Artículo de investigación

Research and development in China: scope and specifics of innovation process

Investigación y desarrollo en China: alcance y especificos del proceso de innovación

Investigação e desenvolvimento na China: âmbito e específico do processo de inovação

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Abstract

The study of issues, related to the innovative processes in the developing countries of the world is one of the most important and popular areas of modern economic science. The scope and country specificity of innovative processes make it possible to identify the most effective models of national innovation development. Consideration of the scope, structure and dynamics of the performance of research and development activities (R & D) is the main tool for the assessment of innovation process development in the country. The object of this study is the scope and specificity of innovation process in modern China. The subject of the study is the scope and structure of research and development activities, seen through the perspective of innovative development of national economy. The purpose of given research is to study the scope and specificity of modern innovation processes in China, through the consideration of the main indicators of development of scientific and research field in China. The methodological basis of the article is the general provisions of modern economic science, in particular: modern macroeconomic theory, the theory of the world economy development, the concept of innovative development, the theory of human capital, general theory of adaptation, applied through the system analysis. According to the data on R & D financing, the authors define China's place in the global process of investment in innovations; they give and analyse extensive statistical data, characterizing the resource intensity and the results of R & D in this country. This analysis is

Resumen

El estudio de cuestiones relacionadas con los procesos innovadores en los países en desarrollo del mundo es una de las áreas más importantes y populares de la ciencia económica moderna. El alcance y la especificidad nacional de los procesos innovadores permiten identificar los modelos más efectivos de desarrollo de la innovación nacional. La consideración del alcance, la estructura y la dinámica del desempeño de las actividades de investigación y desarrollo (I + D) es la herramienta principal para la evaluación del desarrollo del proceso de innovación en el país. El objeto de este estudio es el alcance y la especificidad del proceso de innovación en la China moderna. El tema del estudio es el alcance y la estructura de las actividades de investigación y desarrollo, vistas desde la perspectiva del desarrollo innovador de la economía nacional. El propósito de la investigación dada es estudiar el alcance y la especificidad de los procesos modernos de innovación en China, a través de la consideración de los principales indicadores del desarrollo del campo científico y de investigación en China. La base metodológica del artículo son las disposiciones generales de la ciencia económica moderna, en particular: la teoría macroeconómica moderna, la teoría del desarrollo de la economía mundial, el concepto de desarrollo innovador, la teoría del capital humano, la teoría general de la adaptación, aplicada a través del análisis del sistema. Según los datos sobre financiación de I + D, los autores definen el lugar de China en el proceso global de inversión en innovaciones; brindan y analizan

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carried out in the institutional context: the indicators of development of scientific-research sphere, scientific-educational sphere and business component of R & D are considered separately.

Keywords. Research and development (R & D), innovations, innovation process, R & D in China, innovations in China, R & D financing, R & D costs, economy of China, scientific-research sphere of China, scientific-educational sphere, business innovations in China, technological progress in China, results of R&D.

amplios datos estadísticos, que caracterizan la intensidad de los recursos y los resultados de la I + D en este país. Este análisis se lleva a cabo en el contexto institucional: los indicadores de desarrollo de la esfera de investigación científica, esfera científico-educativa y componente comercial de I + D se consideran por separado.

Palabras clave: Investigación y desarrollo (I + D), innovaciones, proceso de innovación, I + D en China, innovaciones en China, financiación de I + D, costes de I + D, economía de China, esfera de investigación científica de China, esfera científico-educativa, innovaciones comerciales en China, progreso tecnológico en China, resultados de I + D

