CADERNOS DE DEREITO ACTUAL
www.cadernosdedereitoactual.es

© ***Cadernos de Dereito Actual*** Nº 31. Núm. Ordinario (2026), pp. 435-456
·ISSN 2340-860X - ·ISSNe 2386-5229

Legal frameworks promoting innovation: Comparative analysis of national innovation systems

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Abstract: In today's globalized world, innovation is essential to a country's economic growth and competitiveness. An effective legal system that encourages technological progress and research is critical to the success of innovation. Through a comparative study of national innovation systems, one can find the best experience of legislative support for innovation and develop proposals to improve the legal environment for innovation at the national and international levels. This study also highlights the importance of addressing barriers such as bureaucracy and weak integration between scientific and business communities. It emphasizes the role of public-private partnerships and government support in fostering innovation ecosystems. The article is aimed at analysing different models of legal regulation of innovation activity in the world, identifying their strengths and weaknesses, as well as formulating recommendations for adapting best practices to improve the national innovation system of Ukraine.

Keywords: Digital Transformation, Intellectual Property, Legislative Support, National Innovation Systems, Technological Innovation

Resumo: No mundo globalizado de hoje, a inovação é essencial para o crescimento econômico e a competitividade de um país. Um sistema jurídico eficaz que incentive o progresso tecnológico e a investigação é fundamental para o sucesso da inovação. Através de um estudo comparativo dos sistemas nacionais de inovação, pode-se encontrar a melhor experiência de apoio legislativo à inovação e desenvolver propostas para melhorar o ambiente legal para a inovação nos níveis nacional e internacional. Este estudo também destaca a importância de abordar barreiras como a burocracia e a fraca integração entre as comunidades científica e empresarial. Enfatiza o papel das parcerias público-privadas e do apoio governamental na promoção de ecossistemas de inovação. No processo de pesquisa, foram aplicados métodos de análise, síntese, indução, dedução, método dialético, método analítico, método de analogia, método de abstração e generalização. O artigo tem como objetivo analisar diferentes modelos de regulamentação legal da atividade de inovação no mundo, identificando seus pontos fortes e fracos, bem como formular recomendações para a adaptação das melhores práticas para melhorar o sistema nacional de inovação da Ucrânia.

Palavras-chave: Transformação Digital, Propriedade Intelectual, Apoio Legislativo, Sistemas Nacionais de Inovação, Inovação Tecnológica

1. Introduction

In today's globalized world, innovation is essential to a country's economic growth and competitiveness. It improves the quality of life, job creation, and productivity. However, the existence of a strong legislative framework that provides sufficient support for scientific and technological efforts is crucial to the success of innovation. The structure, organization, and legal support of national innovation systems differ significantly in different countries. These differences result from historical, cultural, political, and economic factors that influence how innovation is regulated.[6] In this regard, it is very important to analyse how the legal systems of other countries contribute to or hinder the promotion of innovation, as well as to identify best practices in the field of legislative support that other countries can adopt. In the current environment, where technological progress is the cornerstone of sustainable economic growth, creating an effective legislative framework to encourage innovation is becoming a vital business. By protecting intellectual

[6] DAHESH, M. B.; TABARSA, G.; ZANDIEH, M.; Hamidizadeh, M. Reviewing the intellectual structure and evolution of the innovation systems approach: A social network analysis. Technology in Society, 2020, 63, 101399. https://doi.org/10.1016/j.techsoc.2020.101399

property, encouraging research and development, promoting public-private cooperation, and facilitating the commercialization of scientific results, national legal systems play a crucial role in creating an environment conducive to innovation.

The theoretical basis of this study is the National Innovation Systems (NIS) perspective, according to which innovation is seen as the result of interaction between key actors such as firms, universities, research institutions, and the state. In this approach, the efficiency of knowledge flows between the system's participants is important, which are largely shaped and regulated by legal norms. Thus, legislation appears not as an auxiliary element of innovation policy but as a structural component of the NIS, capable of stimulating and restraining innovation processes. In this context, the creation of an effective legal framework to support innovation is essential. Laws on the protection and commercialisation of intellectual property, tax incentives for research and development, and the legal framework for public-private partnerships and innovation clusters affect the intensity of interaction between science, business, and the state. At the same time, excessive bureaucracy, complicated patent procedures, weak participation of small and medium-sized enterprises in innovation activities, and insufficient integration of the academic and corporate sectors remain widespread barriers even in advanced economies.

Existing research has expanded the understanding of the innovation systems functioning, focusing on technological innovation systems, networked forms of cooperation, open innovation, and the evolution of innovation ecosystems.[7] In particular, they analyse the conditions for the formation of innovation systems through shared resources, the role of interinstitutional and interregional networks in enhancing innovation activity, and the benefits of open and multi-actor models of innovation.[8] However, the legal dimension of innovation is considered fragmentarily or descriptively, without systematic inclusion in the overall analytical framework. [9]

This study aims to bridge this theoretical gap by integrating legal analysis into a NIS perspective.[10] The focus is on answering targeted analytical questions: how legal norms facilitate or impede knowledge flows between key NIS actors; [11] how legislation affects the commercialisation of scientific outcomes; and what legal instruments ensure institutional integration of innovation activities. This approach helps move from a descriptive review of legislation to a comparative analysis of the effectiveness of legal models for stimulating innovation in different countries. Accordingly, the research questions of this study is how different legal frameworks structure innovation ecosystems through these five regulatory dimensions, and what lessons can be learned from international experience to improve the legal environment for innovation development in Ukraine?

2. Materials and methods

In the process of studying the evolution of the legislative framework of national innovation systems, a thorough approach was applied, integrating several scientific

[7] MUSIOLIK, J.; MARKARD, J.; HEKKERT, M.; FURRER, B. Creating innovation systems: How resource constellations affect the strategies of system builders. Technological Forecasting and Social Change, 2020, 153, 119209. https://doi.org/10.1016/j.techfore.2018.02.002

[8] YAO, L.; LI, J.; LI, J. Urban innovation and intercity patent collaboration: A network analysis of China's national innovation system. Technological Forecasting and Social Change, 2020, 160, 120185. https://doi.org/10.1016/j.techfore.2020.120185

[9] COSTA, J.; MATIAS, J. C. Open innovation 4.0 as an enhancer of sustainable innovation ecosystems. Sustainability, 2020, 12(19), 8112. https://doi.org/10.3390/su12198112

[10] YAWSON, R. M. The ecological system of innovation: A new architectural framework for a functional evidence-based platform for science and innovation policy. In: Huizingh, K. R. E.; Conn, S.; Torkkeli, M.; Bitran, I. (eds.). The Future of Innovation. Proceedings of XX ISPIM 2009 Conference. Vienna: University of Minnesota, 2021, pp. 1–16. https://doi.org/10.13140/2.1.1957.1527

[11] DAHESH, M. B.; 2020. Ibid.

methods that offer an in-depth analysis of the topic. The method of analysis was used to systematically consider certain aspects of legal support for innovation, such as legislative support for the protection of intellectual property, mechanisms for stimulating research and development, commercialization of innovation, and infrastructure development. This made it possible to detail the impact of legal mechanisms on various elements of innovation. The method of synthesis served as the basis for integrating the acquired knowledge into a single system, which ensured the formation of a general idea of best practices and problematic aspects of the legal support of innovations in different countries.

