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DETERMINANTS OF HIGH-TECH EXPORTS IN THE EU AND UKRAINE IN THE CONTEXT OF INNOVATION, INDUSTRIAL AND ENTREPRENEURSHIP POLICY

The object of research is the innovation, industrial and entrepreneurial policy of the EU and Ukraine in 2016–2024, assessed by key performance indicators.

The problem lies in the lack of mechanisms for integrating European practices adapted to Ukrainian conditions, which limits investment potential, the development of innovation ecosystems, acceleration of structural modernization and growth of competitiveness in the context of post-war recovery.

The essence of the results obtained is to identify significant differences between the EU and Ukraine in seven indicators of innovation policy, as well as to establish the factors that most affect high-tech exports. For the EU, a close relationship between R&D funding, business participation, human capital development and commercialization of innovations has been confirmed. In Ukraine, science-industry cooperation and the human resource potential of business research have become decisive, while the impact of R&D funding is weak and unstable. Regression modeling showed that in the EU the key drivers are corporate R&D, human capital and scientific-industrial cooperation, while in Ukraine – institutional and personnel factors.

These results are explained by differences in institutional maturity, quality of innovation management, efficiency of commercialization of developments and integration of science into production. The EU has comprehensive and targeted support instruments that ensure a direct link between innovation spending and economic results. In Ukraine, however, there is fragmentation of measures, declarative nature of reforms and low conversion of costs into high-tech exports.

The results obtained can be used to adjust national innovation development strategies, form post-war recovery programs, increase the role of private R&D, human capital development and intensify cooperation between science and business at all levels.

Keywords: *innovation policy, industrial policy, entrepreneurship policy, European Union – Ukraine, policy effectiveness.*

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1. Introduction

Deepening integration ties between Ukraine and the EU requires the effective use of innovation, industrial and entrepreneurial policies as tools for economic recovery. Despite the presence of significant scientific achievements on the impact of these policies on the development of the EU, their complex impact in combination with the conditions of post-war reconstruction and structural modernization of Ukraine remains insufficiently studied. The lack of mechanisms for implementing European practices adapted to national realities limits the possibilities of attracting investments, developing innovation ecosystems and increasing international competitiveness. This necessitates the study of effective models of EU policies and the development of recommendations for their integration into the economic strategy of Ukraine.

Analysis of modern scientific and analytical sources indicates growing attention to the formation of an innovation-oriented EU industrial policy as a key tool for strengthening competitiveness and technological leadership [1]. It is emphasized that the transition to an innovation-based industrial policy requires a systematic combination of scientific research, technological development and industrial strategies. However, existing models demonstrate significant heterogeneity in approaches and performance, which leads to risks of fragmentation of the innovation space within the EU [2].

Some studies emphasize the aggravation of geopolitical and geoeconomic factors that require a rethinking of industrial policy, taking into account the sustainability of supply chains and strategic autonomy [3]. It has also been shown that mission-oriented innovation projects are capable of ensuring a long-term breakthrough, but their implementation often faces coordination problems between levels of government [4].

A number of sources emphasize the structural asymmetries and limitations of the smart specialization concept [5, 6]. Smart specialization mechanisms can deepen inequality between regions due to the unequal ability to attract investment in innovation. Critical conditions for the success of industrial policy and the reasons for its failures are also identified, including insufficient flexibility of instruments and the absence of adaptive mechanisms.

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The European Commission reports emphasize that the impact of research and innovation policy instruments on the performance of economies remains uneven [7]. The effectiveness of such instruments depends on the combination of financial incentives with institutional reforms [8].

At the enterprise level, it is confirmed that access to finance and institutional quality are key determinants of innovation activity, although these factors vary significantly between countries [9]. Attention is also drawn to the risk of a "trap" of average R&D development, which can restrain innovative breakthroughs in less developed EU Member States [10].

Among the methodological aspects of policy evaluation, an integrated framework for the analysis of transformative innovation policies, which combines quantitative and qualitative indicators, is proposed [11]. It is shown that system-oriented policy evaluation requires a comprehensive approach, which is still in the development stage in most EU countries [12, 13].

Some authors argue that the effectiveness of innovation policy largely depends on the ability to adapt its instruments to national conditions [14]. The need for policy reform to avoid the "middle-tech trap" is also emphasized [15]. Theoretical approaches to the formation of institutional frameworks emphasize the importance of good governance in the field of innovation [16, 17]. Despite a significant body of research, most of the sources analyzed have limitations. In particular, works [1] and [3] focus on the development of EU innovation and industrial policies, but there is no systematic analysis of their combination with the entrepreneurial component. Works [5] and [6] consider structural asymmetries and conditions for the success of industrial policy, but do not examine the interaction between different policies as a single complex. Some empirical approaches [9, 10] focus on the determinants of innovation activity at the enterprise level, but do not take into account the integrated effect of combining innovation, industrial and entrepreneurial instruments at the macro level. The reason for such gaps is both methodological limitations (orientation on individual indicators or countries) and the complexity of empirical modeling of interdependencies between several policies. As a result, the problem of forming a single effective model that integrates innovation, industrial and entrepreneurial policies remains unresolved.

The aim of research is to identify the patterns and mechanisms of the relationship between innovation, industrial and entrepreneurial policies of the EU and determine their role in the post-war recovery of the Ukrainian economy. It is planned to develop an analytical model to assess the impact of these policies on the competitiveness and innovative potential of the national economy. The results obtained are designed to ensure the adaptation and integration of effective EU policy instruments into the national economic strategy, which will allow optimizing the use of investment and innovation resources, accelerating structural modernization, and ensuring sustainable economic development of Ukraine.

2. Materials and Methods

The object of research is the innovation, industrial and entrepreneurship policy of the EU and Ukraine in 2016–2024, assessed by key performance indicators.

The empirical basis is the official statistical data of the Global Innovation Index for 2016–2024. Microsoft Excel 365 was used to process and analyze the data. Descriptive statistics and multivariate regression analysis methods were applied for seven indicators of innovation and entrepreneurship. Methods of economic comparison, systematization and generalization were used. The analysis was conducted on the basis of open statistical data, primary data collection was not carried out.

3. Results and Discussion

In the process of selecting relevant indicators, the specifics of the innovation, entrepreneurship and industrial policy of the EU and Ukraine were taken into account. The basis was the systemic logic of the innovation cycle. It covers the stages from the formation of prerequisites and attraction of resources to obtaining practical results. The final stage is their further commercialization. Given the complex multidimensional structure of the Global Innovation Index, which includes more than 80 indicators, seven key indicators were selected for this study that most fully reflect the elements of the innovation chain "investment – implementation – result – diffusion". The systematic relationship between the selected indicators is presented in Fig. 1.

