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INNOVATION-DRIVEN DEVELOPMENT OF THE ECONOMIC RECONSTRUCTION OF UKRAINE IN THE POST-WAR PERIOD

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innovation policy, clusters, post-war economic reconstruction, innovative projects, export, startups, National Research Fund, unmanned aerial vehicles, high-tech sectors.

The article considers key aspects of innovation policy within the framework of post-war economic reconstruction, specifically from the perspective of world experience and analysis of best practices of countries that survived the wars. It was indicated that innovation is a determining factor in competitiveness and reconstruction of the economy after military conflicts. It is emphasized that countries that actively invest in science, technology and startups achieve significant economic growth.
Interpreting the experience of Israel and other countries, the article demonstrates that a successful innovation policy requires a clear strategy and coordination between government structures, academic institutions and the private sector. For Ukraine, suffering from the consequences of the war, this means the necessity to establish specialized organizations to coordinate innovative initiatives and support scientific developments.
Special attention is given to the role of state financing of innovative projects through the National Research Fund, which in Ukraine is essential to the development of scientific potential and the designing innovative products. In the article, the emphasis is placed on the importance of integrating scientific achievements into market mechanisms to ensure sustainable economic development.
Finally, Ukraine's prospects are discussed with reference to increasing exports, development of high-tech sectors and startups, which can become catalysts for the growth of the national economy under the conditions of post-war reconstruction. Taking into account the above-mentioned experience of the countries, the article recommends that for Ukraine it will be important to actively invest in the development of high-tech industries and support innovative projects as a strategic course for overcoming economic challenges after the conflict.
Therefore, the article highlights the key aspects of innovation policy in the post-war period and is indicative of the importance of a multifaceted approach to its implementation in order to achieve sustainable economic development of Ukraine.

ІННОВАЦІЙНИЙ РОЗВИТОК ВІДНОВЛЕННЯ ЕКОНОМІКИ УКРАЇНИ В ПОВОЄННИЙ ПЕРІОД

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Ключові слова:
інноваційна політика, кластери, повоєнне відновлення економіки, інноваційні проєкти, експорт, стартапи, Національний фонд досліджень, безпілотні літальні апарати, високотехнологічні сектори.

Стаття розглядає важливі аспекти інноваційної політики в контексті повоєнного відновлення економіки, зокрема через призму світового досвіду та аналізу кращих практик країн, що пережили війни. Визначено, що інновації є ключовим фактором конкурентоспроможності і відновлення економіки після воєнних конфліктів. Зазначено, що країни, які активно інвестують у науку, технології та стартапи, досягають значного економічного зростання.
Аналізуючи досвід Ізраїлю та інших країн, стаття показує, що успішна інноваційна політика вимагає наявності чіткої стратегії та координації між урядовими структурами, академічними установами та приватним сектором. Для України, що потерпає від наслідків війни, це означає необхідність створення спеціалізованих організацій для координації інноваційних ініціатив та підтримки наукових розробок.

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Особлива увага приділяється ролі державного фінансування інноваційних проектів через Національний фонд досліджень, який в Україні відіграє стратегічну роль у розвитку наукового потенціалу та створенні інноваційних продуктів. В статті підкреслюється важливість інтеграції наукових досягнень у ринкові механізми для забезпечення сталого економічного розвитку.
Нарешті, обговорюються перспективи України в контексті збільшення експорту, розвитку високотехнологічних секторів та стартапів, що можуть стати каталізаторами зростання національної економіки в умовах відновлення після воєнних дій. Враховуючи вищезгаданий досвід країн, стаття рекомендує Україні активно інвестувати у розвиток високотехнологічних галузей та підтримку інноваційних проєктів як стратегічний курс для подолання економічних викликів після конфлікту.
Отже, стаття висвітлює ключові аспекти інноваційної політики у післявоєнний період та вказує на важливість комплексного підходу до її реалізації для досягнення сталого економічного розвитку України.

Statement of the problem

Ukraine has to deal with numerous challenges due to the consequences of the war and the necessity to restore the economy in the post-war period. According to world practice, the period of reconstruction after armed conflicts and wars requires the proper policies to ensure the development of all spheres, including the economy. The main issue is the integration of innovation policy as a driving force for economic reconstruction and growth.

