GENERAL PROBLEMS OF THE MODERN RESEARCH AND INNOVATION POLICY

https://doi.org/10.15407/scine22.03.003

HEYETS, V. M. (https://orcid.org/0000-0002-2895-6114)
State Organization "Institute for Economics and Forecasting of the National Academy of Sciences of Ukraine,"
26, Panasa Myrnoho St., Kyiv, 01011, Ukraine,
+380 44 280 1234, gvm@ief.org.ua

COMMERCIALIZATION AND PRIORITIZATION OF INNOVATIVE DEVELOPMENTS BY THE NATIONAL ACADEMY OF SCIENCES OF UKRAINE AS PART OF THE NATIONAL INNOVATION SYSTEM

Introduction. *The functioning of Ukraine's national innovation system has provided significant opportunities to enhance its effectiveness through the commercialization of priority innovative developments with the highest level of readiness generated by the National Academy of Sciences of Ukraine (NASU).*

Problem Statement. *Research on innovative developments has addressed critical issues related to expanding the activities of academic research institutions in the commercialization of their research and development (R&D) results.*

Purpose. *This study has aimed to substantiate the potential for improving Ukraine's national innovation system through the commercialization of priority innovative developments produced by NASU.*

Materials and Methods. *The study has relied on statistical data, publications by Ukrainian and international scholars, and reports of international organizations. Monographic, analytical, and comparative methods based on socio-economic and statistical analysis have been applied.*

Results. *The study has characterized NASU's innovation developments that are ready for practical implementation, using a methodology for preparing R&D commercialization projects developed by the Institute for Economics and Forecasting of NASU. The portfolio of prospective developments has been classified by fields of activity.*

Conclusions. *To overcome Ukraine's limited experience in prioritizing, commercializing, and economically justifying innovative projects — as well as in assessing the effects of industrial scaling and providing*

Citation: Heyets, V. M. (2026). Commercialization and Prioritization of Innovative Developments by the National Academy of Sciences of Ukraine as Part of the National Innovation System. *Sci. innov.*, 22(3), 03—22. https://doi.org/10.15407/scine22.03.003

patent protection for intellectual property rights — the participation of NASU institutes in R&D commercialization has been expanded. A practical instrument for this process has been the methodology developed by the Institute for Economics and Forecasting of NASU. This approach has contributed to strengthening Ukraine's innovation system, particularly through the launch of various forms of academic startups.

Keywords: economic and innovative activities, transformation, prioritization of innovative developments, market, commercialization, hemostatic agents, wound healing agents, economic and social efficiency.

NOTES ON UNDERSTANDING THE ORIGINS OF THE PROBLEM

Transformational changes in Ukraine's economic activity, driven by the formation of market relations, necessitated changes in the ways the results of scholarly research are utilized to support innovation-driven economic development. In particular, these changes required expanding the commercialization-oriented interaction between science and business.

The transformational shifts in Ukraine during the 1990s and the first decade of the twenty-first century led to the recognition by the European Union in 2005 and by the United States in 2006 that Ukraine had established a market-oriented economy. Accordingly, economic activity — within which innovation is a fundamental driver — faced the task of ensuring the successful modernization of the economy on this basis, since the outcomes of transformation merely "create preconditions for economic growth." During this period, Ukraine's economic activity exhibited signs of deindustrialization, characterized, on the one hand, by an increased role of agricultural production and, on the other, by a decline in output, primarily in manufacturing, which constitutes the foundation for innovation-driven development.

Ukraine's economy began to function as a small open economy with an exceptionally high degree of dependence on foreign trade. This trade is largely based on a model of resource and commodity exchange with a relatively low share of value added embodied in technology, equipment, and transport machinery. In qualitative terms, this model characterizes Ukraine's economy as an appendage to the external world and reflects a technologically dependent, exogenous pattern of development. Consequently, innovation activity also faced the task of adapting to these new conditions, using the accumulated innovation potential to ensure the functioning of the national R&D system — particularly in sectors associated with high-technology nuclear energy, information and communication technologies, aviation and rocket-space industries, selected branches of mechanical engineering, and the chemical industry.

The presence in Ukraine of the aforementioned high-technology activities — whose prospects remain significant — necessitates, on the one hand, the identification of strategic priority areas and future directions for science and technology development through Ukrainian R&D and technology foresight, and, on the other hand, the commercialization of already accumulated priority national developments. When deployed, these developments exhibit a high degree of technological maturity and strong potential for success in both national and global markets.

Under the conditions of the new reality, given the preservation of Ukraine's innovation potential and the accumulation of innovation-oriented developments across a broad range of activities, there exists an opportunity to ensure several key prerequisites for implementing Walt Whitman Rostow's stage model of economic growth. This can be achieved on the basis of historically conditioned life skills and a population with globally competitive levels of education. To this end, it is also necessary to employ the principles of the "developmental state," which allocates resources and exercises regulation and governance in the spheres of science and education.

There is also an opportunity, through mechanisms of commercialization and the prioritization

of structural changes in research and development, to prepare and implement innovation-attractive projects, including those involving the National Academy of Sciences of Ukraine, within the framework of the State Medium-Term Priority Public Investment Plan for 2026—2028.

This paper has identified high-technology equipment and technologies ready for deployment — developed, in particular, within the National Academy of Sciences of Ukraine — and demonstrated, by way of examples, the feasibility of implementing a number of high-technology projects. The analysis includes assessments of effectiveness and efficiency, including social impact, and considers projects that may take the form of startups established within institutes of the Academy. These initiatives span such fields as non-ferrous metallurgy, mechanical engineering, energy and energy efficiency, as well as medicine.

ECONOMIC AND INNOVATION ACTIVITY IN THE TRANSFORMATIONAL CHANGES OF THE LATE TWENTIETH AND EARLY TWENTY-FIRST CENTURIES

Ukraine's experience in building a market economy in the 1990s, as a result of transformational changes of global scale that had no direct historical analogues, culminated — by the first decade of the twenty-first century — in recognition that the objective had been achieved: the centrally planned allocation system in economic activity had been replaced by a market-oriented system [1]. In historical retrospect, such systems proved capable, throughout the twentieth century, of supporting economic growth and improving living standards in many countries.

Achieving this objective should have indicated the presence of conditions and factors conducive to Ukraine's further development on a sustainable basis. At the same time, the subsequent content and character of economic activity — one of the key components in forming the foundation for economic growth — demonstrated that a number of difficulties characteristic of the previous system remained unresolved. Moreover, the transition process generated new challenges, rooted in both endogenous and exogenous factors.

Among the changes initiated and implemented during the transformation process, a dominant orientation emerged toward the so-called private-enterprise development strategy. This approach — considered, among other contexts, particularly effective for developing countries [2, 3] — enabled a number of economies, especially in East Asia, to achieve successful economic modernization and sustained growth, thereby narrowing the gap with the highly developed countries of the Western world.

In the 1950s, Walt Whitman Rostow developed the stages-of-growth theory, which posits that economic development proceeds through five stages. Of particular relevance to Ukraine is the stage described as the "preconditions for take-off," associated in part with the transition from a "traditional society" to a transitional society dominated by industrial forms of activity. Such a condition may be regarded as necessary. In Ukraine, however, on the eve of transformational change, the characteristics of a "traditional society," as distinguished by Rostow, had already been transcended: by the 1990s, economic activity in Ukraine was grounded in an industrial structure encompassing both economic and innovation activity. This indicates that the necessary preconditions for economic take-off were already present.

For Ukraine, other conditions identified in Rostow's theory were critically important but did not receive adequate attention. According to Rostow, these conditions include historically conditioned patterns of everyday life, in which social and cultural components play an essential role, as well as political factors — particularly the place and role of the state in the system of economic governance. Regarding the latter, history provides numerous examples of both successful and unsuccessful state intervention in economic management. In some cases, success has been associated with a predominance of regulatory functions, while in others, effective outcomes have been achieved through

models of the so-called "developmental state," a concept elaborated by Chalmers Johnson [5].

In this study, we do not address our research findings concerning the extent and practical modalities of state intervention in economic activity. Within the scope of the present topic, it is more important to examine other components related to the assessment of key factors that determine growth on an innovation basis — factors that are identified as fundamental in Walt Whitman Rostow's theory. These include the interdependence and interaction of the conditions and drivers of modernization and development. In this context, attention is paid to the interconnectedness, on the one hand, of technological change driven by scientific advances and, on the other, of transformations in the economy and economic activity resulting from business activity and its participation in, and co-participation with, innovation development and deployment.