The first is indicator 2.3.2 "Domestic R&D expenditures (% of GDP)", which captures the level of total investments in scientific research, reflecting the national commitment to supporting innovative development. At the same time, indicator 5.1.3 "Share of R&D performed by business (% of GDP)" details the structure of these investments, demonstrating the degree of involvement of the private sector in the innovation process – one of the main drivers of applied scientific activity in developed economies. Further implementation of innovation policy requires effective interaction between scientific institutions and business. Indicator 5.2.1 "Joint publications between science and industry" is a valid indicator of such cooperation, allowing to assess the real level of exchange of knowledge and technologies. Another key factor is 5.3.5 "Share of employees involved in business research (%)", which characterizes human capital in the field of applied research, demonstrating the resource content of innovation initiatives of the business sector.

At the results stage, indicator 6.1.1 "PCT patent applications per 1 billion GDP" is particularly important, which represents not only innovation productivity, but also the orientation of innovations to the global market.

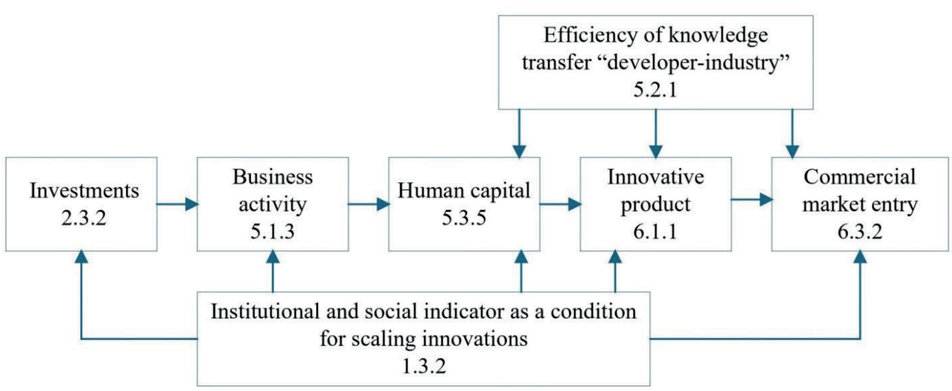

Fig. 1. Systemic relationships between innovation policy indicators and their effectiveness

The final link in the innovation cycle is illustrated by 6.3.2 "High-tech exports (% of exports)" – an indicator of how effectively the country transforms scientific results into competitive products. Its value makes it possible to assess the degree of integration of the economy into high-tech global value chains.

Special attention should be paid to 1.3.2 "Entrepreneurship policy and culture", which is an institutional and social indicator and represents the general perception of the conditions for creating startups, developing small businesses and innovative projects. This indicator is especially important for countries such as Ukraine, where the business environment is in the process of formation or transformation, and the development of an appropriate culture and regulatory environment is crucial for the effectiveness of innovation policy.

The selected indicators form a logically complete system that allows analyzing all key links of innovation policy: from investments in knowledge – through organizational and human resources – to materialized results and their commercial implementation.

The results of the comparative analysis of each of the selected indicators for the EU countries and Ukraine for the period from 2016 to 2024 are presented below. Luxembourg, Malta and Cyprus are not included in the analysis due to the lack of data for most of the selected indicators. At the same time, given their limited role in shaping the overall EU innovation policy, these countries are not decisive in the analytical conclusions.

Indicator 2.3.2 "The level of research and development funding is a basic indicator of national innovation potential" allows to assess the investment base for the development of high-tech sectors of the economy, Table 1.

The distribution of countries by this indicator allows to distinguish three clearly defined groups: countries with high (over 3% of GDP) medium (2–2.99%) and low (less than 2%) levels of R&D financing. The group with a high level (over 3%) has consistently included Sweden, Belgium, Germany, Denmark, Austria, Finland and the Netherlands. These countries demonstrate not only high initial values, but also a gradual increase in investment activity in R&D, which indicates the priority of innovations in their national strategies. The medium level (2–3%) characterizes countries with consistent but more moderate innovation dynamics. This group includes the Czech Republic, Ireland, Slovenia and Estonia. These countries are on the verge of transition to the group with a high level, demonstrating a stable positive growth trend. The low level of R&D spending (less than 2%) dominates among most countries of Central and Eastern Europe and the South of the EU – Italy, Spain, Greece, Portugal, Poland, Lithuania, Latvia, Croatia, Bulgaria, Slovakia, Romania and Hungary. Although the absolute values remain relatively low, the dynamics for most of them are increasing, which reflects the gradual formation of innovation policy in these countries.

Ukraine in the specified period demonstrates negative dynamics – from 0.34% in 2016 to 0.33% in 2024, while the highest value (0.41%) was reached in 2022. This indicates extremely limited R&D funding at the national level and the need for systemic support for the innovation sector. In 2024, Ukraine's indicator is almost ten times lower than the EU average, which is 3.0% of GDP.

Indicator 5.1.3 "Business activity in the field of research determines the ability of the economy to commercially implement innovations" reflects the share of the private sector in the country's innovation dynamics, Table 2.

Table 1

Dynamics of domestic R&D spending (% of GDP)
in the European Union and Ukraine (2016–2024)

Country	2016	2018	2020	2022	2024
Austria	3.07	3.1	3.17	3.26	3.26
Belgium	3.26	3.34	3.45	3.47	3.51
Bulgaria	1.07	1.12	1.16	1.21	1.21
Croatia	1.15	1.19	1.23	1.26	1.34
Czech Republic	1.83	1.89	1.94	1.99	2.04
Denmark	2.78	2.86	2.95	3.02	3.16
Estonia	1.63	1.7	1.78	1.87	2.01
Finland	2.69	2.75	2.85	2.94	3.17
France	2.37	2.43	2.48	2.52	2.51
Germany	2.95	3.02	3.07	3.13	3.13
Greece	1.4	1.45	1.48	1.52	1.57
Hungary	1.65	1.71	1.77	1.83	1.89
Ireland	1.88	1.94	2.01	2.08	2.14
Italy	1.4	1.44	1.48	1.52	1.55
Latvia	0.94	0.98	1.01	1.06	1.12
Lithuania	1.23	1.27	1.33	1.38	1.45
Netherlands	2.7	2.8	2.88	2.95	3.05
Poland	1.19	1.24	1.29	1.34	1.39
Portugal	1.42	1.48	1.54	1.59	1.65
Romania	0.87	0.92	0.96	0.99	1.02
Slovakia	1.25	1.3	1.35	1.39	1.42
Slovenia	1.95	2.01	2.08	2.14	2.23
Spain	1.25	1.3	1.35	1.38	1.41
Sweden	3.26	3.33	3.41	3.49	3.57
Ukraine	0.34	0.37	0.39	0.41	0.33

