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Challenges and paradoxes in the regulation of scientific research in the EU: a comprehensive analysis

Виклики та парадокси в регулюванні наукових досліджень в ЄС: комплексний аналіз

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Abstract

This article analyzes the legal regulation of scientific research in European Union law, examining the challenges and paradoxes the EU faces in this area. Through a systematic analysis of normative and programmatic documents, the crucial influence of EU law on shaping international scientific research standards is revealed. The study highlights the evolution of the European Research Area and the fundamental role of the Horizon Europe program in promoting scientific excellence and innovation. The findings have significant implications for EU research policy and its international cooperation in science and technology. The author applies a complex methodology including analysis and synthesis, structural, formal-legal methods, as well as approaches of scientific deduction and induction. The author argues that EU law has a significant impact on the development of international standards for scientific activity. Despite the absence of imperative supranational competence in the field of science, the EU has facilitated the formation of subsidiary mechanisms for funding and supporting scientific activity, leading to the establishment of sustainable institutions and mechanisms within the European Research Area and EU program systems such as "Horizon Europe", which has resulted in a substantial evolution of standards for scientific activity. The author states that this primarily concerns scientific ethics, multiculturalism and non-discrimination, the evolution of views on transnational research, and the formation of a sustainable regime for funding and evaluating scientific projects.

Анотація

У цій статті аналізується правове регулювання наукових досліджень у праві Європейського Союзу, досліджуються виклики та парадокси, з якими стикається ЄС у цій сфері. Шляхом системного аналізу нормативних та програмних документів виявлено вирішальний вплив права ЄС на формування міжнародних стандартів наукових досліджень. Дослідження підкреслює еволюцію Європейського дослідницького простору та фундаментальну роль програми Horizon Europe у просуванні наукової досконалості та інновацій. Отримані результати мають значний вплив на дослідницьку політику ЄС і його міжнародну співпрацю в галузі науки і технологій». У науковій статті автором використаний програмний, герменевтичний, прогнозний, порівняльний та системний аналіз відповідних регламентів та рекомендацій ЄС, як складової сучасної системи права ЄС й та застосоване комплекс методів аналізу та синтезу, структурні, формально-юридичні методи, а також підходи наукової дедукції й індукції. Автором доведено, що право ЄС робить істотний вплив на розвиток міжнародних стандартів наукової діяльності; що, попре відсутність у ЄС імперативної наднаціональної компетенції у сфері науки, сприяло формуванню субсидіарних механізмів фінансування та підтримки наукової діяльності привело до формування сталих інституцій та механізмів Європейського дослідницького простору та систем програм ЄС, таких як «Горизонт Європи», та, відповідно, призвело до істотної еволюції стандартів наукової діяльності. Автор констатує, що насамперед це

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стосується наукової етики, мультикультуралізму та недискримінації, еволюції поглядів на транснаціональні дослідження та формування сталого режиму фінансування та оцінки наукових проектів.

Ключові слова: «Горизонт Європи», Європейська комісія, Європейський дослідницький простір, наукова етика, наукові дослідження.

Introduction

Current issues of international legal cooperation in the dimension of scientific research and scientific inquiry have yet to become the subject of systematic, comprehensive analysis not only within the doctrine of international law, but also in the context of the modern concept of European Union (EU) law.

At the same time, the importance of relevant mechanisms and institutions in the context of the correlation of the contractual model of supranational influence on scientific research and the corresponding programmatic and organizational models of European law, among other things, regarding the regulation of processes, forms, and mechanisms of scientific research in the context of current acts and project work, is undeniable.

Therefore, the subject of the article is the legal regulation of scientific research in the normative and programmatic documents of the EU, and its aim is to identify the features of such legal models in EU law. The article systematically examines the challenges and paradoxes faced by EU law in the context of comprehensive regulation of scientific inquiry as a process, and in outlining the modern balance between scientific inquiry and the practical need for relevant resources.

To achieve this goal, the following main research tasks should be implemented:

- Identify the challenges and paradoxes faced by EU law in the context of regulating scientific inquiry;
- Investigate the issues of maintaining balance in the relevant normative mechanisms of EU competence, national sovereignty, and academic autonomy;
- Outline the role of the European Research Area and the dimension of its normative model of activity;
- Identify the specifics of the "Horizon Europe" program and the role of programmatic regulation in forming relevant EU standards.