Resumo

O estudo de questões relacionadas a processos inovadores nos países em desenvolvimento do mundo é uma das áreas mais importantes e populares da ciência econômica moderna. O escopo e a especificidade nacional dos processos inovadores permitem identificar os modelos mais eficazes para o desenvolvimento da inovação nacional. A consideração do escopo, estrutura e dinâmica do desempenho das atividades de pesquisa e desenvolvimento (P & D) é a principal ferramenta para avaliar o desenvolvimento do processo de inovação no país. O objeto deste estudo é o escopo e a especificidade do processo de inovação na China moderna. O objeto do estudo é o escopo e a estrutura das atividades de pesquisa e desenvolvimento, vistas sob a perspectiva do desenvolvimento inovador da economia nacional. O objetivo da pesquisa é estudar o alcance e especificidade dos processos modernos de inovação na China, através da consideração dos principais indicadores do desenvolvimento do campo científico e da pesquisa na China. A base metodológica do artigo são as disposições gerais da ciência econômica moderna, em particular: teoria macroeconômica moderna, a teoria do desenvolvimento da economia mundial, o conceito de desenvolvimento inovador, a teoria do capital humano, a teoria geral da adaptação , aplicado através da análise do sistema. De acordo com dados sobre financiamento de P & D, os autores definem o lugar da China no processo global de investimento em inovação; fornecer e analisar dados estatísticos extensos, que caracterizem a intensidade de recursos e os resultados de P & D nesse país. Esta análise é realizada no contexto institucional: os indicadores de desenvolvimento da esfera de pesquisa científica, esfera científico-educacional e componente comercial de P & D são considerados separadamente.

Palavras-chave: Pesquisa e desenvolvimento (P & D), inovação, processo de inovação, P & D na China, inovações na China, financiamento de P & D, custos de P & D, economia chinesa, campo de pesquisa científica da China, esfera científico-educacional, inovações comerciais na China, progresso tecnológico na China, resultados de P & D.

Introduction

The relevance of research issues, associated with the development of innovations and innovation process, is defined by the significant role, played by advanced technologies in economic life. The most important trend in the development of modern world economy is the steady growth of innovative processes, manifested in many features and traits. Since the 1960s, the positive dynamics of innovative activity in developed and developing countries has become the foundation for the growth of production forces of national economies. There are such countries as the United States, Germany, the Republic of Korea, China and others. The interconnection of innovation process and economic growth, noted by modern scientists, is the reason why the issues, related to innovations, go beyond the interests of only science or business, acquiring national, state significance for each of the developing countries (Nikonova, 2016).

Rapid development of innovative processes in national economies, within the framework of

transition to post-industrial economy, has generated a large number of scientific researches in the field of innovation activity, its dynamics, factors and conditions in which it occurs. The term "innovations" was introduced into scientific discourse in the early 20th century by Austrian and American economist J. Schumpeter (Bazilevich, 2006). Further, the fundamental essence of innovations and innovation process in the world economy was presented in the works of such scientists as P. Drucker, G. Itskovitz, G. Mensch, R. Romer, R.B. Tucker, B. Twiss, K. Freeman, H. Chesbrough, V. Ebner, and many others.

The study of the country specificity of innovation processes allows to identify the most effective models of innovative development, to gain and use valuable experience of others' successes and mistakes. The combination of development of fundamental science with applied researches, inventive activity with the introduction of new products into practice - all these are the links in the continuous innovation process, taking place in modern developed and developing countries. One of such countries is China. The World Intellectual Property Organization (WIPO) called it the "hot spot" of world innovations. Two zones were defined in China, which are leading in terms of the number of international patent applications in 2011-2015, with the highest degree of innovation activity - Shenzhen-Hong Kong (the 2nd place in the world, 41.2 thousand applications) and Beijing (the 7th place in the world, 15.2 thousand applications).

Interest in the innovation process, taking place in China, is quite natural: as for the scope of research and development (R&D) financing, as for the productivity of innovation process, China is one of the world leaders. Over the past decade, the issues related to innovation development in China have become the object of close attention of scientists from different countries: M.L. Titarenko, Ya.M. Berger, V.Ya. Portyakov, A.V. Ostrovsky, S.G. Luzyanin, Hú Āngāng, Justin Yifu Lin, Li Shucheng, Zhou Yuan, Xiliang Zhao, John Whalley, M. Shaaper, K Henning, S. Serger, and others.