Note: compiled based on [18]

Table 2

Dynamics of the share of R&D performed by businesses (% of GDP)
in the EU countries and Ukraine in 2016–2024

Country	2016	2018	2020	2022	2024
Austria	2.01	2.03	2.09	2.18	2.29
Belgium	2.39	2.47	2.58	2.61	2.63
Bulgaria	0.6	0.64	0.67	0.69	0.69
Croatia	0.7	0.73	0.76	0.78	0.81
Czech Republic	1.38	1.43	1.48	1.52	1.55
Denmark	2.19	2.26	2.31	2.36	2.44
Estonia	1.1	1.14	1.2	1.25	1.33
Finland	2.01	2.06	2.13	2.21	2.38
France	1.78	1.82	1.86	1.89	1.91
Germany	2.33	2.39	2.43	2.49	2.53
Greece	0.85	0.89	0.91	0.93	0.96
Hungary	1.23	1.29	1.35	1.39	1.43
Ireland	1.5	1.54	1.6	1.64	1.68
Italy	0.82	0.85	0.88	0.9	0.92
Latvia	0.65	0.67	0.69	0.71	0.74
Lithuania	0.8	0.83	0.86	0.88	0.91
Netherlands	2.02	2.09	2.14	2.18	2.21
Poland	0.72	0.75	0.78	0.8	0.83
Portugal	0.85	0.87	0.89	0.91	0.95
Romania	0.49	0.52	0.55	0.57	0.59
Slovakia	0.85	0.88	0.91	0.94	0.97
Slovenia	1.42	1.47	1.51	1.55	1.63
Spain	0.82	0.85	0.88	0.9	0.92
Sweden	2.54	2.61	2.67	2.71	2.76
Ukraine	0.11	0.12	0.13	0.14	0.12

Note: compiled based on [18]

The average level of this indicator in the EU countries for the studied period was 1.419% of GDP, which indicates a stable moderate involvement of business in the development of innovations. For comparison, in Ukraine the average level was only 0.124% of GDP, which indicates a systemic weakness of the private sector in the field of R&D. The first group of countries with a high level of involvement (over 2.1% of GDP) includes: Sweden, Belgium, Germany, Denmark, Finland, the Netherlands and Austria. These countries demonstrate a high level of corporate innovation culture, active use of state incentive mechanisms and well-developed innovation ecosystems. The second group with an average level of funding (1.0–2.1% of GDP) includes France, Slovenia, Ireland, the Czech Republic, Estonia and Hungary. These countries demonstrate a gradual increase in business investment in R&D. The third group with a low level of the indicator (less than 1% of GDP) includes most of the CEE countries: Lithuania, Italy, Spain, Portugal, Slovakia, Latvia, Greece, Poland, Croatia, Bulgaria, Romania and Ukraine. In these countries, the participation of business in scientific research remains insufficient.

Indicator 5.2.1 "Joint publications between science and industry" illustrates the level of integration of academic science into production processes. Effective cooperation is a critical condition for knowledge transfer to the commercial environment, Table 3.

The group of countries with a high level of cooperation (over 65%) includes Sweden, the Netherlands, Denmark, Finland and Belgium. These countries have a consistently high level of partnership between universities, scientific institutions and industry, which reflects an effective policy of promoting innovative cooperation. The group with an average level of cooperation (50–65%) includes Germany, Ireland, Austria, France, Estonia, Slovenia, Spain, Italy, the Czech Republic and Portugal. These countries are characterized by moderately high indicators, which indicate the stable development of innovative interaction. At the same time, the potential for its further scaling remains significant. The third group, with a low level of cooperation (less than 50%), is mainly made up of countries in Central and Eastern Europe – Hungary, Greece, Poland, Croatia, Bulgaria, Lithuania, Slovakia, Latvia and Romania. The lowest level was recorded in Ukraine, where the average value over the nine-year period was only 32.40%. Despite a slight increase from 28.9% in 2016 to 35.6% in 2024, this value remains almost half the EU average. These trends demonstrate the need to intensify measures to form an effective system of scientific and industrial cooperation in Ukraine.

Indicator 5.3.5 "Share of employees involved in business research" reflects the share of employees involved in business research and allows to assess the level of involvement of human capital in the innovation activities of the private sector, Table 4.

Table 3

Share of joint publications between science and industry
(% of total publications) in the EU countries and Ukraine in 2016–2024

Country	2016	2018	2020	2022	2024
Austria	60.9	62.1	63.2	64.4	60
Belgium	62	63.4	64.7	65.2	66.7
Bulgaria	41.3	42.7	43.5	44.3	46.8
Croatia	43.2	44.6	46.2	47.9	50.1
Czech Republic	48	49.6	50.8	51.7	52.3
Denmark	68.2	69.3	70.5	71.2	72.5
Estonia	56.7	58.4	59.8	61	62.4
Finland	64.1	65.6	67.2	68.4	70.6
France	55.9	57.2	58.3	59.1	60.2
Germany	60.1	61.5	62.4	63.6	64.4
Greece	43.1	44.8	46.2	47.3	48.3
Hungary	47.1	48.2	49.4	50.3	51.2
Ireland	60.4	62	63.3	64.1	65.8
Italy	49.3	50.8	52.2	53.3	55.3
Latvia	37.2	38.6	39.9	41.1	42.5
Lithuania	41.5	42.7	44.1	45.6	47.2
Netherlands	69.3	70.9	72.2	73.3	75.4
Poland	43.5	44.8	46	47.2	48.7
Portugal	47.3	49.2	50.5	51.9	53.1
Romania	33.7	35.2	36.9	38.2	39.4
Slovakia	39.6	41	42.3	43.5	44.9
Slovenia	50.1	51.8	53.5	55.1	56.4
Spain	49.3	50.7	52.1	53.2	54.7
Sweden	71.8	73.2	75.1	76.3	78.2
Ukraine	28.9	30.8	32.6	34.1	35.6

Note: compiled based on [18]

Table 4

Dynamics of the share of business research personnel
in the EU countries and Ukraine, 2016–2024