Analysis of recent researches and publications

With a view to developing an effective innovative policy and strategy for the reconstruction of Ukraine's economy after the war, it is important to consider the latest research and publications in this field. Yatskevich I. V.

Bila I. S., Posna V. S., Shevchenko O. O. investigated the innovation policy of the state taking into account the Global Innovation Index. Investigation shows that innovation is the main engine of economic growth and competitiveness of countries. The introduction of new technologies, the development of scientific research and the provision of a background for innovative business significantly increase economic indicators. Rusnak I., Melikhov O., Oleg Ya., Vladislav Sh., Gilova G. give consideration to the development of the defense industrial complex, namely the UAV market, as an innovative economic and military breakthrough. The investigation highlights the importance of the development of unmanned aerial vehicle technology for military and civilian needs. Ukraine has great potential in this area, which can contribute not only to technological development, but also to attracting investments.

Analysis of the latest research and publications confirms that innovation policy is a determining factor in the reconstruction and development of Ukraine's economy after the war. The use of international practice, promotion of exports, development of innovation clusters and introduction of new technologies can ensure sustainable economic growth and competitiveness of the country in the world market.

Objectives of the article

The purpose of this study is to determine the main instruments of Ukraine's innovation policy in the post-war period and to develop an investment strategy for the reconstruction y of the economy with an emphasis on improving Ukraine's innovation policy.

The main material of the research

Ukraine faces many challenges due to the consequences of the war and the reconstruction of the economy in the post-war period. As the world practice of armed conflicts and wars shows, after their end, a period of reconstruction, and the development of all spheres, including the development of the economy, depends on the proper policy.

First and foremost, it is important to define what the term "innovation policy" means. The innovation policy of the state is an integral implementation of the strategic priorities of innovative reconstruction and development of the country's economy in sectors and regions, balanced with the intellectual potential and production resources of the regions based on knowledge and innovation [1].

To begin the reconstruction of the economy after the war, it is important to generate comprehensive reconstruction programs, find sources of investment and determine socio-economic developmental factors. Under current conditions, innovation is a critical driver of economic reconstruction. International practice confirms the positive impact of innovations on the country's competitiveness, and their absence can lead to the loss of competitive positions.

The most innovatively developed are Asian countries such as Singapore, Japan and South Korea, in North America – the USA and Canada, in the Middle East – Israel, and among European countries – Germany, Sweden, Switzerland, Denmark and Finland [2].

Thus, the World Intellectual Property Organization (WIPO) in the published annually report of Global Innovation Index 2023 reflects the development of global innovation trends in a period of complete uncertainty of the world economy [3].

The rating is based on more than 80 indicators and determines the level of innovation development in different countries of the world. Specifically, in our region the top rating countries are: Switzerland, Sweden and Great Britain. In the global innovation index, Switzerland, Sweden and the USA rank the first, while Ukraine ranks 55th out of 132 possible countries, and 34th among European

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countries, having fallen by 6 positions since 2021, from ranking 49th to 55th [1].

In the post-war period, the innovation strategy should be aimed at achieving long-term socio-economic goals, among other things at the restoration of high-quality fixed capital. This is achieved by developing a forecast of scientific and technological development and using a complex methodology when generating state programs, investment and innovation projects. It matters that these arrangements are properly integrated into market mechanisms and promote the creation of a favorable innovation environment. State promotion of investment processes in various sectors should consider the necessities of the market and ensure the security of the country.

After analyzing the practice of other countries that experienced armed hostilities, it is now becoming apparent that the successful implementation of innovation policy in the post-war period required the establishment of specialized organizations that coordinated and managed the introduction of new technologies. This approach is also recommended for Ukraine, specifically in regarding the reorientation of the activities of the National Research Fund.

The fund is a critical instrument of state policy, aimed at financing measures promoting the development of science as the determining factor of economic growth. The main goals of the Fund are:

• provision of incentives for fundamental and applied scientific research, development of the national research space and its integration into the world research space;

• development of research infrastructure in Ukraine and its integration into the world one;

• promoting the establishment of scientific and technical cooperation between scientific institutions, institutions of higher education and representatives of the practicable sector of the economy and the service sector;

• people-to-people exchange of information and scientists, involvement of students and college youth in scientific and technological activities;

• production (branch) based scientific institutions by arranging tenders at the request of central executive bodies or other customers, subject to the fact that such central executive bodies or customers provide appropriate funds;

• popularization of scientific and technological activities [4].

