

МІЖНАРОДНА ЕКОНОМІКА І ЗМІНИ ГЕОЕКОНОМІЧНОГО ПРОСТОРУ

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CONCEPTUAL DIRECTIONS OF CHINA'S INNOVATION ACTIVITIES STIMULATION IN THE GLOBALIZATION CONDITIONS

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The conceptual foundations research results of the People's Republic of China (PRC) innovation system transformation and the determination of the directions for stimulating its innovative activity have been presented in the paper. The purpose of the article is the disadvantages identification of the PRC's scientific and technological policy and based on its generalizations, determination of the main directions for improving the legislation of the PRC's in the field of science and technology, as well as the substantiation of scientific and practical recommendations for stimulating the innovative activities of the PRC in the context of globalization. In the course of the research, the disadvantages of the scientific and innovation policy of the PRC are analyzed and it is pointed out that the awareness of these problems and tasks led to the transformation of China's state innovation strategy towards comprehensive support of innovative entrepreneurship. One of the successful manifestations of this program is the rapid development of new organizational technical and financial forms that stimulate and support their innovative activity, namely: hackspace, business incubators, business angels and private venture investment funds, focused mainly on innovative small and medium-sized enterprises (SMEs) financing. The main directions of improving the legislation of the PRC in the field of science and technology have been identified, namely: highly qualified personnel potential increase by expanding accessibility and improving the quality of education; a combination of a centralized state policy in the field of science and technology with the involvement of private capital to the scientific and technological sector; inclusion of research organizations in the structure of production companies and holdings, as well as encouraging the introduction of new technologies in production; popularization of science and technology, the formation in the public mind of the idea of the extreme importance of the scientific and technological base for the successful and harmonious development of the country as a whole. It is concluded that the dynamics of the development of new elements in the landscape of innovative entrepreneurship in China is interdependent. Joint R&D activities in Chinese realities will contribute to increasing the economic success of innovative projects, and the expansion of innovative activity in the field of small and medium-sized businesses will serve as a powerful impetus for the development of the private venture capital market in China.

Keywords: high-tech production; innovation; innovation infrastructure; scaling of the innovation process; national innovation system (NIS); science and technology policy; financing of innovative projects

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**КОНЦЕПТУАЛЬНІ НАПРЯМИ СТИМУЛЮВАННЯ
ІННОВАЦІЙНОЇ ДІЯЛЬНОСТІ КНР В УМОВАХ ГЛОБАЛІЗАЦІЇ**

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У статті наведено результати дослідження концептуальних засад трансформації інноваційної системи КНР і визначення напрямів стимулювання його інноваційної діяльності. Метою статті є ідентифікація недоліків науково-технологічної політики КНР та на основі їх узагальнення визначення основних напрямів удосконалення законодавства КНР у сфері науки і технологій, а також обґрунтування науково-практичних рекомендацій щодо стимулювання інноваційної діяльності КНР в умовах глобалізації. У процесі дослідження проаналізовано недоліки науково-інноваційної політики КНР і зазначено, що усвідомлення зазначених проблем і завдань, призвело до трансформації державної інноваційної стратегії КНР у бік всебічної підтримки інноваційного підприємництва. Визначено, що одним з успішних проявів цієї програми є стрімкий розвиток нових організаційних технічних і фінансових форм, що стимулюють і підтримують їх інноваційну активність, а саме: хакспейсів, бізнес-інкубаторів, бізнес-ангелів і приватних венчурних інвестиційних фондів, зосереджених головним чином на фінансуванні інноваційних МСП. У ході дослідження ідентифіковано основні напрями удосконалення законодавства КНР у сфері науки і технологій, а саме: збільшення висококваліфікованого кадрового потенціалу шляхом розширення доступності та підвищення якості освіти; поєднання централізованої державної політики у сфері науки і техніки із залученням приватних капіталів до науково-технологічного сектору; включення науково-дослідних організацій до структури виробничих компаній і холдингів, а також заохочення впровадження у виробництво нових технологій; популяризація науки і техніки, формування у суспільній свідомості ідеї важливості науково-технологічної бази для успішного і гармонійного розвитку держави у цілому. Зроблено висновок, що динаміка розвитку нових елементів у ландшафті інноваційного підприємництва КНР, носить взаємозалежний характер. Спільна НДДКР діяльність у китайських реаліях сприятиме підвищенню економічного успіху інноваційних проєктів, а розширення інноваційної активності у сфері малого та середнього бізнесу слугуватиме потужним імпульсом для розвитку ринку приватного венчурного капіталу в КНР.