In particular, Russian scientists speak about significant increase in China's global scientific potential, about China's readiness and ability to take leading positions in world science and innovations. They also analyse the problems and consequences of such a powerful innovation process (Berger, 2017). Chinese scientists consider the factors of innovation development, emphasizing their national human potential as one of the most important strategic resources, ensuring national competitiveness of China in the world economy (Hu Angang & Mien Huongua, 2007). Scientists of Cambridge and other universities define the statistical links between innovation and economic development (Whalley & Zhao, 2010). Famous Chinese economist Justin Yifu Lin singles out the financing of R&D and capital accumulation, industrial modernization and new technologies as the main factors in the transition to an "advanced market economy" (Lin, 2012).

However, the innovation process in China, its scientific-research component, scope and specificity are still the relevant issues for consideration, due to the changes in internal and external conditions, directions of state policy and other factors. The purpose of this research is to study the extent and specificity of modern innovation processes in China, through the reviewing of current basic indicators of development of scientific and research area in China. The object of this study is the scope and specificity of innovation process in modern China. The subject of the study is the scope and structure of performed R&D, seen through the perspective of innovative development of national economy.

Methods.

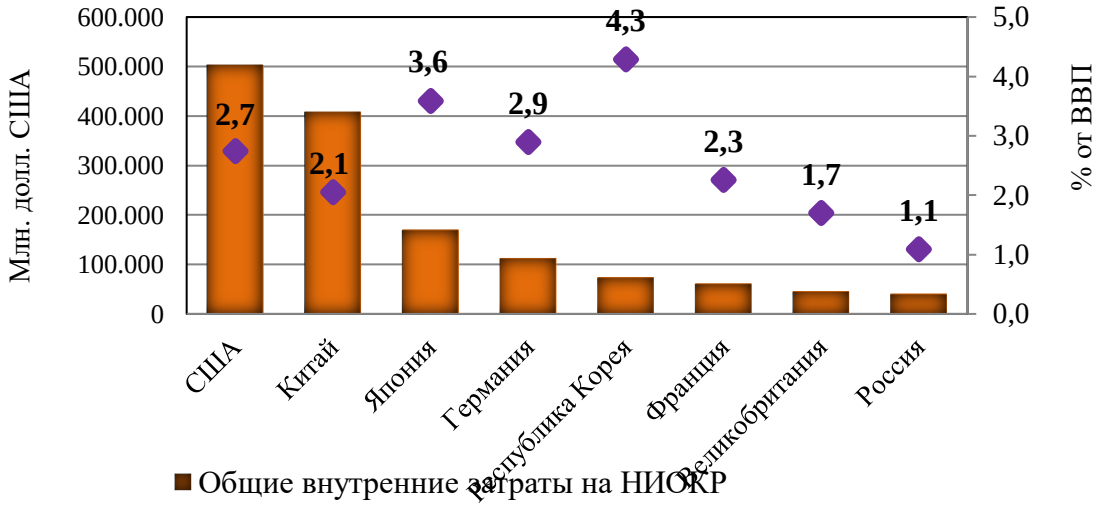
The methodological basis of the article is the general provisions of modern economic science, in particular: modern macroeconomic theory, the theory of the world economy development, the concept of innovative development, the theory of human capital, general theory of adaptation, applied through the system analysis. The research is based on the methods of economic and institutional analysis, comparative studies, expert assessments, structural and statistical analysis, socio-economic forecasting, as well as on the approaches, applied in world practice of making managerial decisions.

The use of system approach allows to consider the specifics of the research object. The investigation is based on the classical conceptual apparatus, developed by the world science, which allows to study the extent and country specificity of innovation processes in China objectively and reasonably. The authors adhere to the concept, which determines the leading role of innovations in the economic growth of

modern developed and developing countries, and consider the forward volumes of R&D financing as the main support of the innovation process. Due to this, the authors pay great attention to the analysis of the size and structure of expenses for R&D, as in traditional scientific-research and scientific-education spheres, as in business.

Results of the research.

