



GENERAL PROBLEMS OF THE MODERN RESEARCH AND INNOVATION POLICY

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KURBET, O. P. ¹ (<https://orcid.org/0000-0002-4519-0552>),
NEBRAT, V. V. ¹ (<https://orcid.org/0000-0002-5419-3181>),
GORIN, N. O. ¹ (<https://orcid.org/0000-0002-9110-9129>),
and **BODNARCHUK, T. L.** ² (<https://orcid.org/0000-0002-7682-487X>)

¹Institute for Economics and Forecasting
of the National Academy of Sciences of Ukraine,
26, Panasna Myrnoho St., Kyiv, 01011, Ukraine,
+380 44 280 1234, gvm@ief.org.ua

²Kamianets-Podilskyi Ivan Ohiienko National University, Ukraine,
61, Ohiiienka St., Kamianets-Podilskyi, 32300, Ukraine,
+380 3849 30513, post@kpnu.edu.ua

INTERNATIONAL EDUCATIONAL AND R&D INTEGRATION: TRENDS AND CHALLENGES FOR UKRAINE

Introduction. *In the context of the knowledge-based economy, technology and information have become key drivers of economic development, underscoring the growing importance of international educational and research integration.*

Problem Statement. *Integration into the global educational and R&D landscape is not an end in itself. Rather, it shall serve as a means to enhance national competitiveness in strategic sectors and to strengthen the global positioning of the national economy.*

Purpose. *This study aims to identify pathways and mechanisms for advancing Ukraine's integration into the global educational and R&D space, with consideration of current risks to the country's human capital and the strategic priorities of national economic development.*

Materials and Methods. *The research has employed comparative analysis, interdisciplinary synthesis, and a dialectical approach. The data analyzed span 2013–2023 and include sources from the UNESCO Institute for Statistics, the National Erasmus+ Office in Ukraine, Horizon 2020 program reports, the European Commission's assessment of Ukraine's national research and innovation system, and reports by the National University of Kyiv-Mohyla Academy.*

Results. *The study has identified key mechanisms for Ukraine's integration into the international educational and research environment. These include: (1) the development of international R&D cooperation; (2) the internationalization of higher education; and (3) institutional support for academic mobility. These mechanisms have been shaped by the country's unique circumstances, particularly the impact of pandemic-related restrictions and the ongoing full-scale Russian invasion.*

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Conclusions. Major trends in international educational and research integration include the expansion of academic mobility, the convergence of research and education through university participation in global projects and programs, increased engagement of Ukrainian scholars in international publishing, and the continued advancement of distance education and research. Key challenges include rising emigration, the proliferation of remote employment, constrained public funding, underdeveloped alternative funding sources for research, and safety concerns — all of which threaten the retention of human capital essential for innovation. The findings underscore the need for a coherent national policy aimed at leveraging international integration to secure long-term R&D and educational advantages for Ukraine.

Keywords: knowledge economy, international integration, education internationalization, R&D cooperation, academic mobility, R&D integration, Ukraine, European Research Area.

Integration into the global educational and R&D space is important and relevant for Ukraine, especially in terms of knowledge economy development, increasing economic and social competitiveness of the national economy, overcoming the lag in development, and implementing progressive and breakthrough technologies. Information, technology and new knowledge are becoming key drivers of economic development in the context of the knowledge economy. It is necessary to unite efforts in both of these areas in order to increase the positive effects in education and science. Education internationalization is an objective process in the context of global digitalization and the formation of the information society, because at the current level of theoretical and applied research, it is impossible to achieve success in an isolated space and local environment. At the same time, education internationalization and research integration take place in specific institutional forms. Therefore, the search for these institutional forms and their optimization in order to achieve socially significant goals is an urgent problem.

Nowadays, both communication with the international community and integration into the global R&D space are essential for acknowledging every researcher's professional development and qualification level. The study based on information available in the international scientometric database Web of Science showed that the number of mobile scientists who work on the international level is only 3.7%. However, this 3.7% has the most significant impact worldwide [1]. This fact makes the problem of international educational and R&D integration more relevant. Simulta-

neously, it becomes one more argument for increasing the professional level of Ukrainian researchers and professors using academic mobility as a tool of entry into the world level and promoting returning to the country of origin.

German researcher Teichler [2] has analyzed approaches to defining “internationalization” and “academic mobility”. He has found that the connection with border crossing had been a common thing for different interpretations of “internationalization” and singled out the six most widespread key meanings of “internationalization”. Among them, physical mobility along with international cooperation and communication are the most related to academic mobility [2, pp. 180–182].