Ключові слова: високотехнологічне виробництво; інноваційна діяльність; інноваційна інфраструктура; масштабування інноваційного процесу; національна інноваційна система (НІС); науково-технологічна політика; фінансування інноваційних проєктів

Relevance of the issue. PRC NIS is one of the largest in the world. In terms of scale and scientific equipment, it came close to the countries leaders in innovation growth. Currently, China is actively working on the development of new technologies for mass production, which is due to the desire to change the structure and nature of production in the country's economy.

One of the basic components of the Chinese NIS and the main instrument of the scientific and technical policy of the government of the PRC are national

programs for solving the most important scientific and technical problems. As a matter of fact, these are long-term target programs in which scientific and technical tasks especially relevant for a given period are established, long-term goals and technical and economic results of work are formulated, comprehensive (material, personnel, financial, etc.) resource support of the goals set and set tasks. Important tasks of China's innovation policy, according to the country's development plan, is to achieve by 2020 the share of research and development costs of up to 2.5% of GDP, the contribution of the scientific and technological component to GDP growth of 60% [1]. The key role in the economy modernization is played by the transition from the imitative type of development to the innovative one, which determines the relevance and actuality of the research topic in both scientific and practical directions.

Analysis of recent research and publications. The development of the Chinese economy in recent decades, its current state and prospects cause growing interest of researchers from different countries [2, 3, 4, 5, 6]. This is largely due to the significant successes of the PRC in the field of economics, science, technology, high technology, and the place and role of the country in the world economy.

The methodology of the formation and estimation of the country development innovation is embedded in the scientific papers of such foreign authors as K. Akamatsu, H. Brooks, M. Kondratiev, M. Kremer, D. Calduell, R. Lucas, M. Popova, R. Solow, P. Romer, A. Shakhmaev, T. Shtterzer, J. Schumpeter, Yu. Yakovets and others [7-9].

The influence of innovative technologies for the current economic development of the country is considered at the researches of A. Goncharov, N. Goncharenko, O. Dovgal, E. Koblov, M. Kogut, I. Matyushenko, O. Fedirko and others [10-16].

However, in our opinion, insufficient attention is paid to the research of the PRC innovation policy disadvantages and problems of PRC innovative activities stimulating in the world economy system.

The purpose of the article is the disadvantages identification of the PRC scientific and technological policy and based on its generalizations, determination the main directions for improving the legislation of the PRC in the field of science and technology, as well as the substantiation of scientific and practical recommendations for stimulating the innovative activities of the PRC in the context of globalization.

Statement of the main research. A characteristic feature of the Chinese NIS is the determining role of the state in shaping the institutional infrastructure and stimulating the innovation process. The modern NIS of the

PRC is a complex of state, public and private institutions that are interconnected, and whose joint activities should lead to the creation, distribution and use of new and high technologies.

An analysis of the state strategy of innovative development of China made it possible to single out a distinct bifurcation periodization in it:

- establishment of an innovative system in an incremental type (1949-1976);
- modernization of the innovation system (“universal” industrialization) (1976-2006),
- transition from the “Market in exchange for technology” strategy to “Interaction and integration into the world market” and the creation of own high-tech products (2006 - present) [17].

Today, there are three main documents that regulate the development of science and technology in China: State program for long-term and medium-term planning for the development of science and technology in 2006-2020; Planning program to improve the quality of science in the country in 2006-2010-2020; State long-term and medium-term talent development planning program for 2010–2020 [23].

Expanding the scope of market mechanisms and stimulating innovation activity at the micro level, the country's leadership did not let go of the macroeconomic levers of regulation necessary for solving strategic tasks. The state initiated the creation of high technology zones, technology parks, innovation clusters, funds to support innovative projects. Using a wide arsenal of direct and indirect regulatory instruments (subsidies, targeted tax and credit incentives, preferential rental rates for premises, customs preferences, shared financing of large innovative projects in the format of public-private partnerships, etc.), state bodies formulate the specialization of scientific and technical organizations, stimulate their innovation.