Growth theory further posits that successful economic modernization and sustained growth occur when innovation activity characterizes a broad spectrum of business operations. This includes firms engaged in production as well as those capable of independently generating innovations, both within large enterprises and — especially — within small and medium-sized innovation-oriented firms, which are widely regarded as particularly well suited to pioneering innovation at the technological frontier [6]. Because the present analysis concerns the application of pioneering innovations derived from fundamental research — particularly that conducted within the National Academy of Sciences of Ukraine — prioritizing their deployment through such channels can significantly strengthen the national innovation system under market conditions.

Innovation activity, in which the state and its institutions play a substantial role, includes a market-organized component, as do other forms of economic activity. This implies the presence of both supply and demand, including in relation to innovation. Supply arises from the functioning of the innovation system and results in a portfolio of developments that, when deployed, can enhance the efficiency and competitiveness of economic activity. Demand for innovation emerges within the process of economic activity itself, primarily as a means of increasing labor productivity and generating profit.

Effective interaction between scholarly research and innovation-adopting businesses requires a structured and substantive framework of cooperation. Such cooperation can and should occur, inter alia, with state participation. The state is capable of assessing existing and emerging demand within the economy as a whole and within individual enterprises — including those in traditional and strategically important sectors developed in Ukraine — while also influencing the formation of supply from academic and educational institutions in line with national strategic interests, where the state plays a key coordinating role. In strategic terms, reliance on purely market-based principles in this sphere has often proven insufficient, as evidenced by numerous well-documented market failures.

This study addresses innovations that encompass productive activity, in which the manufacturing sector plays a primary role in shaping demand. In Ukraine, during the first decade of independence, this sector experienced large-scale structural problems. Between 1990 and 1999, the share of machine building and metalworking output — one of the key components of manufacturing and, accordingly, of the development of a high-technology material infrastructure — declined from 30.7% to 13.8%. At the same time, the combined share of fuel-energy and metallurgical production increased to 53.7% in 1999, compared with 21.0% in 1990.

Overall, economic activity in Ukraine during the 1990s exhibited features of structural simplification. The share of agriculture and related activities increased substantially. According to Walt Whitman Rostow's stage theory of economic growth, such structural shifts may be interpreted as a partial regression from the industrial stage toward a more traditional stage of development, reinforced by a regression in the structure of capital investment. In particular, the share of capital investment in machine building and the chemical industry —

sectors that generate advanced economic transformation based on innovation — declined to 9.2% in 1999 from 34.9% in 1990. A more than threefold decrease in the share of investment in high-technology activities contributed to a long-term slowdown in innovation processes [7]. At the same time, the scale of contraction and the imperative of economic modernization and development — objectives that do not always coincide in practice — should, in principle, have generated stable demand for innovation.

Under the previous economic system, such demand was met primarily through the activities of research institutions, including academic institutes and sector-specific research organizations financed largely from the state budget. During the period of transformation, these institutions were compelled to change the nature of their activities and seek commercialization opportunities against the backdrop of declining demand for innovation caused by economic contraction. Under conditions of compressed demand and limited state resources — particularly financial resources — the supply side of the national innovation system also contracted.

In such circumstances, the capacity to generate innovations as supply for markets in which demand for innovation exists is determined primarily by institutional conditions defined in the Law of Ukraine "On Priority Areas of Innovation Activity in Ukraine" [8]. The successful implementation of these priorities depends on the readiness of individuals and society as a whole to generate innovation, which in turn is shaped by educational, cultural, social, and psychological factors characteristic of Ukraine. Taken together, these factors constitute a potential foundation enabling innovation activity, particularly as Ukraine pursues its strategic course toward integration with the European Union.

The development and realization of this strategic trajectory — including the achievement of innovation-driven economic growth — necessitate, first and foremost, consideration of the modernization experience of Central and Eastern European economies [9], as well as an assessment of the appropriate balance between the utilization of domestic scholarly research and the importation of technologies [10].

Ideally, at the initial stage of economic take-off, both the intensity of technology imports and the creation of domestic technologies based on national scholarly research remain relatively low. By the final, fourth stage, however, the internal accumulation of knowledge and innovation should become dominant, reflecting a state in which a country advances along a trajectory consistent with globally recognized levels of achievement.

Under conditions of extreme economic openness — characteristic, in particular, of Ukraine — the second and, especially, the third stages in the balance between technology imports (and the equipment embodying them) and the utilization of domestically generated innovations become critically important. Historically, the dominance of imported equipment and technologies did not resolve the challenges of achieving sustained economic growth and productivity gains sufficient to converge with the development levels of advanced economies. At the same time, it would be incorrect to deny that the path of industrialization pursued by the former Soviet Union — and, consequently, Ukraine — achieved a relatively high level of industrial development, partly through the extensive use of imported technologies of exogenous origin, which contributed to socio-economic progress. As Peter L. Berger observed, modern technology possesses an autonomous transformative force that affects virtually any socio-economic environment; consequently, the introduction of new technologies tends to generate improvements in material living conditions, including rising living standards and increased life expectancy.

On the eve of the transformational changes in Ukraine's economy, its productive capacity exhibited a distinctly industrial character. Our analysis of data aggregated from the early twentieth century — covering the pre-revolutionary Russian Empire, of which Ukraine formed a part, as well as the period of the former Soviet Union and the years of Ukraine's independence — indicates the following structural features. In 1913, machinery and equipment ac-

counted for only 0.3% of exports from Russia, while imports of such goods reached 15.9%. On the eve of the World War II, exports of machinery and equipment in the Soviet Union rose to 5.0%, whereas imports exceeded one-third (34.5%). In the postwar period, particularly in 1970, exports of machinery, equipment, and transport vehicles reached their highest share at 21.5%, yet imports surpassed this figure by 14.1 percentage points, reaching 35.6%. By 1985, the export share had declined to 13.9%, while the share of imports of machinery, equipment, and transport vehicles continued to increase. The Soviet Union — and, with it, Ukraine — thus developed an export–import pattern approximating a "resources in exchange for machinery, technologies, and transport equipment" model [11—13].

With respect to Ukraine, a dependence of a similar nature has persisted. In 1989, imports of machinery and equipment exceeded exports by nearly 10 percentage points. Over time, this imbalance remained: by 2016, the export share of machinery and equipment had declined to about 10%, while imports reached 20.1%, indicating continued import dependence despite the sharp contraction of economic activity during the 1990s associated with transformational change and GDP decline. The resumption of economic growth after 2005—2006 — when Ukraine's economy was internationally recognized as market-based — did not alter the pattern of technological dependence; on the contrary, it significantly reinforced it.

By 2016, agricultural, forestry, and fisheries products, together with food industry outputs, accounted for 41.4% of exports, while ores, ferrous metals, and related products maintained a substantial share of 27.2%. Combined, these categories constituted nearly 70% of total exports, clearly demonstrating the persistence of the earlier export–import model. In essence, the economy continued to function largely as a resource appendage to external markets, while remaining technologically dependent on imports of machinery, equipment, chemical products, and related industrial outputs. The combined share of these imports reached 34.5% in 2016 [14—16].

By its structural characteristics, Ukraine's economy can be classified as a small open economy, with exports and imports together accounting for up to — or exceeding — 90% of GDP. This structure assigns a critically important role to exogenous factors, including foreign investment and the country's capacity to attract it. Research by Rajneesh Narula and Hervé Guimon, particularly regarding Eastern European countries, indicates that these economies face limited prospects for attracting foreign direct investment (FDI) capable of generating competitive new sectors; such cases remain rare exceptions, often shaped by contingent circumstances rather than systematic, economy-wide experimentation with new ideas [17].

Their findings suggest that, in Ukraine's case — given the presence of advanced capabilities in rocket and space technologies, aircraft manufacturing, nuclear energy, selected branches of mechanical engineering, and accumulated innovation outputs — there is a clear need to prioritize endogenous innovation activity. Leveraging domestic scholarly research and technological developments to foster new competitive industries should form the foundation for technological modernization of Ukrainian industry. This approach should primarily rely on national investment and an appropriate investment policy, while not excluding — and indeed encouraging — the attraction of foreign investment across a broad spectrum of high-technology activities present in Ukraine. Ukraine's experience in the ICT sector already confirms the effectiveness of such a strategy and supports its further expansion.

