Investigating the State Regulation Mechanisms of Supply Chain Innovations in the Aspect of Developed Countries

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***Abstract*- The economic and technological development of the state in the contemporary world directly depends on supply chain innovations. Developed countries, such as Japan, invest 3% of gross domestic product (GDP) in financing innovation. The problem is that post-Soviet states such as Russia do not have a well functioning mechanism of state regulation of supply chain innovations. This situation leads to technological and economic lag. In this regard, the purpose of this article is to examine the mechanisms of the state regulation of supply chain innovations, using the example of developed and developing countries. For this purpose, a complex of complementary research methods was used, such as comparative analysis, systematization of data, as examples, the following states were considered: the USA, the UK, Germany and China. As a result, key features of state policy of considered states are pointed out, such as tax deductions, reducing bureaucracy, building up public-private enterprises. Also, the main tasks, solutions, which directly affect the development of the innovation sector, are highlighted.**

***Keywords*-** *Supply chain innovations, state regulation, mechanism, developed countries, technology.*

1. Introduction

The strategic direction of Russia's development lies in the formation and the state regulation of supply chain innovations in all key areas [20]. 80-95% of the increase in GDP in developed countries falls to the share of new knowledge embodied in engineering and technology [1]. Innovations in the modern world have turned into a real driver of economic growth, in contrast with the inflation of financial bubbles as a speculative driver [2]. In the global economy at the present time there are three models of support for innovative processes in developed countries:

- The first model being applied in the USA [3], the UK and France is focused on leadership in research and development. The state also supports large-scale projects with a large share of scientific and innovation potential, which cover all stages of the production cycle;
- The second model is aimed at creating a favorable scientific and innovative environment, diffusion of innovation, and also aims to rationalize the entire structure of the economy. This model is typical for such countries as Sweden, Germany and Switzerland [4];
- In the third model, the stimulation of supply chain innovations and perceptivity of the scientific achievements is performed owing to the development of infrastructure. The state here coordinates the actions of various sectors in technology and science. The model is typical for developed Asian countries, in particular, Japan and South Korea [5].

The subject of the state regulation of the innovation development lies in several aspects:

1. Do not systematize standards on scientific, technical and innovative activities in a single regulatory act;
2. Low funding, for example, research and development expenditures in Russia in 2015 are estimated at 1.1% of GDP, against 2.1% of GDP in China, and 2.2% in France, 2.8% of GDP in the USA, 3.3% of GDP in Japan;
3. Administrative problems. This group includes problems related to the provision of benefits, the corruption component, the regulatory and legal aspects, etc.
4. Problems of innovative infrastructure.

In view of these challenges, the gap in supply chain innovations, technology and economics between Russia and developed countries is widening. In this regard, the purpose of this article is to consider the basic models of the state regulation of the innovation sphere in foreign countries.

Study of this subject will provide an opportunity to identify possible ways of developing the state regulation of supply chain innovations both in Russia and the post-Soviet countries [17].

2. Methods

The theoretical and methodological basis of the research is works of leading local and foreign researchers in the field of innovation. Conclusions are developed as a result of using abstract-logical, analytical, statistical methods of the comparative analysis.

3. Data, Analysis, and Results

Currently, according to the innovation development index, the countries with the most developed innovation sectors in 2017 are Switzerland, Sweden, the United Kingdom, the Netherlands, the United States of America, Finland, Hong Kong, Singapore, Denmark, and Ireland. The same 10 countries were in the top 10 in 2013.