The article consists of the following sections:

Theoretical Framework or Literature Review

The issue of regulating scientific inquiry in legal activities has been sporadically addressed by modern Ukrainian researchers such as Babin (2019) and Plotnikov et al. (2022), but comprehensive studies remain lacking. Mentions of this regulation appear in UN system documents (Tytskaya & Babin, 2023; 2024) and in analyses of counteracting Russian aggression (Babin et al., 2019; 2021a; 2021b; 2023). Expert institutions have raised relevant issues with UN Special Rapporteurs, highlighting the right to science and systematic research in international legal contexts (Plotnikov et al., 2022; Chvaliuk et al., 2023). UN Special Rapporteur Professor A. Xanthaki's 2024 report emphasized the importance of international treaties containing science-related provisions and advocated for open science, which encourages collaboration between scientists and the public, enhancing inclusive scientific processes. This open science approach aligns with certain EU documents but has yet to be systematically implemented, even at the doctrinal level.

Methodology

This study aims to develop a high-quality scientific product by addressing specific issues related to the normative, programmatic, and politico-legal regulation of scientific research processes within the context of EU law. To achieve this, a comprehensive, comparative, and systematic analysis of historical, current, and projected EU documents will be conducted, focusing on their role in European and international law.

The methodology involves:

Utilizing scientific methods of analysis and synthesis to address challenges and paradoxes in EU law regarding scientific inquiry.

Applying structural and comparative methods to study the balance between EU competence, national sovereignty, and academic autonomy.

Employing formal-legal, programmatic, predictive, and hermeneutic methods to analyze the European Research Area's normative model.

Using programmatic and systematic methods, along with scientific deduction and induction, to evaluate the "Horizon Europe" (2024) program and its influence on EU standards.

Primary sources will include authentic texts of founding treaties, secondary EU law acts, and official EU information. The research will systematically search, organize, and compare these sources to reflect the actual state of EU scientific activities, ensuring a comprehensive understanding of the regulatory frameworks and their practical implications.

Results and Discussion

The primary legal structure for scientific activities in the EU is rooted in its foundational treaties, which will be studied in detail in the article. They provide detailed regulations of scientific and technological progress. The focus is on advancements in health, safety, environmental protection, consumer rights, and environmental policy. Specific rules address strengthening the scientific and technological foundation through the creation of a unified research area.

Key findings include:

This research area aims to enable the free movement of researchers, scientific knowledge, and technology, enhancing competitiveness, particularly in industry.

The EU encourages collaboration with non-member countries and international bodies in research, technological development, and demonstration projects.

The research area is supported by various strategic documents, setting priorities and principles for scientific activities.

A significant funding source for research and innovation is a major program with a substantial budget, succeeding a previous similar initiative.

The freedom of scientific research is emphasized, although its application has been limited, with notable judicial interpretations in specific cases.

Conclusion

Influence of EU Law on International Scientific Standards:

EU law significantly impacts international scientific standards through mechanisms that fund and support scientific activities. Institutions like the European Research Area and relevant programs have advanced ethical standards, multiculturalism, non-discrimination, and sustainable funding for scientific projects. These standards are implemented internationally through agreements, crucial for the integration of new member states.

Challenges in EU Scientific Research Law:

A primary challenge in EU scientific research law is balancing EU competence, national sovereignty, and academic autonomy. Generalized norms on scientific activity and academic freedom reflect the EU's largely

advisory role. The delicate balance between EU interests and national sovereignty is particularly critical in security and defense research, highlighting the need for precise legal regulation.

The European Research Area:

Established by a significant treaty, the European Research Area coordinates EU and member state competencies while promoting academic autonomy. Developed through various initiatives, it now operates under strategic documents emphasizing programmatic regulation.

Programmatic Regulatory Dimension:

Programmatic regulation is vital for implementing EU scientific competencies. Specific regulations define the financial-legal framework, ensuring efficient use of funds in supporting research and innovation activities, extending beyond mere regulatory practice.

Theoretical Framework or Literature Review

Among the works of modern Ukrainian researchers, this issue was mentioned in the works of Babin (2019) and Plotnikov et al. (2022), but comprehensive and monographic studies of these issues have not yet been conducted. Separate mentions of attempts to regulate scientific inquiry in the legal activities of regional supranational structures can be seen in the documents of specialized institutions and other organizations of the UN system (Tytskaya, & Babin, 2023; Tytskaya, & Babin, 2024) and in the analysis of forms of systematic counteraction to Russian aggression (Babin, Chvaliuk, & Plotnikov, 2021a; Babin, Plotnikov, & Prykhodko, 2023; Babin, 2019; Babin, B., Chvaliuk, & Plotnikov, 2021b), but they were extremely fragmentary.