Nevertheless, it is necessary to focus attention on finding and implementing research results, ensuring the availability of funding and protecting intellectual property [1].

The reconstruction of Ukraine should be aimed at investing in sustainable companies and infrastructure development. The growth of export volumes, the extension of value-added chains in agribusiness, the production of environmentally friendly steel and the support of IT startups will contribute to the country's economic growth [5].

Studies confirm that policies promoting to trade and increased exports can contribute to the growth of a country's GDP. Exports contribute to the productivity of companies, while the structure of exports affects the overall development of a country. Therefore, the strategy of increasing exports may be appropriate for the future economic development of Ukraine. The transition to the production of goods with a higher added value may be a smart move, considering that the majority of Ukrainian exports are currently raw materials and semi-finished products.

To deal with the issue how export promotion has contributed to economic growth, let's look at examples of countries that have successfully implemented this strategy and made significant progress. The best practices of these countries confirm that prioritizing export sectors, in particular those with higher added value, may become a determining factor for growth. Other important catalysts are investment in innovative high-tech industries, support for research and development, and reskilling of the workforce.

The first group of countries under consideration includes the Republic of Korea, Hong Kong, Taiwan and Singapore, which are known as the "Four Asian Tigers". The main driving power of their economic growth in the second half of the 20th century was export orientation and a strict policy in the field of innovation development. These countries took different approaches, with Singapore and Hong Kong implementing neoliberal trade regimes, while Taiwan and South Korea adopted hybrid regimes suited to their export businesses, including incentives for commodity exports.

It is important to emphasize that the main focus was on exporting products with high added value. For all four "Asian tigers", the largest export sectors in 2020 were: electrical equipment, equipment and spare parts; devices for recording and reproducing television images and sound, as well as parts and accessories for such products; nuclear reactors, boilers, machines and mechanical devices.

Israel has been holding a course to transform its economy since the mid-1970s, prioritizing innovative, high-tech sectors. Furthermore, the country has concentrated on the development of the defense industry, which includes the production of complex military systems for the domestic market and export. Today, Israel is among 10 largest exporters of military equipment. This practice can be a useful case study for Ukraine, which also has a significant domestic demand for military equipment and the potential to become a leading arms producer [6].

Over recent years, Israel has turned into an innovative economy with a high rate of development. The country entered the top 10 of the Bloomberg Innovation Index 2021 due to government programs aimed at supporting the science and technology sector. Over the past 10 years, Israel has spent more than 4% of GDP on government research and development, and that amount is growing. High-tech industries are prosperous in Israel, contributing to economic growth. Technology-enabled manufacturing grew by more than 10% in 2021, maintaining its share of GDP at 15.3%. Moreover, in 2021, high-tech exports accounted for 54% of Israel's overall exports. This is an example for Ukraine, where high-tech industries currently account for about 5% of GDP 7.

In view of the territorial proximity to the potential danger and excluding the possibility of a quick conflict management and a change in the imperial policy of the neighboring country, Ukraine should draw attention to the model of economic development using the example of Israel.

Israel actively promotes innovation, which is represented by the establishment of Yissum in 1964, which is

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the technology transfer center of the Hebrew University of Jerusalem. During its existence, Yissum registered 10,700 patents for 3,000 inventions, licensed more than 1,000 technologies and launched 170 startups. This contributed to attracting more than 2 billion dollars of investments. Israel is known for its support of entrepreneurship, innovative approaches and inventions financed through loans, grants and government funding [8].

In in the space of 10 years starting in 1954, Israel's GDP grew by about 10% annually, and per capita consumption increased by 221%. The country practically achieved zero unemployment and was able to attract significant investments, establishing a framework of its industry [9].

Consequently, according to the GII, Israel ranks 14th in the overall rating and ranks the first in the North African region [3].

Let's consider Ukraine's rating over the past 5 years and analyze trends and prospects for development. The data are shown in Fig. 1.

Based on the results obtained, we can arrive at the conclusion that before the full-scale invasion, Ukraine improved its indicators, but with the beginning of open armed aggression, the indicators deteriorated and the country lost several positions in the rating, which indicates a deterioration of the innovation and investment climate.