Continuing this approach to defining academic mobility, Kurbet [3] has analyzed it as a modern form of R&D and educational internationalization, revealing the negative impact of COVID-19 on the mobility of students, academic and non-academic staff in Ukrainian universities. Kalenyuk and Djakon [4] have also analyzed the effect of Russia's war in Ukraine on academic mobility and on changing the landscape of European educational space. On the one hand, the pandemic led to increasing penetration of ICTs in educational processes that became the basis for so-called internationalization at home. On the other hand, two opposite processes appeared after the beginning of the full-scale war. Academic mobility from Ukraine has rapidly increased, due to unprecedented measures in supporting Ukrainian students and scholars by Western countries, while the Russian Federation was excluded from the Bologna Process and a number of international

opportunities, including grants and mobilities closed or suspended.

Larbi and Ashraf [5] have conducted research on the mobility of scientists, while Greek and Jonsmoen [6] have examined the impact of transnational academic mobility on university communities, in various countries. Godłów-Legiędź [7] has stressed the significance of academic freedom as one of the fundamental pillars for the successful development of a democratic society. Stalivieri and Vianna [8] justify the need for responsible internationalization of higher education and the introduction of new forms of cooperation. Huisman, Smolentseva and Froumin have summarized the changes in higher education and science in post-socialist countries [9]. Additionally, Sikorskaya [10], Liashenko, Pidorycheva and Antoniuk [11] have highlighted the challenges that Ukraine faces in integrating into the European educational and R&D community. Onyshchenko [12] and Kistersky [13] have considered the role of state administration in providing the R&D and educational basis for the economic revival of Ukraine in the context of global competition for human resources.

The findings of another study indicate that the impact of globalization on higher education in Ukraine is closely linked to Americanization, Europeanization, homogenization through diversification and Westernization. These concepts have been discussed in the relevant literature, as highlighted by Martyniuk, Ivanova, Tsymbal, Yakushko and Kochetkova [14].

De Rassenfosse, Murovana and Uhlbach [15] have indicated that Russia's full-scale military invasion of Ukraine has profoundly affected the Ukrainian R&D community, changed the directions of scholarly research for reconstruction and improvement of Ukraine's defense capability, substituted R&D collaboration partners, weakened research activities in Ukrainian universities, and increased scientist and student emigration. Nevertheless, new initiatives and forms of researchers' support [16] were established to strengthen the Ukrainian research and innovation system.

The analysis of the historical experience in state policies for obtaining foreign technical assistance [17] and the generalization of practices pertaining to international R&D and educational collaboration during the modernization and reconstruction of economies [18, 19] have demonstrated the advantages of integration and the significance of active state policy in this area.

This study aims to identify ways and mechanisms to ensure Ukraine's integration into the global educational and R&D space, taking into account current risks for the human potential of the national economy and strategic priorities of economic development. Accordingly, the objectives of this study are to determine the conditions and results of the internationalization of higher education, reveal trends and prospects for international R&D cooperation, identify the potential of academic mobility, and characterize opportunities and threats to international educational and R&D integration.

The structure of the study is as follows: The body of the paper starts by defining the historical preconditions of academic integration in Ukraine since the 1920s and the essence of integration. The next sections have focused on the analysis of three main forms of educational and R&D integration: internationalization of higher education, development of international R&D cooperation, and institutionalization of academic mobility. In the conclusions, we formulate the main trends and challenges of educational and R&D integration according to the obtained results.

To achieve the aim of the article, we based this study on comparative analysis and interdisciplinary synthesis methods, which helped us identify the primary areas of educational and R&D integration in Ukraine. Additionally, we used the dialectical method to reveal the challenges and contradictions in international integration.

To analyze the dynamics of international student mobility, which discloses the direction of internationalization of Ukrainian higher education, we used the following data: the number of Ukrainian students abroad and international students

in Ukraine from the UNESCO Institute for Statistics [20]; the number of students and staff in the educational process within the EU *Erasmus+* Program (*KA1. International Mobility in Higher Education*) from the National *Erasmus+* Office in Ukraine [21, 22]. To analyze international R&D cooperation, we used the following sources of information: the reports of the *Horizon 2020* program [23] and the European Commission's Final report of an independent European audit of Ukraine's national research and innovation system [24]. Additionally, we used data on international academic mobility in the National University of Kyiv-Mohyla Academy [25] to show the impact of quarantine restrictions and full-scale war on a specific university. Data limitations related to the absence of complete information on the number of academic and non-academic staff involved in academic mobility in 2021–2023.

In general, data covers the period from 2013 to 2023, which is representative in two aspects: firstly, in terms of revealing somehow a long-term trend, and secondly, in the context of global challenges that Ukraine has faced during the last few years, namely the pandemic restrictions and Russia's full-scale invasion.

PREREQUISITES AND ESSENCE OF INTEGRATION

With the establishment of a global information society and knowledge economy, the R&D space is becoming more open and the main resources are more mobile. It means that the countries are involved in the global processes of international R&D and educational cooperation, the formation of a single intellectual space and open research environment. The integration of young people into the global information society is a prerequisite and factor for Ukraine's inclusion in the system of international production and technological cooperation.