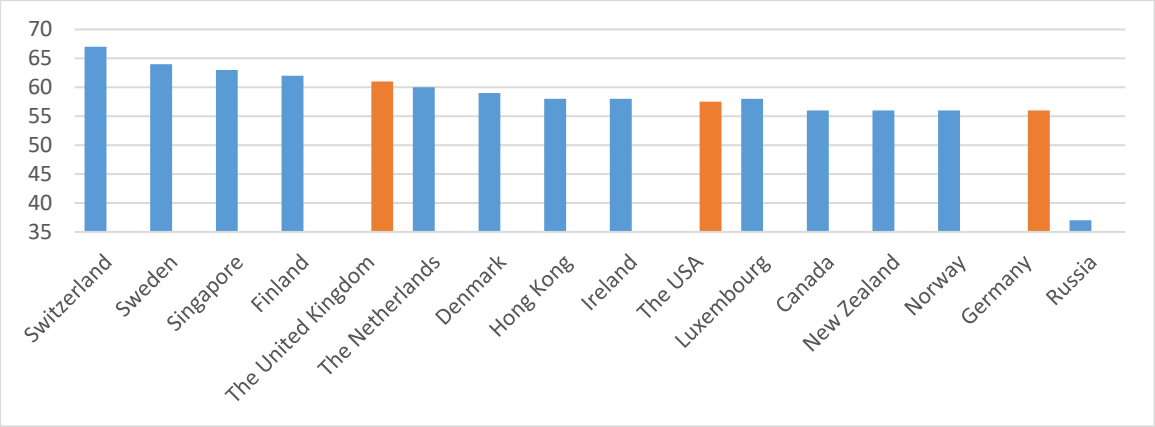

Figure 1. The rating of countries with the best innovation development according to the version of the Global Innovation Index-2016.

Let us consider the state support for the innovation sphere of some of these countries. Most of the state regulatory bodies of the USA's innovation sphere are funded from the federal budget (American Science Foundation, NASA, American Scientific Council and others). State policy is focused on stimulating research centers and venture funds. The federal budget fully funds the most effective research centers during the first 5 years due to their risk, complexity, keen international competition and high costs. The state innovation policy of the USA is also distinguished by the low bureaucratic concentration of decisions on the development and implementation of innovative projects; while the main emphasis is on forecasting, optimization of management decisions, state expertise of innovative projects. A mechanism of the development of domestic and international competition in high technology is well-developed. In the USA two major programs are implemented to support the supply chain innovations in small businesses, which are principal in supporting innovations in the country:

1. The Small Business Innovation Research (SBIR) is a program by which the state coordinates small businesses. 2.5% of the total volume of extramural research budgets of all federal agencies and extramural research budgets over $ 100 million are reserved for contracts or grants for small businesses. By 2009, 112,500 grants were awarded for a total of more than $ 26.9 billion [6].
2. The Small Business Technology Transfer Program (STTR) is an important small business program that expands the financing of innovative research and development. The expansion of public/private partnerships, as well as the possibility of establishing joint ventures for small businesses and national enterprises, for example, non-profit research institutions hold a central place in the program. The most important role of the STTR program is to promote the supply chain innovations required to solve the scientific and technological problems of the country in the 21st century [7].