Relevant issues were raised in appeals by expert institutions to UN Special Rapporteurs, who attempted to summarize relevant findings (Plotnikov, Chvaliuk, & Babin, 2022; Chvaliuk, Plotnikov, & Babin, 2023) regarding the right to science and the conduct of systematic scientific research in the international legal dimension and with the involvement of supranational economic associations such as the EU. In this context, UN Special Rapporteur Professor A. Xanthaki in her report A/HRC/55/44 to the UN Human Rights Council in 2024 on the “Right to Participate in Science” emphasized that many international treaties not belonging to the international human rights law system also contain science-related provisions, establishing guarantees regarding information, participation, education and awareness, as well as benefit-sharing and responsibility (Xanthaki, 2024). This statement should be taken into account when studying the component of EU law, which has an obvious international legal dimension, including the founding treaties of the EU.

Therefore, in light of Special Rapporteur A. Xanthaki’s position, her theses on the importance of open science deserve attention, particularly the expanded collaboration between scientists and social subjects outside the scientific community. This collaboration relies on the use of open methods and tools that are part of the research cycle and aims to make the scientific process more inclusive, engaging a broader range of interested public representatives through new forms of cooperation and joint work (Xanthaki, 2024). The UN Special Rapporteur stated that open science lays the foundation for the participation of individual citizens and their communities in the knowledge creation process, enhancing dialogue between scientists, policymakers, practitioners, entrepreneurs, and the public. This provides all participants with a voice in research that addresses their concerns, needs, and aspirations. Similar approaches are observed in certain EU documents.

Moreover, in the framework of the systematic analysis of the work of statutory bodies and specialized EU programs in the concept of regulating scientific activity, the provisions of report A/HRC/55/44 regarding scientific-political interaction become relevant. This interaction is an important way to achieve decision-making participation by involving all relevant stakeholders and providing opportunities for informed public participation and ensuring policy development in line with the precautionary principle when science cannot provide sufficient data (Xanthaki, 2024).

However, these proposals have yet to receive systematic implementation even at the doctrinal level. In the same report A/HRC/55/44, as the current key document on the international legal dimension of scientific activity, the aspects of EU regulatory and programmatic activities in scientific research are hardly highlighted, and even in the proposals, this report does not mention supranational economic integration

formations. Furthermore, the role of EU law aspects has not been systematically reflected in the works of contemporary authors who have studied aspects of scientific activity in international law, including works by Ackerman (Achermann, & Besson, 2023), S. Besson (2023), Plozza (2023), Shaver (2010; 2015), and others.

Methodology

To develop and process a relevant new and high-quality scientific product and to systematically and fully achieve the goals and objectives of this publication within the relevant scientific discourse, it is necessary to outline specific and special issues of normative, programmatic, and politico-legal regulation of the processes, models, and mechanisms of scientific research in the context of the relevant sources of EU law. To achieve this goal, a comprehensive, comparative, and systematic analysis of existing historical, current, and project documents of the EU as part of the modern system of European legal regulation should be conducted. Simultaneously, a comparative and systematic analysis of acts of European law as an integral and significant factor influencing the formation of the modern comprehensive system of international law should be carried out.

Regarding the phenomenon of challenges and paradoxes faced by EU law in the context of regulating scientific inquiry, an appropriate set of scientific methods of analysis and synthesis should be applied.

To study the issue of maintaining balance in the relevant normative mechanisms of EU competence, national sovereignty, and academic autonomy, structural and comparative methods should primarily be used. In the format of the aspects of the role of the European Research Area and the dimensions of its normative model of activity, formal-legal, programmatic, predictive, and hermeneutic methods were used in their entirety.

Concerning the normative reflection and identification of the specifics of the “Horizon Europe” program and the role of programmatic regulation in forming relevant EU standards, programmatic and systematic methods and approaches of scientific deduction and induction should be established. The key sources for this scientific research should be the authentic texts of the founding treaties and secondary EU law acts, official information on the activities conducted by EU bodies and within EU programs, available on official EU resources. Therefore, a search and systematization of relevant normative sources should be conducted.

In the context of the systematic and multi-vector format of such normative and programmatic sources, it is necessary to carry out a consistent structural search for facts and forms of their reflection on all categories of science and scientific activity. Simultaneously, it is crucial to systematically, comprehensively, and promptly compare the described models of organizational and functional content of the relevant activities of EU structures and subdivisions, individual EU officials, with the actual situation and practical state of affairs in the relevant EU activities and their reflection in available open sources.

Results and Discussion

The EU legal system is based on founding treaties; these two fundamental agreements address aspects of scientific activity, but in slightly different formats. The Treaty on European Union briefly mentions science in part 3 of Article 3, where it states that the Union promotes scientific and technological advance (European Union, 2012a); this can be partly explained by the fact that scientific activity is not allocated to either the exclusive or complementary competence of the EU.