A key condition for the development and effective functioning of the NIS is sufficient funding for R&D. The volume of expenditures for these purposes, their share in GDP, reflect the role of science, technology and innovation in the process of reproduction of a social product and the attention paid to this sphere in a given country as a factor in the formation of a new knowledge-based economy. In China, R&D spending is constantly growing. Even during the global financial crisis of the last decade, their positive dynamics were noted: in 2008-2019 their volume increased by 2.65 times, and today China is the second only to the United States in investments in this area. The share of R&D expenditures in the country's gross product also increased, and in 2019 reached 2.2 % of GDP, which is significantly higher than the corresponding indicator

in other BRICS countries and is not inferior to the average for the EU countries [18].

Table 1 – Research and development spending in the BRICS and the EU countries in 2000-2019, % from GDP

Country	2000	2005	2010	2015	2019
Brasil	0.9	0.9	1.2	1.2	1.3
Russia	1.1	1.1	1.1	1.2	1.2
India	0.8	0.9	0.9	0.8	0.8
China	0.9	1.3	1.8	2.0	2.2
SAR	0.7	0.9	0.9	0.8	0.8
EU	1.9	1.8	2.0	2.0	2.0

Source: compiled by the author from [18]

Along with rising costs, changes are also taking place in the sources of R&D funding. Over the past decade, a tendency towards a reduction in the share of budget funds (from 33.4 to 22.1%) has been clearly manifested, in favor of funds from organizations in the business sector. Currently, in China, the main source of financing R&D expenses is the funds of enterprises (75%), approximately 22 % of the costs are covered by budget funds, the rest is financed by foreign and other sources.

The share of foreign sources in R&D financing in 2000-2019 decreased from 2.7 to 0.9 %, which is due to a change in emphasis in development factors, focus on the accumulated internal scientific and technological potential and the consistent implementation of the government policy on import substitution.

However, along with the advantages, China's scientific and technological policy has a number of disadvantages:

- imperfection of legislation in the field of intellectual property protection. Most companies underestimate this section of law as an important part of corporate strategy. Many entities lack a clear understanding and methods of assessing the market value of patents. Chinese enterprises consider the results of R&D only from the point of view of momentary own benefits and do not take into account the interests of the state, society and economy;

- norms for the application of world achievements, international technical exchange and, in general, the development of cooperation are not clearly regulated;

- implicitly defined mechanisms for joining the global innovation network and methods for using its resources;

- there are legal contradictions in the field of science and technology at the intergovernmental and interregional levels;

- it is necessary to improve R&D management concepts;

- insufficiently stimulated internal innovation;

- there is no clear coordination between manufacturing enterprises, universities, research organizations;

- there is a lack of new approaches that differentiate financial instruments and mechanisms for small, medium and large high-tech enterprises.

But at the same time, thanks to the effective state scientific and technological policy in China, there is a powerful economic, scientific and legal groundwork for the subsequent successful development. Effective measures have been developed in the country to stimulate scientific and innovative activity, laws have been enacted to provide for a number of relevant benefits and preferences, and clusters are being formed to ensure the creation of competitive high-tech industries.

The innovative infrastructure created in the country contributed to the development of high-tech industries and increased international competitiveness of the Chinese economy. In 1990, China's share in world exports of high-tech products was 2.2%, in 2000 it increased to 4.1, and in 2019 exceeded 35%. In the ranking of global competitiveness published in the reports of the World Economic Forum, China moved from 39th place in 2001 to 28th place in 2019, significantly ahead of other BRICS countries, and slightly behind Israel (20th place) and Republic of Korea (13th place) [19].

Particularly noteworthy is the fact that the PRC leadership emphasizes the creation of a competitive business sector as the main generator of innovations, as well as integration into the global innovation sphere. It is these factors that are considered as the most important conditions for the development of national high-tech industries, along with state support for education and science, the creation of favorable institutional conditions for innovative growth.

One of the main conditions for the PRC NIS transition to a self-developing state is the development of mass creative potential and innovative entrepreneurial skill. In other words, today China needs to scale the innovation process by incorporating small and medium enterprises (SMEs) into it. It is their inclusion, as shown by the experience of innovative countries, that forms the new driving forces of the next stage of development of the country's economy.

Awareness of these problems and challenges led to the transformation of China's state innovation strategy towards comprehensive support for innovative entrepreneurship. The state program "Mass Entrepreneurship, Comprehensive Investment", launched in 2010, accelerated the inclusion of SMEs in innovative production. One of the successful manifestations of this program is the rapid development of new organizational technical and financial forms that stimulate and support their innovative activity. In the Chinese

realities, these are hackspace, business incubators, business angels and private venture investment funds, focused mainly on financing innovative SMEs.