Country	2016	2018	2020	2022	2024
Austria	1.65	1.69	1.72	1.75	1.8
Belgium	1.76	1.81	1.85	1.88	1.95
Bulgaria	0.74	0.78	0.8	0.83	0.85
Croatia	0.63	0.67	0.7	0.73	0.78
Czech Republic	1.1	1.14	1.17	1.2	1.23
Denmark	1.87	1.93	1.98	2.03	2.1
Estonia	0.94	0.97	1	1.06	1.14
Finland	1.74	1.8	1.84	1.89	2.04
France	1.54	1.58	1.62	1.66	1.72
Germany	1.89	1.93	1.97	2	2.08
Greece	0.8	0.84	0.87	0.89	0.92
Hungary	1.03	1.07	1.1	1.14	1.2
Ireland	1.43	1.48	1.52	1.55	1.62
Italy	0.91	0.94	0.97	1	1.05
Latvia	0.52	0.56	0.59	0.61	0.64
Lithuania	0.6	0.64	0.68	0.71	0.75
Netherlands	1.74	1.79	1.83	1.89	1.95
Poland	0.74	0.78	0.81	0.84	0.89
Portugal	0.84	0.88	0.91	0.93	0.98
Romania	0.5	0.54	0.57	0.59	0.62
Slovakia	0.68	0.72	0.76	0.79	0.83
Slovenia	1.12	1.16	1.21	1.25	1.31
Spain	0.87	0.9	0.93	0.95	1
Sweden	1.96	2.02	2.08	2.13	2.2
Ukraine	0.18	0.21	0.23	0.26	0.29

Note: compiled based on [18]

During the period under study, the average value of this indicator for the European Union countries was 54.47%, which can be considered as a target benchmark for countries with lower indicators.

During 2016–2024, the average value of this indicator across the EU countries increased from 1.15% to 1.319%, demonstrating a stable growth dynamics of business innovation activity.

The average level for the period within 1.23% can be considered as a baseline for assessing national results. The group of countries with a high level of personnel involvement in business research (over 1.7%) includes Sweden, Denmark, Germany, Finland, Belgium, the Netherlands, Austria and France. These countries demonstrate deep integration of human capital into the innovation cycle, which is evidence of a mature ecosystem of business research and scientific support for technological development. The group of countries with an average level (1.0%–1.7%) includes Ireland, Slovenia, the Czech Republic, Hungary and Estonia. These countries have observed positive growth dynamics, although the potential for activating research personnel in business has not yet been exhausted. In particular, Ireland has shown a steady growth from 1.43% in 2016 to 1.62% in 2024, which indicates an increasing role of human resources in the private scientific sector.

The largest category is formed by countries with a low level (less than 1%) – Lithuania, Latvia, Romania, Croatia, Bulgaria, Poland, Greece, Portugal, Slovakia, Spain and Italy. In this group, the involvement of innovative personnel in business is limited, which is a possible consequence of weak incentives for the private sector to invest in R&D. In Ukraine, the situation is critical, the average value for 2016–2024 is only 0.234%, which is almost five times lower than the EU average. Despite some growth from 0.18% in 2016 to 0.29% in 2024, such dynamics are insufficient for the effective development of national innovation potential.

Indicator 6.1.1 "PCT patent applications per 1 billion GDP" measures the number of patent applications filed under the PCT procedure per 1 billion USD GDP, Table 5. It is a direct indicator of the effectiveness of innovation activity and the commercial viability of scientific developments.

The average value of this indicator for EU countries in 2016–2024 increased from 1.95 to 2.35, averaging 2.188 for the period. This indicates a gradual increase in innovation productivity in developed EU economies. At the same time, the average indicator for Ukraine for this period was only 0.1, which actually reflects the systemic lack of internationally oriented patenting.

Countries with a high level of patent activity (more than 4.5 applications per 1 billion GDP) include Sweden, Germany, Belgium, Finland, the Netherlands and Denmark. These countries have a high level of commercialization of scientific results, which is a consequence of a mature intellectual property management system, state support for patenting and active participation in global innovation chains. The average group (1.0–4.5 applications) includes France, Austria, Ireland, Italy, the Czech Republic, Slovenia and Spain. These countries have a stable level of patenting, although the growth rates of the indicator in them do not always demonstrate breakthrough trends.

At the same time, this group is the most promising in terms of scaling up innovative activity, provided that additional stimulation of technology transfer and support for international patenting of small and medium-sized businesses is provided. The group with a low level of patent activity (less than 1.0 applications) includes most of the countries of Central and Eastern Europe, in particular Bulgaria, Croatia, Lithuania, Latvia, Slovakia, Poland, Portugal, Romania, Hungary, Greece and Estonia.

Indicator 6.3.2 "High-tech exports (% of exports)", which measures the share of exports of high-tech products in the total volume of exports, Table 6.

Table 5

Dynamics of the number of PCT patent applications per 1 billion GDP in the EU countries and Ukraine in 2016–2024

Country	2016	2018	2020	2022	2024
Austria	3	3.2	3.3	3.6	3.5
Belgium	4.5	4.8	5	5.2	5.1
Bulgaria	0.2	0.3	0.3	0.4	0.4
Croatia	0.1	0.2	0.2	0.3	0.3
Czech Republic	1.2	1.4	1.5	1.6	1.7
Denmark	4.1	4.3	4.5	4.7	4.8
Estonia	0.7	0.8	0.8	0.9	1
Finland	4	4.4	4.6	4.8	5
France	3.8	4	4.1	4.2	4.3
Germany	5.3	5.6	5.8	6	6
Greece	0.4	0.5	0.6	0.6	0.6
Hungary	0.7	0.8	0.8	0.9	0.9
Ireland	2.3	2.5	2.6	2.7	2.7
Italy	1.6	1.8	1.9	2	2.1
Latvia	0.2	0.2	0.2	0.2	0.2
Lithuania	0.3	0.4	0.5	0.5	0.5
Netherlands	4.3	4.6	4.7	4.8	4.9
Poland	0.6	0.7	0.7	0.8	0.8
Portugal	0.7	0.8	0.8	0.9	0.9
Romania	0.2	0.2	0.3	0.3	0.3
Slovakia	0.3	0.4	0.5	0.5	0.5
Slovenia	1	1.2	1.2	1.3	1.3
Spain	0.9	1	1	1	1.1
Sweden	6.5	6.8	7.1	7.3	7.4
Ukraine	0.1	0.1	0.1	0.1	0.1

Note: compiled based on [18]

Table 6

Share of high-tech exports in total exports of the EU and Ukraine in 2016–2024

Country	2016	2018	2020	2022	2024
Austria	10.7	11.1	11.6	11.8	12.1
Belgium	13	13.8	14.2	14.6	15.3
Bulgaria	5.4	5.9	6.1	6.4	6.5
Croatia	5.7	6.4	6.8	7.3	7.8
Czech Republic	11.6	12.1	12.7	13.1	13.6
Denmark	12.4	12.9	13.3	13.8	14.9
Estonia	7.7	8.5	8.9	9.5	10.2
Finland	14.5	15.7	16.4	17.3	18.4
France	12.6	13	13.5	13.9	14.6
Germany	15	15.7	16.1	16.6	17.5
Greece	4.7	5.1	5.3	5.6	5.7
Hungary	10.7	11.8	12.2	12.6	12.9
Ireland	21.3	22.5	23.7	24.4	25.1
Italy	8.4	9	9.5	9.8	10.6
Latvia	3.5	3.9	4.2	4.6	4.8
Lithuania	4.9	5.3	5.7	6	6.2
Netherlands	17.6	18.6	19.5	20.1	21.2
Poland	7.5	8.1	8.6	8.9	9.1
Portugal	7	7.6	7.9	8.2	8.6
Romania	2.9	3.1	3.3	3.6	3.9
Slovakia	5.6	6.1	6.5	6.8	7.2
Slovenia	7.5	8.3	8.9	9.4	10.1
Spain	7.5	8.1	8.6	9	9.8
Sweden	18.2	19.3	20.2	21.3	22.4
Ukraine	2.4	2.8	3	3.2	3.5