Ukraine currently possesses a population with world-class educational attainment that has demonstrated its capacity — even under wartime conditions — to organize small and medium-sized innovative enterprises and establish the production of aerial systems that meet global standards of competitiveness and are suitable for contemporary warfare. This achievement is, on the one hand, the result of demand generated by the war. On the other hand, success in this area has been ensured by mobilizing Ukraine's accumulated scholarly research,

experimental design, and engineering capabilities to form an effective supply response. This capacity has been realized on the basis of previously developed rocket and space technologies and a strong aviation industry, which was capable of producing the world's largest competitive transport aircraft.

Additional opportunities of a similar nature exist and further illustrate the successful realization of Ukraine's world-class potential, particularly in the development of information and communication technologies (ICT). By their performance characteristics and export scale, Ukraine's ICT services sector already ranks among the world's top ten countries in this domain. These examples demonstrate that Ukraine possesses substantial potential for economic growth based on innovation. At the same time, Ukraine ranked 66th in the 2025 Global Innovation Index, while Estonia ranked 16th, owing to effective digital governance, startup ecosystem development, and sustained investment in education [18]. This comparison underscores the need for systemic improvements in innovation policy and practice.

In Ukraine, "…the weak side (referring to innovation activity) is partly associated with a narrow understanding of innovation, particularly from the perspective of public policy … rather than with the diffusion of innovation as a means of sustainable development. Such a perception overlooks a major share of the innovation potential" [19] already accumulated in the country and, accordingly, the issue of its commercialization. This problem will be examined in subsection 2 of this study.

In the research works of Slavo Radosevic on the functioning of innovation systems, it is noted that "…the main share of innovation potential in the sub-region (which includes Ukraine — V.H.) lies outside this narrow approach, in areas such as improvements in productive capabilities, technological design, business models, or platform capacity. A platform generates demand and supply for new types of activities" [9]. It should be emphasized that Ukraine is currently developing the conditions necessary to apply a platform-based ideology for economic recovery on an innovation-driven basis, thereby creating opportunities to expand both demand and supply, including for new types of economic activities.

According to experts of the United Nations Economic Commission for Europe, the majority of innovations emerge through the use of existing ideas, business models, and technologies that are adapted and modified as needed [19, p. 9]. At present, a new initiative in this direction for Ukraine is the establishment, according to available data, of eleven specialized platforms whose combined scope and functions can — and should — be integrated into a single Economic Reconstruction Platform for Ukraine (its structure and components are presented in Table 1 below).

Platforms of the above scale are the most systemically organized and, at present, the most comprehensively developed instruments for achieving the goals of Ukraine's post-war development. An analysis of the functional orientation of platforms already operating in Ukraine — such as *Rozetka,* marketplace platforms, *Diia*, *Monobank*, and *Nova Poshta* — has demonstrated that platform solutions genuinely open new opportunities for economic development at the national, regional, and enterprise levels and are inherently innovation-driven.

The above-mentioned Economic Reconstruction Platform of Ukraine represents a system of specialized platforms. Each platform is innovative in its orientation and contributes to a holistic perception of innovation not only in economic processes but also in social and even cultural revitalization. Its implementation requires and encourages the use of an innovation culture, the content of which is defined by Ukrainian legislation. An analysis of the strategic orientation of the platforms already launched to support Ukraine's recovery and development indicates that a platform-based framework for post-war development is already emerging, envisaging broad engagement of foreign investment.

Within the framework of the specialized platform for Ukraine's economic recovery — the *Ukraine Recovery Conference* (URC) — held in Lugano (2022), London (2023), Berlin (2024), and Rome (2025) [48] (see Table 1), it is proposed that Ukraine's econo-

Table 1. **Content and Structure of the Platform for the Economic Recovery of Ukraine**

Special-purpose platform	Target directions of special purpose platform
The *Ukraine Recovery Conference* (URC) has been held in Lugano (2022), London (2023), Berlin (2024), and Rome (2025) [20, 21] At the Ukraine Recovery Conference 2025 in Rome, an initiative to establish *Recovery Coalition* — a European flagship fund for Ukraine's reconstruction — was presented	At the *Ukraine Recovery Conference* 2025 (URC-2025), 18 new programs were announced to attract private capital, with a particular focus on supporting small and medium-sized enterprises In addition to the 18 programs presented, cooperation has been expanded with the U.S. International Development Finance Corporation (DFC); guarantees from Multilateral Investment Guarantee Agency (MIGA) have been broadened; and new agreements have been concluded with European export credit agencies and development banks. Privatization initiatives are being prepared, accompanied by the presentation of an investment catalog comprising 250 projects valued at approximately USD 40 billion The *Create Ukraine* program continues, and an agreement is being prepared for Ukraine's accession to the European Social Fund to support entrepreneurship development and a range of social initiatives, including retraining and reskilling programs within Ukraine
The *Ukraine Facility Platform* [22—24] a dedicated instrument designed to support financing for Ukraine's reconstruction needs for the period 2024—2027, consisting of three components	**Component 1** — public administration reform, good governance, the rule of law, anti-corruption measures, and sound financial management **Component 2** — designed to attract and mobilize public and private investment **Component 3** — technical assistance focused on mobilizing reform expertise and supporting municipalities and civil society
The *Made in Ukraine* Platform [25] partial compensation of 15% of the cost of equipment manufactured in Ukraine with a localization level of at least 40%; incentives to support the development of industrial parks	Support for domestic manufacturers and stimulation of demand for Ukrainian-made products, contributing to the creation of new jobs; founders receive funding for the construction of engineering and transport infrastructure or compensation for electricity connection costs
Affordable Loans 5—7—9% [26, 27] — a government support program for domestic businesses	**Two objectives:** investment and working capital financing **Distribution by sector:** 45% — agriculture (preferential loans) 24% — trade 21% — industry 7% — services 2% — construction **Support recipients:** 53% — microenterprises 30% — small enterprises 12% — medium enterprises 5% — large enterprises
Ukraine Development Fund [28] Established by a private investor with capital of USD 15 billion and registered in Luxembourg. BlackRock and JPMorgan will help form public-private enterprises	The fund is focused on supporting government institutions and capital markets

End of Table 1

Special-purpose platform	Target directions of special purpose platform
Ukraine Investment Framework (UIF) [29—31] A major EU initiative to support investments in Ukraine	It finances critically important projects in the public sector — including energy efficiency, transport, housing and utilities, and education — as well as small and medium-sized enterprises for municipal investment needs, in accordance with Public Investment Management (PIM) reform requirements. Submission of projects to the Single Project Pipeline (SPP) is mandatory
Ukraine Energy Support Fund [32] Established to provide international assistance in the energy sector to companies across all regions of Ukraine	The fund brings together donors from 22 countries — including governments, private companies, corporations, and international organizations — to support Ukrainian energy companies
Joint Weapons Production [33] Under the slogans "Buy in Ukraine for Ukraine" and "Build Together with Ukraine," factories are being established in Western countries to operate under licenses from Ukrainian arms manufacturers	Western partners have shown the greatest interest in investing in drones. For example, following the "Danish model," a consortium in Finland, Summa Defense, has created a production facility in collaboration with four Ukrainian companies. Drones produced there will be supplied to Ukraine, the EU, and NATO. The United Kingdom is also focusing on domestic drone production The United States, France, Croatia, Lithuania, the Netherlands, Germany, and Canada are actively organizing drone manufacturing. Ukraine has launched the Defence City program to develop joint weapons production with international partners, both within Ukraine and in Ramstein partner countries [34—36]
Investment Platforms for Ukraine [37, 38] In accordance with a memorandum with the European Bank for Reconstruction and Development and Development Finance Institutions (DFIs), investment platforms have been coordinated in Ukraine	The DFIs and EBRD plan to expand the number of participating institutions from different countries On May 12, 2023, in Tokyo, the DFIs, G7 countries, and EBRD agreed to establish a Co-Investment Platform based on identified needs within the framework of the Interagency Donor Coordination Platform for Ukraine
U.S. — Ukraine Reconstruction Investment Fund [39—45] Established under a bilateral agreement with equal participation by both parties	Ukraine shall allocate 50% of future revenues from new royalties on licenses for new sites to the fund. The fund invests in projects related to mineral extraction, oil and gas, associated infrastructure, and processing. The agreement covers 57 types of enterprises
e-Oselia (Home) Government program [46] *e-Recovery* [47]	Program providing accessible mortgage financing with interest rates ranging from 3—10% Program for compensation and improvement of housing

mic policy prioritize the attraction of private capital, including through large-scale privatization initiatives with innovation-oriented investment prospects. These initiatives encompass approximately 250 projects across 11 sectors of the economy, with an estimated value of USD 40 billion. At the same time, the limited capacity of Eastern European countries to attract foreign direct investment into entirely new sectors aimed at global market entry must be taken into account, which also applies to Ukraine. As noted in the research of Rajneesh Narula and Henk W. M. G. Gimeno [7], a more practical approach involves concentrating efforts on the activities of existing subsidiaries of foreign inves-

tors operating within the country. The authors also emphasize that each country requires a distinct combination of innovation policy instruments, depending on its technological and institutional profile across specific sectors of economic activity.