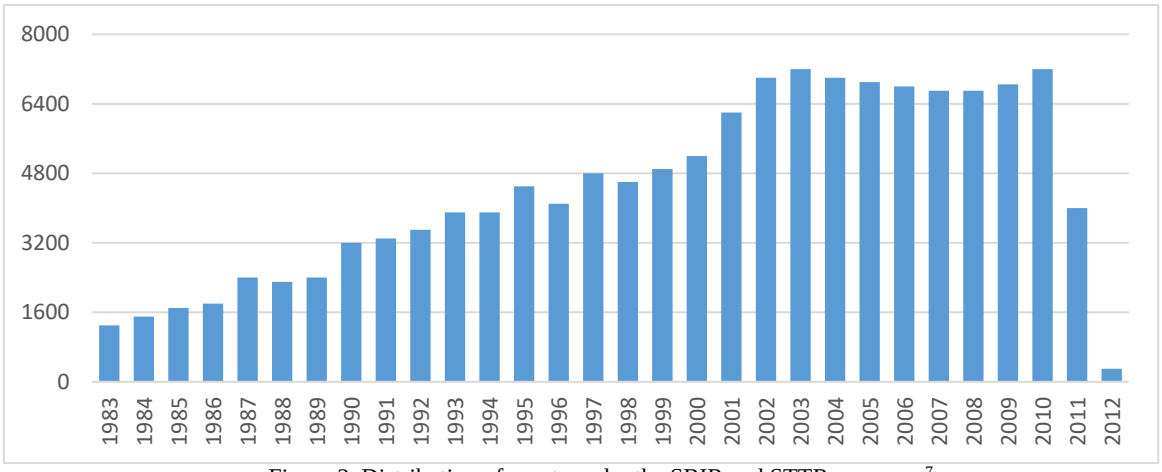

Figure 2. Distribution of grants under the SBIR and STTR programs[7]

Innovation regulation in the UK is carried out by the Department for Business, Innovation and Skills aimed to make the UK the most attractive place to invest in technology businesses [8]. Proceeding from the fact that there is a separate structure in the country that deals with innovation development, it can be concluded that innovation development has the highest priority in the country.

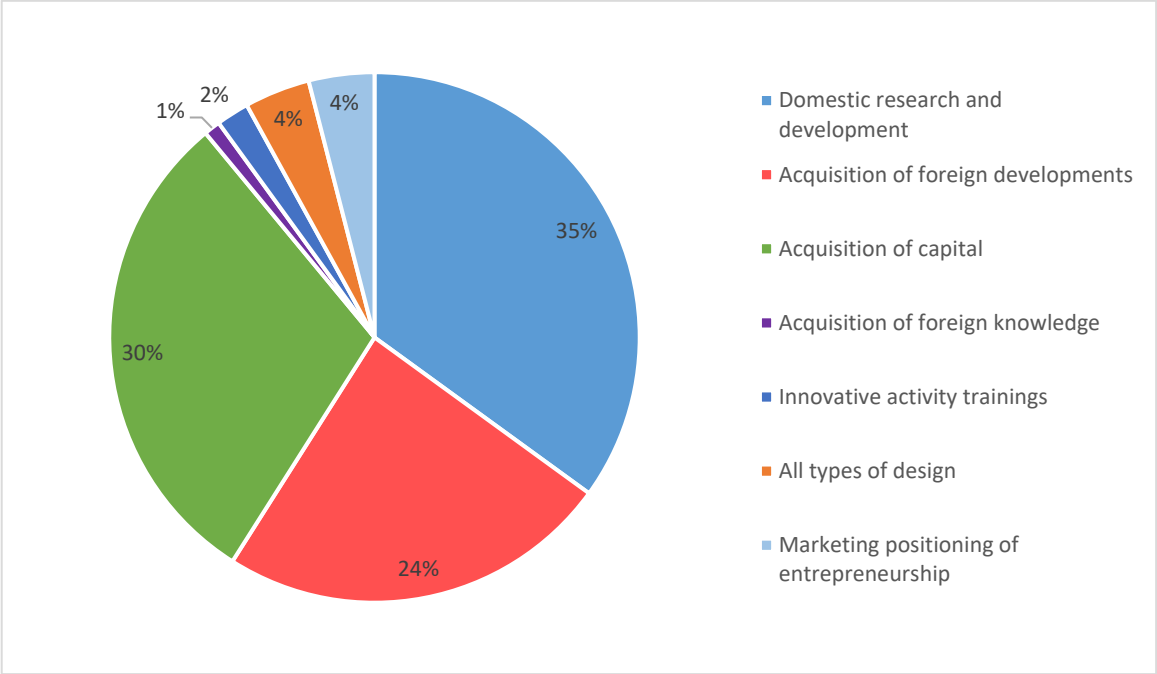

Figure3. Distribution of investment in innovation by articles in the UK [9]