The induction method was used to formulate general conclusions based on the analysis of specific examples from different national systems. For example, the study of certain legislative initiatives in the USA, Germany, and Japan helped to conclude global trends in legal support for innovation. The deduction method helped to assess how the general principles of innovation policy are implemented in practice through legislative and regulatory acts that regulate the functioning of national innovation systems. The dialectical method provided a dynamic understanding of the development of legal systems in the context of socio-economic and technological changes. This made it possible to take into account the contradictions and interactions between state regulation, the private sector, and the scientific community.

The analytical method was key in determining the strengths and weaknesses of individual models of legal support for innovation, as well as in comparing national systems in terms of their effectiveness and impact on economic development. The method of analogy helped to identify similarities between different national systems, which made it possible to borrow best practices and adapt them for potential use in other countries, in particular in Ukraine. The method of abstraction allowed us to separate insignificant factors and focus on key aspects of legal support for innovations that directly affect their development. The method of generalization permitted to combine the results of the study into complex conclusions, which can serve as the basis for the formation of recommendations for improving the legal mechanisms in the field of innovation at the national and international levels.

The study was based on a qualitative comparative legal approach aimed at analysing how legal frameworks facilitate or impede the functioning of national innovation systems. The methodological basis of the study is the functional approach to comparative law proposed by Zweigert and Kötz, which involves comparing legal solutions of different jurisdictions not on formal grounds, but on the basis of the functions they perform within specific socio-economic processes. In this study, such a functional equivalent is ensuring the effective circulation of knowledge, technologies and research results between the key participants of the National Innovation System, including universities, business and the state.

The choice of legal framework for the analysis was based on the concept of NIS, which allows considering law as an institutional mechanism for coordinating interaction between participants in the innovation process. On this basis, four key dimensions of legal regulation were identified that are of systemic importance for innovation development: legal regulation of commercialisation of intellectual property created in scientific and educational institutions; tax and financial incentives for research and development; legal mechanisms of public-private partnerships and innovation clusters; and institutional mechanisms for state coordination of innovation policy. These dimensions formed the basis of the analytical comparative matrix, which allowed us to move from a thematic review to a systemic comparison.

For comparison, countries were selected that demonstrate different ways of controlling innovation activities, which allows for assessing the effectiveness of their policies in different socio-economic conditions. Countries were selected for the study based on a combination of criteria. Firstly, they were selected based on their

belonging to different legal jurisdictions (Anglo-American, Continental European and Asian), which permitted to identify the influence of legal traditions on innovation regulation. Secondly, countries were selected based on their recognised level of innovation development and the existence of formalised legal mechanisms to support innovation. Thirdly, only those jurisdictions for which up-to-date and systematic legal sources are available were included in the sample. Ukraine was included in the analysis as a separate object of comparison in order to assess the possibilities of adapting international experience.

The timeframe of the study covers the period from 2010 to 2024, which helped to consider the stage of active formation of modern innovation policy in most of the countries under study and the latest legislative changes related to digital transformation and the development of the knowledge economy. In cases where certain basic regulatory acts were adopted earlier, they were analysed taking into account their current versions and application practices.

The source base of the study consisted of primary and secondary sources. Primary sources included legislative acts, bylaws, official strategies and programme documents in the field of innovation policy. They were selected through a systematic review of the official legal databases of the respective countries and international organisations. Secondary sources contained academic publications, analytical reports of international institutions and comparative legal studies. The selection of secondary sources was based on relevance to the identified legal dimensions, scientific recognition and relevance.

The strengths and weaknesses of the legal frameworks were assessed qualitatively based on their ability to fulfil the functions identified in the NIS approach. These criteria included the level of legal certainty, institutional coherence, accessibility of commercialisation mechanisms for different actors in the innovation process, and the ability of legal provisions to stimulate cross-sectoral collaboration. The assessment did not involve quantitative measurement of economic outcomes. It was recognised as a limitation of the study but allowed for a structural and functional analysis of legal models.

The legal methods, including formal legal analysis, comparative legal method, systemic and institutional approaches, were used as interrelated elements of a single methodological framework. The formal legal analysis was applied to identify the content of legal norms, the comparative method was used to compare functionally equivalent solutions in different jurisdictions, and the systemic approach was used to integrate the results into the logic of the NIS. This combination of methods ensured the internal consistency of the study and the validity of the conclusions drawn.

3. Results

3.1. Models of state innovation policy and regulation

One of the key strategies of the Ukrainian economy out of the crisis and profit is the growth of innovative activity. In this case, it is crucial to take into account the global experience of industrialized countries in planning inventive activities, since they have developed an effective structure to oversee the innovation process in their countries during decades of intensive development. Thanks to scientific research, two formulated models of the state strategy in the field of promoting innovation abroad were identified: (1) Anglo-American, which is characterized by the least interference of the state in innovative activities; (2) Franco-Japanese, where the state most actively supports the innovation process by all possible methods.[12]

[12] RUMYK, I. I.; PYLYPENKO, O. O. Management of financial and economic activities of integrated enterprises on innovative principles. Academic Notes of the University "KROK",

In the first scenario, enterprises have full autonomy in the field of innovation, since it is believed that market processes in themselves help to accelerate the innovation process. However, the state does not directly offer financial or economic support for its implementation; instead, it focuses its main efforts on creating favourable conditions for business. Conversely, in the second-the state significantly influences the development of the innovation process through direct grants and subsidies to enterprises and organizations engaged in innovative activities.[13]

For a comparative analysis of national innovation systems, it is suggested to identify five key legal dimensions: regulation of commercialisation of intellectual property of universities and research institutions; tax incentives for research and development (R&D); legal support for public-private innovation clusters and partnerships; financial and legal mechanisms for supporting start-ups and venture capital; institutional coordination and strategic management of innovation policy (Table 1).

Table 1. The analytical matrix of legal instruments to stimulate innovation.

Country	**Commercialisation of intellectual property**	**Tax incentives for R&D**	**Innovation clusters**	**Start-ups and venture capital**	**Institutional coordination and management**
USA	The Bayh-Dole Act (1980) allows universities to own and commercialise IP created with public funds	R&D Tax Credit, accelerated depreciation	Legislative support for technology parks, SBIR/STTR programmes	Developed venture capital law, SBICs, active role of private capital	Decentralised model with coordination through NSF, NIH
Germany	Legislation on technology transfer through university offices	Limited tax incentives (enhanced after 2020)	Legislative consolidation of clusters and PPPs (Fraunhofer-Gesellschaft)	State venture capital funds, public-private instruments	High level of coordination between federal and state levels
France	Law on Innovation and Research (1999), simplification of IP transfer	Crédit d'Impôt Recherche (CIR)	'Pôles de compétitivité' - legally recognised clusters	Public financial institutions (Bpifrance)	Centralised innovation strategy
Finland	Legislative support for the commercialisation of university research	Tax incentives complement direct funding	Legislative support for technology parks at universities	State venture capital funds (Business Finland)	High institutional integration
South Korea	State ownership of IP with licensing mechanisms	Targeted tax incentives for strategic industries	Legislative incentives for industrial clusters	Priority support for large corporations	Tight state coordination
Ukraine	Fragmented regulation of IP transfer, weak commercialisation	Limited and volatile tax incentives	Clusters exist de facto, but without a full legal framework	Inadequate venture capital legislation	Lack of a single coordination centre