Ukraine and its economy, operating within the framework of industrial activity in the second half of the twentieth century and the early twenty-first century, have accumulated extensive experience in the use of imported technologies and equipment and in export–import operations. At the same time, the country possesses a developed system of R&D institutions, including academies of sciences, sectoral research and design institutes, and higher education institutions that collectively conduct national R&D and train highly qualified personnel — doctoral and candidate degree holders — for high-technology sectors such as aviation, aerospace, nuclear energy, ICT, chemistry, and selected branches of mechanical engineering. This accumulated innovative experience creates the conditions for further modernization by combining knowledge embedded in imported technologies with the development of competitive new industries based on Ukraine's national R&D achievements, including those capable of competing in global markets.

The integration of results from national R&D with accumulated knowledge embodied in imported technologies corresponds, in the classification proposed by Slavo Radosevic, to the potential implementation — during Ukraine's post-war recovery — of the third stage of technological modernization. At this stage, opportunities emerge to utilize national knowledge assets accumulated in equipment, technologies, managerial practices, the population's innovative capabilities, and its skill base. Their combined use can become the dominant component of innovation-driven economic activity. This is particularly important given findings by the United Nations Economic Commission for Europe indicating that countries such as Ukraine continue to rely on a limited range of products and export markets and exhibit a low level of export sophistication, reflecting a significant divergence from global dynamics.

The war has destroyed a substantial number of enterprises specializing in traditional activities associated with the second and third technological paradigms. In the post-war period, Ukraine faces a strategic challenge that may evolve along two alternative paths.

War is not a form of creative destruction — the concept embedded in modern growth theory — but rather a devastating destruction of Ukraine's productive forces, accompanied by loss of life and labor outflows. The resulting losses coexist with new opportunities, although these arise not because of, but despite, the mechanisms commonly associated with creative destruction. During post-war recovery, it is critically important to avoid a return to stagnation-inducing processes; therefore, reconstruction must simultaneously ensure the deployment of innovation-driven opportunities in rebuilding the economy.

One approach involves restoring activities that rely on traditional technologies, with the potential to improve the recovery of processes based on corresponding research and development (R&D). Another pathway for addressing post-war reconstruction challenges lies in promoting the development of production focused on the creation of new products through the practical implementation of outcomes from national R&D initiatives.

From a strategic perspective, the first approach may allow relatively rapid recovery, leveraging existing expertise and skills while incorporating opportunities for their improvement. However, over time, the potential for enhancing traditional techniques and technologies is limited, especially when compared to the benefits of creating new products and establishing their production through mechanisms supporting startup activities. Startups, as noted, "…play a central role in transforming laboratory discoveries into commercial products" [6]. Therefore, it becomes crucial to activate the potentially untapped fundamental research within Ukraine's academy system, particularly the National Academy of Sciences of Ukraine (NASU), through commercialization efforts.

COMMERCIALIZATION AND PRIORITIZATION OF STRUCTURAL CHANGES IN RESEARCH AND DEVELOPMENT

Expanding the activities of academic research institutions toward the commercialization of R&D outcomes — especially those with the highest current readiness for practical application — can, over time, substantially transform the prevailing research-to-business model. This transformation reshapes how research is conducted and results are translated into business applications, thereby altering the pre-existing system. Such development strengthens and broadens the linkages between science and business, enhancing the practical impact of scholarly research.

Over time, small but successful initiatives within research or design organizations — where innovation is initiated and implemented — may be sold to large enterprises to scale the startup to a global market. Large businesses possess the financial, organizational, and human resource capacities to execute such endeavors successfully, although not always without challenges.

Implementing innovative projects within institutes that are part of NASU will create opportunities for future increases in R&D expenditure, both within the institute itself and among its real business partners. For example, in 2016, enterprises in the pre-war period spent 2.3 times more on R&D per employee than the public sector and 5.9 times more than the higher education sector. Despite the war, in 2024, this lead persisted, as the R&D expenditure of the enterprises exceeded more than 2.5 times that of the public sector and 4.2 times the expenditure of the higher education sector.

This trend indicates that the expected commercialization of research within state-funded institutions, particularly in the NASU system, not only opens avenues for increased investment in science and development but also serves as a motivating factor for the return of research personnel who were forced to emigrate. This is particularly important given evidence suggesting that reintegration of scholarly research activity in Ukraine will face significant challenges [49].

The integration of science and business is important not only for expanding the technical, technological, organizational, and financial capabilities of both research institutions and their staff, but also for shortening the time from scientific discovery to production and enhancing overall labor productivity in the economy. This increased effectiveness elevates the productive activity of researchers involved in commercialization through science-business collaboration.

Studies conducted at the Institute for Economics and Forecasting of the NASU on this topic indicate that the citation impact of researchers engaged in science-business collaboration exceeds that of researchers without such engagement by more than tenfold in Ukraine (Table 2). A similar pattern is observed in the European Union, although the magnitude of the difference is approximately half as large.

The pathway of science-business interaction outlined above can, to some extent, mitigate Ukraine's existing constraints in increasing investment in science, including enabling the expansion of the research and development workforce by at least 30,000 employees [50]. It will also reduce the time required for the practical application of R&Ds.

Globally, R&D expenditure as a share of GDP has averaged around 3%, although this figure varies across time and regions. In 2021, the global average was approximately 2.8%, with Israel leading at 5.76%, while Ukraine's share was only 0.38% of GDP (see Fig. 1). Within the European Union, it is generally recommended that R&D expenditure

Table 2. **Publication Activity of Ukraine and the EU, 2022—2024**

Activity	Citations per publication		Field-Weighted Citation Impact	
	Ukraine	EU	Ukraine	EU
Science-Business Collaboration	32.8	11.6	6.9	1.96
Science-Business Collaboration Is Absent	3.0	6.3	0.75	1.09

Source: data on collaboration indicators [50].

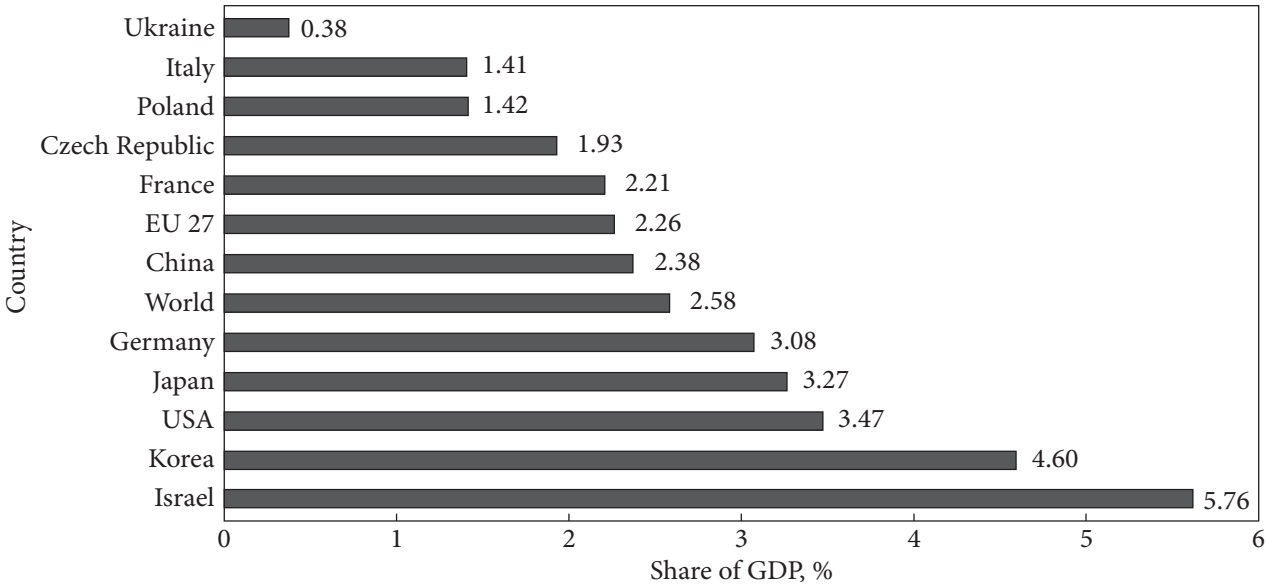

Fig. 1. Share of R&D expenditure in GDP across countries in 2021, %
Source: based on [51—53].

be maintained at around 3% of GDP. Significant cross-country differences exist not only in the volume of R&D spending but also in its composition (Table 3).