Note: compiled based on [18]

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On average across the European Union, this figure increased from 9.83% in 2016 to 12.02% in 2024. The average value over the nine-year period is 10.96%, which confirms the pan-European trend towards a stronger technological component in foreign trade. For Ukraine, the average level over the same period was only 2.98%, which indicates an extremely limited representation of high-tech goods in the country's export structure. Countries with a high level of high-tech exports (over 15% on average for the period) include Ireland, Sweden, the Netherlands, Finland and Germany. In these countries, the export of high-tech products is one of the key drivers of economic growth. High values are ensured by the functioning of powerful sectors of electronics, pharmaceuticals, aviation equipment, as well as a favorable institutional environment for scaling innovations and scientific and technological transfer. The middle group of countries (10–15%), where the share of high-tech exports is moderate, includes Belgium, France, Denmark, the Czech Republic, Hungary and Austria. These countries have recorded stable positive dynamics of the indicator, which indicates the gradual strengthening of high-tech industries, but without their dominance in foreign trade. The potential for further growth depends on the policy of supporting knowledge-intensive industries and the development of export-oriented innovations. The largest group of countries consists of countries with a low level of high-tech exports (less than 10%). It includes Italy, Spain, Slovenia, Estonia, Poland, Portugal, Slovakia, Croatia, Bulgaria, Greece, Lithuania, Latvia, Romania and Ukraine. In these countries, the export structure remains focused on products of medium or low technological level.

Indicator 1.3.2 "Entrepreneurship Policy and Culture" characterizes the level of favorability of the national environment for the development of entrepreneurship, including both political conditions and cultural and institutional factors that stimulate innovative initiative, Table 7.

Table 7

Entrepreneurship policy and culture in the EU countries and Ukraine in 2016–2024

Country	2016	2018	2020	2022	2024
Austria	51.5	52.6	53.2	53.7	53.9
Belgium	54.8	56	57.1	58.3	59.3
Bulgaria	38.9	40.6	41.8	42.3	43.1
Croatia	41.5	43.1	44.4	45.1	46.2
Czech Republic	45.9	47.3	48.5	49.4	50.5
Denmark	53.7	55.3	56.2	57.1	58.7
Estonia	48.6	50.3	52.1	53.6	55.1
Finland	55.1	57.3	58.9	59.7	61.4
France	53	54.9	56.2	57.3	58.1
Germany	54.1	56.2	57.3	58.5	59.7
Greece	40.6	42.3	43.7	44.6	45.4
Hungary	43.5	45.1	46.3	47.6	48.8
Ireland	52.2	53.8	55.1	56.4	57.3
Italy	47.9	49.3	50.4	51.3	52.7
Latvia	36.4	37.5	38.7	39.8	40.9
Lithuania	38.4	39.6	41	41.9	42.8
Netherlands	55	56.5	58.2	59.4	60.3
Poland	41.9	43.6	44.8	45.7	46.8
Portugal	43.6	45.2	46.3	47.4	48.3
Romania	33.8	35.1	36.4	37.4	38.7
Slovakia	38.6	40.2	41.8	42.6	44.1
Slovenia	45.1	47.1	48.7	49.8	51.2
Spain	44.3	46.2	47.3	48.3	49.6
Sweden	59.2	61	62.3	63.4	64.5
Ukraine	27.5	29.7	31.2	32.5	34.2

Note: compiled based on [18]

According to data from 2016–2024, the average value of this indicator across the EU countries was 49.24%, demonstrating a gradual but steady improvement in the conditions for entrepreneurial activity (from 46.57% in 2016 to 51.56% in 2024). At the same time, the average value in Ukraine for the same period was only 31.02%, which indicates systemic problems in the institutional and cultural environment of entrepreneurship. Countries with a high level of entrepreneurship friendliness (over 55%) include Sweden, Finland, the Netherlands, Germany, Belgium, Denmark, France and Ireland. In these countries, institutional support for entrepreneurship is combined with a culture of innovative initiative, a high level of trust in the regulatory environment and the presence of effective mechanisms to support startups and small businesses. The group with an average level (45–55%) includes Austria, Estonia, Italy, the Czech Republic, Slovenia, Spain, Portugal, Hungary and Greece. These countries are characterized by a relatively stable business environment, but may face barriers related to bureaucratic procedures, tax pressure or insufficient development of business support infrastructure. A low level of entrepreneurship friendliness (less than 45%) was recorded in Lithuania, Bulgaria, Slovakia, Poland, Latvia, Croatia and Romania.

Based on the results of the analysis of seven selected indicators, a general grouping of the European Union countries was carried out. The division was made into four groups: the first – countries with the highest values of the indicators, the second – with average values, the third – with the lowest, and the fourth group was allocated specifically for Ukraine, Fig. 2.

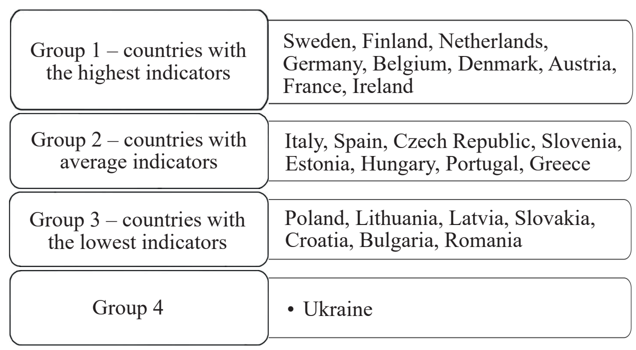

Fig. 2. Typology of EU countries and Ukraine by the level of innovation policy effectiveness based on seven key indicators (2016–2024)

The first group includes countries with consistently high values of all the studied indicators, which determine institutional stability and policy effectiveness. The second group includes states with moderate results that demonstrate the potential for growth. The third group unites countries with the lowest values of indicators, which indicates the presence of deep barriers to the development of the innovation sphere. Ukraine is singled out in a separate fourth group due to systematically lower, several times, values of key indicators compared to EU countries, which requires targeted political decisions to overcome structural lag.