The United States, China, Japan, Russia, Germany and the Republic of Korea are the world leaders in terms of total internal costs for R&D (in absolute value figures), according to the information of the Organization for Economic Cooperation and Development, the data section "Main indicators of science and technology". In all these countries, as well as in some other, there has been a continuous positive growth in expenditures on research and development (R&D) for the period 2004-2016. In terms of absolute value of expenditures for R & D, the leader is the United States, where annual costs are several times higher, than similar costs in Germany, Russia, the Republic of Korea, France and the United Kingdom, taken all together. In 2016 in the US, annual costs for research and development exceeded 500 billion dollars, and this is the absolute record. Since 2010, China has firmly established itself as the second best. It is gradually catching up with the United States in terms of innovation financing: the United States has increased its annual R & D financing by 1.5 times, or by $ 175 billion over the past 10 years, and China has increased it by 4,7 times, or by $322 billion . It should also be noted, that the share of expenditures for R&D in the total GDP of the US remains stable - 2.75%; and in China it is gradually growing - from 1.32% in 2005 to 2.05% in 2015. Given this, the United States today can hardly be called a global hegemon in the field of innovation development, as it shares leading positions with China. The rest of the countries are still lagging behind the leaders in terms of financing, although some of them demonstrate a noticeable increase in the quality of innovations (Figure 1).



Млн. долл. США	Million US dollars
% от ВВП	% of GDP
США	USA
Китай	China
Япония	Japan
Германия	Germany
Республика Корея	The Republic of Korea
Франция	France
Великобритания	United Kingdom
Россия	Russia
Общие внутренние затраты на НИОКР	Total internal costs for R&D
Внутренние затраты на НИОКР в процентах от ВВП	Internal costs for R&D as a percentage of GDP

Figure 1 - The scope of research and development financing in the countries, which are the leaders in the sphere of innovations, 2015

The volume of financing is not the only indicator of the national economy propensity to innovations. A number of authoritative scientific and educational organizations form the Global Innovation Index, which is an integral rating indicator, calculated for each country, and considering the quantity and quality of available resources and conditions for implementation of innovations, as well as the effectiveness of innovations and innovation activity. In 2017, twenty-four of the first twenty-five places are taken by the countries with high per capita income, herewith China, ranking 22nd, is an exception. In 2016, China became the first middle-income country, which was one of the top twenty-five countries of innovation rating.

The above opinion of experts is confirmed by extensive statistics on the development of scientific-research sphere of China. Statistical data on almost all indicators and directions of innovative activity testify to the continuous development of innovation process, the active involvement of a large number of labour, equipment, materials and other types of resources in this process. Also, the innovation process in China is characterized by a qualitative institutional component, when the number of scientific-research and educational institutions at various levels is rapidly increasing and expanding, in accordance with additional functions and research areas. Table 1 presents general data on the development of the institute of innovations in China.

Table 1 - The most important indicators of development of scientific-research component of innovation process in China, 2011-2015.

Indicators	Units of measurement	2011	2015	Changes, %
Labour inputs of R&D, including:	Thousand people/years	2883	3759	130.4%
- fundamental research	Thousand people/years	193	253	131.1%
- applied research	Thousand people/years	353	430	121.8%
- experimental and laboratory investigations	Thousand people/years	2337	3075	131.6%
Expenses for R&D, including:	Billion yuans	868.7	1417.0	163.1%
- fundamental research	Billion yuans	41.2	71.6	173.8%
- applied research	Billion yuans	102.8	152.9	148.7%
- experimental and laboratory investigations	Billion yuans	724.7	1192.5	164.6%
Total expenditures of state budget	Billion yuans	188.3	301.3	160.0%
Total expenditures of private investors	Billion yuans	642.1	1058.9	164.9%

% of expenses for R&D from GDP	%	1.78	2.07	116.3%

As can be seen from Table 1, the volumes and labour inputs for all types of research, including fundamental, applied, experimental and laboratory, are rapidly growing. According to labour inputs (the number of personnel involved in the research activity), the largest share (81%) is occupied by experimental and laboratory research, reflecting the tendency for the active commercialization of scientific results, and the development of practical, necessary things for the economy: new types of materials, resources, products, etc. The share of fundamental and applied research accounts for only 19% of all labour inputs, however, they demonstrate the sustainable growth rates: all types of research are carried out in parallel.

Expenditures for R&D, denominated in yuans, also show a predominance of experimental and laboratory studies in the overall structure of all costs - 84%. This indicates their key importance for the economy of China.