Data from Table 3 indicate that the United States, as a global technological leader, reduced its expenditure on fundamental research in many respects over the period 2010–2022. Israel shows a similar pattern, despite having achieved a high level of technological performance and one of the highest national R&D expenditure relative to GDP (Fig. 1). Table 3 also shows that several European countries have either maintained or only slightly reduced the share of spending allocated to fundamental research.

Table 3. **Share of Basic R&D in Total R&D Expenditure, %**

Country	Year			
	2010	2015	2020	2022
France	25.2	24.3	22.9	20.3
Italy	25.6	24.1	22.0	24.1
Poland	29.2	32.0	33.6	27.8
Czech Republic	29.8	31.4	27.2	25.4
Israel	**13.0**	**12.1**	**9.3**	**7.1**
China	**4.8**	**5.0**	**5.9**	**6.4**
Korea	18.2	17.2	14.4	15.1
USA	18.8	16.6	15.5	14.3
Japan	12.3	12.0	12.2	12.1
Ukraine	**22.1**	**24.1**	**25.0**	**23.9**

Source: based on [51, 53].

Nevertheless, as of 2022, the proportion of spending on fundamental research in many European countries remained nearly twice as high — or even more — compared to the United States, Japan, and Israel. In Israel, by 2022, the share of expenditure on fundamental R&D had fallen to a level three times lower than that observed in selected European countries. In countries such as Poland and the Czech Republic, over one-quarter of R&D spending is devoted to fundamental research, although overall R&D expenditure relative to GDP remain below the global average.

This demonstrates that some countries, while lagging behind global averages in total R&D spending relative to GDP, allocate a comparatively larger share of these funds to fundamental research,

even without being technological leaders like the United States, Japan, or South Korea.

Regarding Ukraine, data from Fig. 1 and Table 3 show a pronounced lag in both the volume of R&D spending and its structure relative to countries such as Israel, which, despite facing frequent threats of air strikes, maintains a significantly more balanced and higher level of R&D investment relative to GDP. Specifically, Ukraine allocates more than three times the share of R&D funding to fundamental research compared to Israel, yet its total R&D expenditure is 15 times lower. Analysis of the data in Fig. 1 and Table 3 suggests a certain inefficiency in the financing of research and development in Ukraine.

Primarily, to address the identified inefficiencies in the level and structure of R&D funding, it is necessary to increase investment to a target of three percent of GDP. However, such an increase should not be an end in itself. Changes must be guided by strategic priority areas and the applied prospects for the further development of science and technology, in line with international experience, while strengthening the state's role both in financing scholarly research and in supporting mechanisms for subsidizing innovative developments.

At the same time, the determination of these priorities should be based on R&D foresight. Ukraine has experience in periodically conducting such foresight exercises, including under wartime conditions. In particular, in 2024, a Ukrainian R&D and technology foresight was developed and published, reflecting appropriate shifts in research priorities that occurred over the previous three years due to the challenges of the full-scale war and global trends in science and technology development [54]. Given the ongoing large-scale efforts to define pathways for ensuring the successful future of the Ukrainian economy, it is now appropriate to begin developing a foresight specifically focused on the scientific support of decision-making at the highest state level. Consequently, the defined priorities will also determine the structure of funding, both in terms of research directions and the balance between fundamental and applied R&D.

It is also important to note that, as funding levels increase and their structure changes, measures must be taken to enhance the impact of scholarly research on economic performance, particularly through reforms in science-business interaction practices. This need arises from Ukraine's classification as a "modest innovator" according to the European Innovation Scoreboard, which is the lowest tier in the current ranking. However, according to global competitiveness indices, such as the availability of a highly educated workforce, Ukraine possesses the potential to support post-war recovery based on advanced technological foundations.

At the same time, data from the Ukrainian Institute of R&D Expertise and Information and international assessments of Ukraine's innovation performance from 2010—2019 indicate a decline across all indices. Yet, even amid wartime conditions, as of 2025, opportunities exist to expand

Table 4. **Structure of Advanced R&Ds of the NAS of Ukraine by Level of Readiness for Use (TRL), % of the Total**

Field	Total	TRL		
		1—3	4—6	7—9
Total Including:	205	5.4	57.6	37.1
Energy and Energy Efficiency	40	0.5	8.8	10.2
Technologies for Structural and Functional Materials	34	2.4	9.8	4.4
Medical Products and Medical Device Engineering	33	2.0	7.8	6.3
Mechanical Engineering and Instrumentation	27	0.0	6.8	6.3
Ecology and Environmental Protection	19	0.5	6.8	2.0
Information Technologies	13	0.0	2.9	3.4
Information and Sensor Systems and Devices	12	0.0	2.9	2.9
Technologies and Equipment for Mineral Exploration, Assessment, and Extraction	12	0.0	2.9	2.9
Others		0.0	6.2	1.1

Source: based on [55].

innovative activity within the NASU, particularly by leveraging existing R&D outputs. In 2024, there were 3,739 active protection documents covering promising scientific and analytical developments.

Furthermore, the structure of NASU's advanced R&Ds at the highest readiness levels (TRL 7—9) (Table 4) demonstrates that over one-third (37.1%) of these projects are ready for implementation, including developments relevant to key sectors of the manufacturing industry.

The data indicate that over 200 national developments from the NASU, protected by intellectual property rights, have the potential, once commercialized, to reduce Ukraine's exogenous dependence on dominant imports relative to its exports of both technology and technical equipment.

Before the war, the implementation of projects strategically important for Ukraine's industrial activity, based on innovative developments, faced several significant shortcomings. In particular, the funding needs of selected state-supported innovation projects, for example in 2021, exceeded the available budget nearly twentyfold. Moreover, formalized criteria and mechanisms for managing state projects were largely absent, professional managerial capacity for large-scale projects within state institutions was insufficient, and the competence of independent expert evaluations was often questionable.

Despite the wartime conditions, Ukraine completed the establishment of new mechanisms for state support of major investment projects and for co-financing public investment projects during 2023—2024. A model has also been established for concentrating resources on financing public investment projects in 2025—2027, including the following sources:

- Loans from foreign states, international financial institutions, and organizations (UAH 59.2 billion in 2025; UAH 17 billion in 2026; UAH 30.3 billion in 2027);
- Funds from the general state budget (UAH 25 billion annually from 2025—2027);
- Resources obtained under the Ukraine Facility (Component II) for investment in priority sectors (UAH 6.97—300 billion in 2025—2027);
- Resources from the Road Fund (a special state budget fund), excluding expenditure related to road maintenance and debt obligations of the Agency for Restoration and Development of Infrastructure (UAH 41.2 billion in 2025; UAH 106 billion in 2026; UAH 199.7 billion in 2027).

Priorities for 2025—2027 have been identified in the fields of energy, critical infrastructure protection, and energy-related projects, including:

- Improving electricity transmission efficiency (integration of Ukraine's united energy system with the European interconnected system, phases III and IV);
- Establishing a comprehensive system for handling reactive materials generated during decommissioning of power units and the reconstruction of the "Shelter" object;
- Enhancing energy efficiency of public buildings across Ukraine.