To assess the significance of the impact of key components of innovation policy on the effectiveness of technology commercialization, a series of univariate regression models were conducted, in which the dependent variable was indicator 6.3.2 "Share of exports of high-tech products", and the independent variables were each of the systemically related indicators: internal R&D spending (2.3.2), share of R&D performed by business (5.1.3), effectiveness of science and industry cooperation (5.2.1), human resource potential in business research (5.3.5), patent activity (6.1.1), as well as the institutional and entrepreneurial environment (1.3.2). All calculations were made based on the average indicators for the EU for five observations – 2016 to 2024.

For clarity, the obtained models are presented in the form of regression equations and in general have the following structure: $Y = \alpha + \beta X + \varepsilon$, where Y is the share of exports of high-tech products (indicator 6.3.2), and $X1$ is the corresponding indicator of innovation policy.

The estimated models for the EU have the following form:

1. EU_1 – domestic R&D spending

$Y = -7.34 + 9.15X$ (Table 1) – an increase in domestic R&D spending by 1 pp of GDP is associated with an increase in the share of high-tech exports by 9.15 pp.

2. EU_2 – the share of business R&D

$Y = -7.333 + 12.89X$ (Table 2) – private investments in R&D have the greatest multiplier effect.

3. EU_3 – science-industry cooperation

$Y = -11.83 + 0.42X$ (Table 3) – even a small increase in cooperation significantly enhances innovation exports.

4. EU_4 – human capital in business R&D

$Y = -5.04 + 13.00X$ (Table 4) – involving personnel in business research directly transforms into an increase in high-tech exports.

5. EU_5 – patent activity

$Y = -0.51 + 5.24X$ (Table 5) – patenting demonstrates a significant positive relationship.

6. EU_6 – entrepreneurial policy and culture

$Y = -10.37 + 0.43X$ (Table 7) – institutional conditions and entrepreneurial culture create the basis for scaling innovations.

The obtained equations indicate the systemic nature of the impact of key indicators of EU innovation policy on the commercialization of technologies, Table 8.

The highest strength of the relationship was recorded for indicator 5.2.1 (science-industry cooperation): the coefficient of determination $R^2 = 0.9984$ indicates an almost complete dependence of the result on the effectiveness of interaction between the academic sphere and business. The regression coefficient is 0.42, which means that an increase in the cooperation index by one point leads to an increase in the share of high-tech exports by 0.42 pp. The P-value = 0.00019 confirms the statistical significance of the model. No less important is indicator 5.1.3 – the share of R&D performed by business. It has a regression coefficient of 12.89, which is the highest among all variables, and $R^2 = 0.9976$. This indicates an extremely powerful multiplicative effect of involving the private sector in innovation activities. The model confirms: the more actively business invests in science, the higher the level of high-tech exports. A similar strength of influence was also demonstrated by indicator 5.3.5 (human capital in business research), for which the coefficient was 13.00, and $R^2 = 0.9920$. This once again confirms the importance of high-quality human resources as a prerequisite for the effective implementation of innovations in industry. A somewhat lower, but high result was shown by 6.1.1 (patent activity) – regression coefficient 5.24, $R^2 = 0.9609$, P-value = 0.0033, which is also statistically significant.

A high level of correlation was also found for the indicator of institutional support for entrepreneurship (1.3.2): $R^2 = 0.9967$, coefficient – 0.43. Although the regression coefficient is moderate, its significance (P-value = 0.0007) indicates a stable connection between entrepreneurship policy and high-tech exports. This confirms that institutional and cultural prerequisites create the basis for scaling innovation. Finally, internal R&D spending (2.3.2) also has a high impact ($R^2 = 0.9961$, coefficient = 9.15, P-value = 0.00010), indicating a direct effect of investment on innovation performance.

All models showed high statistical significance (F-statistics > 70 and P-value < 0.01), which allows to state the systemic and reliable nature of the identified dependencies. The analysis substantiates the recommendation to focus innovation stimulation policies on three main areas: expanding the corporate R&D sector, developing human capital in business research, and supporting scientific-industrial cooperation.

A similar study was conducted for Ukraine, the equations obtained for Ukraine are as follows:

1. UA_1 – domestic R&D spending

$Y = 2.50 + 1.29X$ (Table 1) – the relationship is statistically insignificant; R&D spending is not converted into high-tech exports.

2. UA_2 – share of business R&D

$Y = 0.50 + 20.00X$ (Table 2) – the direction is positive, but the relationship is insignificant, which indicates a weak role of private R&D in shaping exports.

3. UA_3 – science-industry cooperation

$Y = -2.07 + 0.16X$ (Table 3) – a very strong and significant association; even a slight increase in cooperation significantly increases performance.

4. UA_4 – human capital in business R&D

$Y = 0.73 + 9.62X$ (Table 4) – high-quality human resources in business research turned out to be a key driver of high-tech exports.

5. UA_5 – patent activity

$Y = -1.15 + 35.00X$ (Table 5) – moderate but statistically insignificant relationship; lack of sustainable commercialization of patents.

6. UA_6 – entrepreneurial policy and culture

$Y = 0.16 - 2.01X$ (Table 7) – a significant negative relationship was found: a formal increase in the entrepreneurial policy index is accompanied by a decrease in the share of high-tech exports, which indicates the declarative nature of reforms.

Unlike the EU, in Ukraine, the key determinants of high-tech exports are science-industry cooperation and human resources, while R&D funding and institutional indicators show weak or contradictory effects, Table 9.

Table 8

Results of regression modeling of innovation efficiency in the EU context

Results/Indicators	2.3.2	5.1.3	5.2.1	5.3.5	6.1.1	1.3.2
R Square	0.9961	0.9976	0.9984	0.9920	0.9609	0.9967
Coefficient X Variable	9.15	12.89	0.42	13.00	5.24	0.43
P-value	0.00010	0.00051	0.000191	0.008961	0.003312	0.000668
F-statistic	762.76	1235.40	1890.159	372.23	73.86	927.88
Intercept (const)	–7.34	–7.333	–11.83	–5.04	–0.51	–10.37

Table 9

Results of regression modeling of innovation efficiency in the context of Ukraine

Results/Indicators	2.3.2	5.1.3	5.2.1	5.3.5	6.1.1	1.3.2
R Square	0.010914	0.302326	0.987499	0.984115	0.498547	0.99751
Coefficient X Variable	1.294643	20	0.155826	9.617486	35	–2.01498
P-value	0.867226	0.336999	0.000595	0.000854	0.182617	0.000798
F-statistic	0.033104	1.3	236.988	185.856	2.982609	1201.895
Intercept (const)	2.503571	0.5	–2.06875	0.729508	–1.15	0.161025

The results obtained indicate a significant difference in the structure of influence compared to the EU countries. First of all, the highest explanatory power (R^2 = 0.9975) was demonstrated by the model with the independent variable 1.3.2 – the institutional and entrepreneurial environment. The inverse regression coefficient (–2.01) and the statistically significant P-value = 0.0008 indicate that the growth of this indicator is accompanied by a decline in the share of high-tech exports. This result can be explained by the dysfunctionality and formality of the relevant policy in Ukraine – despite the increase in the estimates for indicator 1.3.2, this is not accompanied by a practical increase in innovative exports, which indicates the formal presence of institutional prerequisites without effective implementation.