The expenditures of private investors prevailed among all costs for R & D in 2015. This fact brings China closer to the level of developed countries: according to Chinese data, their value is 74.7% of total expenditures. At the same time, since 2011 this indicator has increased by 0.8 percentage points. The indicator of the share of expenditures for R & D in the total GDP, calculated from the data of Chinese statistics, correlates with the data of world statistics, and now is just over 2%.

China pays particular attention to the effectiveness and productivity of R&D. The effectiveness of scientific research can be measured through the following indicators: the number of published scientific works, the number of received awards and authoritative scientific prizes, the number of supported grants, etc. (Table 2).

Table 2 - Statistics of the research results in China, 2011-2015

Indicators	Units of measurement	2011	2015	Changes, %
Number of published scientific works	Thousand units	1500	1640	109.3%
Number of publishing houses in the field of science and technology	Thousand units	45.5	52.2	114.7%
Number of achievements in priority areas of science and technology	Thousand units	44.2	55.3	125.1%
Number of national awards in the field of invention	Units	55	66	120.0%
Number of national awards in the field of scientific progress	Units	283	187	66.1%
Number of received patents	Thousand units	1633.3	2798.5	171.3%
Number of supported grants	Thousand units	960.5	1718.2	178.9%

As can be seen from Table 2, the greatest growth among the results of scientific research activity was recorded in the number of received patents - 171.3%, and the number of supported grants - 178.9%. This is closely correlated with the amount of labour and financial costs, aimed at the implementation of experimental and laboratory research. According to the number of published works, as well as the number of inventions, China takes one of the first places in the world, and the number of publications (both domestic and international), patents and inventions continues to grow.

If we correlate some of the indicators of research work results with the basic indicators of social and economic development, we can draw the following conclusion: today, on the average 2-3 people, involved in the research process, are accounted for every 1,000 people in China. According to Russian experts, "China increases the number of its scientific elite purposefully and force-paced. In 1985-2005 the growth rate of the number of researchers in Chinese economy was 2.25 times higher, than the growth rate of population, while in Japan this figure was 1.25 times for the same period, in the USA it was 1.71 times (for 1980-2000), in Russia - 0.79 times (for 1995-2005)" (Leonov & Domnich, 2008).

In 2016, Chinese scientists published 426,000 scientific and engineering articles. It was about 19% of the total number of scientific publications in the world. The number of publications is approximately 44% of the number of personnel, engaged in the field of science, i.e. about a half of this staff is actively published. For the first time, this number exceeded the number of publications of American authors (about 409,000). In many scientific fields, in particular, in medicine and human sciences, Americans still occupy a leading position in the number of articles, but they are much inferior to China in the number of articles on chemistry and engineering sciences. A number of Chinese scientists note that there is a relationship between the country's share in the total number of scientific publications and the scope of financing for R & D (Zhou & Leydesdorff , 2006).

An important indicator of the demand for intellectual products of Chinese scientists and researchers is the level of citation of their work. According to the data for 2015, the scientific works of Chinese researchers, published in the world scientific database, were cited 447162 times. Herewith, 235139 citations, or 52.6%, belong to the Science Citation Index, and 163799, or 36.6%, belong to Engineering Index. The remaining 48224 citations were fixed by the base index CPCI-S, or Conference Proceedings Citation Index Science. The largest number of citations was in the field of chemistry (17.6% of all citations in the SCI), clinical medicine (13.2%), physics (11.3%) and biology (10.8%).

Considering the institutional structure of innovations in more detail, it can be noted, that the innovation process develops in two directions - through the scientific-research institutes, and through the scientific-educational ones. In China, both these structures are developed, while many of the indicators of these areas of activity show an increase in the process and performance indicators, outstripping the growth of industrial sectors. The main performance indicators of scientific-research institutes are presented in Table 3.