As the main mechanism of state support for the development of high technology and science in the UK, tax remissions for the organizations involved in research and development are being considered. As a part of a strategy to support investment in research and development, in 2000 the UK government introduced tax remissions for small and medium businesses, then in 2002, tax remissions extended to large companies. Companies that annually invest more than 10 thousand pounds sterling for research and development in high technologies are eligible for profit tax deductions. The size of the remission is fixed depending on the size of a company:

• 150% of development and research costs for small and medium businesses;

• 125% of development and research costs for large companies. Additionally, companies are eligible for accelerated depreciation for certain types of fixed assets used for development and research. This policy of introducing tax remissions is aimed at improving the efficiency and transparency of relations between the state and the private sector. The strategy for establishing and maintaining public-private partnerships, implemented in the UK, is recognized as the best practical model of such measures at the international level [10].

The positive impact on the development of innovation policy in the UK is provided by information support for the implementation of innovative projects. With this view, the Department for Business, Innovation and Skills on its official website places a large document collection beneficial to participants in the innovation process [11]. It is also important to mention the role of infrastructure support, which is the basis for innovative activity. Thus, companies providing services and consulting on technology development have become very popular. Such companies were initially established on the basis of universities and possess different innovation centers that provide laboratories and offices for young innovative companies. They are also intermediaries between the developers of innovative ideas and business representatives ready to implement these ideas in practice. The main tool of financial support for research and development in Germany in the field of innovation is the state support. It is the German government that is called upon to play an active role in scientific research: up to 80% of the research activities of universities are financed by the state through grants from five major scientific societies. Besides, the government financially supports the development of risky and long-term projects in the basic branches of industrial and scientific activities. This support is carried out in the following areas: firstly, the state finances risky projects in order to attract private investors to innovative projects. Secondly, it provides direct financial support to private investors. In 2004 the Act for Promoting of Venture Capital was adopted, which provides tax remissions for initiators of venture capital funds. As a consequence special funds were established in Germany, which are intended to support the market of risky share participation. Just like in the UK much attention is paid to the information support in the innovation sphere. The main source of information in the business sector is the Patent and Trade Mark Office of Germany. Over 20 patent and information services have been established to facilitate the access for medium and small enterprises to the needed information on support and development of innovative projects.

Science and techno parks are actively developing in Germany; one of the most famous is the Berlin-Adlershof science city. There are 445 innovative enterprises on the territory of this science city, more than 5000 employees have a job here. Figure 4 shows the ratio of public and private investment in the construction of the Berlin-Adlershof science city. It can be concluded from the graph, that initially state investments made up the essential part of the financing (82%), but in recent years the share of state participation is declining, and private investments are growing in direct ratio, for which it has grown by 54% in the last 6-7 years [16].