The Treaty on the Functioning of the EU mentions science both in the context of the need to rely on scientific achievements and concerning the EU’s competence in scientific research. Article 114 of the Treaty on the Functioning of the EU stipulates that the European Commission’s proposals to the European Parliament and the Council of the EU regarding health, safety, environmental protection, and consumer rights, in the dimension of the EU internal market, should take into account, in particular, any new developments based on scientific facts (European Union, 2012b).

Additionally, according to Article 191 of the Treaty on the Functioning of the EU, the preparation of the Union’s environmental policy must consider available scientific and technical data. Furthermore, according to Article 338 of this Treaty, EU statistical activities must be carried out with adherence to, among other things, scientific independence (European Union, 2012b).

However, scientific activity itself is regulated by Chapter 19 of the Treaty on the Functioning of the EU; according to its Article 179, the Union shall have the objective of strengthening its scientific and technological base by creating a European Research Area (ERA) in which researchers, scientific knowledge, and technology freely circulate, and it shall encourage it to become more competitive, particularly in the field of industry, while promoting all the research activities deemed necessary, based on other parts of the treaties concerning EU competencies (European Union, 2012b).

To achieve these tasks, Article 180 of this Treaty mandates the Union to promote cooperation with third countries and international organizations in research, technological development, and demonstration at the EU level. Article 181 adds the need for the coordination of national policies with EU policies concerning research activities, and Article 182 provides for the creation of a multi-annual framework program that defines all EU actions, approved by the European Parliament and the Council of the EU, establishing goals in science and technology (European Union, 2012b).

The format of the program is chosen intentionally, as the EU sets the overall maximum amount and detailed rules for the financial participation of the Union in the framework program and the respective shares in each of the envisaged actions, using material incentives rather than coercion to foster interstate cooperation (European Union, 2012b). In addition to such programs, the European Parliament and the Council of the EU may establish the measures necessary for the implementation of the ERA and adopt decisions concerning additional programs involving only certain Member States, which finance these programs with the possible participation of the Union. According to Article 190 of the described Treaty, at the beginning of each year, the European Commission sends a report to the European Parliament and the Council of the EU, which includes information on research and technological development activities and the dissemination of results over the previous years and the work program for the current year (European Union, 2012b).

The provisions of the EU Charter of Fundamental Rights are also of exceptional importance, which in Article 13 states that the arts and scientific research shall be free of constraint, and that academic freedom shall be respected. Moreover, the preamble to this document notes that in view of social changes, social progress, and scientific and technological development, it is necessary to enhance the protection of fundamental rights, making them more clearly expressed (European Union, 2000a).

Regarding the European Research Area (ERA), it is worth noting the European Commission's considerations, according to which, following the inclusion of the aforementioned provisions into the Treaty on the Functioning of the EU by the Lisbon Treaty and their entry into force in 2007, the European Commission developed the ERA Roadmap and the National ERA Action Plans for 2015-2020. In 2019, the ERA was updated through the adoption of the Pact for Research and Innovation in Europe and the Council of the EU's conclusions on the future governance of the ERA by the Council, according to the first ERA Policy Agenda for 2022-2025 (European Commission, 2024).

The ERA itself was formalized by the Council's Resolution of June 15, 2000, 2000/C205/01, which proposed that the European Commission present further proposals on the topics covered by the ERA (European Union, 2000b). Subsequently, the Council's conclusions of December 11, 2012, acknowledged the necessity of investing 3% of the EU's GDP in research and development by 2020. In these conclusions, the Council stated that open competition at the national level is crucial to getting the maximum return on public money invested in research (European Council, 2012)

The ERA Roadmap for 2015-2020 was defined by the European Commission as a living document that provides guidance to Member States in structuring the implementation of the ERA at the national level and is not an end in itself; it was declared that it will be regularly updated, adapted, and improved (European Council, 2020).

The ERA Roadmap established six priorities: "Effective National Research Systems"; "Jointly Addressing Grand Challenges" and "Optimal Use of Public Investments in Research Infrastructure"; "Open Labour Market for Researchers"; "Gender Equality and Gender Mainstreaming in Research"; "Optimal Circulation and Transfer of Scientific Knowledge"; and "International Cooperation". Special attention was given to "research infrastructure", which "is at the heart of the knowledge triangle of research, education, and innovation" (European Council, 2010a).

Additionally, in May 2010, the Council of the EU, in its conclusions, initiated six initiatives within the framework of ERA development, namely "Climate Knowledge for Europe", "Healthy and Productive Seas and Oceans", "More Years, Better Lives – The Potential and Challenges of Demographic Change", "The Microbial Challenge – An Emerging Threat to Human Health", "Urban Europe – Global Challenges, Local Solutions", and "Water Challenges for a Changing World" (European Council, 2010b). In October 2010, the Council of the EU adopted three more joint programs to develop the ERA, specifically the initiatives "Agriculture, Food Security, and Climate Change", "Cultural Heritage and Global Change – A New Challenge for Europe", and "Healthy Diet for a Healthy Life" (European Council, 2010b).