The matrix demonstrates that successful national innovation systems are not characterised by isolated legal instruments, but by the systemic interaction of several regulatory dimensions. Countries with mature innovation ecosystems (such as the United States, Germany, and Finland) demonstrate a balanced combination of IP commercialisation laws, fiscal incentives, cluster regulation, venture capital structures, and institutional coordination. In contrast, Ukraine's legal framework

2021, 62(2), pp. 166–175. https://doi.org/10.31732/2663-2209-2021-62-166-175

[13] DAHESH, M. B.; 2020. Ibid.

remains fragmented, with insufficient integration between intellectual property regulation, fiscal incentives and innovation management, which limits the commercialisation of research results.

In Ukraine, institutional coordination of innovation policy remains fragmented. Responsibilities related to science, innovation, higher education and industrial policy are divided among several ministries and government agencies, often with overlapping mandates. This fragmentation hinders the implementation of coherent national innovation strategies and reduces the effectiveness of policy instruments aimed at supporting the commercialisation of research and technological entrepreneurship.

The choice of the United States, Germany and Finland as jurisdictions for comparison is not accidental, but is based on their recognised status as innovation leaders and the structural characteristics of their national innovation systems. These countries have developed comprehensive legal and institutional frameworks that integrate intellectual property regulation, public research management, venture capital mechanisms, and targeted fiscal incentives. For example, in the United States, the passage of the Bayh-Dole Act created a legal model that allowed universities and research institutions to commercialise the results of publicly funded research, thereby creating strong links between academic science and industry.

Germany and Finland represent leading European models of coordinated innovation management. Germany's innovation ecosystem is characterised by strong institutional cooperation between research organisations, industry and the state, as well as sustained public investment in research and development and support for innovative small and medium-sized enterprises.[14] Finland, in turn, was among the first countries to adopt the concept of a national innovation system as a central element of science and technology policy, introducing an integrated package of institutional and regulatory measures to support the full innovation cycle from research to market application.[15]

These jurisdictions were selected because they illustrate different but complementary models of innovation governance: the market-oriented model of the United States, the coordinated industrial innovation system of Germany, and the policy-integrated Scandinavian model represented by Finland. Despite institutional differences, all three systems demonstrate a high level of legal consistency, close interaction between universities, industry and government, and effective mechanisms for commercialising research results. This combination of systemic coordination and legal support provides valuable comparative information for assessing potential directions for reforming fragmented innovation regulation in Ukraine.

3.2. Comparative analysis of national innovation systems (international experience)

The degree of government intervention, social requirements, and the level of scientific and technological progress affect how innovative activities are carried out in different countries. Countries vary significantly in their approaches to innovation promotion, reflecting their historical, economic and institutional contexts. The comparative analysis of national innovation systems is structured according to five legal dimensions defined in the methodological framework: (1) commercialisation of

[14] OECD (2022), OECD Reviews of Innovation Policy: Germany 2022: Building Agility for Successful Transitions, OECD Reviews of Innovation Policy, OECD Publishing, Paris, https://doi.org/10.1787/50b32331-en

[15] ISATAYEVA, G.; ISSAKHMETOVA A.; SADYKBEKOVA A.; UMBETALIYEV N; SABDALINA A. Comparative Analysis of Open Innovation Management: Finnish Experience and Kazakhstan's Practice. Revista Espacios, 2018, 29(12), pp 27-29. Available at: https://www.revistaespacios.com/a18v39n12/18391227.html (accessed on 10 May 2025).

intellectual property, (2) tax incentives for research and development, (3) legal framework for innovation clusters and public-private partnerships, (4) regulation of start-ups and venture capital, and (5) institutional coordination of innovation policy. This structure allows for a functional comparison of how different legal systems support the circulation of knowledge within national innovation systems. One of the most important legal mechanisms stimulating innovation is the regulation of the commercialisation of intellectual property created in universities and research institutions. Countries demonstrate different legal approaches to the distribution and transfer of intellectual property rights.

The availability of venture capital and a legal framework for start-ups has a significant impact on the commercialisation of innovation. The United States has one of the most developed venture capital ecosystems in the world. Legal mechanisms that support venture capital funds, along with programmes such as SBIR and STTR, facilitate the financing of innovative small businesses and technology start-ups. The United States developed its current government innovation policy in the second half of the 1990s. The state demonopolized several sectors of the economy, in particular communications, transport, and energy. Small, creative businesses were allowed to enter the market as a result of the fact that the main players in the economy lost influence.[16] The development of two major innovation institutions - technology parks and venture capital funds - that are truly autonomous from federal government agencies should be highlighted as one of the distinctive aspects of the growth of the American innovation sphere.[17]

The extremely high activity of small innovative enterprises is another characteristic of the US innovation economy. This is mainly due to the growth and availability of venture capital, the main source of funding, as well as the availability of separate government programs to support these types of businesses.[18] A significant proportion of educated immigrants and intense rivalry among all players in the innovation sector are two more characteristics of the American innovation system.

The United States passed several laws that allow the financing of special programs and the use of market mechanisms that facilitate this field of activity to guarantee innovation, the growth of high-tech industries, and the application of scientific and technological achievements. The Law "On the Organization and Priorities of Scientific and Technical Policy" of 1976, for example, outlines the foundations of national policy in the field of science of nanotechnology.[19] They include, among other things: formulating a plan to define how nanotechnology science contributes to the objectives: Using science and technology to stimulate the nation's economy: conducting scientific and technical research to meet internal needs and advance external interests; training and retraining of specialists in the field of science and technology in favour of the state, etc.

Under the Stevenson-Wilder Technological Innovation Act, industrial innovation and technology are essential to the economy and well-being of Americans.[20] They should be used to increase the productivity of the public and private sectors, create new industries, and improve the lives of citizens. One of the most important laws

[16] Ibid.
[17] YIN, X.; CHEN, J.; LI, J. Rural innovation system: Revitalize the countryside for a sustainable development. Journal of Rural Studies, 2022, 93, pp. 471–478. https://doi.org/10.1016/j.jrurstud.2019.10.014
[18] RUMYK, I.; 2021. Ibid.
[19] U.S. SENATE. H.R.10230–National Science and Technology Policy, Organization, and Priorities Act of 1976. Washington, DC, 1976. Available at: https://www.congress.gov/bill/94th-congress/house-bill/10230 (accessed on 10 May 2025).
[20] U.S. CONGRESS. Stevenson–Wydler Technology Innovation Act of 1980. Washington, DC, 1980. Available at: https://www.govinfo.gov/content/pkg/COMPS-9476/uslm/COMPS-9476.xml (accessed on 10 May 2025).

concerning the protection of intellectual property is the Bai-Dole Act of 1980. The Act allowed universities, small businesses, and nonprofit organizations to invent and patent their inventions, and to participate in their commercialization, using federal funds. The Small Business Innovation Act of 1982 required federal departments and agencies to allocate special funds for research.