At the same time, the peculiarities of academic integration for Ukraine have historical preconditions. In particular, during the 1920s and 1980s

(Soviet period), education and science were under the full control of the state. Basic academic freedoms were restricted in a totalitarian society [26]. At the same time, the state determined the priorities and forms of R&D cooperation to achieve the specified goals and fulfill the assigned tasks. R&D internships, participation in the work of international institutions' research units (for instance, United Nations Statistics Division (UNSD)), the import of technologies, as well as their illegal acquisition and implementation through industrial espionage, were subordinated to the state policy of R&D support for the development of the economy.

The commercialization of education and science that has taken place in Ukraine over the last thirty years and this process does not always yield the desired results. There are internal problems of education and science development in Ukraine, which are: inconsistency of structure and content of education with the needs of economic development, growing inequality of access to educational services, insufficiency and instability of research funding, insufficient use of modern information and network technologies. The openness of national economies, the digital revolution, and the rapid informatization of society have revealed the low functional and adaptive capacity of the traditional system of higher education and academic science. Currently, the requirements for specialists are rapidly changing and growing. Therefore, the search for a new model for the development of education and science, ensuring academic inclusion, and increasing the international competitiveness of national higher education are the most important for the current and future economy of Ukraine. At the same time, the priority should be not only integration into the European and world educational and research space but also the achievement of socially significant positive effects from this integration.

As it was shown by research and confirmed in practice [27], the implementation of science education is a means of forming a new type of thinking, creative approaches to solving new problems

arising in the global digitalization of the economy and exacerbating social and environmental problems of mankind. Training provides the formation of human capital for economic development. Education, which includes R&D skills, is a prerequisite for innovative development. At the same time, science provides an expanded reproduction of intellectual capital. Thus, the integration of science and education on an international scale is a modern trend of social development.

The synthesizing effect of globalization and digitalization is the internationalization of the information and knowledge space, in other words, it is the process of convergence and strengthening of links between national educational and research centers due to the development of global information networks. Internationalization means going beyond national borders. This process provides opportunities for the realization of academic freedom at the international level. As an objective process, internationalization has become a major challenge for the entire education and science system in Ukraine.

International educational and R&D integration involves pooling resources and efforts, creating joint institutions, unifying regulatory norms and standards of higher education certification. This process requires the implementation of an international system for assessing the quality of education, internationalization of educational and research programs, international presentation of results in leading scientometric databases, journals of abstracts, etc. Academic integration increases opportunities for innovative economic development. The advantages of integration are related to the complementarity of developments, additional verification of ideas and R&D results. It also saves effort and resources by avoiding duplication and parallelism in research, provides a synergistic effect of research centers' cooperation, etc.

Generating new knowledge increases the R&D potential of society. However, international integration also creates additional risks [3]. These risks are due to the growing spatial mobility of human resources, the development of new forms of emp-

loyment, increasing global competition to attract intellectuals, creative and active workers, talented inventors, entrepreneurs, innovators, successful managers, etc. For countries that are unable to use their own human potential, which have not created the appropriate conditions for its implementation, there is a problem not only labour migration but also intellectual one [28], the loss of leading professionals, and up-and-comers. The opportunity to study abroad is becoming an attractive alternative for mobile young people seeking personal and professional growth.

INTERNATIONALIZATION OF HIGHER EDUCATION

One of the key tasks of reforming higher education in Ukraine, which is actual nowadays, is to create favourable conditions for its internationalization [29], which is carried out primarily through the education of Ukrainian students abroad. During 2013–2022 about 69,660 Ukrainian students studied abroad every year (Fig. 1). The number of Ukrainian students abroad has doubled in the last ten years since 2013. In particular, it increased significantly in 2014–2016. It was due to the military situation in Ukraine. In subsequent years, consistently high indicators are observed. In 2020, as compared with 2019, the number of students who went to study abroad decreased by 12%. The COVID-19 pandemic has complicated educational migration and international mobility in general. The significant increase caused by Russia's full-scale war in Ukraine is noticeable from 2022.

The countries where Ukrainian youth go to study prevail the countries of Europe, in particular, Poland, Germany, Slovakia, the Czech Republic, and Austria. After Russia's full-scale invasion of Ukraine, the weight of the US and Canada as the host countries for Ukrainian students increased. Many partner countries have offered favorable study conditions for Ukrainian youth, as well as various scholarship programs within the framework of temporary refugee protection and academic mobility programs.

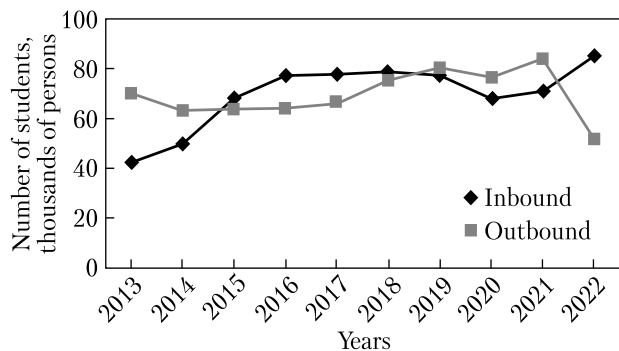


Fig. 1. Dynamics of the number of Ukrainian students abroad and international students in Ukraine

Source: Own preparation based on [20].