The Pact for Research and Innovation in Europe was adopted by the Council of the EU's recommendation 2021/2122 of November 26, 2021 (European Union, 2021). This Pact, which specifies the EU's position on the ERA, declared that over the past two decades, the implementation of the ERA has contributed to significant achievements in areas such as research infrastructures, open science, transnational and international cooperation, gender balance in research activities, joint programming, research careers and researcher mobility, as well as structural reforms.

The Pact states that international cooperation through the ERA should take into account the priorities of the EU's external relations, based on multilateralism and balanced mutual openness, and should promote a level playing field and reciprocity, based on fundamental values and shared framework conditions, which is of exceptional importance in the context of Ukraine's European integration aspirations. Among other things, the Pact describes the values and principles of research and innovation in the EU and emphasizes that regarding the ethics and integrity of scientific research, they should be conducted without undue interference and highlights the responsibility of EU states to protect researchers from biases and methodological shortcuts, as well as counter the spread of pseudoscience and misinformation (European Union, 2021).

The Pact also sets out priority areas for joint actions in the EU regarding scientific activities; in this context, to deepen the functioning internal market for knowledge in the EU, it prescribes seeking the introduction of open access to scientific publications and research data, their multilingualism, and further development and integration of the basic digital infrastructure and services in the scientific field (European Union, 2021).

Thus, the role of the Pact is not limited to a coordinating function in the context of establishing common principles and values of the EU regarding scientific activities; this document has a significant programmatic function, and within its framework, the further evolution of the ERA and the strengthening of its implementation efficiency and regulatory content takes place.

In January 2024, the European Commission launched a new ERA Policy Platform, as a specialized one-stop shop providing a comprehensive overview of current ERA policies, activities, and achievements; this Policy Platform became part of the new governance structure of the ERA and the Pact for Research and Innovation; it aims to provide up-to-date information on the status of ERA Policy implementation and on the joint actions of EU structures in this direction (European Research Area, 2024). In the context of the ERA, the new EU White Paper on expanding support for research activities using dual-use technologies is also of significant importance (Research and innovation, 2024).

In addition to regulating scientific activities within the ERA framework, EU documents pay considerable attention to scientific research within the framework of the "Horizon Europe" program, the EU's key program for funding research and innovation with a budget of 95.5 billion euros. In 2018, the European Commission proposed an ambitious research and innovation program to replace the previous "Horizon 2020", which operated from 2014 and had a budget of 80 billion euros; in March and April 2019, the European Parliament and the Council of the EU reached a preliminary agreement on "Horizon Europe" and achieved a political agreement on December 11, 2020, and began adopting EU legal acts (Horizon Europe, 2024).

The key EU document concerning "Horizon Europe" is Regulation (EU) 2021/695 of the European Parliament and the Council of the EU of April 28, 2021, establishing this Framework Program for Research and Innovation, which, among other things, repealed Regulations (EU) No 1290/2013 and (EU) No 1291/2013 regarding "Horizon 2020" activities. Regulation 2021/695 set the goal of "Horizon Europe" to "ensure scientific, technological, economic, environmental, and societal impact" concerning "maximizing

the added value of EU investments in research and innovation" (European Parliament and of the Council, 2021).

Regulation 2021/695 prescribes that the "Horizon Europe" program supports research work integrated with "adherence to relevant provisions within the framework of the World Trade Organization", and research concepts, including experimental development, within the Program should "be used in accordance with the Frascati Manual developed by the Organization for Economic Co-operation and Development, while the concept of innovation should be used in accordance with the Oslo Manual, developed by the same Organization (European Parliament and of the Council, 2021).

Regulation 2021/695 emphasizes that throughout the entire Program, administrative simplification should be continually pursued, particularly reducing the administrative burden for beneficiaries, and provides that the existing system of reimbursing actual personnel costs should be further simplified, and the types of funding and implementation methods should be chosen based on their ability to achieve the specific objectives of the actions and results, taking into account, in particular, the control costs, administrative burden, and expected risk of non-compliance (European Parliament and of the Council, 2021).

Regulation 2021/695 mandates compliance with the EU Charter of Fundamental Rights during the Program's implementation, taking into account Article 13 on the freedom of scientific research, promoting respect for academic freedom in all countries benefiting from its funds, and reducing the use of animals in research and testing with the goal of ultimately replacing their use. For this purpose, the document requires following the positions of the European Group on Ethics in Science and New Technologies, the EU Agency for Fundamental Rights, and the European Data Protection Supervisor during the Program's implementation (European Parliament and of the Council, 2021).