Indicator 5.2.1 – cooperation between science and industry also turned out to be a very strong predictor (R^2 = 0.9875, P-value = 0.0006), with a positive coefficient of 0.16. This indicates that even a small improvement in academic-industrial interaction significantly improves innovation performance. Similarly, human resource potential in business research (5.3.5) showed R^2 = 0.9841, coefficient 9.62, P-value = 0.00085 – the model confirms that investments in human capital are transformed into high-tech exports.

In contrast, the relationships for key variables such as internal R&D spending (2.3.2) and business-performed R&D (5.1.3) are very weak or insignificant: R^2 = 0.011 and 0.302, respectively, P-value = 0.867 and 0.337. This indicates a structural disconnect between the investment base of Ukraine's innovation system and its export performance. In other words, the presence of research spending or its distribution through business does not provide stable growth in the foreign economic sphere, which indicates the inefficiency or dispersion of such spending. Finally, 6.1.1 – patent activity shows a moderate correlation (R^2 = 0.4985), with a coefficient of 35 and P-value = 0.1826. Despite the formally sufficient coefficient, the statistical significance of the model is low. This indicates the instability of patent productivity as a prerequisite for the outcome in the case of Ukraine, due to the limited commercialization of patents and their weak technological potential. Unlike the EU countries, Fig. 3, where the effectiveness of the innovation system was formed under the influence of clearly structured factors – investments, business activity and the human resource base, in Ukraine the most significant factors were cooperation between science and industry and the availability of human capital.

In contrast, R&D funding does not have a statistically significant effect, which indicates the need not only to increase the volume of funding, but also to improve its efficiency and targeting. The feedback with business policy is indicative – a high level of declarativeness of institutional reforms does not provide a practical effect, and in some cases even correlates with deterioration in innovation performance. This indicates the need to review the mechanisms for implementing innovation development policy in Ukraine.

The data obtained indicate that in the EU countries there is a stable and reproducible relationship between the level of the innovation sector, business participation in R&D, human capital development and the volume of high-tech exports. This is explained by a mature institutional base, targeted support mechanisms and effective integration of scientific developments into production processes. In Ukraine, a different profile of influence was found: the key determinants of performance are science-industry cooperation and human resources in business research, while the direct connection between the volume of R&D funding and results is weak. This situation is due to the fragmentation of innovation policy, low conversion of costs into commercial products, and institutional barriers.

Unlike most studies that emphasize the role of financial investments in R&D as the main driver of innovation, the analysis conducted for Ukraine showed that under the existing institutional conditions, the volume of funding is not a sufficient prerequisite for high-tech exports. This contradicts typical models for developed economies, but coincides with some observations for developing countries, where institutional efficiency and quality of management have a more decisive influence.

The results of the study can be used to improve national innovation development strategies. They will help reorient state support to projects with a direct commercial effect. It is also possible to expand programs to stimulate private R&D. Separately, it is planned to create a system for monitoring the effectiveness of cooperation between science and industry.

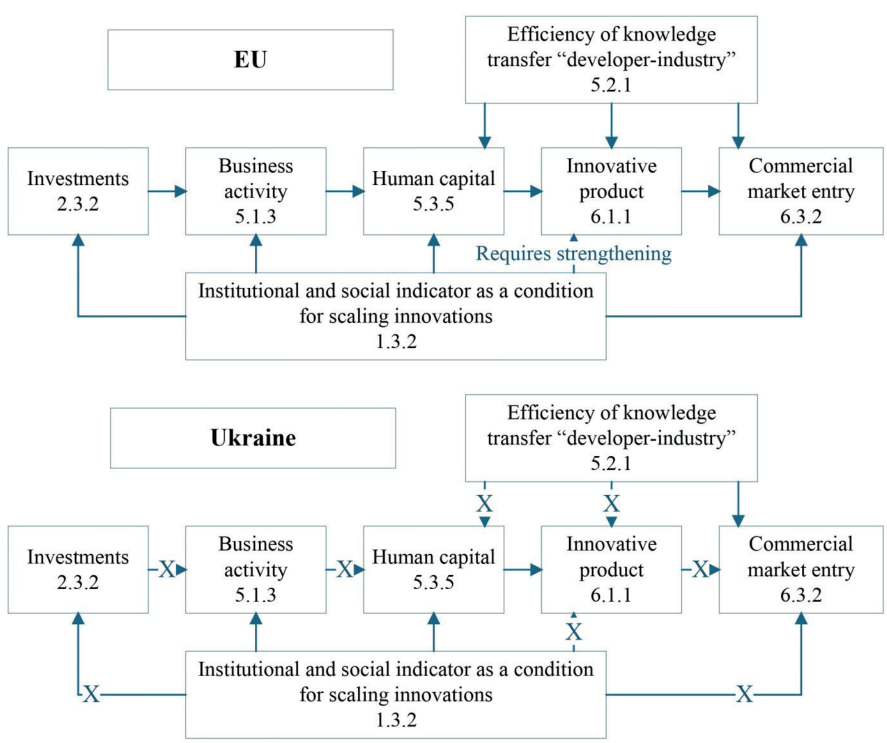

Fig. 3. Structural relationships between key indicators of innovation policy in the EU and Ukraine

The proposed conclusions are relevant for government structures, regional administrations, industry associations, as well as for international organizations financing the recovery of the Ukrainian economy.

The study is based on aggregated indicators for the period 2016–2024, which do not take into account regional disparities and industry differences. The data used from international statistical sources may have differences in the calculation methodology with national statistics. In addition, the model does not cover the impact of informal innovation practices, the startup ecosystem, and internal migration of highly qualified personnel.

Military actions and related economic shocks led to a partial loss of industrial capacity, migration of scientists, reduction in budget funding for civilian research, and a shift in state policy priorities towards the security sector. Limited access to some official statistical data, as well as changes in international partnerships, have affected the completeness and relevance of some indicators. The transition of a significant part of educational and research activities to an online format has slowed down the development of infrastructure projects, but at the same time stimulated the digitalization of cooperation processes between scientific and business structures.