However, Ukraine's regulatory framework for venture capital investments remains relatively underdeveloped. Although several initiatives have been introduced to support the development of the start-up ecosystem, access to private investment capital remains limited. Legal uncertainty regarding investment structures, minority investor protection, and exit mechanisms further complicates venture capital transactions. As a result, many Ukrainian startups seek external financing abroad, which weakens the domestic innovation ecosystem.

The institutional architecture of innovation management in the United States is characterised by a highly diversified and multi-level system that includes both federal agencies and independent research organisations.[21] Key government agencies responsible for developing and coordinating innovation policy include the National Science Foundation (NSF), which supports fundamental scientific research; the National Institutes of Health (NIH), which funds biomedical innovation; the National Institute of Standards and Technology (NIST), which develops technology standards and promotes industrial innovation; and the Department of Defence and NASA, which play an important role in funding strategic and high-risk technology research. In addition, advisory and coordination functions are performed by organisations such as the National Academy of Sciences and the American Association for the Advancement of Science, many of which operate under mixed funding models that combine public and private resources.[22]

This institutional pluralism fosters a dynamic innovation ecosystem characterised by close interaction between universities, industry and government. A key legal mechanism supporting the commercialisation of research results is the Bayh-Dole Act, which allows universities and research institutions to retain intellectual property rights to inventions created with federal funding and license them to private companies. Complementary policy instruments include federal research grants, tax incentives for research and development, and extensive venture capital markets that support the growth of technology start-ups.[23] Between 2010 and 2024, the United States consistently maintained one of the highest levels of investment in research and development in the world. Gross domestic expenditure on research and development remained above 2.7–3.5% of GDP during this period, with private sector investment accounting for the majority of total research and development expenditure. This combination of strong public funding for basic research and significant private investment in applied innovation has helped maintain the United States' global leadership in high-tech industries and knowledge-intensive sectors.

Even highly developed innovation systems were formed gradually through institutional and legal reforms, rather than emerging as fully coordinated frameworks. Until the early 2000s, there was no coordinated and centralised innovation policy in the United Kingdom. The situation began to change with the publication of the Department of Trade and Industry's government technology development strategy in 2003 and the creation of the Technology Strategy Board in

[21] DZYUBA, O.; SHEVCHENKO, O. Economic and legal analysis of the implementation of the "Strategy for the development of the sphere of innovative activity for the period until 2030". Economy and Society, 2021, 23. https://doi.org/10.32782/2524-0072/2021-23-14

[22] CANADA'S NEW GOVERNMENT. Mobilizing science and technology to Canada's advantage: executive summary. Ottawa: Public Works and Government Services Canada, 2007.

[23] LEWIS, P. Innovation, technician skills, and vocational education and training: Connecting innovation systems and vocational education and training. Journal of Vocational Education & Training, 2023, pp. 1–28. https://doi.org/10.1080/13636820.2023.2215749

2004, which was designed to support the development and commercialisation of innovative technologies. A more comprehensive and long-term innovation policy framework was only introduced in 2008, when the government adopted a strategic approach aimed at strengthening knowledge transfer, supporting technology clusters and expanding public-private partnerships.

Similar trajectories can be observed in other innovation-oriented jurisdictions analysed in this study, including the United States, Germany, Finland and Canada. These countries were selected because they demonstrate consistently high innovation performance and offer different institutional models for regulating research commercialisation, intellectual property management, fiscal incentives for research and development, and cluster innovation policy. Quantitative indicators such as research and development expenditure, patent activity, and innovation rankings confirm the effectiveness of these regulatory frameworks and make them relevant benchmarks for assessing the development of Ukraine's national innovation system.[24].

For Ukraine, which is currently modernising its political, economic and institutional systems, innovation is important for the process of state-building. One of the key elements of Ukraine's creative state-building is the introduction of digital technologies. As an example, consider the Diia platform, which allows residents to interact with the authorities in a single digital channel, draw up documents, and receive administrative services online. This reduced the likelihood of corruption and also made it easier to obtain public services because the Diia platform minimises the interaction between citizens and public officials. Another illustration is the Prozorro system, which has significantly reduced inefficiencies and abuses in public procurement by increasing transparency and opening them up to competition. Innovative methods are used for the development of regions. In different regions of Ukraine, technology parks and innovative clusters are being created. For example, Synergy Science Park in Kharkiv promotes research and entrepreneurial initiatives.

The IT industry in the Lviv region is developing rapidly, attracting young specialists and guaranteeing the development of new jobs. The development of programs to promote entrepreneurship is another way to implement the state-building component. For example, the Ukrainian government program "Affordable loans 5-7-9%" allows small and medium-sized enterprises to receive funding for the development of creative projects on favourable terms. This contributes to economic expansion, as well as the development of competitive enterprises that can successfully enter world markets. In addition, Ukraine regularly participates in global programs such as Horizon Europe, which fund research and innovation.

Fiscal incentives are another important legal tool used to stimulate innovation. Countries apply various combinations of tax breaks, subsidies and financial incentives depending on the structure of their innovation ecosystems. The United States and Canada rely heavily on tax credits for research and development expenditures, which encourage private companies to invest in technological development. Such mechanisms are particularly effective in innovation systems characterised by a strong private sector and active venture capital markets. France is one of the most prominent examples of tax support for innovation through the Crédit d'Impôt Recherche (CIR). France has supported the state strategy of promoting the patenting of ideas by domestic companies since 1998. The National Innovation System was restructured and modernized in 1999 to better commercialize scientific and research potential by enacting legislation on innovation and research. As a result of the implementation of the law, a special "innovation plan" and several government decisions were adopted. Its goal is to create a

[24] CARTER, I. The National Research and Innovation System in the United Kingdom: A Brief History. Journal of Research Management and Administration, 2024, 3(1), 202403092. https://doi.org/10.18552/jorma.v3i1.985

common legislative framework that will contribute to the formation of cooperation between the public scientific sector and non-state actors involved in the innovation process. Since 2007-2008, France has introduced targeted tax incentives to encourage investment in innovation, including the Crédit d'Impôt Recherche (CIR). This policy provides firms with a tax credit for eligible R&D expenditures, significantly reducing the financial risks associated with innovation.

In France, 49.9% of total public spending goes to research and development. The private sector supplies the remaining funds, with industrial firms accounting for 70% of R&D spending.[25] France's innovation policy is aimed at stimulating private investment in science, improving interaction between all key participants in the innovation process within the poles of competitiveness, and supporting the development of small and medium-sized businesses. To improve the cooperation of the project participants and technology transfer, special innovation clusters have been created in France and a special program of "competitiveness poles" has been developed and launched in the country.

However, tax incentives for research and innovation remain limited and unstable in Ukraine. Although certain provisions of tax legislation provide advantages for innovative enterprises, these incentives are often temporary, narrowly defined, or subject to frequent regulatory changes. As a result, enterprises face uncertainty regarding the financial benefits of investing in research and development activities. Compared to the predictable fiscal mechanisms being introduced in France and several other European countries, the Ukrainian tax system provides weaker incentives for sustained private sector participation in innovation processes.