Millions of Ukrainians have gone abroad due to the security situation in the country. However, according to the trends of the last ten years, Ukrainian youth enter foreign universities to gain the best professional knowledge and skills, new cultural experience, increase the level of knowledge of foreign languages. The acquired professional knowledge and additional skills could be implemented in the country of origin. Despite this fact, in general, 80–90% of Ukrainian youth who enter foreign universities find employment after graduation and stay abroad for permanent residence. This is a serious problem for the country, as it is losing qualified professionals due to the annual increase in the outflow of young people to

other countries. This problem is aggravated by the war conditions.

It seems that reverse student mobility could compensate for these losses for the country. Every year Ukraine accepted thousands of foreign students. On average, during 2013–2022 about 69,580 foreign students studied in Ukraine every year (Fig. 1). However, with the full-scale war, there is a significant reduction in the number of foreign students in Ukraine. In 2022, as compared with 2021, the indicator decreased by 38.5%. As of 2022, the leading donor countries were India, China, Morocco, Azerbaijan, and Nigeria. Foreigners entered Ukrainian universities to obtain professional education, mostly medical. This is evidenced by the fact that 9 out of 10 most popular Ukrainian universities among foreign applicants were medical universities. After graduation, foreigners either return to their country of origin or go to work in economically developed countries. At the same time, international students are an important source of funding for the state higher education system. This issue sets the task of diversifying educational programs for foreigners, reducing the bureaucratization of the process of international youth entering, and encouraging their employment in Ukraine.

An important area of internationalization of higher education in Ukraine is participation in international exchange programs. However, the conclusion of bilateral inter-university agreements on staff exchange is sporadic and often unilateral. The priority of education internationalization is the participation of universities in joint research projects and international grants. It is especially relevant in the context of reducing public funding for higher education in Ukraine. These forms of international educational cooperation allow improving the material and technical base of universities, opening innovative laboratories and research centers, to bringing educational training programs to international standards, improving educational management, etc.

The EU *Erasmus+* Program is one of the most powerful international educational cooperation

Table 1. The Dynamics of Participants' Mobility in the Educational Process within the EU Erasmus+ Program. KA1. International Mobility in Higher Education, persons

Years	Students and staff moving to the EU	Students and staff moving to Ukraine	Total number
2014–2020	11532	5474	17006
2021–2022	3252	996	4248
2023	3563	362	3925
2021–2027	6815	1358	8173

Source: Own preparation based on [21, 22].

programs involving Ukrainian universities. In particular, during the EU *Erasmus+* Program 2014–2020, only in the direction of *KA1. Academic Mobility (International Mobility in Higher Education)* supported the EU mobility of more than 11 thousand students and staff. The amount of grant support was more than EUR 54 million. In 2021–2023, almost 7 thousand Ukrainians got individual grants for the EU mobility (Table 1). 123 Ukrainians were funded to join Erasmus Mundus Joint Master Degree Programs in 2021–2023 calls.

According to the National *Erasmus+* Office in Ukraine the direction of *KA2. Cooperation projects* involved more than 100 Ukrainian universities in 2014–2020. The total amount of grant support was over EUR 50 million. In 2022, there were 13 projects in which 51 universities and other organizations from Ukraine were selected for funding under the *Erasmus+* Program for Capacity Building for Higher Education. In 2023, the number of such projects was 20, and the number of universities was 58. Under the Fulbright Program, which has been operating in Ukraine since 1992, more than 1,000 Ukrainians have studied, trained, and conducted research in the United States.

The internationalization of higher education is an objective trend today. Educational cooperation in various international programs and projects promotes the exchange of the best R&D and pedagogical experience, ensures the implementation of best pedagogical practices, creates a foundation for R&D and educational cooperation, and is one of the factors of nation intellectualization. Educational internationalization is a determinant of the formation of the knowledge economy in Ukraine. It contributes to the modernization of Ukrainian universities, turning them into drivers of R&D and socio-economic development. Given this, further integration of Ukraine into the global educational space is one of the strategic objectives of the state educational policy. Its implementation requires improvement of the institutional mechanism of international educational cooperation and diversification of funding sources for academic exchanges. Additionally, the modernization

and internationalization of Ukraine's higher education are the factors of its development in the war period and successful post-war reconstruction.