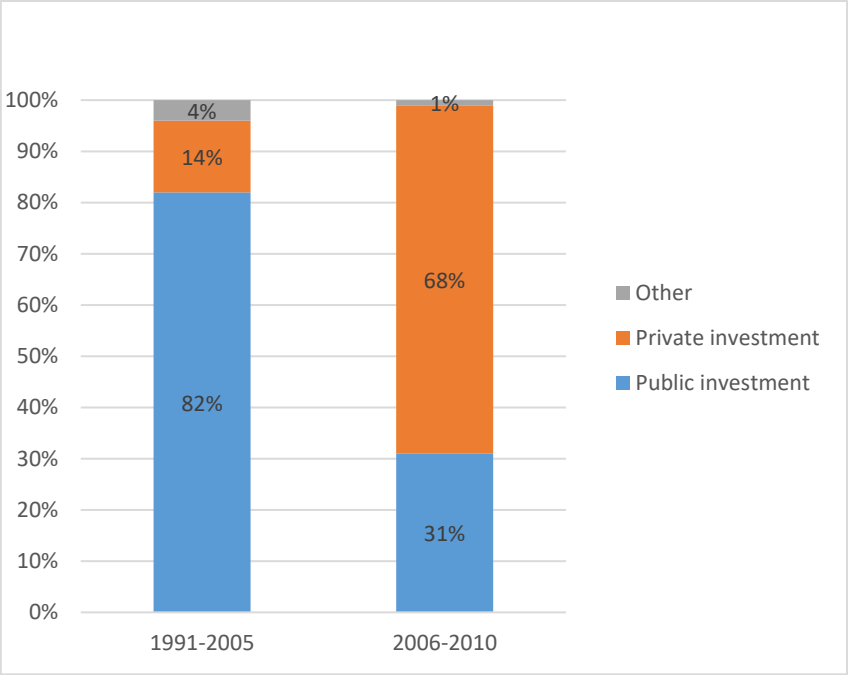

Figure 4. The ratio of public and private investment in construction [12]

Also, there is the Joint Initiative for Science and Innovation program, which aims to increase the competitiveness of national research. Since 2005, it has been implemented by the federal government, German research organizations and federal states. The purpose of the program is to strengthen cooperation between scientific disciplines, as well as industry and science. Up to 2010, 3% of annual additional funding was allocated to German research organizations as a reward. From 2011 to 2015 it was decided to raise the budget to 5%. Along with that, the state has developed a new paradigm on higher education - 2020, which aims to modernize the system of higher education in Germany. As a result of international competition, there is a need for active development of the research profile of universities. The state undertakes the responsibility to create the financial conditions for more effective work of higher education institutions at the international level. This initiative is coming from the fact that in Germany the demand for qualified personnel in complex professions is constantly growing, especially the need for graduates in such sciences as high technologies, informatics and mathematics is high. The state support allows, among others, to invest up to 26,000 Euros in each student seat by 2015. Also, it is necessary to give consideration to the state stimulation of China's innovation processes, since this state has entered the next stage of development in the scientific and technical field. Therefore, the experience of this country could be helpful for developing the state innovation strategy of Russia. The Chinese governance considers the increasing of scientific, technological, and intellectual potential as a major driving force of socio-economic development and growth of the country's competitiveness.

The state policy was officially initiated in 2006 after the publication of the 15 year Medium-to-Long-Term Plan (MLP) for the Development of Science and Technology for the period of 2006-2020, which marked the purpose of creating a business environment capable of promoting independent supply chain innovations through the efforts of private companies. The task was to master all possible technologies [13], [21]. At the present time the primary task for China is to decrease the dependence on foreign technologies, which has grown over the last decades as a result of the "market in exchange for technology" state policy, which led to the transformation of China into an industrial export-oriented center of global importance. The country's governance has concluded that it is crucial to participate directly in the processes of globalization of scientific and innovation development based on own ideas and developments, to "grow" leaders on priority areas in China itself. Much attention is currently being paid to innovations in “narrow spaces” of economic progress, such as power economy, including manufacturing process and consumption of basic energy sources and the use of new sources of energy, such as food security arrangements, public health service, production of basic equipment for machine-tool industry, transport engineering, electric power. The main emphasis is made on the development of owned innovations as a lever for building up the aggregate national power, which, at the same time, does not exclude the necessity and reasonability of using technological and other borrowings at a certain stage that could contribute to the development of owned innovations. At the present day in the PRC a system of scientific research and development has formed, covering nearly all areas of science and technology, including

biology, nanotechnology, and astronautics. The main efforts in China are directed to the creating conditions facilitating the expansion of innovative scientific activity, fundamental researches and researches in applied sciences, as well as accelerating the processes of implementing the achievements of science and technology into practice in order to promote the country's social and economic development and ensure national security. Among the priorities are power economy, water and mineral resources development, ecology, agriculture, manufacturing, transport, informatics, public health care, urbanization and urban development processes, as well as social security and national defense. In order to improve the efficiency of using the existing scientific, technical, technological and intellectual potential and resources, China has begun to reform the interaction mechanism between the research institute of the Military-Industrial Complex (MIC) and the national economy. In accordance with these plans, MIC research institutions will be involved in general-purpose research and development, and the civilian sector research institutions for research and development of military products.