The new public investment project (PIP) system specifies requirements for comprehensive professional scientific support, encompassing both the authors of innovative developments and experts in economics and finance. As a result, the new PIP requirements address and minimize the deficiencies in project preparation and implementation that were noted in previous assessments.

This approach has created opportunities for the implementation of completed scholarly research and the development of innovative applications with practical significance through expanded science-business collaboration.

Currently, several institutes within the NASU are initiating projects based on completed, innovation-ready developments that are prepared for practical application through industrial-scale implementation. Notably, this includes the commercialization project of the O. V. Palladin Institute of Biochemistry, which aims to establish the production of fibrin gel and collagen matrices as wound-healing agents. The project has achieved a readiness level of IRL 7.

The objective of this project is to produce, at the specified center, innovative hemostatic agents —

specifically *Carbogemostat*, *Fibrin Gel*, and *Collagen Matrix* — which demonstrate superior effectiveness [56] compared to existing hemostatic products and substitutes.

The need and prospects for such a project are driven by both national and global factors. In Ukraine, the necessity of establishing domestic innovative production of critically important hemostatic products has significantly increased under martial law, due to the sharp rise in demand for modern hemorrhage-control devices resulting from elevated trauma levels among military personnel and civilians.

At the global level, healthcare expenditure is projected to rise, the pharmaceutical market is expanding, and the hemostatic products segment is developing rapidly. This growth is driven by increasing global demand for modern medical technologies and services, rising prevalence of traumatic injuries, and greater demand for surgical interventions.

Despite a post-pandemic decline in the global public healthcare expenditure to 9.9% of GDP in 2022 [57, 58] — a reduction of 0.9% of GDP as compared with 2021 — WHO forecasts an increase in global healthcare spending to 2040 by 2.6% of GDP [59]. The temporary reduction in healthcare spending priority has occurred amid a gradual return to austerity policies following peak pandemic-related expenditure growth, when the healthcare system was the state's primary funding priority.

A major driver of rising global healthcare expenditure in the medium term is the rapid impact of technological progress in the medical sector. Under these conditions, investments in the modernization of core equipment and the digital transformation of healthcare systems are expected to require, on average, an additional 0.4% of GDP [59].

The prospects for establishing innovative domestic production of hemostatic agents in Ukraine also align with global trends in the growing pharmaceutical market, which reached a value of USD 2.4 trillion in 2024 [60] and is projected to increase to USD 4.1 trillion by 2035, corresponding to an average annual growth rate (CAGR) of 5% over the forecast period.

The Institute for Economics and Forecasting of the NASU conducted a scenario-based forecast assessment of the project *Establishment of a Chromatography Center for Biotechnological Production of Innovative Hemostatic and Wound-Healing Agents* in collaboration with the O. V. Palladin Institute of Biochemistry, NASU. The analysis considered three scenarios based on different procurement strategies for raw materials — specifically activated carbon fiber and collagen — from various countries, including the United States, the European Union, and China, for the production of innovative hemostatic agents over a five-year period.

The analysis demonstrates that the project exhibits high levels of economic efficiency, investment profitability, and short payback periods, ranging from 2.3 to 3.5 years depending on the scenario, assuming implementation as a public investment project with a public investment volume of UAH 50 million.

Beyond its potential economic efficiency, the implementation of this project is expected to generate additional budgetary benefits for the state through the operations of the chromatography center, the production and sale of innovative hemostatic agents, and the associated collection of taxes and contributions.

In addition to economic and budgetary benefits, the project holds significant social value for Ukraine. The O. V. Palladin Institute of Biochemistry, NASU, emphasizes its potential to improve the effectiveness and quality of medical care in the context of military field medicine, as well as enhance healthcare delivery in civilian medical institutions.

Following the approach outlined above, projects are underway for the production of fibrin gel and collagen matrices, as well as for the commercialization of several other innovative developments from NASU institutes, including:

- Dielectric materials for microwave equipment. Readiness level: IRL 7, TRL 7 (V.I. Vernadsky Institute of General and Inorganic Chemistry, NASU);
- Integrated equipment and technology for producing high-quality ingots and specialized profi-

les from deformable aluminum alloys. Readiness level: IRL 9, TRL 9 (Physical-Technical Institute of Metals and Alloys, NASU);
- High-capacity thermal energy storage units. Readiness level: IRL 7, TRL 7 (Institute of Technical Thermophysics, NASU);
- Heat storage and accumulation systems. Readiness level: IRL 8, TRL 7 (Institute of Technical Thermophysics, NASU);
- Gas-fired power plants and cogeneration units. Readiness level: IRL 8, TRL 9 (Institute of Gas, NASU);
- Briquetting equipment with extended operational life. Readiness level: IRL 8, TRL 8 (Z.I. Nekrasov Institute of Ferrous Metallurgy, NASU).

During the execution of these projects, NASU's innovative R&Ds are prioritized, and their commercialization will be carried out with economic justification, expert evaluation, and patent support. Through these projects, experience will be gained in realizing the accumulated potential of NASU's innovations and expanding it across Ukraine, including for research institutes of other national academies.

As a result, we can assert that:
- Transformational changes in economic and innovation activities, driven by liberalization and market transition, have, on one hand, led to developmental losses by partially primitivizing the economic structure, increasing exogenous dependence on resources, technology, and engineering equipment; on the other hand, these changes have set the stage not only for post-war reconstruction but also for a technologically and innovatively driven recovery, leveraging primarily the existing technological potential developed through national R&D and the human capital with world-class education levels;
- The "new reality" on a global scale, characterized by uncertainty and instability, underscores the importance of promoting endogenous features in the interaction of innovation activities within the economy. This approach aims to overcome existing exogenous dependencies by leveraging the accumulated innovation potential generated through national R&D, primarily via the commercialization of research projects.
- Strategically, the post-war reconstruction of Ukraine's economy based on traditionally dominant activities, even with opportunities for improvement, offers limited long-term prospects for economic growth due to their inherent exhaustibility. This orientation highlights the need for a long-term strategy focused on creating new products through the expansion of national startup activity, which plays a crucial role in accelerating the transition of inventions from the laboratory to the market.
- The structure of NASU's advanced R&D assets, at the highest readiness levels, includes more than 200 developments ready for implementation across key areas: energy and energy efficiency (40 projects), constructional and functional materials technology (34 projects), medical devices and healthcare technologies (33 projects), environmental protection and ecology (19 projects), among others. These assets provide a strong foundation for expanding NASU's participation in the practical application of research through enhanced commercialization practices, utilizing existing public investment mechanisms.

Funding. This work was carried out within the framework of the research project *Development of Methodological Principles for the Economic Justification of NASU Investment in R&D Projects* (Contract No. 1, March 17, 2025).

REFERENCES

1. Kostyuk, B. (February 2006). The United States granted Ukraine the status of a country with a market economy. URL: https://www.radiosvoboda.org/a/940304.html (Last accessed: 18.10.2025).
2. Berger, P. L. (1995). *The Capitalist Revolution: Fifty Proposals for Prosperity, Equality, and Freedom:* monograph. Kyiv [in Ukrainian].