Table 3 – The main performance indicators of scientific-research institutes of China, 2011-2015

Indicators	Units of measurement	2011	2015	Changes, %
Number of research institutes, including:	Units	3673	3650	99.4%
- national level (subordinated to the Government of China)	Units	686	715	104.2%
- regional level (subordinated to the provincial authorities)	Units	2987	2935	98.3%
Number of employees	Thousand people	362	436	120.4%
Labour inputs of research institutes personnel, including:	Thousand people/years	316	384	121.5%
- fundamental research	Thousand people/years	50	71	142.0%
- applied research	Thousand people/years	113	131	115.9%
- experimental and laboratory investigations	Thousand people/years	152	181	119.1%
Expenses for R&D, including:	Billion yuans	130.7	213.7	163.5%
- fundamental research	Billion yuans	16.0	29.5	184.4%
- applied research	Billion yuans	41.7	61.8	148.2%
- experimental and laboratory investigations	Billion yuans	72.9	122.3	167.8%
Total expenditures of state budget	Billion yuans	110.6	180.3	163.0%
Total expenditures of private investors	Billion yuans	3.4	6.5	191.2%

As can be seen from Table 3, at present there are 3,650 scientific-research institutes in China, whose activities involve 4,360,000 people. State budget defrays the main expenses for the maintenance of activity

of these institutions: 84.4% of all costs are sponsored by the Government of China, or the authorities of Chinese provinces. It can be said, that R & D is the most important sphere of application of state interests and financial resources. This is manifested in the fact, that the state shows the strongest interest in the development of fundamental and applied science, and is an active participant in research activities of the country. In general, the scientific-research institutes include 10.2% of all labour inputs in innovations in China, and 15.1% of financial support for innovations.

The sphere of higher education (scientific-educational sphere, or SES) as one of the branches of innovation activity, in principle, does not lag behind the growth rates of various indicators of scientific-research activities. Along with the scientific-research institutes, SES has a broad scientific infrastructure; it continues to be one of the flagships of the innovation process in China. In general, the institute of science and education includes 65.8% of all scientific personnel in China, 9.4% of all labour inputs on R & D, and 7% of all expenditures on R & D in the country. A small percentage of expenditures for R & D, accounted for educational sphere, is explained by the fact, that the main goal of the functioning of higher education institutions remains the training of personnel for the real sector of economy, and not for the production of innovations. State funds play an important role in the structure of financing sources: they account for 63.8% of all funds received. In comparison with the scientific-research institutes, innovative activity of SES institutions is financed 53% less, and the state financing is 64.6% less. However, the integration of university science and business continues to be an important element in the national innovation system (Vorozhbit & Krivoshapov, 2015).

Chinese authorities also create a special climate, infrastructure and conditions for the business community, which stimulate the innovative work of national producers of high-tech products. According to the observations of specialists, in addition to tax incentives and subsidies, in the broad practice there is the provision of land plots to enterprises, engaged in the scientific and technical sphere. In terms of area, these land plots are larger than necessary for the construction of a plant or factory. In the additional territories, the companies build residential houses or hotels, the proceeds of which are then directed to investments in R & D and compensate for factory losses. State banks issue low-interest loans to innovative companies, and local governments often reimburse interest payments on loans of this type (Petinenko, 2014).

Previously, before the 2000's, Chinese enterprises were giant factories, using purely industrial, predominantly extensive methods of production increase and expanding their spheres of activity. Such companies were difficult to call innovative and technologically advanced. In the 1990's - 2000's, the innovation process of the most Chinese companies was limited to foreign borrowings of products samples, methods of production and used technologies. The current stage of development of Chinese companies is characterized by a steady transition to the new quality of production, based on the own or advanced import technologies, and the sale of products, in accordance with international standards.

China's statistics demonstrate the unprecedented growth rates of innovative interest of national companies, regardless of their size and industry. Strong growth is demonstrated by almost all indicators, which reflect the innovative activities of Chinese companies, both as compared to the indicators of eleven years ago, and for a five-year period. In fact, during the period of ten years, innovative development of China's business environment can be called active (Table 4).