By building scientific and technical potential, the Chinese administration is planning to substantially increase the financing of science. 33 million US dollars were allocated to the Academy of Sciences for the organization of 60 international science and techno parks on the territory of China and abroad, and for establishing new research structures on the problems of development of coastal areas, bioenergy, nanotechnology and nanobionics, and launching a national system of standards by 2015, meeting the world standards. According to the projections of Chinese analysts, Beijing will be able to become a scientific capital of the world by 2020. The China's administration at the same time considers it necessary to use the opportunities that are opening up in connection with the processes of globalization and the expansion of foreign relations. China is determined to continue adopting best practices, technologies, scientific and technical achievements of other countries, expand the practice of attracting foreign scientists and specialists to research and development in China [14], [18].

4. Discussion

Hence the following features of the state innovation policy of developed countries could be marked out:

1. The state innovation policy is designed to cover all aspects of the scientific and technical sphere: legal, economic, organizational and managerial.
2. The state innovation policy is a system which consists of three levels: national, regional and local. Levels complement each other, despite the fact that the significance and scope of the policies pursued in each of them are different.
3. There is a tendency to strengthen the role of innovation policy in the region. It is considered to be leading in the policy of the USA's neo-feudalism and in the Lisbon Strategy.
4. The state innovation policy is aimed at mobilizing and activating the internal reserves of the country's innovation potential, in particular, the personnel, scientific and technical potential of the region. Also, a great emphasis is placed on the reducing the differentiation in the development level of regional scientific and innovation potentials.
5. At the domestic level, the innovative activity of all economic entities is boosted through the cluster strategies aimed at launching specific knowledge networks. A new cluster-network principle of innovation policy is found during the launching process.
6. The nature of inter-regional innovative cooperation is changing. The foundation of innovative regional networks and the implementation of cluster strategies have contributed to the development of transnational interaction and the establishment of trans-regional network structures. They are launched by the regions themselves and represent an innovative network of regions with common goals of innovation development.

With the reference to the performed analysis, in our opinion, the Chinese experience of the state regulation of the innovative economy is the most acceptable for the further development of supply chain innovations in Russia. This view is based on the common approaches to regulating the economy, where in both countries the state continues to play an important role, as well as on the near simultaneous start of the countries' transition to the market economy (China – in 1978, Russia as a part of the USSR – in 1985). In the realm of innovation regulation in Russia, the main emphasis, as well as in China, should be made on the development of their own supply chain innovations, in order to reduce dependence on foreign technologies. It is required to stimulate the development of its own intellectual capital, to ensure effective cooperation of business communities with research centers, in order to boost the introduction of research and development in the native industry. It is also possible to make use of the China's experience in the development of supply chain innovations based on the MIC, Russia's one of the most developed direction. The main tasks that should be fulfilled for the effective development of supply chain innovations in Russia are the following [15], [20]:

- Support of innovative business;
- Increase in demand for supply chain innovations in the economy;
- Development of innovative infrastructure;
- Effective integration into the global innovation system;
- Implementation of technological and research projects ensuring competitiveness in world markets;
- Development of scientific and educational potential;

These particular areas, primarily need the state regulation. Currently, a promising project is the Skolkovo research center; through the example of which it is able to continue to develop a mechanism for the state regulation of supply chain innovations [22].

5. Conclusion

As a result of the performed analysis, mechanisms for the state regulation of supply chain innovations of such countries as the USA, the UK, Germany, and China were considered.

The following tendencies are typical for the mentioned countries:

- Launching science and techno parks;
- Granting benefits;
- Low bureaucratic concentration of decisions (in the USA);
- Reforming the mechanism of interaction between the MIC Research Institute and the national economy (in China).

For Russia it is important to strengthen innovative activity in modern economic and political conditions, and for this, a well-established mechanism of the state regulation is needed. Based on the analysis performed in the article, it is possible to develop theoretical models of the state regulation acceptable for Russia [19].

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