DEVELOPMENT OF INTERNATIONAL R&D COOPERATION

The limited financial, human and technical capabilities of every individual country make it difficult to respond to global challenges and threats adequately. This leads to the growing role of international R&D cooperation. The dominant areas are non-commercial science and R&D activities within the framework of interstate, intergovernmental and interdepartmental agreements on R&D cooperation and commercial innovation activities on a bilateral and multilateral basis. These forms of cooperation contribute to the achievement of sustainable competitive advantages by countries through a combination of efforts in the development of new technologies and their industrial implementation.

After Ukraine gained independence in 1991, the Science and Technology Center in Ukraine (STCU), established with the support of the United States, Canada, and Sweden, played an important role in preserving the country's R&D potential and research institutes during the period of post-socialist market transformations. This organization helped prevent the proliferation of technologies and expertise related to weapons of mass destruction and contributed to the conversion of the military-industrial complex. Since its founding, STCU has raised nearly USD 300 million in research projects and implemented more than 2,000 projects in the fields of instrumentation, materials science, biosafety, energy conservation, aerospace research, etc. [30]. A necessary condition for funding projects under the STCU is the participation of at least 30–50% of scientists who have previously been involved in arms development. Another important form of technical assistance for post-socialist countries was Technical Assistance for the Commonwealth of Independent States (TACIS) program. Through such coopera-

tion, Ukraine received various technical, advisory, and financial assistance from the EU during 1991–2016, including for R&D purposes. The cooperation with the TACIS program allowed Ukrainian researchers to establish cooperation with European Organization for Nuclear Research (CERN) and the European Atomic Energy Community (Euratom). Wide access to EU structural funds has allowed many post-socialist countries (Poland, Romania, the Czech Republic, Slovakia, Croatia, Estonia, Latvia, Lithuania) to solve the problem of creating a modern research infrastructure. The legal basis for cooperation between Ukraine and the EU in the field of science and research is the Association Agreement between the EU and Ukraine, the Agreement on cooperation in science and technology between the European Community and Ukraine, as well as a number of relevant bilateral agreements. In 2015, Ukraine became an associate member of the European Union Research and Innovation Framework Program – *Horizon 2020/H2020* [23]. In 2016 European Commission gave recommendations to the Government of Ukraine on the development and implementation of reforms of the national system of research and innovations [24]. The Joint EU-Ukraine Research and Innovation Committee has been established to coordinate and discuss the roadmap for Ukraine’s integration into the ERA. The Ministry of Education and Science of Ukraine has set up a network of national and regional contact points. In 2016–2020, 153 Ukrainian subjects of scientific, R&D and innovative activities have signed 203 grant agreements worth EUR 38.358 million [31].

In 2021, “H2020” was replaced by the program *Horizon Europe* with a budget of EUR 95.5 billion for the period 2021–2027. On 9 June 2022, the Agreement associating Ukraine to Horizon Europe, the EU research and innovation program (2021–2027), and to the Euratom Research and Training Program (2021–2025) entered into force. In terms of Russia’s full-scale invasion of Ukraine financial procedures for project coordinators of *Horizon Europe* and *Erasmus+* programs have been simplified. In the context of the current situation

in Ukraine European Commission established *Horizon4Ukraine* special program, that has been put in place for projects funded under the *Horizon Europe* program, consisting in the publication in the Funding and Tenders Portal of opportunities addressed to researchers or other specialists from Ukraine. In addition, the Commission opened the *Horizon Europe* office in Kyiv December 2023. It promotes EU funding opportunities, offers technical support to Ukrainian researchers and innovators, and strengthens networks between Ukrainian and European institutions. The Commission also supports additional measures [16] for the Ukrainian researchers and innovators affected by war, such as: MSCA4Ukraine; EIC4Ukraine; ERC4Ukraine etc.

H2020 programs are universal platforms for joining international efforts to meet global challenges. Ukraine participates in the research and training programs Euratom, Eurofusion, EUREKA, Europe’s program for small and medium-sized enterprises COSME, the NATO Science for Peace and Security (SPS) Program, signed a Framework Agreement to support research activities between the National Academy of Sciences of Ukraine and the Joint Research Center of the European Commission (JRC). Ukrainian research organizations and universities cooperate with international organizations and foundations, including the European Organization for Nuclear Research (CERN), the European Space Agency (ESA) and the space agencies of the EU member states, the R&D Committee on Antarctic Research (SCAR), and they participate in s GALILEO/EGNOS, COPERNICUS. However, it is necessary to strengthen participation in such projects as EUREKA, Network projects, Eurostars, Globalstars, Cluster projects, INNOWIDE (H2020). These projects provide funding for innovative market-oriented programs that are drivers for industrial innovation and economic growth. In order to use joint resources more effectively to solve common problems, Ukraine should join the largest European network for cooperation in R&D – COST, European Technology Platforms (ETR), Joint Technology Initiatives

(JTI). Although there has been some progress in building national digital infrastructures for research and education (Ukrainian Research and Academic Network – URAN, Ukrainian Academic and Research Network – UARNet, Ukrainian National Grid).