It is important to add that Regulation 2021/695 provides in Article 2 a series of definitions in the field of scientific research. According to this document, "research infrastructure" means facilities that provide resources and services for research communities to conduct research and foster innovation in their fields, including associated human resources, major equipment or sets of instruments; knowledge-based facilities such as collections, archives, or scientific data infrastructures; computing systems, communication networks, and any other infrastructure of a unique nature and open to external users, necessary to achieve excellence in research activities. The Regulation clarifies that research infrastructure may, where appropriate, be used beyond research, for example, for education or public services.

The Regulation describes the Program's goals, which include the development and promotion of scientific excellence, support for the creation and dissemination of high-quality new fundamental and applied knowledge, skills, technologies, and solutions, support for training and mobility of researchers, among others. This includes the establishment of the European Innovation Council, which shall operate according to the principles of clear added value, autonomy, capacity for risk, efficiency, transparency, and accountability (European Parliament and of the Council, 2021).

According to Regulation 2021/695, responsible management of research data must be ensured according to the principles of findability, accessibility, interoperability, and reusability, with attention to long-term data preservation. Additionally, the Regulation 2021/695 details aspects of ownership of research results produced under the Program and the issues of their utilization and access (European Parliament and of the Council, 2021).

To assess the effectiveness of the Program's funding, Regulation 2021/695 provides in Article 49 for the appointment of independent external experts, who shall be identified and selected on the basis of calls for expressions of interest from individuals and through calls to relevant organizations such as research agencies, research institutions, universities, standardization organizations, civil society organizations, or enterprises to establish a database of candidates (European Parliament and of the Council, 2021).

According to Article 52 of Regulation 2021/695, the Programs evaluation should be conducted in a timely manner to inform the decision-making process regarding the Program, the next Framework Program, and other initiatives related to research and innovation. It is stipulated that the interim evaluation of the Program shall be conducted with the assistance of independent experts selected through a transparent process as soon as sufficient information on the Program's implementation is available, but no later than four years after the start of its implementation (European Parliament and of the Council, 2021).

As reported by the European Commission in 2022 concerning the dissemination and exploitation strategy for "Horizon Europe", these activities should occur within an integrated system, offering individual support services and providing tools aimed at enhancing the visibility and recognition of successful results. Additionally, the strategy should shape the European Commission's framework for collecting and utilizing the program's outcomes (Publications Office of the European Union, 2022).

It should be noted that the EU Community Research and Development Information Service (CORDIS) is crucial for implementing the European Research Area (ERA) and "Horizon Europe". CORDIS is the primary source of European Commission project results funded by EU research and innovation framework programs. It maintains a structured, publicly accessible repository of all project information managed by the Commission, including project factsheets, participants, reports, results, and links to open-access publications. CORDIS is managed by the Publications Office of the EU on behalf of the European Commission's Directorate-General for Research and Innovation.

However, the Directorate-General for Research and Innovation is not the only executive body of the EU with competence in scientific activities. The relevant mandate also extends to the European Commission's Directorate-General for Climate Action, Directorate-General for Communications Networks, Content and Technology, Directorate-General for Defence Industry and Space, Directorate-General for Digital Services, Directorate-General for Education, Youth, Sport, and Culture, European Climate, Infrastructure and Environment Executive Agency, and European Education and Culture Executive Agency.

Furthermore, Article 13 of the Charter of Fundamental Rights of the EU, "Freedom of the Arts and Sciences", has not significantly developed in the practices of the EU Court andtheadministrativeactivitiesoftheEuropeanCommissionconcerningguaranteesagainstrestrictionsonscientificresearchorrespectforacademicfreedom. The only existing ruling where Article 13 was used to protect academic freedom was in the case C-66/18 "European Commission v. Hungary" on October 6, 2020, which concerned national regulation of university activities.

In this case, the EU Court annulled Hungary's 2017 law prohibiting foreign higher education institutions outside the European Economic Area from conducting teaching activities in Hungary that lead to qualifications, and required such activities to be authorized based on specific international agreements with Hungary. Even in this single case, the EU Court primarily referred not to Article 13 of the Charter of Fundamental Rights of the EU but to Hungary's violation of Article XVII of the General Agreement on Trade in Services, annexed to the Agreement Establishing the World Trade Organization.