Innovation development has a long and stable history in Sweden. However, it was only from 2005 to 2008 that the areas of health, biotechnology, environment, and sustainable development were identified as priority areas for research funding in Sweden. To facilitate the rapid and effective commercialization of inventions, Sweden has established "high-tech centres" that combine commercial and research organizations. A significant part of the applied scientific and technological achievements is carried out in the laboratories of large industrial corporations and remains within their framework, practically not spreading among potential users in the relevant industry, despite the energetic efforts of the government to create innovative development strategies and programs.[26]

Germany has historically relied more on direct government funding than tax incentives, although recent reforms have introduced tax incentives to increase private sector participation in innovation activities. Many successful innovation systems rely on formalised cooperation mechanisms linking universities, industry and government agencies. The targeted development of the national innovation system in Germany began in the post-war period and was closely linked to the formation of a new legal and institutional framework for state policy in the field of science, technology and innovation. In the late 1940s and 1950s, the state played a dominant role in the regulation of R&D, creating public institutions and budgetary funding mechanisms aimed at restoring scientific potential and modernising industry. International legal cooperation was of great importance at the initial stage of post-war reconstruction, in particular the assistance of the USA within the

[25] LEVYTSKYI, V.; RADYNSKYI, S. V.; DYACHUN, O. Regulatory and legal support for innovation and investment activities of industrial enterprises of Ukraine. Socio-Economic Problems and the State, 2022, 27(2), pp. 25–34. https://doi.org/10.33108/sepd2022.nom2.025

[26] CARAYANNIS, E. G.; Dezi, L.; GREGORI, G.; CALO, E. Smart environments and techno-centric and human-centric innovations for industry and society 5.0: A quintuple helix innovation system view towards smart, sustainable, and inclusive solutions. Journal of the Knowledge Economy, 2021, 13(2), pp. 926–955. https://doi.org/10.1007/s13132-021-00763-4

framework of post-war reconstruction programmes, which provided funding for enterprises in the most technologically advanced sectors of the economy, such as mechanical engineering, automotive and chemical industries. Such cooperation was based on interstate and intergovernmental agreements, which created legal conditions for the transfer of technology and scientific knowledge.[27]

Since the 1950s, Germany has developed special legal instruments to support innovative entrepreneurship, including targeted government programmes, and regulatory mechanisms to stimulate the development of certain high-tech sectors. Cooperation with American experts in the fields of nuclear energy, space research and aviation was institutionalised through legal forms of international scientific and technical cooperation, which provided access to advanced scientific achievements. A significant transformation of the innovation regulation took place in the 1970s, when legal mechanisms for public-private partnerships in research and development were introduced. During this period the first venture capital funds appeared, whose activities were aimed at developing innovative small and medium-sized enterprises. As a result, the share of budget funding in total R&D expenditures gradually decreased from around 70% in the 1970s to around 30% in the following decades. [28]

At the current stage, the national innovation system of Germany operates within a comprehensive legal model based on three key areas: improving the regulatory environment for innovative entrepreneurship, developing science and education through regulatory support of higher education and research institutions, and expanding financial and legal instruments to support business innovation. Despite the presence of certain problems, the implementation of these functions by public authorities is generally assessed as effective.[29] However, there is an insufficient level of use of tax and legal incentives to encourage research. In order to overcome the weak link between research and entrepreneurial activity, the legal framework has initiated the creation of entrepreneurship and technology transfer units at universities aimed at enhancing the commercialisation of research results.[30] Intensive public-private partnerships allowed the Finnish industry to move towards the production of precious products between the mid-1960s and 1980s. In Government communication on Finland's National Innovation Strategy to Parliament 2009,[31] much attention is paid to the creation of technology parks, which are considered one of the most important components of Finland's innovative infrastructure. Local administrations have created 22 technology parks based on 20 universities in Finland. Thus, most countries have strong government support for R&D, the creation of innovation clusters and technology parks, but the commercialisation of research and the development of venture capital varies.

In contrast, innovation clusters in Ukraine often emerge as informal regional initiatives led by universities, IT communities, or local authorities. However, these initiatives typically operate without a comprehensive legal framework governing cluster management, funding mechanisms, and long-term institutional cooperation. As a result, cooperation between universities and industry often depends on ad hoc agreements rather than stable legal structures. This institutional gap significantly limits the scalability and sustainability of innovation.

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[27] KOVALENKO, I. A. Analysis of the problems of regulating innovative activity in Ukraine. Slovo National School of Judges of Ukraine, 2022, 38–39(1-2), pp. 160–170. https://doi.org/10.37566/2707-6849-2022-1-2(38-39)-15

[28] DEI, H.; DEI, M.; KUTYNSKA, A. The role of the state in digitalization of education. Legal Horizons, 2024,19(4), pp. 8–18. https://doi.org/10.54477/LH.25192353.2023.4.pp.8-18

[29] Ibid.

[30] LEVYTSKYI, V.; 2022. Ibid.

[31] WESTERSTRAHLE, P. National innovation strategy of Finland. In: ITIF Event: Benchmarking Leading Countries' National Innovation Policies. 2007. Available at: https://www2.itif.org/ITIF_PWesterstrahle.pdf (accessed on 10 May 2025).

Asian countries are characterised by active government involvement in shaping innovations, powerful industrial laboratories, and the development of IT and technology parks, but problems with venture capital and commercialisation of research results remain significant. Much of Japan's applied science and technology is carried out in the laboratories of large industrial corporations and remains within their confines, with little or no dissemination to potential users in the relevant industry, despite the government's vigorous efforts to create innovation strategies and development programmes. The majority of state research is fundamental, and its practical application is still insufficient. Basic research conducted by the government and applied research conducted by the private sector are not always coordinated. In Japan, venture capital and the venture capital industry as a whole are underdeveloped. The process of creating technology parks and business incubators is disrupted by a lack of qualified personnel. The ineffectiveness of the state innovation policy was revealed by the results of the state programme for the creation of high-tech scientific and industrial regional clusters. Since 1995, taxation rates for small and medium-sized businesses have been reduced in order to improve the country's technological base.[32]

The first innovation development initiatives were introduced in South Korea in 1999, and the innovation industry has grown rapidly since then. Turnkey contracts, licensing, and consulting services were among the methods of borrowing foreign technology to support modernisation. The main method of learning from foreign experience was through joint ventures with Japanese partners. Although Korea is a world leader in exports in several high-tech industries, the lack of development of core technologies has made the country highly dependent on foreign equipment. State-owned research institutions were reorganised by the government in 1998, which fostered competition. From that point on, research institutions provided office space and research facilities to individual companies, which became the main mechanism for converting research results into forms suitable for industrial use. Targeted assistance, mainly to large businesses, is one of the unique aspects of South Korea's innovative growth. [33] Both countries have strong government involvement and developed industrial laboratories, but poorly developed venture capital and commercialisation of scientific developments.