3. Papanek, G. F. (1968). *Development Policy. I: Theory and Practice*. Harvard University Press.
4. Rostow, W. W. (1960). The Stages of Economic Growth. URL: https://www.cia.gov /readingroom/docs/CIA-RDP78-03062A001100030001-6.pdf (Last accessed: 30.05.2025).
5. Chalmers, J. (1995). Japan: Who governs?: the rise of the developmental state. New York: Norton. URL: https://archive.org/details/japanwhogovernsr00john/page/8/mode/2up (Last accessed: 28.04.2025).
6. Frey, C. B. (September 2025). How the Battle for Control Could Crush AI's Promise. *Finance & Development Magazine*. URL: https://www.imf.org/-/media/files/publications/fandd/article/2025/09/frey.pdf (Last accessed: 15.10.2025).
7. Statistical Yearbook of Ukraine for 1999. State Statistics Committee of Ukraine (Ed. O.G. Osaulenko). 648 p. [in Ukrainian].
8. Law of Ukraine "On priority areas of innovation activity in Ukraine." (January 2024) [in Ukrainian]. URL: https://zakon.rada.gov.ua/laws/show/3715-17#Text (Last accessed: 02.08.2025).
9. Radosevic, S. (2017). *Upgrading technology in Central and Eastern European economies.* IZA World of Labor. Institute for the Study of Labor (IZA), Bonn. https://doi.org/10.15185/izawol.338
10. Radosevic, S. (Ed.). (2015). *Synthesis Report: WP3. Innovation, Entrepreneurship and Industrial Dynamics.* Technology Upgrading and Innovation Policy in Central and Eastern Europe. GRINCOH Working Paper Series, Paper No. 3.
11. *National economy of the USSR in 1985: Stat. Yearbook.* (1986). Central Committee of the USSR. Moscow [in Russian].
12. *National economy of the USSR in 1960: Stat. yearbook*. (1961). Moscow [in Russian].
13. Strumylin, S. G. (1960). *Essays on the economic history of Russia.* Moscow [in Russian].
14. *National Economy of the Ukrainian SSR in 1989: Statistical Yearbook*. (1990). Kyiv [in Ukrainian].
15. *Statistical Yearbook of Ukraine for 1996.* (1997). Kyiv [in Ukrainian].
16. Commodity structure of Ukraine's foreign trade. State Statistics Service of Ukraine. URL: https://stat.gov.ua/uk/datasets/zovnishnya-torhivlya-tovaramy-misyachna-kvartalna-operatyvni-dani (Last accessed: 01.10.2025).
17. Narula, R., Guimon, J. (2009). The contribution of multinational enterprises to the upgradion of national innovation system in the EU new member states: policy implication. *VIII Global Forum on International Investment. OECD*. URL: https://www.researchgate.net/publication/237219544_The_contribution_of_multinational_enterprises_to_the_upgrading_of_national_innovation_systems_in_the_EU_new_member_states_policy_implications (Last accessed: 12.09.2025).
18. Global Innovation Index 2025. Geneva: *WIPO*. URL: https://tind.wipo.int/record/58864?ln=ru&v=pdf. https://doi.org/10.34667/tind.58864 (Last accessed: 30.09.2025).
19. Sub-regional Innovation Policy Outlook 2020: Eastern Europe and the South Caucasus. *United Nations.* (2021). Geneva. URL: https://unece.org/sites/default/files/2021-06/UNECE_Sub-regional_IPO_2020_Publication.pdf (Last accessed: 16.03.2025).
20. Ukraine Recovery Conference Achievements and prospects for Ukraine. (June 21—22, 2023). *ONOVA*. URL: https://onova.org.ua/news/ukraine-recovery-conference-2023-dosiahnennia-ta-perspektyvy-dlia-ukrainy (Last accessed: 16.03.2025).
21. Results of the Ukraine Recovery Conference — 2024: international aid and agreements worth over 16 billion euros signed and announced (June 12, 2024). Ministry of Economy. URL: https://me.gov.ua/News/Detail?lang=uk-UA&id=93cc36ca-2ede-4b7b-9548-4f1dcfca69df&title=RezultatiURC2024; https://interfax.com.ua/news/general/1086375.html (Last accessed: 17.08.2025).
22. Ukraine has fulfilled 25 indicators of the Ukraine Facility plan, — the Ministry of Economy reports the results. (November 11, 2024). *Judicial and Legal Newspaper in Ukraine*. URL: https://sud.ua/uk/news/ukraine/315294-ukraina-vypolnila-25-indikatorov-plana-ukraine-facility-minekonomiki-otchityvaetsya-o-rezultatakh (Last accessed: 17.08.2025).
23. 50 billion euros from the EU for recovery. What should Ukraine do? (June 22, 2023). URL: https://zn.ua/ukr/macroeconomics/50-miljardiv-jevro-vid-jes-na-vidnovlennja-shcho-maje-zrobiti-ukrajina.html (Last accessed: 14.06.2025).

24. Plan for the implementation of the Ukraine Facility 2024—2027. (2024). Ministry of Economy. URL: https://www.ukrainefacility.me.gov.ua/ (Last accessed: 14.06.2025).
25. Made in Ukraine: agricultural machinery and equipment with 25% compensation — already 14 thousand items. (August 15, 2025). Ministry of Economy. URL: https://me.gov.ua/News/Detail/844997b4-a688-4d97-867d-7a3ee8b6a530?lang=uk-UA&title=ZroblenoVUkraini-AgrotekhnikaTaObladnanniaZKompensatsiiu25-Vzhe14-TisiachNaimenuvan (Last accessed: 17.08.2025).
26. Every fifth "Affordable Loan" was issued to a business in a high-risk war zone: who else receives such loans in Ukraine? (April 15, 2024). URL: https://zn.ua/ukr/ECONOMICS/kozhen-pjatij-dostupnij-kredit-vidano-biznesu-v-zoni-visokoho-vojennoho-riziku-khto-shche-otrimuje-taki-krediti-v-ukrajini.html (Last accessed: 20.06.2025).
27. Available credits 5—7—9: what we have in the fourth year of the war. (June 12, 2025). URL: https://delo.ua/news/dostupni-krediti-5-7-9-shho-mi-majemo-na-cetvertomu-roci-viini-447818/ (Last accessed: 14.06.2025).
28. Private investors will create a $15 billion fund for the recovery of Ukraine. (March 14, 2024). URL: https://mind.ua/news/20270912-privatni-investori-stvoryat-fond-na-15-mlrd-dlya-vidnovlennya-ukrayini (Last accessed: 16.07.2025).
29. The European Commission held a meeting of the Ukraine Investment Framework Steering Board and approved new projects. (Juny 19, 2025). Ministry of Community and Territorial Development of Ukraine. URL: https://mindev.gov.ua/news/yevrokomisiia-provela-zasidannia-kerivnoi-rady-ukraine-investment-framework-i-zatverdyla-novi-proiekty (Last accessed: 29.06.2025).
30. Mechanisms for financing investments in Ukraine within the framework of the Ukraine Investment Framework (Ukraine Facility II pillar). (2024). URL: https://www.ukrainefacility.me.gov.ua/wp-content/uploads/2024/06/ukraine-investment-framework.pdf (Last accessed: 20.04.2025).
31. New EU investment package will help Ukraine mobilize 10 billion — European Commissioner Kos. (July 11, 2025). URL: https://www.ukrinform.ua/rubric-economy/4014107-novij-paket-investicij-vid-es-dopomoze-ukraini-mobilizuvati-10-milardiv-evrokomisarka-kos.html (Last accessed: 16.07.2025).
32. The Energy Support Fund of Ukraine is three years old: donor contributions have reached €1.2 billion. (April 22, 2025). Ministry of Energy of Ukraine. URL: https://mev.gov.ua/novyna/fondu-pidtrymky-enerhetyky-ukrayiny-try-roky-vnesky-donoriv-syahnuly-eu12-mlrd (Last accessed: 25.04.2025).
33. Joint arms production: which countries does Ukraine cooperate with? (July 19, 2025). URL: https://www.radiosvoboda.org/a/slipne-vyrobnytstvo-zbroia-ukraina/33475099.html (Last accessed: 20.07.2025).
34. Ukraine is preparing to launch the Defence City joint weapons production program with international partners by September. (June 27, 2025). URL: https://day.kyiv.ua/news/270625-ukrayina-hotuyetsya-do-zapusku-prohramy-spilnoho-vyrobnytstva-zbroyi-defence-city-z (Last accessed: 29.06.2025).
35. The launch of the Defence City project has been announced in Ukraine: what is known. (July 4, 2025). URL: https://finteco.com.ua/article/20100-v-ukraini-anonsovano-zapusk-proiektu-defence-city-shcho-vidomo/ (Last accessed: 05.07.2025).
36. Without aircraft manufacturing, there is no complete defense: why aviation should be in Defense City. (July 10, 2025). URL: https://unn.ua/news/bez-litakobuduvannia-nemaie-povnoi-oborony-chomu-aviatsiia-maie-buty-v-defence-city (Last accessed: 11.07.2025).
37. Reconstruction conference in London: 19 countries join co-investment platform in Ukraine. (June 26, 2023). URL: https://www.ukrinform.ua/rubric-vidbudova/3725945-konferencia-z-vidbudovi-u-londoni-do-platformi-spivinvestuvanna-v-ukrainu-dolucilisa-19-krain.html (Last accessed: 30.05.2025).
38. "Nobody just gives money like that." Marchenko spoke about the conditions of the financial "Ramstein" for Ukraine. (May 17, 2023). URL: https://gordonua.com/ukr/news/money/prosto-tak-groshi-nihto-ne-daje-marchenko-rozpoviv-pro-umovi-finansovogo-ramshtajnu-dlja-ukrajini-1664402.html (Last accessed: 05.08.2025).
39. Ukraine and the United States signed three documents at once on a subsoil agreement, — Politico. (May 1, 2025). URL: https://www.rbc.ua/rus/news/ukrayina-ta-ssha-pidpisali-odrazu-tri-dokumenti-1746114962.html (Last accessed: 02.05.2025).