Integration into the ERA, approximation to EU policy and law in the field of science and technology, and reforming of the science management system provide the adaptation of Ukrainian legislation to European norms and rules. The Ministry of Education and Science of Ukraine has approved a roadmap for Ukraine's integration into the ERA, which clearly states that the development of a modern national research system should take place in the context of general economic reform [32]. Any “internal changes” in the R&D system will not have the desired effect without stimulating demand for the results of R&D by the subjects of economic entities, public authorities and potential partners from other countries.

In 2021, the ERA has begun the fourth phase of its development, which will last until 2027. It is characterized by the transition from the free movement of researchers, knowledge, and technology to the formation of a pan-European community of producers and users of knowledge. In modern conditions, due to economic, social and geopolitical circumstances, it is extremely difficult for Ukraine to maintain the proper pace of reforms and real integration into the ERA. Russia's ongoing war of aggression caused increasingly damaged research infrastructure, logistical and financial difficulties in maintaining research activities in Ukraine. Ukraine's public science sector comprises about 450 research institutes and 140 universities. From February 2022 to January 2024, a total of 1,443 buildings belonging to 177 institutions were damaged or destroyed, more than 12% of scientists and university teachers had been forced to emigrate or internally displaced [33, p. 11].

In the context of preparation of joint projects for participation in *Horizon Europe* programs, it is necessary to intensify cooperation with the Ukrainian R&D diaspora, as well as to develop repatriation programs for Ukrainians, working in Western academic institutions and R&D centers.

Ukraine should more actively raise funds to build its own research infrastructure, located in safe places, and increase the capacity of national contact points to reduce the migration of Ukrainian scientists to Europe due to unsatisfactory working conditions, low wages, and security threats. The protection of R&D infrastructure should become a fundamental element of ensuring the national security of Ukraine. In addition, it is more appropriate to put into practice a new project selection procedure based on expert evaluation, as well as new funding methods that support research groups and laboratories, rather than institutes in general.

Cooperation between Ukrainian and European organizations is gradually expanding. Russia's full-scale invasion caused the destruction of research infrastructure and the emigration of scientists. However, it simultaneously led to an increase in the interest of business and the state in science and innovative developments, particularly in the military and medical fields, artificial intelligence, robotic systems, new materials. Cooperation with the European countries, the USA and Japan has also strengthened. Opportunities for the participation of Ukrainian institutions and organizations in various EU programs, R&D foundations of various countries, R&D organizations and private donors have significantly expanded. Ukraine is in a unique situation, where existing challenges and threats can stimulate the rapid restoration of its R&D and innovative potential, that will ensure victory and accelerate the country's post-war recovery.

ACADEMIC MOBILITY AS A TOOL OF EDUCATIONAL AND R&D INTEGRATION

For a long time, academic mobility was meant mainly as short-term student's mobility. Meanwhile, the mobility of teachers, researchers and non-academic staff was considered quite seldom. It concerns not only the Ukrainian context, Teichler [34] has also emphasized this fact. For Ukraine, the

institutionalization of academic mobility became an essential part of integration into the European educational and R&D space, including European Higher Education Area (EHEA). Although the Bologna Process was implemented in 2005, the regulation of the academic mobility procedure and realization took place only in 2015 [35]. According to the current legislation, academic mobility is “the opportunity to study, teach, train or conduct research activities in another institution of higher education (or R&D institution) in Ukraine or abroad for all of the educational process’ participants” [36]. It includes training in academic mobility programs, language and R&D internship, participation in joint projects, teaching, upgrading qualification.

Scopes of academic mobility increase each year, as was shown in section “Internationalization of Higher Education”. It means that Ukrainian researchers, professors and students are interested in getting new knowledge, experience and professional development abroad. In 2020, the COVID-19 pandemic and quarantine restrictions radically influenced physical movement. According to the President of the Kyiv-Mohyla Academy Annual Reports [25], the number of academic and non-academic staff mobilities decreased from 31 in 2019 to 8 in 2020. Students’ mobility decreased from 98 to 54 in those years. Terms “nominated” and “ompleted” appeared in the 2020 report to emphasize the fact of canceled mobilities due to the quarantine, which were mainly short-term ones. We observe radically opposite trends with the beginning of a full-scale war. Students’ academic mobility increased tenfold in 2022 and was defined as urgent (“evacuation”) in reports for 2022 and 2023. In 2023, the volume of academic mobility for Ukrainian students decreased by 40% due to fewer offers related to the full-scale war. Nevertheless, it remains significant, as compared with previous periods, and describes a response to dramatic events rather than a long-term trend.

