді қарастыруды міндет етті. Инновациялық қызметті ынталандыру мен қолдауда ең жиі пайдаланылатын шаралар тізімдемесі берілді. Ғылыми мақалада әлемнің жетекші елдеріндегі инновациялық қызметті жетілдірудегі мемлекеттің рөлі сипатталған. Э. Спирменнің аралық корреляция коэффициентінің көмегімен зерттеулер мен әзірлемелерге жұмсалған ЖІӨ үлесі мен оның Корнелл университеті, INSEAD Бизнес мектебі және Дүниежүзілік зияткерлік меншік ұйымы әзірлеген Ғаламдық инновациялық индекстегі орны арасындағы байланыс зерттелді. Осы қатынастарды зерттеудің нәтижесі осы екі көрсеткіш арасындағы тікелей қалыпты қарым-қатынас бар екендігі болып табылады.

Түйінді сөздер: инновация, инновациялық қызмет, мемлекеттік қолдау, шетелдік тәжірибе, қаржыландыру, технопарк, бизнес-инкубатор, аралық корреляция коэффициенті.

М.М. Петрова¹, Е.А. Ахмедьяров²

¹Великотырновский университет имени Святых Кирилла и Мефодия, Велико-Търново, Болгария

²Евразийский национальный университет имени Л.Н. Гумилева, Нур-Султан, Казахстан

Зарубежный опыт поддержки инновационной деятельности

Аннотация. В статье был проведен анализ зарубежного опыта поддержки инновационной деятельности. Авторами статьи была поставлена задача рассмотреть основные финансовые, управленческие и организационно-правовые механизмы, используемые странами-лидерами в области инновационного развития для стимулирования инновационной деятельности. Приведен перечень наиболее часто используемых мер поддержки и стимулирования инновационной деятельности. В научной статье обозначена роль государства по активизации инновационной деятельности в ведущих экономиках мира. При помощи коэффициента ранговой корреляции Э. Спирмена исследована взаимосвязь доли ВВП, расходуемой на научные исследования и разработки, и места в рейтинге согласно Глобальному индексу инноваций, разрабатываемому Корнельским университетом, школой бизнеса INSEAD и Всемирной организацией интеллектуальной собственности. Результатом исследования указанной взаимосвязи явилось то, что между этими двумя показателями существует прямая умеренная связь.

Ключевые слова: инновация, инновационная деятельность, государственная поддержка, зарубежный опыт, финансирование, технопарк, бизнес-инкубатор, коэффициент корреляции рангов.

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Information about authors:

Petrova M. M. – doctor of economic Sciences, Professor of «St. Cyril and St. Methodius» University of VelikoTarnovo, Bulgaria, Veliko Tarnovo, 2 T. Tarnovski str.

Akhmedyarov Ye. A. – PhD student Department of «Management» of L.N. Gumilyov ENU, Kazhymukan st., 11, Nur-Sultan, Kazakhstan.

Петрова М. М. - экономика ғылымдарының докторы, Әулие Кирилл мен Мефодий атындағы Великотырнов университетінің профессоры, Феодосий Тырновски 2, Велико Тырново, Болгария.

Ахмедьяров Е. А. - Л.Н. Гумилев атындағы Еуразия ұлттық университеті «Менеджмент» кафедрасының докторанты, Қажымұқан көшесі, 11, Нұр-Сұлтан, Қазақстан.