Table 4 - The most important indicators of development of business component of the innovation process in China, 2004-2015

Indicators, units of measurement	2004	2009	2015	Changes, %	
				2015 against 2004	2015 against 2009
Number of enterprises, using innovations, units	17075	36387	73570	430.9%	202.2%
Share in the total number of enterprises in the country	6.2	8.5	19.2	309.7%	225.9%

Labour inputs for innovation, thousand people/year	542	1447	2638	486.7%	182.3%
Business costs for R&D, billion yuans	110.5	377.6	1001.4	906.2%	265.2%
Share of expenses for R&D in sales revenue, %	0.56	0.69	0.90	160.7%	130.4%
Number of innovative business projects, thousand units.	53.6	194.4	309.9	578.2%	159.4%

As can be seen from Table 4, the number of enterprises, using innovations and producing innovative products, has increased 4.3-fold over the past eleven years, labour inputs in innovations - 4.9-fold, total business expenses for R & D - 9.1-fold, quantity of innovation projects, produced by the business environment - 5.8-fold. In general, the labour inputs of business for R & D are accounted for 70.2% of the total labour inputs, related to the innovations in the country. Total business expenses for R & D account for 70.7% of all costs for innovations in the country. The number of personnel, engaged in research activities at enterprises and organizations, is 2668 thousand people, that is 2.1 times more, than the same number of people in the scientific-research and scientific-educational sphere taken together. The total amount of business expenses for R & D is 2.2 times higher, than the similar total costs for the scientific-research and scientific-educational spheres. In general, it can be confidently said, that the business environment has already become an important customer and sponsor of innovations in China, which are successfully implemented in practice.

Discussion of the results.

Thus, the statistics show that in recent decades, China has paid great attention to innovation processes. It can be said, that due to their development, the intensive growth of national economy, with the rates, outstripping the whole world, became possible. The role of innovations and innovation activity, the increase of competitiveness on the basis of innovations implementation, the importance of state instruments, regulating the creation and development of innovative industries in provinces of China and in the country as a whole, become more and more significant every year. It is obvious, that in many provinces and cities of central subordination, such as Beijing, Tianjin, Shanghai, innovation processes play a decisive role in the technological support of the economy and in socio-economic development. It is important to emphasize the peculiarity, characteristic for the development of innovation processes in China over the past half century - their constant expansion and qualitative transformation. National innovation centres were formed in the country, attracting the best technologies and the best specialists from all over the world. This contributes to fundamentally new level of productive forces of Chinese society.

Today's China, having reached an unprecedented rate of economic development in a short time, continues to strengthen its influence on the world economy, and has every chance to become the world's leading economic power. According to the experts, the results of economic development, achieved by China, became possible due to the specific innovations of the state: the combination of socialist system and market economy, the development of special economic zones, and the attraction of foreign investments. Successfully coordinated actions of the state apparatus and economic structures, as well as the implementation of modernization processes, were reflected in the course of operating the policy of reform and openness. This course also served as a starting point for Chinese economy on the way to the world leadership. It can be considered as the beginning of innovative development of China's economy (Yusupov & Kolpakova, 2015).

Innovation policy of China has its own history, where two important stages can be distinguished. The first period began in the 1980s and was over in 2005. The second stage started in 2006, with the state's establishment of the task for creation of innovative economy in the country. The first stage is characterized by the adoption and implementation of a number of government programs, aimed at a rapid reduction of the gap in innovative development between developed countries and China. In particular, the Program "863" (1986) was of great importance. Its essence was interpreted as "the development of the country's scientific and technical potential, as a basis for ensuring a stable economic growth in the medium term". The following priority areas were identified there: bioengineering, space technology, informatics, laser

technology, automatics, power engineering, new materials, technology for the development of the world ocean. Special mention should go to the following programs: Spark Program (1986) on the development of agriculture, based on the application of scientific and technical achievements; Torch Program (1988) on the introduction of advanced foreign and domestic developments in production; the Program "973" (1997) on the development of fundamental research in the system of the Chinese Academy of Sciences; the Program "Creation of new knowledge", providing for the formation of a network of international knowledge centres for the development of intellectual innovation. Also, the Foundation of Medium and Small Enterprises of Scientific and Technical Profile was established, aimed at improving the mechanisms of venture investments, and commercialization of scientific and technological achievements of small and medium-sized enterprises, with high manufacturability and competitiveness.