During quarantine restrictions, academic mobility and its participants faced many challenges, yet some of them became new opportunities. For

instance, quarantine restrictions (which lasted since March 2020) were challenging for many businesses and industries worldwide. They accelerated online resources development, made entrepreneurs re-evaluate their businesses and reorganize their services. The quarantine made everybody be as flexible as possible. In the context of academic mobility R&D and educational community stood a chance of distance learning. For instance, in Ukraine, to earn an academic title, a candidate shall provide a document confirming his/her international experience. Only in July 2020, the Ministry of Education and Sciences of Ukraine ruled that “internships can be conducted in distance” [37]. This form of upgrading qualification was not something new, but it has become the main or even the only possible one under those circumstances. If somebody could stay uninterested in an online internship earlier, the lack of other offers changed one’s opinion. It put on the agenda the role of physical mobility of educational process’ participants in the future. Although the demand for international competencies has undoubtedly increased [2, p. 208]. In education, such phenomena that related to the virtual border crossing, as “Massive Open Online Courses” (MOOCs) and “internationalization at home”, had spread before. The quarantine only has accelerated this spreading and made all the participants of the educational process adapt to the new online reality.

A solid push for widespread development and adaptation to distance learning and digitization of the educational and research process tremendously impacted sustainability in the field after February 24, 2022. The system turned out to be ready for distance learning. At the same time, new challenges have appeared, which are terrifying with their inevitable consequences and intensify existing problems [38].

In Ukraine, academic mobility is strongly connected with educational, academic and intellectual migration so as with brain drain. The last two points are the most dangerous threats. Academic mobility is a precondition for high-skilled emp-

loyees' emigration in these cases. Successful participants of academic mobility programs develop and improve hard skills, form social connections abroad, develop communication skills, face another culture and learn how to deal with it, which are essential for a modern professional. At the same time, they stand better chances of applying for working permits abroad and relocating to another country in the end. It means that potential changers may leave Ukraine for good, searching for better living conditions, decent work and salary, developed infrastructure and opportunities they could have there. This problem is exacerbated during wartime when there is a tangible threat to life and health. That is why the formation of a competitive R&D and educational environment along with its internationalization can be a strong foundation for Ukraine's entry into the globalized economy as a full-fledged subject.

The main results of academic mobility for its participants are:

- ◆ getting a unique experience abroad,
- ◆ improving professional and personal skills, including soft skills,
- ◆ increasing their competitiveness in the world labour market.

The main results of academic mobility for its participants' country of origin are:

- ◆ increasing the competitiveness of the national economy,
- ◆ deepening educational and R&D internationalization,
- ◆ improving educational and R&D space.

We see that the consequences of academic mobility appear rather oppositely. They are both factors of human capital development and preconditions for negative long-term trends. Nevertheless, no matter which kind of results it has for a donor country, academic mobility is an excellent tool for improving the quality of educational and R&D space and economic growth.

This study was carried out to discover the main mechanisms of international educational and R&D integration of Ukraine, which are the internationalization of the Ukrainian higher education sys-

tem, the development of international R&D cooperation, the institutionalization of academic mobility. As a result, we have identified the following main *trends of integration processes* in this area:

- ◆ integration of science and education through the participation of universities in international educational and research projects and programs, which allows universities to attract grants for logistical and organizational improvement, improve the image and become research centers;
- ◆ development of various forms of academic mobility, which provide for a limited period of staying abroad and return to Ukraine: credit educational mobility, research internships, research, international teaching and volunteering;
- ◆ involvement of a wide range of scientists in international publishing activities, which contributes to assessing objectification of scientific novelty and significance of the research findings obtained;
- ◆ unification of Ukrainian legislation on international R&D cooperation, integration into the ERA, expansion of participation in the EU Framework Programs, diversification of research funding sources, search for means to modernize research infrastructure with EU structural funds;
- ◆ strengthening the need to create better security conditions for conducting priority research due to wartime;
- ◆ further development of distance and online learning, as well as modern forms of distance participation in international research projects as a mechanism to increase opportunities for educational and R&D integration.

According to the results of the study, we found out that the main *challenges of educational and R&D integration* are:

- ◆ a high proportion of Ukrainian students studying abroad do not intend to return to Ukraine for employment. As the training takes place on one's own initiative and mainly at one's own expense, there are no obligations to implement the acquired professional knowledge and professional skills in Ukraine;

- ◆ the threat of human potential losses due to the closure of research teams and research groups, limited public funding and the weakness of alternative sources of conducting research, and ongoing war;
- ◆ inefficiency of the current management system of international R&D cooperation, government inaction in ensuring Ukraine's integration into the ERA, excessive transfer of responsibility to the Ministry of Education and Science of Ukraine, which does not have sufficient opportunities to fully implement goals, measures and tools of Ukrainian science integration into the ERA;
- ◆ academic mobility forms high potential of intellectual migration under conditions of the low international competitiveness of the Ukrainian educational and R&D space;
- ◆ ongoing war, with no clarity regarding its duration, which yet could hide benefits from international support and from pushing the development of educational and R&D cooperation.