In 2023, Ukraine ranked 49th in the annual rating of startup ecosystems Global Startup Ecosystem Index 2023 by the Global Startup and Innovation Research Center StartupBlink. The country has deteriorated its ranking by 15 positions compared to 2022, when it ranked 34th. StartupBlink, associated such an aggressive reduction along with the full-scale war in our country, which could not but affect the Ukrainian system of startups [14].

In the process of development and implementation of innovative policy in the post-war period, all ministries of the country should be involved. They should develop a general strategic concept of innovative development, as well as form targeted national security and development programs. State policy should contribute to the creation of a positive environment for innovative development through:

- Support for reforms of higher educational institutions, focusing them on innovation;
- Creation of incubators and support of enterprising individuals in the creation of startups together with companies and research institutes, orienting them to the needs of national and international markets;
- Reduction of taxes and social benefits to reduce the burden on companies that take innovative risks;
- Barrier lowering to enter markets with a high potential for innovation;
- Ensuring access to venture capital, especially for startups;
- Improvement of mechanisms for the protection of intellectual property rights.
- Adopting the experience of other countries and implementing innovative policies in the military-industrial complex.

It is worthwhile noting that in the post-war period, the development of entrepreneurial activity in different regions of Ukraine will be unequal due to the consequences of military actions (for example, in Bucha, Izium, Irpen, Mariupol, Mykolaiv, Zaporizhzhia). This will contribute to the creation of innovation clusters, which are a complete system of enterprises and organizations engaged in the production and consumption of innovative products. Clusters cover the entire innovation chain – from the development

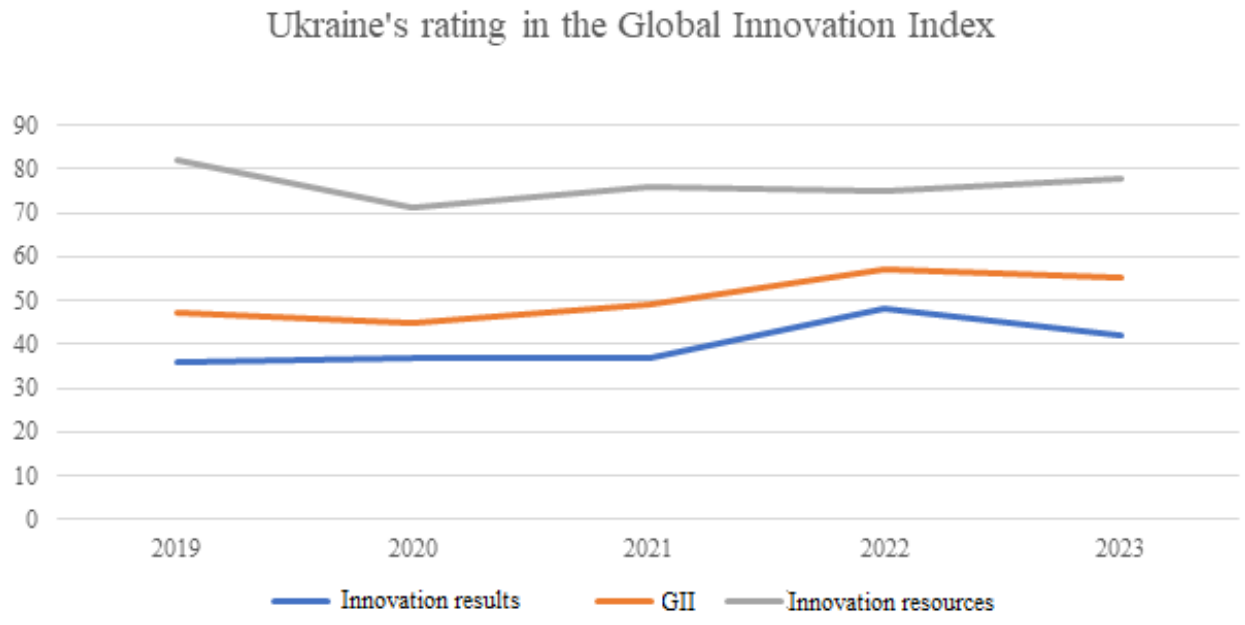

Fig. 1 –Ukraine's Rating for 2019 to 2023

The source is generated based on [3], [10], [11], [12], [13].

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of fundamental scientific ideas to the production and distribution of finished products, as well as a system of close ties between firms, their suppliers, customers and educational institutions.