In 2006, the State Council of the People's Republic of China issued a regulatory document "Instructions on the application of state medium-term and long-term programs for scientific and technological development for the period from 2006 to 2020", according to which the innovation course was declared as the main national strategy of China. The purpose of this document was to create a business environment, which would facilitate the emergence of independent innovations, promoted by the forces of private companies. As specialists note, Robert Atkinson, the president of the Information Technology and Innovation Fund (ITIF) of the Washington Analytical Center, considers this document as the beginning of Chinese innovative mercantilism, which also develops in Russia, India, Brazil. In October 2010, Chinese authorities formulated a plan for the development of the PRC for the 12th Five-Year Plan (2011-2015). The priority was given to the development of seven strategic industries, which should completely change the structure of China's economy: clean energy technologies, a new generation of telecommunications equipment, biotechnology, high-tech equipment, new energy, new materials, hybrid and electric cars.

Justin Yifu Lin, senior vice president on economic development and chief economist at the World Bank, notes that technology is an important factor in the economic growth of modern China, along with the structure of economy and the factors of production. "Technical progress means higher productivity. Even when the structure of industry and factors of production remain unchanged, the output, and the growth rate will grow with new technologies... Chinese economy follows the path of innovations faster, and they are cheaper for it "(Lin, 2012). In turn, the improvement of the factors of production can also strength the innovative processes, in particular, if we are talking about such interrelated concepts as Chinese human capital and innovative activity, produced by it (Kuzmicheva & Danilovskikh, 2016; Krasova & Yan, 2016).

As noted by Russian experts, despite the emerging difficulties on the way to economic and innovative domination, it is undeniable that China has a phenomenal potential for further growth and development. The main task of the country for the next 10-15 years is the transition to innovative way. The state strives to stimulate young scientists, enterprises, engaged in scientific and technical sphere, scientific-research institutes through innovative funds, 90% of which are state-owned. Scientific parks have been created and continue to be formed. The largest universities of the country are involved in the program of innovation development. The integration of Chinese universities with foreign colleagues has great prospects... In the universities of the PRC, there is a clear predominance of natural-technical and applied specialties (about 60% of student places against 14% in the USA, 18% in the Netherlands, 22% in Thailand, 26% in Japan). The skill level of China in science and technology is growing. It relies on a national network of innovation research, which already includes 5,400 national government institutions, 3,400 universities, affiliated with scientific-research institutions. In China, 13,000 research institutes operate at large state-owned enterprises, and 41,000 non-state scientific-oriented enterprises. According to American statistics, every fifth person, receiving a PhD degree in the United States, is a Chinese (Politaev & Fedorets, 2014).

Conclusions.

Summarizing the research, it can be said, that innovation is the most important factor of sustainable economic development of modern China, and the main condition for the return of priority rates to the country's economic growth, which it demonstrated in the 1990s and 2000s. The innovation process in such actively developing country as China is characterized by the following trends and features.

1. China ranks second in the world after the United States in terms of financing of research and development activity. At the same time, China is the leader in terms of innovation funding among

developing countries. The amount of R & D expenditures in 2016 was about 1.5 trillion yuans (250 billion US dollars). Accelerated increase of investments in innovation is the basis for further advancement of China to the world scientific, technological and economic leadership.

2. The innovation process in China, as well as in other developing countries, is implemented through the development of scientific-research activities, scientific-educational sphere, and business innovations. Since the 2010's the leading role has been played by business structures, whose share in the total amount of resources, spent on innovations, takes more than two thirds, bringing China closer to the innovative level of developed countries.

3. Active development of innovations and their manufacturing application are reflected in the significant growth and improvement of almost all indicators of innovative development of China's national economy: the number of scientific achievements, the number of inventions, patents and grants, and the increase in the share of science-intensive products in total volume of production and exports. Development of fundamental science in China, based on strategic guidelines for economic growth, is combined with the results from the introduction of intellectual products into the practical sphere.

4. At present, China is at the second stage of its innovative development, which is based on the introduction of new research results into practice.

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