Thus, the processes of internationalizing education and science testify to the need for a state policy aimed at obtaining benefits and advantages for Ukraine from the deepening of R&D and educational integration. A key prerequisite for reducing the negative consequences of this integration is the implementation of comprehensive reforms that will transform the overall institutional environment in Ukraine, along with achieving lasting peace to guarantee security. To develop and realize Ukraine's human potential, the primary task is to ensure sufficient funding for education, science, and healthcare, as well as effective management of research activities. Creating favorable conditions for R&D work and establishing R&D hubs and centers that can attract

both Ukrainian and foreign intellectuals is extremely important when the whole R&D system is increasingly dependent on R&D cooperation.

The risk of losing human potential is a matter of state security. Therefore, addressing the problem of brain drain should be a top priority for state policy since the only way to return those who have already left Ukraine (that is, to provide better conditions than those abroad for the realization of their research and inventive potential) is, unfortunately, unrealistic. Implementing administrative measures aimed at securing personnel for a R&D or educational institution or making them dependent on returning from abroad after a period of academic mobility or other forms of international cooperation may help prevent a loss of human potential. However, such measures contradict the principles of democracy and human freedom and are, therefore, unacceptable. Instead, a promising approach is to involve Ukrainian scientists who have emigrated in research projects within Ukraine and facilitate the transfer of knowledge and technology. This can serve as a counterbalance to the participation of Ukrainian researchers in foreign projects. It is also crucial to encourage the maintenance of ties with educational and research institutions, ensuring that academic mobility does not lead to irreversible emigration.

To effectively counter the negative effects of international R&D and educational integration, we need to focus on several key areas: providing competitive R&D education, expanding opportunities for project participation, funding research infrastructure, and implementing systemic reforms. These long-term strategies aim to enhance the quality of life and ensure a better future.

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О. П. Курбет ¹ (<https://orcid.org/0000-0002-4519-0552>),
В. В. Небрат ¹ (<https://orcid.org/0000-0002-5419-3181>),
Н. О. Горін ¹ (<https://orcid.org/0000-0002-9110-9129>),
Т. Л. Боднарчук ² (<https://orcid.org/0000-0002-7682-487X>)

¹ Державна установа «Інститут економіки та прогнозування НАН України»,
вул. Панаса Мирного, 26, Київ, 01011, Україна,
+380 44 280 1234, gvm@ief.org.ua

² Кам'янець-Подільський національний університет імені Івана Огієнка,
вул. Огієнка, 61, Кам'янець-Подільський, 32300, Україна,
+380 3849 30513, post@kpnu.edu.ua

МІЖНАРОДНА ОСВІТНЯ ТА НАУКОВА ІНТЕГРАЦІЯ: ТЕНДЕНЦІЇ ТА ВИКЛИКИ ДЛЯ УКРАЇНИ

Вступ. У формуванні економіки знань технології та інформація стають критичними чинниками економічного розвитку, тим самим актуалізуючи міжнародну освітню й наукову інтеграцію.

Проблематика. Водночас, інтеграція країн у світовий освітній і науковий простір не є самоцілью, вона має забезпечувати досягнення конкурентних переваг у ключових секторах, а також сприяти покращенню глобального статусу національної економіки.

Мета. Визначити шляхи та механізми забезпечення інтеграції України у світовий освітній і науковий простір з урахуванням актуальних ризиків для людського потенціалу та стратегічних пріоритетів економічного розвитку.

Матеріали й методи. Використано порівняльний аналіз і міждисциплінарний синтез. Для аналізу використано дані 2013–2023 рр. Інституту статистики ЮНЕСКО, Національного офісу Еразмус+ в Україні, звіти програми «Горизонт 2020», звіт Європейської Комісії про національну систему досліджень та інновацій в Україні й звіти Національного університету «Києво-Могилянська академія».

Результати. Окреслено механізми включення України у світовий освітньо-науковий простір і три основні напрями інтеграції: розвиток міжнародного науково-технічного співробітництва, інтернаціоналізація вищої освіти й інституційне забезпечення академічної мобільності. Враховано особливі виклики, зокрема, пандемічні рестрикції та повномасштабне вторгнення Росії.

Висновки. Основними тенденціями освітньої та наукової інтеграції є розвиток академічної мобільності, участь університетів у міжнародних дослідницьких проєктах і програмах, зростання кількості зарубіжних публікацій, розвиток дистанційного навчання та досліджень. Виклики пов'язані зі збільшенням міграції, дистанційною зайнятістю, обмеженням державним фінансуванням та проблемами безпеки, які можуть призвести до втрати людського потенціалу для інноваційного розвитку. Аргументовано необхідність державної політики, спрямованої на отримання зиску і переваг України від міжнародної науково-освітньої інтеграції.

Ключові слова: економіка знань, інтернаціоналізація освіти, науково-технічне співробітництво, академічна мобільність, наукова інтеграція, Україна, Європейський дослідницький простір.