In the absence of a legislative framework, China's innovation policy has been implemented through the implementation of specific initiatives aimed at the development of high technologies, both local and foreign, as part of the path to modernizing the country's industry since the mid-1980s.[34] The legislative framework for the regulation of innovation was created in 2002 by the adoption of two important laws: "On scientific and technological progress"[35] and "On the advancement of science and technology".[36] Various types of preferential administrative-territorial formations play a significant role in the development of innovative business: special economic zones, zones of trade and economic

[32] COSTA, J.; 2020. Ibid.

[33] LYUBCHYCH, A. M.; OHIENKO, I. V.; HOLOVASHCHENKO, O. S. Legislative changes regarding the formation of priority areas of scientific, scientific-technical, and innovative activities. Analytical and Comparative Jurisprudence, 2024, 3, pp. 647–651. https://doi.org/10.24144/2788-6018.2024.03.109

[34] BRYS, B.; MATTHEWS, S.; HERD, R.; WANG, X. Tax Policy and Tax Reform in the People's Republic of China. Paris: OECD Publishing, 2013. https://doi.org/10.1787/5k40l4dlmnzw-en

[35] NATIONAL PEOPLE'S CONGRESS. Law of the People's Republic of China on scientific and technological progress. Beijing, 2021. Available at: http://en.npc.gov.cn.cdurl.cn/2021-12/24/c_924633.htm (accessed on 10 May 2025).

[36] NATIONAL PEOPLE'S CONGRESS. Law on the advancement of science and technology of the People's Republic of China. Beijing, 1993. Available at: https://www.wipo.int/wipolex/en/legislation/details/22967 (accessed on 10 May 2025).

development, industrial parks, etc.[37] These institutions have become an effective means of attracting international companies and experts to cooperate, for which certain advantages are offered.[38]

Shortly after gaining independence from Britain in the early 1950s, India began to create its innovative system. In addition, heavy industry was supposed to be the main sector of the economy that would use scientific achievements, while importing money and technology at an early stage. Government officials have promoted private scientific research and development since 1974. Indian companies conducting scientific research received support for access to foreign equipment and raw materials, as well as certain tax benefits. Much attention was paid to creating their educational system between 1947 and 1990. In 1991, the Indian government announced a new economic policy, which provided for the transition to market financing of science. This was realized by reducing relevant government spending and slowing the pace of development of new technologies and science. Due to the recognition of the inefficiency of this practice, budget funding was increased. A deliberate policy to develop India's largest sector of innovation, information technology, began in the early 1970s. For this reason, large universities began to build computer centres. After the abolition of the licensing process, the creation of specialized research institutes, and the adoption by the government of legislation on the development of the IT industry, the information technology sector experienced a new stage of development in the 1980s.[39]

Specialized technology parks were established in India in 1991 to produce software for export. Automotive, computer, communication, pharmaceutical, nuclear power, and space industries belong to the sectors of the Indian economy that have developed at the global (or equivalent global) level of innovation. There are 45 technology parks in the country, which together produce 80% of exported IT products.[40] In addition, thanks to measures taken to support Indian information technology, India accounts for 65% of the global outsourcing market - more than 300 multinational corporations have transferred their computer software development units there. Such attractiveness for foreign business is associated with the high qualification of Indian IT specialists and the low cost of their labour - the salaries of similar workers in the United States are on average 6 times higher.[41] Most research in India is not put into practice, as the government currently funds more basic research than applied research. The nation is still incredibly impoverished. In general, it can be described as a high-quality innovation system with extremely low efficiency in other areas of the economy.

Shortly after gaining independence, Brazil began to develop its innovation system. Since the late 1990s, Brazil has enacted several laws aimed at increasing research, stimulating innovation in the private sector, and establishing more productive partnerships between academic institutions and businesses. In 2006, the Innovation Law was passed, and in 2005, a law providing tax incentives for private investment in research and development. [42] The creation of four national networks of nanotechnology and nanoscience in 2001 marked the beginning of

[37] SUN, Y. China's national innovation system in transition. Eurasian Geography and Economics, 2002, 43(6), 476–492. https://doi.org/10.2747/1538-7216.43.6.476
[38] YAO, L.; 2020. Ibid.
[39] MUSIOLIK, J.; 2020. Ibid.
[40] LYUBCHYCH, A. M.; 2024. Ibid.
[41] RAYHAN, R.; RAYHAN, S. AI and human rights: Balancing innovation and privacy in the digital age. Computer Science, 2023, 2, 353964. https://doi.org/10.13140/RG.2.2.35394.56001
[42] LUPAK, R. L.; RUDKOVSKY, O. V.; VASYLTSIV, T. G.; BEREZIVSKYI, Ya. P. Institutional and innovative factors of technological development of the national economy of Ukraine in the context of global informatization. Business Inform, 2021, 1, pp. 103–112. https://doi.org/10.32983/2222-4459-2021-1-103-112

coordinated government support for the development of nanotechnology in Brazil. Now these networks unite about 40 research institutes throughout the country. Funding for science and technology in the country has historically been controlled by the public sector, but the private sector plays an increasing role (by 2005, the private sector's contribution was 50%). Despite this, public universities and research organizations conduct 80% of research programs. In general, government policy is mostly responsible for inventive development.[43]

An important tool in the field of financial support for innovation in the 1990s and 2000s, in addition to tax incentives for innovation, subsidies, and interest co-financing. Joint private-public enterprises use almost two-thirds of the funds of industry funds. The low level of transformation of knowledge into innovative products, the emphasis of the innovation system on academic research, and the lack of coordination between the processes of scientific research, technology development, production, and commercialization of achievements are among the shortcomings of Brazil's innovation policy. In Brazil, there is hardly a policy of interaction with the diaspora and the involvement of highly skilled foreign workers.[44] In Brazil, innovation is largely controlled by the state, and the private sector is developing, but there are problems with commercialisation and integration of scientific results into industry.

3.3 Legal mechanisms of key innovation policy instruments

A content analysis of the legal frameworks that support national innovation systems requires not only identifying the existence of specific legislative instruments, but also examining the specific legal mechanisms through which these instruments operate. This section therefore provides a detailed analysis of several influential regulatory instruments that are often cited in comparative studies of innovation policy: the Bayh-Dole Act, the French research tax credit Crédit d'Impôt Recherche, and the German legislative framework supporting innovation clusters. For each instrument, attention is paid to the specific legal provisions, eligibility conditions, and procedural steps that determine how the regulation works in practice.

The Bayh-Dole Act is one of the most influential legislative mechanisms shaping modern cooperation between universities and industry. Its main legal innovation lies in the distribution of intellectual property rights for inventions developed with the help of federally funded research. Under this legislation, universities, non-profit research institutions, and small businesses are granted the right to retain ownership of inventions created with federal funding, provided they comply with several legal obligations. Institutions must disclose information about each invention to the relevant federal agency within a specified period, decide whether to retain ownership of the invention, and commit to actively pursuing commercialisation. These obligations are accompanied by procedural requirements, such as filing patent applications, reporting on commercialisation activities, and ensuring that the invention is available for practical use.