Further scientific developments should be focused on in-depth industry analysis, the inclusion of micro-level indicators of innovation efficiency, as well as on assessing the impact of institutional reforms on the transformation of the innovation ecosystem. Modeling post-war development scenarios taking into account different amounts of funding and the scale of integration into the European innovation space is promising.

4. Conclusions

The research revealed significant differences in the effectiveness of innovation, industrial and entrepreneurial policies between the EU countries and Ukraine. In most EU member states, stable innovation ecosystems have been formed with high business involvement in R&D, strong scientific and industrial cooperation and stable positions in global high-tech markets. In contrast, in Ukraine, key indicators remain several times lower, and the impact of investment and institutional factors on high-tech exports is weak or statistically insignificant.

The identified differences are explained by the quality of innovation management, the efficiency of commercialization of developments, the transparency of the regulatory environment and the degree of integration of science and production. The EU is characterized by targeted support instruments and a comprehensive personnel policy that ensure a direct link between innovation costs and economic results. In Ukraine, however, fragmentation of measures persists, which reduces the multiplier effect of funding and creates a gap between formal reforms and actual innovation dynamics.

The results obtained have theoretical and applied value. Theoretically, they expand the understanding of the factors of innovation efficiency in countries with different institutional models. Practically, they form the basis for revising national strategies: increasing the role of private R&D, developing human resources in the field of business research and intensifying scientific and industrial cooperation. Quantitative estimates show that in 2024, Ukraine's R&D spending is almost ten times lower than the EU average, and the share of high-tech exports is four times lower, which determines the scale of the challenges.

The proposed set of changes can be integrated into long-term post-war recovery programs, taking into account the experience of EU leading countries and national characteristics. Only a combination of targeted financing, institutional modernization and stimulation of innovative business activity can ensure Ukraine's entry onto the trajectory of sustainable high-tech growth.

Conflict of interest

The authors declare that they have no conflict of interest regarding this research, including financial, personal, authorship or other, that could influence the research and its results presented in this article.

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The manuscript has no related data.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the presented work.

References

1. Veugelers, R. (2024). An Innovation-Based Industrial Policy for the EU. *Intereconomics, 59 (5),* 254–261. https://doi.org/10.2478/ie-2024-0052
2. Dugo, A., Erixon, F., Guinea, O. (2025). Models of industrial policy: Driving innovation and economic growth. *European Centre for International Political Economy.* Available at: https://ecipe.org/wp–content/uploads/2025/04/ECI_OccasionalPaper_05–2025_LY02.pdf
3. Landesmann, M. A. (2025). *EU industrial policy in the evolving geo-political and geo-economic environment.* The Vienna Institute for International Economic Studies, 44. Available at: https://wiiw.ac.at/eu-industrial-policy-in-the-evolving-geo-political-and-geo-economic-environment-dlp-7342.pdf
4. Batbaatar, M., Larsson, J. P., Sandström, C., Wennberg, K.; Henrekson, M., Sandström, C., Stenkula, M. (Eds.) (2024). The State of the Entrepreneurial State: Empirical Evidence of Mission-Led Innovation Projects around the Globe. *Moonshots and the New Industrial Policy.* Cham: Springer, 125–143. https://doi.org/10.1007/978-3-031-49196-2_8
5. Wigger, A. (2023). The New EU Industrial Policy and Deepening Structural Asymmetries: Smart Specialisation Not So Smart. *JCMS: Journal of Common Market Studies, 61 (1),* 20–37. https://doi.org/10.1111/jcms.13366
6. Garcia Calvo, A., Hancké, B. (2025). When does industrial policy fail and when can it succeed? Case studies from Europe. *Socio-Economic Review.* https://doi.org/10.1093/ser/mwaf045
7. The impact of R&I policy instruments: Quarterly R&I literature review 2022/Q4 (2023). *European Commission.* Available at: https://research–and–innovation.ec.europa.eu/system/files/2023–03/ec_rtd_quarterly–ri–review_042022.pdf
8. Veugelers, R. (2021). *Research and innovation policies and productivity growth.* Bruegel. Available at: https://www.bruegel.org/system/files/wp_attachments/WP–2021–08–100521.pdf
9. Makrevska Disoska, E., Tonovska, J., Toshevska-Trpchevska, K., Tevdovski, D., Stojkoski, V. (2024). Empirical Determinants of Innovation in European Countries: Firm-level Analysis Based on CIS 2018. *European Review, 32 (3),* 269–290. https://doi.org/10.1017/s106279872400019x
10. Belanová, K., Ochotnický, P., Sivák, R. (2025). Innovation performance of EU countries in context of R&D: R&D trap risk in Slovakia? *Journal of Innovation and Entrepreneurship, 14 (1).* https://doi.org/10.1186/s13731-025-00533-5
11. Haddad, C. R., Bergek, A. (2023). Towards an integrated framework for evaluating transformative innovation policy. *Research Policy, 52 (2),* 104676. https://doi.org/10.1016/j.respol.2022.104676
12. Borrás, S., Laatsit, M. (2019). Towards system oriented innovation policy evaluation? Evidence from EU28 member states. *Research Policy, 48 (1),* 312–321. https://doi.org/10.1016/j.respol.2018.08.020
13. Edler, J., Berger, M., Dinges, M., Gok, A. (2012). The practice of evaluation in innovation policy in Europe. *Research Evaluation, 21 (3),* 167–182. https://doi.org/10.1093/reseval/rvs014
14. Cunningham, J. A., Link, A. N. (2016). Exploring the effectiveness of research and innovation policies among European Union countries. *International Entrepreneurship and Management Journal, 12 (2),* 415–425. https://doi.org/10.1007/s11365-016-0394-7
15. Fuest, C., Gros, D., Mengel, P.-L., Presidente, G., Tirole, J. (2024). *Reforming innovation policy to help the EU escape the middle-technology trap.* VoxEU. Available at: https://cepr.org/voxeu/columns/reforming–innovation–policy–help–eu–escape–middle–technology–trap

ISSN-L 2664-9969; E-ISSN 2706-5448

16. Borrás, S., Edler, J. (2014). The governance of change in socio-technical and innovation systems: three pillars for a conceptual framework. *The Governance of Socio-Technical Systems. Edward Elgar*, 23–48. https://doi.org/10.4337/9781784710194.00011

17. Cavalcante, P. L. C.; Farazmand, A. (Ed.) (2022). Innovation Policy Governance. *Global Encyclopedia of Public Administration, Public Policy, and Governance*. Cham: Springer, 6704–6709. https://doi.org/10.1007/978-3-030-66252-3_4234

18. Global innovation index 2024 (2024). *World Intellectual Property Organization.* Available at: https://www.wipo.int/publications/en/details.jsp?id=4758&plang=EN

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