The scale and dynamics of the development of these forms are such that the obvious change in the innovation landscape of China's NIS is apparent, which affects the dynamics of the development of innovative entrepreneurship in its economy. In total, by 2019, the Government of China had spent more than \$ 65 billion to stimulate mass innovative entrepreneurship [21]. The result of such a significant level of support was not only the large-scale inclusion of small and medium-sized businesses in R&D activities, but also the development of new innovative structures that led to certain changes in the Chinese NIS landscape. By 2019, business incubators and technological creativity clubs (hackspace), directly related to them, have significantly strengthened their positions, both in quantity and in terms of economic efficiency. In the financial sector, business angels and small venture investment funds focusing on financial and legal support, primarily SMEs, are operating on a larger and larger scale.

The intensity of the interaction of science with the real sector is an important characteristic of the country's innovative potential. Due to the functional division of labor, for many years in the PRC there have been numerous barriers to the transfer of scientific achievements from universities and research institutes to enterprises. However, over the past 20 years there has been an intensive process of strengthening cooperation in this area, stimulated by economic reform, various institutional changes and competition. Government policy is aimed at strengthening the ties between science and business. State universities and research institutes were given the right to create subsidiaries with the goal of commercializing technology. At the same time, a gradual reduction in budget funding for research and development began. Most state research institutes and universities managed, at least in part, to compensate for the lack of funds by attracting additional financial resources through subsidiaries [22].

The effectiveness of the policy pursued by the Chinese government confirms the appearance on the market of a number of successful high-tech companies. These include Lenovo, established at the Chinese Academy of Sciences, and Beida Founder, at Peking University. At present, these companies occupy leading positions in the PRC industry of information and communication technologies. There are examples of large biotechnology firms that were created by scientists from former employees of the research institute: Shenyang Sunshine Pharmaceutical Co. Ltd., Beijing Shuanglu Pharmaceutical Co. Ltd. and Anhui Anke Biotechnology Co. Ltd. [23].

The creation by universities and research institutes of subsidiaries engaged in the commercialization of technologies is not the only form of communication between scientific organizations and production. State scientific institutions and universities of China conduct research on the order of industrial enterprises on a contract basis, and this activity has been very popular, since companies representing small and medium-sized businesses often do not have the organizational and financial capabilities to maintain their own research units. Thus, for many enterprises, the transfer of scientific and technical activities to research institutes and universities has become a way of solving specific production problems and an integral part of the development strategy.

Conclusions: China has created a fast-growing and very large innovative complex. Over the past decade, the country has been able to increase the production of high-tech products by 27 times. Its percentage increased from 8.1% to 35.4%. Every year, China increases the export of high-tech goods and services by 15-20%, thereby significantly reducing the share of raw materials in its supplies abroad [24].

It seems that it is precisely the combination of heterogeneous elements in the Chinese NIS: the successfully found symbiosis of state and market regulation of the economy, science, technology, and innovation processes is one of the main reasons for its undeniable success for many years and the key to long-term stability in the future. Government intervention can compensate for market defects, and the market, in turn, helps to overcome the shortcomings of government regulation through the development of competition. The experience of China is of lasting importance for countries in which innovation policy is only being formed and the contours of the future NIS have not yet been determined, for countries facing the challenges of modernizing the national economy and more effectively integrating it into the global economy.

The experience of China in this area is very successful and is of interest from the point of view of its analysis and possible borrowing. The PRC leadership plans by 2030 to substantially reduce the technological gap with advanced countries, and by 2050, to carry out a new type of industrialization based on science and education, in close connection with informatization, that is, to create a knowledge economy.

Thus, a review of Chinese experience in the field of reforming and developing the scientific and technological complex allows us to determine the following conclusions. Firstly, one of the factors of economic development is scientific and technological progress and the introduction of its results in production. Secondly, regardless of the economic system in the country, a

prerequisite for the successful development of scientific and technological research is the interest of corporations (private and state) in obtaining and applying R&D results and, as a result, the increasing role of entrepreneurs in financing the scientific and technological sector. Thirdly, in the formation of state policy in the field of science and technology, as well as in the development of specific measures for its implementation, it is necessary to take into account the experience of foreign countries. However, the borrowing of such experience should not be carried out by full copying; it is necessary to create a well-thought-out model for the implementation of appropriate measures, taking into account the national characteristics of the economy, political and social system, and national mentality.

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