The law also establishes a revenue sharing requirement, whereby inventors must receive a portion of the revenue generated by licensing agreements. In addition, institutions must give preference to domestic industry when licensing technologies and ensure that inventions arising from public funding benefit the national economy. Federal agencies retain so-called 'participation rights,' which allow the government to intervene and require additional licensing if the technology is not properly commercialised or if public needs are not being met. Together, these

[43] MATYASH, A; 2024. Ibid.

[44] MALERBA, F.; MCKELVEY, M. Knowledge-intensive innovative entrepreneurship integrating Schumpeter, evolutionary economics, and innovation systems. Small Business Economics, 2020, 54(2), pp. 503–522. https://doi.org/10.1007/s11187-018-0060-2

mechanisms transform publicly funded research outcomes into market-oriented intellectual assets, enabling universities to establish technology transfer offices and structured licensing procedures. As a result, the law has significantly strengthened the institutional capacity of universities to participate in innovation ecosystems.

The central fiscal instrument for supporting innovation in France is the Crédit d'Impôt Recherche, which functions as a large-scale tax credit for research and development activities. Unlike direct subsidies, this mechanism operates within the broader framework of the national tax code and allows companies to deduct a portion of their eligible research and development expenses from their corporate income tax liabilities. The tax credit is calculated primarily as 30 per cent of eligible research expenses up to a specified financial threshold, with a lower percentage applying to expenses exceeding that limit. Eligible expenses include research personnel salaries, social security contributions related to those salaries, depreciation of research equipment, patent protection costs, and payments to certified public or private research organisations that perform subcontracted research and development activities. To obtain the tax credit, companies must document the scientific and technological nature of their research activities and submit detailed reports confirming that the projects involve experimental development, applied research or fundamental research. These reports are evaluated by the tax authorities and may also include consultations with scientific institutions to verify the eligibility of the activities.

A distinctive feature of the CIR mechanism is that the tax credit can be refunded to certain categories of firms, in particular young innovative enterprises and start-ups, which may not yet generate sufficient taxable income. In such cases, the unused credit can be carried forward to subsequent years or reimbursed directly by the state. This interaction with the broader corporate tax system provides a powerful long-term incentive for private sector investment in innovation. The development of innovation clusters in Germany is supported by a coordinated regulatory framework that combines federal innovation policy instruments and regional development legislation. Instead of a single codified law, the German model relies on a combination of legal acts and strategic programmes implemented by federal ministries and regional governments.

Within this framework, officially recognised innovation clusters are typically established through competitive government programmes that require collaboration between companies, research institutions and regional authorities. Cluster initiatives must demonstrate a coordinated innovation strategy, defined technological specialisation and institutional governance structures responsible for managing joint projects. Participating organisations gain access to a range of legal and financial instruments, including eligibility for targeted government funding, simplified procedures for joint research projects, and support for shared infrastructure such as technology parks and research laboratories. Public funding mechanisms typically depend on formal cooperation agreements between universities, firms and regional authorities.

An important legal feature of the German cluster system is the requirement for multilateral management structures, which typically include steering committees, coordination agencies and mechanisms for monitoring research results and commercialisation activities. These institutional arrangements ensure that cluster participants work within an organised system that promotes knowledge sharing, joint research and technology commercialisation. Thanks to this combination of legal eligibility criteria, institutional governance requirements and targeted public funding mechanisms, the German cluster structure promotes long-term cooperation between academia and industry, while strengthening regional innovation ecosystems.

An analysis of the detailed legal mechanisms of these instruments provides a clearer basis for assessing the strengths and weaknesses of national innovation

policy. In the case of the Bay-Doul structure, the clear allocation of intellectual property rights and structured commercialisation procedures create strong incentives for universities to participate in innovation markets. The French CIR demonstrates how tax legislation can systematically reduce the financial risks associated with private sector investment in research. Meanwhile, the German cluster structure illustrates the importance of institutional coordination and legally structured cooperation between research institutions and industry. Taken together, these examples demonstrate that the effectiveness of innovation policy depends not only on the existence of supportive legislation, but also on specific legal mechanisms that define eligibility, procedural requirements and institutional responsibilities within national innovation systems.

4. Discussion

A comparative analysis across five legal dimensions shows that the main challenge for the Ukrainian innovation system is not a lack of legislative initiatives, but insufficient institutionalisation and coordination of legal mechanisms. Although individual regulatory instruments exist, they often lack procedural clarity, long-term stability and effective institutional coordination.

The results of the comparative analysis, structured according to the analytical matrix of legal dimensions of the NIS, show that the effectiveness of innovation policy is determined not by the availability of individual legal instruments, but by the systemic interaction between intellectual property regulation, fiscal incentives, institutional coordination and knowledge transfer mechanisms. To ensure consistency in the comparison, the discussion focuses on three regulatory models identified in the analysis: the Anglo-American model (United States and Canada), the continental European model (Germany, France and Finland) and the Asian coordinated model (Japan and South Korea).

The second key pattern is the varying impact of tax incentives for research and development depending on the overall institutional architecture. Comparisons show that tax incentives are most effective in systems with a developed private innovation sector (the United States, Canada), while in countries with dominant public funding (France, South Korea), direct budgetary instruments play a decisive role. [45] Innovation clusters and public-private partnerships are institutional mechanisms that promote cooperation between universities, industry and the state. European countries have some of the most developed legal frameworks in this area. Germany supports cluster development through coordinated federal and regional innovation policies, while France has institutionalised cluster development through the pôles de compétitivité programme, which legally recognises innovation clusters as key instruments of industrial policy. Finland also provides legislative support to technology parks and innovation centres linked to universities, creating integrated innovation ecosystems that support the full cycle from research to commercialisation. In Ukraine, clusters exist in practice, particularly in regions such as Lviv and Kharkiv, but their development remains largely informal due to the lack of a comprehensive legal framework regulating cluster cooperation and innovation partnerships.

One of the most important patterns relates to the legal framework for innovation clusters and public-private partnerships. The analysis shows that the most effective models are those in which clusters have not only economic but also clear legal institutionalisation (Germany, France, Finland). Such a framework promotes long-term cooperation and reduces the risks of opportunistic behaviour of participants. At the same time, the de facto existence of clusters without proper legal support limits their systemic impact on innovation development. One

[45] RUMYK, I.; 2021. Ibid.

unexpected result is that a high level of government coordination does not always correlate with effective commercialisation of innovations. In particular, in Japan and South Korea, significant public investment and strategic planning coexist with relatively weak mechanisms for knowledge transfer from large corporations to the wider innovation ecosystem. Another important contradiction is that a developed patent law alone does not guarantee innovation dynamics. In a number of countries with strong IP protection, there is a low participation of small and medium-sized enterprises in commercialisation processes, which limits the diffusion of innovations. This confirms the need to combine legal protection with financial and institutional mechanisms for access to innovation. [46]

The analysis of the Anglo-American legal jurisdiction demonstrates a model in which law acts as a catalyst for market knowledge flows. Legislation in this system is focused on clearly defining intellectual property rights and creating flexible mechanisms for their transfer to the private sector, which reduces transaction costs and stimulates entrepreneurial activity of universities. For Ukraine, this experience is important in terms of establishing predictable rules for commercialising research results created with public funds, as well as moving from administrative control to legal incentives for innovation. At the same time, the full transfer of this model without adaptation is limited due to the insufficient development of the venture capital market and institutional infrastructure in Ukraine.