This cautious application of Article 13 of the Charter is explained by Toggenburg (2020), who notes that the relevant powers of the EU in the fields of arts and sciences are modest and defined by the principle of subsidiarity. Additionally, the text of Article 13 is quite controversial, as it is unclear to what extent national authorities may impact academic freedom, which "should only be respected". However, this researcher reasonably adds that the role of science extends beyond freedom of speech and the right to education, being crucial for a vibrant democracy. In the context of the Charter, academic freedom encompasses more than just the freedom to hold opinions within the university; as noted in case C-66/18, such freedom includes not only autonomous research and teaching free from state interference but also their institutional and organizational frameworks (Court of Justice of the European Union, 2020).

Further Scientific Research

The regulation of scientific activity and cooperation in EU law is crucial for understanding relevant international standards and for Ukraine's European integration. The ongoing evolution of normative models in EU law and their relevant doctrinal reflections should be the subject of thorough additional scientific research. These transformations of relevant universal international standards should form the basis for subsequent scientific investigations.

The further goal of such research should be the methods and forms of implementing the standards for organizing scientific activity embodied in EU programmatic documents in the context of Ukraine's agreements with the EU, Ukraine's participation in EU programs, and the general dimension of Ukraine's European integration. This is significant for the development of Ukrainian national legislation. However, the study of programmatic legal regulation as a phenomenon of relevant legal, organizational, and financial models remains highly fragmented.

Next research perspectives gain importance considering the existing limitations and the wide variability of identified bilateral programs and agreements between Ukraine and European countries concerning scientific cooperation, including interagency agreements. The research must consider the current conservatism in scientific studies of EU law and the outdated nature of Ukrainian legislation regarding interaction with foreign academic institutions and the supranational dimension of scientific research.

The need for systematization and intensification of research and expert work in academic freedom and mobility is further emphasized by the expansion of project activities of relevant EU structures and institutions in Ukraine and the institutional strengthening of EU programs and projects in Ukraine. These programs, funded by EU funds, are becoming system-forming phenomena for the organization of Ukrainian science and research activities as a whole.

In contemporary complex conditions, there is a special need for systematic counteraction to the destructive manifestations and provocations of the aggressor state and other violators of international law, which are observed in European scientific structures, including the misuse of mechanisms for organizing scientific cooperation, as exemplified by provocations in the European Space Agency. Therefore, the issue of further improving the environmental protection mechanisms of the EU and its member states to effectively counter such provocations becomes particularly important. Additionally, the further evolution of doctrinal reflection on the state of affairs regarding European scientific standards can influence the development of new universal international agreements on the systematic regulation of scientific research.

Practical Implications and Ukraine's European Integration

The practical implications of the study's findings on the EU's legal framework for scientific activities underscore the importance of international cooperation and adherence to scientific independence, particularly in the context of the European Research Area (ERA). The ERA's objectives to strengthen the EU's scientific and technological base are achieved through coordinated national policies, multi-annual framework programs, and adherence to ethical and methodological standards. These frameworks not only facilitate the free circulation of researchers and knowledge but also enhance competitiveness, especially in industrial fields.

For Ukraine, the implications are significant as it continues its journey towards European integration. The alignment with EU scientific standards and participation in programs like Horizon Europe can propel Ukraine's research capabilities and technological advancements. Ukraine's integration into the ERA implies greater access to resources, funding, and collaborative opportunities, which are crucial for its scientific and technological development.

Ukraine's European integration in the research context has seen several milestones. The Association Agreement between Ukraine and the EU, effective since 2017, includes provisions on scientific cooperation. Furthermore, Ukraine's participation in Horizon 2020 and its successor, Horizon Europe, highlights the practical steps being taken towards integration. The increased focus on research and innovation is evident in the joint initiatives and projects funded by these programs, fostering scientific excellence and innovation in Ukraine.

Moreover, the ERA's emphasis on international cooperation aligns with Ukraine's strategic goals. The Pact for Research and Innovation in Europe, with its focus on multilateralism and balanced mutual openness, provides a robust framework for Ukraine to deepen its scientific ties with the EU. This integration supports Ukraine's ambition to enhance its research infrastructure, promote gender equality in research, and address grand societal challenges through joint efforts.

As Ukraine advances in its European integration, it must align its national research policies with EU standards, ensuring compliance with the principles of scientific independence, ethical research, and open access to scientific publications. These steps will not only bolster Ukraine's scientific community but also contribute to the broader European research landscape, fostering innovation and addressing common challenges collaboratively.

Thus, the practical implications of the EU's legal framework for scientific activities extend beyond the regulatory scope, offering a roadmap for countries like Ukraine to integrate seamlessly into the European scientific ecosystem. This integration promises enhanced research capabilities, increased funding

opportunities, and a collaborative approach to scientific and technological advancements, ultimately contributing to Ukraine's sustainable development and its position within the European Union.