40. What Ukraine and the USA signed: the text of the agreement, key conditions, what will happen next. (May 1, 2025). URL: https://www.rbc.ua/rus/news/shcho-pidpisali-ukrayina-i-ssha-tekst-ugodi-1746091849.html (Last accessed: 02.05.2025).
41. Agreement between the Government of Ukraine and the Government of the United States of America on the Establishment of the American-Ukrainian Reconstruction Investment Fund. (April 30, 2025). URL: https://zakon.rada.gov.ua/go/840_001-25 (Last accessed: 30.05.2025).
42. Order of April 30, 2025 No. 416-r. (2025). Kyiv. On the signing of the Agreement between the Government of Ukraine and the Government of the United States of America on the establishment of the American-Ukrainian Reconstruction Investment Fund. URL: https://www.kmu.gov.ua/npas/pro-pidpysannia-uhody-mizh-uriadom-ukrainy-ta-uriadom-spoluchenykh-shtativ-ameryky-pro-t300425 (Last accessed: 30.05.2025).
43. Will the US have priority for the development of Ukrainian minerals: what the Ministry of Economy says. (May 8, 2025). URL: https://www.rbc.ua/rus/news/chi-bude-ssha-prioritet-rozrobku-ukrayinskih-1746693686.html (Last accessed: 10.05.2025).
44. Not before 2040: when will Ukraine begin extracting minerals under the Subsoil Agreement with the US. (May 13, 2025). URL: https://focus.ua/uk/economics/705900-ne-ranishe-2040-roku-koli-v-ukrajini-pochnut-vidobuvati-kopalini-v-ramkah-ugodi-shchodo-nadr-zi-ssha?utm_source=ukrnet_news (Last accessed: 17.05.2025).
45. The Ministry of Economy explained the management structure of the investment fund for the reconstruction of Ukraine and the United States. (May 28, 2025.) URL: https://sud.ua/uk/news/ukraine/332124-v-minekonomiki-obyasnili-strukturu-upravleniya-investfondom-vosstanovleniya-ukrainy-i-ssha (Last accessed: 30.05.2025).
46. Affordable housing mortgage lending program. URL: https://ukrfinzhytlo.in.ua/e-oselia/ (Last accessed: 09.09.2025).
47. Ministry of Community and Territorial Development of Ukraine. URL: https://mindev.gov.ua/proiekty/yevidnovlennia (Last accessed: 17.08.2025).
48. Ukraine recovery conference. URC2025. (10—11 July, 2025). URL: https://www.urc-international.com/#past (Last accessed: 12.07.2025).
49. Ganguli, I., Waldinger, F.(July 17, 2023). War and science in Ukraine. https://doi.org/10.3386/w31449. URL: https://www.nber.org/papers/w31449 (Last accessed: 07.08.2026).
50. SciVal. Elsevier B.V. URL: https://scival.com/ (Last accessed: 05.08.2025).
51. Main Science and Technology Indicators (MSTI database). OECD. URL: https://www.oecd.org/en/data/datasets/main-science-and-technology-indicators.html (Last accessed: 05.08.2025).
52. World Development Indicators. URL: https://databank.worldbank.org/source/world-development-indicators (Last accessed: 23.09.2025).
53. State Statistics Service of Ukraine. URL: https:// stat.gov.ua (Last accessed: 18.09.2025).
54. Ukrainian Scientific and Technical Foresight. (2024). G.M. Dobrov Institute for Research on Scientific and Technical Potential and History of Science, NAS of Ukraine. Kyiv [in Ukrainian]. URL: https://foresight.in.ua/UkrSciTechForesight2024.pdf (Last accessed: 25.09.2025).
55. Reference publication "Prospective scientific and technical developments of the NAS of Ukraine" (2017, 2019, 2022). Scientific and scientific and applied developments of the NAS of Ukraine. National Academy of Sciences of Ukraine [in Ukrainian]. URL: https://www.old.nas.gov.ua/RDOutput/UA/book2017/Pages/default.aspx (Last accessed: 25.09.2025).
56. Chernyshenko, V. O. (2021). Search and study of mechanisms of action of new biologically active compounds and biomaterials that affect blood clotting. (Doctoral dissertation). O.V. Palladin Institute of Biochemistry of the NAS of Ukraine, Institute of Molecular Biology and Genetics of the NAS of Ukraine. Kyiv. URL: https://imbg.org.ua/docs/specscicouncil/20210323/ Chernyshenko_disser.pdf [in Ukrainian] (Last accessed: 01.10.2025).
57. Global spending on health: emerging from the pandemic. *(*2024). World Health Organization. URL: https://iris.who.int/handle/10665/379750 (Last accessed: 01.10.2025).
58. Current health expenditure (% of GDP). World Bank Group. URL: https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS (Last accessed: 25.09.2025).

59. Fiscal Sustainability of Health Systems: How to Finance More Resilient Health Systems When Money Is Tight? (January, 2024). OECD. OECD Publishing, Paris. URL: https://doi.org/10.1787/880f3195-en (Last accessed: 22.10.2025).
60. Pharmacy Market. Roots Analysis. 2024. URL: https://www.rootsanalysis.com/reports/pharmacy-market.html (Last accessed: 01.10.2025).

Received 29.10.2025
Revised 30.10.2025
Accepted 30.10.2025

В.М. Геєць (https://orcid.org/0000-0002-2895-6114)

Державна установа «Інститут економіки та прогнозування
Національної академії наук України»,
вул. Панаса Мирного, 26, Київ, 01011, Україна,
+380 44 280 1234, gvm@ief.org.ua

КОМЕРЦІАЛІЗАЦІЯ ТА ПРІОРИТИЗАЦІЯ ІННОВАЦІЙНИХ РОЗРОБОК НАН УКРАЇНИ ЯК СКЛАДОВОЇ НАЦІОНАЛЬНОЇ ІННОВАЦІЙНОЇ СИСТЕМИ

Вступ. Функціонування національної інноваційної системи визначається розширенням можливостей підвищення її результативності через комерціалізацію пріоритетних інноваційних розробок НАН України, що мають найвищий рівень завершеності.

Проблематика. Актуальним є дослідження розв'язання проблемних питань розширення діяльності академічних науково-дослідних установ в частині комерціалізації результатів досліджень і розробок (ДіР), що суттєво трансформуватиме існуючу модель, за якою проводяться дослідження і пропонуються отримані результати до впроваджень у бізнес-середовищі.

Мета. Обґрунтувати можливості вдосконалення національної інноваційної системи України шляхом комерціалізації пріоритетних інноваційних розробок НАН України.

Матеріали й методи. Використано матеріали статистичних спостережень, публікації іноземних, національних дослідників та міжнародних організацій. Застосовано монографічний, аналітичний та порівняльний методи на базі соціальних та статистичних спостережень.

Результати. На основі аналізу пріоритетного характеру інноваційних розробок НАН України, які готові для практичного впровадження із використанням запропонованої Інститутом економіки та прогнозування НАН України методики підготовки проєктів для комерціалізації ДіР, охарактеризовано їхній зміст за видами діяльності.

Висновки. З метою подолання наявної в Україні обмеженості досвіду оцінювання перспектив пріоритизації, комерціалізації, економічного обґрунтування інноваційних проєктів, а також розрахунків ефектів їхнього промислового масштабування та патентного супроводу прав інтелектуальної власності на науково-технічні розробки з метою розбудови інноваційної системи в Україні доцільно розширити участь інститутів НАН України у комерціалізації ДіР на основі запропонованої методики Інституту економіки та прогнозування НАН України, започаткувавши діяльність академічних стартапів.

Ключові слова: економічна й інноваційна діяльність, трансформація, пріоритизація інноваційних розробок, ринок, комерціалізація, кровоспинні засоби, ранозагоювальні засоби, економічна та соціальна ефективність.