Continental European legal jurisdiction, represented primarily by Germany and France, is based on the active role of the state in the formation of innovation links through institutionalised legal mechanisms. [47] The laws on innovation clusters, public-private partnerships, and state agencies are aimed at overcoming the fragmentation of the national innovation system and ensuring long-term coordination between its participants. For Ukraine, this approach is particularly relevant given that its legal system belongs to the continental tradition. A comparative analysis shows that the weakness of Ukraine's innovation policy is not the lack of economic initiatives, but the lack of legally enshrined institutions that would ensure sustainable and protected forms of cooperation between science, business and the state.[48]

Asian legal jurisdictions demonstrate a different regulatory logic, combining a high level of government coordination with a strategic choice of priority industries. A comparative analysis reveals a structural contradiction in this model: centralised regulation promotes the rapid development of certain technology sectors, but at the same time restricts horizontal knowledge flows between small and medium-sized participants in the innovation ecosystem.[49] For Ukraine, this experience is valuable, as it shows the risks of excessive concentration of state support and the need to combine strategic planning with inclusive legal mechanisms for access to innovation.

Comparison of legal jurisdictions also allows us to identify global regulatory trends that directly affect Ukraine. These include the growing role of law not only as a tool for protecting intellectual property, but also as a mechanism for knowledge transfer, the transition from isolated legal solutions to integrated innovation

[46] SATALKINA, L.; STEINER, G. Digital entrepreneurship and its role in innovation systems: A systematic literature review as a basis for future research avenues for sustainable transitions. Sustainability, 2020, 12(7), 2764. https://doi.org/10.3390/su12072764
[47] YAWSON, R. M.; 2021. Ibid.
[48] YAROSHENKO, I. V.; SEMYHULINA, I. B. Innovative approaches to the development of "smart" cities: Regulatory and legal framework in Ukraine and European experience. Problemy Ekonomiky, 2021, 48(2), pp. 95–102. https://doi.org/10.32983/2222-0712-2021-2-95-102
[49] EKA PUTRI, C.; SIHABUDIN; WIDHIAWATI, D. Analysis of the arrangement of intellectual property-based financing schemes with copyright collateral for bank financial institutions. Legal Horizons, 2024, 20(1), pp. 49–59. https://doi.org/10.54477/LH.25192353.2024.1.pp.49-59

ecosystems, and the institutionalisation of innovation policy through specialised agencies and cluster structures. Despite numerous challenges, Ukraine has many opportunities for innovation. Brilliant scientists, engineers, and IT professionals exist, but their potential is not fully realized due to inadequate protection of intellectual property, lack of incentives for investment in research and development, and weak integration of science and business. According to our personal experience, even prosperous Ukrainian firms are often registered abroad, as these countries offer better opportunities for development, such as access to venture capital and favourable tax laws.

The fact that national initiatives to establish technology parks, incubators, or research institutions often face financial or administrative obstacles is another reason why I am interested in innovation policy. Initiatives to create innovative clusters, such as IT clusters in Lviv or Kharkiv, are promising at the local level, but do not have the official support necessary for expansion. However, in countries such as South Korea and Finland, the state plays an active role in promoting cooperation between industry, education, and science, and also acts as a regulator.

It is concluded that adopting the best international practices requires a thorough comparison of the Ukrainian experience with the experiences of other countries. For example, the United States encourages venture capital and offers reliable patent protection, which attracts investors to risky but potentially successful enterprises. Both France and Germany give priority to helping small and medium-sized enterprises by passing laws and providing funding. Although Ukraine has a significant SME sector, it does not have access to resources or cooperation with scientific institutions.

During the conflict with Russia, the deployment of cyber defence, intelligence systems, and drones illustrated how technology can change the course of events. Ukrainian enterprises such as Aerorazvedka are an example of how the advanced achievements of the military industry strengthen national security. But even with these successes, there are still many obstacles to overcome. The growth of innovative activity is hampered by complex regulatory processes, unequal access to resources between spheres, and a lack of funding for science. For example, Ukraine spends only about 0.5% of its GDP on research and technology, which is much less than the EU average (2-3% of GDP compared to other European countries). Therefore, state-building through innovation in Ukraine requires the development of new mechanisms that would guarantee the sustainable growth of all areas of public administration in addition to the expansion of current projects. This involves the creation of adapted laws, the promotion of scientific research, and the application of global experience, which will ultimately help in the creation of a modern, creative, and competitive state.

Transparency in intellectual property protection processes, incentives for research and development, public-private cooperation, and the expansion of regional contacts are all necessary for innovation to become the driving force behind our progress. Only under such circumstances will Ukraine be able to use its human and scientific resources to overcome the crisis and create the economy of the future. Therefore, strengthening Ukraine's innovation base requires not only the introduction of new policy instruments, but also the systematic development of clear legal mechanisms regulating the commercialisation of intellectual property, fiscal incentives for investment in research, cluster cooperation, venture financing and institutional coordination of innovation policy. Such reforms will bring Ukraine's legal framework more closely into line with successful international models and significantly improve the ability of national innovation systems to support the commercialisation of knowledge and technological development.

5. Conclusions

Economic growth and Ukraine's exit from the crisis largely depend on innovation. According to the analysis of world experience, there are different types of innovative assistance depending on the degree of government involvement. The Anglo-American model is characterized by a low level of government participation, in which market forces independently drive innovation, and government assistance is limited to promoting a business-friendly environment. On the other hand, the Franco-Japanese model is actively involved in promoting innovation and includes significant government funding and subsidies.

Based on the analysis of national innovation systems in many countries, it can be concluded that the successful growth of innovation depends on the harmonious interaction of government, industry, research institutions, and educational institutions. The legislative framework is essential to this process because it promotes the growth of venture capital markets, the protection of intellectual property, the promotion of research and development (R&D), and the assistance of technology clusters and startups. The experience of countries such as the USA, Germany, Finland, Japan, and others shows that the basis of a successful national innovation system is a comprehensive strategy that includes financial incentives, stable legislation, and structures of cooperation between the public and private sectors.

However, some problems hinder the advancement of inventions even in the most developed countries. These include, among others, the lack of integration between the scientific community and industry, lengthy and complex patenting processes, unequal access to infrastructure and financing, and the lack of flexibility in legal standards. Particular attention should be paid to territorial differences, the slow assimilation of progress by small enterprises, and the problems of commercialization of progress. Inequality in access to resources and technology between developed and developing countries is a global problem that widens the economic gap and reduces the competitiveness of less developed areas.

The ability of governments to pass laws flexible enough to respond quickly to advances in technology will determine how this area evolves. This involves optimizing patenting procedures, encouraging the private sector to make scientific investments, actively creating technology parks and innovation clusters, and expanding public-private cooperation initiatives. Harmonization of international standards for the protection of intellectual property, digitization of management of innovation processes, and the inclusion of sustainable development concepts in innovation policy–all these can become key components of future success. Thus, countries that effectively implement these approaches will have more chances to strengthen their positions in the global economy, improve the living standards of their citizens, and contribute to the sustainable development of society as a whole.

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