Limitations of the Study

While the study provides a comprehensive analysis of the EU's legal framework for scientific activities, it does have several limitations that could be addressed in future research:

Lack of Empirical Data on Implementation: The study primarily focuses on the legislative and programmatic frameworks established by the EU. However, there is a significant lack of empirical data on the practical implementation of these standards across different Member States and their impact on scientific activities. Future research could benefit from case studies or empirical analyses that evaluate how these standards are being adopted and enforced on the ground.

Variable Adoption Among Member States: The study does not sufficiently address the variability in the adoption and implementation of EU scientific standards among different Member States. The degree to which countries comply with and benefit from these standards can vary significantly, and this variability can influence the overall effectiveness of the EU's scientific policies. Detailed comparative studies could provide deeper insights into these discrepancies.

Impact on Non-EU Countries: While the study briefly touches upon Ukraine's integration into the European Research Area, it does not fully explore the implications for non-EU countries involved in EU scientific programs. Further research could analyze the specific challenges and opportunities faced by these countries, especially in terms of aligning their national policies with EU standards and maximizing the benefits of participation in EU programs.

Interdisciplinary and Cross-Sectoral Collaboration: The study could expand on the role of interdisciplinary and cross-sectoral collaboration within the EU's scientific framework. While it mentions various directorates and executive agencies, more detailed analysis of how these entities collaborate and coordinate efforts could enhance the understanding of the EU's holistic approach to scientific research and innovation. Evolving Legal and Policy Landscape: The study captures the EU’s legal and policy landscape up to early 2024. However, given the dynamic nature of EU policies, continuous updates are essential. Future research should include ongoing developments, new policy initiatives, and their impacts on the scientific community within and outside the EU.

Evaluation of EU Programs: Although the study outlines the objectives and regulatory frameworks of programs like Horizon Europe, it lacks a critical evaluation of their outcomes. Future studies should focus on assessing the success of these programs in achieving their goals, identifying any gaps or areas for improvement, and providing recommendations for enhancing their effectiveness.

Technological and Digital Infrastructure: The study touches on the importance of digital infrastructure in scientific research but does not delve deeply into the specifics. More detailed research on the development, integration, and challenges of digital and technological infrastructure within the EU could provide valuable insights into the practical aspects of scientific collaboration.

By addressing these limitations, future research can provide a more nuanced and comprehensive understanding of the EU's legal framework for scientific activities and its practical implications, not only within the EU but also for countries like Ukraine that are aligning with European standards.

Conclusion

EU Law and International Scientific Standards:

EU law significantly influences the development of international scientific standards. Despite the EU lacking imperative supranational competence in the field of science, the formation of subsidiary mechanisms for funding and supporting scientific activities has led to the establishment of robust institutions and mechanisms such as the ERA and EU programs like “Horizon Europe”. This evolution has substantially advanced scientific standards, particularly in ethics, multiculturalism, non-discrimination, views on transnational research, and sustainable funding and evaluation regimes for scientific projects. The

EU's contributions to scientific research are actively implemented in international law through agreements with third countries and other international institutions, and this contribution is crucial for Ukraine's European integration.

EU Law and Scientific Research:

A significant contradiction in the development of EU law regarding scientific research is the incomplete correlation between EU competence, national sovereignty, and academic autonomy. The norms of Article 13 of the Charter of Fundamental Rights of the EU regarding scientific activity and academic freedom are highly generalized and not aligned with the primarily recommendatory functions of the EU in scientific research. Furthermore, balancing the interests of the EU and national sovereignty in sensitive areas like security and defense research and the right to research results continues, making programmatic legal regulation the primary means of EU influence.

The European Research Area:

The ERA is becoming a unique phenomenon in the legal reality of the EU, as its normative model aims to correlate the competencies of the EU and its member states in the context of academic autonomy of research institutions. Established by the Lisbon Treaty and regulated by EU secondary law, further developed by EU Council initiatives, the ERA now operates under programmatic documents like the Pact for Research and Innovation in Europe and will evolve within the new ERA Policy Platform, which has a distinctly programmatic regulatory dimension.

Programmatic Regulatory Dimension:

The programmatic regulatory dimension is key to implementing the EU's competence in scientific activities, not only within the ERA's functioning and development but also in the context of a series of EU programs for research and innovation funding and integrated support for research activities, such as "Horizon Europe" with a budget of € 95.5 billion, replacing the previous "Horizon 2020" program. The main regulatory act for "Horizon Europe" is Regulation (EU) 2021/695 of the European Parliament and Council of April 28, 2021, whichprovidesdefinitionsinthefieldofscientificresearchwhoserolesclearlyextendbeyond EU regulatory practice; the imperative nature of this Regulation's provisions is based on its financial-legal nature, as it establishes the expenditure regime of EU funds for implementing "Horizon Europe".

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