Innovation clusters form a system of extension of new knowledge and technologies, accelerate the transformation of inventions into innovations, and innovations into competitive advantages. They also contribute to the development of quality and sustainable relationships between all participants.

Another trend of development of the innovation policy of the state may be the development of unmanned aerial vehicles. Consequently, as of 2021, according to the information bulletin *White Book 2021. Defense Policy of Ukraine*, 42 remotely piloted aircraft systems of various modifications were purchased [15], and from July 1, 2022 to June 15, 2023, just one *Drone Army* concluded 64 contracts for 10.6 billion UAH for the purchase of more than 17,000 unmanned combat aerial vehicles and reconnaissance and surveillance drones [16].

In June 2023, in connection with the change in the nature of hostilities in the south and east of Ukraine and state support for the production of UAVs, the situation in the Ukrainian market for the production of military drones began to change. Manufacturers began to pay more attention to the development and production of combat unmanned combat aerial vehicles.

Prospects for the development of the market of unmanned aerial vehicles in Ukraine. The Minister of Digital Transformation of Ukraine has evaluated the progress in the development of unmanned technologies as far as our own production is concerned. According to him, in comparison of the last year, the production of UAVs in Ukraine in some categories has tenfold increased, and in some cases even hundredfold. The industry is actively developing: if 7 companies were brought into production in the fall of 2022, then as of July 2023 there were 40 of them. Moreover, dozens more companies with which the state will conclude contracts are planned to be established in the near future.

Around military needs, the development of the UAV market in 2024 is predicted to be aimed at increasing the production of kamikaze-type combat drones and reusable FPV combat drones. The segment of using transport UAVs and mission-oriented UAVs, for example, for the search and detection of mine-explosive barriers, remains open.

For the production of more technological UAVs, it is possible to use the infrastructure of foreign factories. In the future, due to state support, the economic model of demand and supply will encourage developers to produce a larger number of existing drones, and the competitive market will promote the development of new types of UAVs with improved characteristics [17].

The war has entailed significant losses among the population and large-scale destruction, which significantly affected the economy of Ukraine. According to the Rapid Damage and Needs Assessment for Ukraine as of 2022, direct material damage is estimated at $135 billion, which is more than 60% of the country's pre-war GDP. These damages include residential buildings, transportation infrastructure, energy systems and businesses. The estimated cost of reconstruction and rehabilitation is approximately 411 billion US dollars [18].

Considering these circumstances, the report identifies effective mechanisms for sustainable and effective reconstruction and transformation of Ukraine. With an emphasis on innovative investment strategies to support local small and medium-sized enterprises, entice international companies and create specialized investment mechanisms. These strategies are aimed at promoting economic sustainability and development, creating a road map for the reconstruction and transformation of Ukraine with an emphasis on sustainable development and international cooperation.

The future of Ukraine is connected with integration with other democratic countries, especially with those closest to it. The report notes that improving cooperation and integration with the European Union is beneficial for Ukraine and Europe, for global trade, and for the entire democratic world [19].

Conclusion

Considering the world practice and national realities, Ukraine can improve its innovation policy by implementing the following critical aspects:

1. Creation of innovative infrastructure platforms: it is necessary to promote the formation and development of innovative clusters, where conditions for interaction and joint development of new technologies will be created on the basis of scientific institutions, higher educational institutions and private companies.

2. Financial support for innovative projects: development of specialized funding programs for startups and high-tech enterprises, including state grants, investment funds and tax incentives for innovative companies.

3. Incitement of technology transfer: creation of conditions for active transfer of scientific developments from the field of science to the field of practical application in industry and services.

4. Development of education and science: strengthening the connection between the educational process and the needs of the labor market, promoting an innovative approach in education and research, as well as engaging young talented people to scientific and technical activities.

5. Protection of intellectual property: development of an effective system of protection of intellectual property rights, which would facilitate the introduction of innovations and support of innovative enterprises.

6. International cooperation: development of international partnerships and cooperation with countries with developed innovative economies for the exchange of experience and technologies.

7. Regulatory changes and legal framework: improving legislation aimed at supporting innovation and creating a favorable legal environment for the development of high-tech industries.

These aspects shall be integrated into a single strategy of innovative development, which would take into account the specifics and needs of the Ukrainian economy in the conditions of post-war reconstruction. Such a multifaceted approach will create a stable basis for economic growth and increase the country's competitiveness.

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