Horyzonty Polityki
2025, Vol. 16, N° 54
OPEN ACCESS

Wanda Dugiel
http://orcid.org/0000-0003-1369-3523
Warsaw School of Economics (SGH)
wdugie@sgh.waw.pl
Izabela Kowalik
http://orcid.org/0000-0001-9066-0974
Warsaw School of Economics (SGH)
iza123@sgh.waw.pl
DOI: 10.35765/HP.2816

Entrepreneurship and economic effects of innovation policy of the European Union: international trade and economic growth

Abstract

RESEARCH OBJECTIVE: The aim of the article is to present the effectiveness of the European Union's innovation policy for economic growth in the Member States, taking into account the dynamics and growth of export potential and the competitiveness of exports of European companies and the level of entrepreneurship.

THE RESEARCH PROBLEM AND METHODS: Based on the theory of international trade, the article examines the effectiveness of the innovation policy, as a result of which the EU countries achieve benefits, by increasing the level of exports and increasing the level of competitiveness in international trade. The article identifies geographic clusters and enterprises located in a given geographic region that benefitted from the Europe 2020 program and A New European Innovation Agenda, as part of the European Union's innovation policy.

THE PROCESS OF ARGUMENTATION: The article uses the example of EU funds under the Europe 2020 program and A New European Innovation Agenda to present a theoretical review of the relationship between exports and the development of innovations in the economy, determining the specialization and competitiveness in international trade.

RESEARCH RESULTS: The export potential of EU Member States results from the competitiveness of SMEs operating on the global market, which is why state intervention in the form of innovation policy at the supranational and

Suggested cittation: Dugiel, W., & Kowalik, I. (2025). Entrepreneurship and economic effects of innovation policy of the European Union: international trade and economic growth. *Horizons of Politics*, *16*(54), 273–296. DOI: 10.35765/HP.2816.

regional level is necessary. The innovation policy of the European Union has enabled increasing the level of exports of EU Member States and increasing the competitiveness of products manufactured in clusters.

CONCLUSIONS, INNOVATIONS, AND RECOMMENDATIONS: An important problem to be examined is the issue of creative destruction in the sense of Schumpeter, an increase in the level of innovations/innovativeness should lead to an increase in the technological progress (patents) of companies and the economic growth of industries.

Keywords:
innovation policy of the European Union, European Union, international trade

INTRODUCTION

The aim of the article is to present the effectiveness of the European Union's innovation policy for economic growth in the Member States, taking into account the dynamics and growth of export potential and the competitiveness of exports of European companies and the level of entrepreneurship.

The article uses the example of EU funds under the Europe 2020 program and A New European Innovation Agenda to present a theoretical review of the relationship between exports and the development of innovations in the economy, determining the specialization and competitiveness in international trade. The export potential of EU Member States results from the competitiveness of SMEs operating on the global market, which is why state intervention in the form of innovation policy at the supranational and regional level is necessary. As a result, the article identifies geographic clusters and enterprises located in a given geographic region that benefitted from the Europe 2020 program and A New European Innovation Agenda, as part of the European Union's innovation policy. So far, the literature has examined the mutual correlation between the liberalization of international trade and the level of innovation for selected countries of the world (Coelli et al., 2022). There are also a number of studies in the literature on the premises of the European Union's innovation policy in conditions of increased international competition (Anvret, Granieri, & Renda, 2010).

Based on the theory of international trade, the article examines the relationship between the increase in exports and economic growth in a given Member State and the increase in the level of GDP in a given EU industrial region. Then, the effectiveness of innovation policy is presented, as a result of which countries, by increasing the level of exports, can achieve economies of scale and long-term dynamic effects. As a result of creative destruction in the sense of Schumpeter, an increase in the level of innovations/innovativeness leads to an increase in the technological progress (patents) of companies and the economic growth of industries.

The analysis of the application of the most important elements of the European Union's innovation policy confirmed in most cases the effectiveness of the transfer of public funds from the Europe 2020 program to companies in selected geographical clusters and regions of the EU. Entrepreneurship enables companies to adopt a strategy of expansion into the global market based on the development of innovations and the production of more technologically advanced products (Wales, Covin, & Monsen, 2020).

The first part of the study examines the theoretical impact of innovation on the intensification of trade, in particular export growth, which is a key factor in accelerating economic growth. Then, a review of the literature on the challenges for the EU's mission-oriented innovation policy and the importance of geo-economics is presented. The second part presents the tools of the EU's innovation policy and examines the factors determining the effectiveness of innovation policy leading to the acceleration of trade. The new approach of the European Union to mission-oriented innovation policy, consisting of playing the fundamental role of an entrepreneurial state in increasing the innovativeness level of regions, is examined.

The analysis covers changes in the European Union's trade flows for products of a given industry receiving financial support under the EU's innovation policy. The subject of the research in the article are trade flows: EU exports and imports for the years 2014–2023 with selected countries (The United States, Japan, China) and the entire trade exchange in the products of the analyzed industry.

1. RESEARCH METHODS

The article uses both qualitative and quantitative methods. In the case of the qualitative method, an analysis of the theory of international trade was carried out in the context of the development of innovation and business entrepreneurship in the economy. The analysis of scientific literature and reports of European Union institutions, including the European Commission, international organizations World Trade Organization, UN Comtrade, International Monetary Fund covered the issues of mutual dependencies between foreign trade and the level of innovation in EU member states, issues of mission-oriented innovation policy, innovation policy of the European Union. Thanks to the quantitative method, the article analyzes statistical data on trade between European Union member states and China in the context of the competitiveness of the European Union. The analysis of the competitiveness of the European Union exports in trade relations with China was based on data from UN Comtrade and the RCA (Revealed Comparative Advantage) index.

2. INNOVATION AS A KEY FACTOR OF ECONOMIC GROWTH – THEORETICAL APPROACH

The intensification of trade increases the process of creating innovations and advanced technologies. There is a flow of technology from developed countries to developing countries. As a result of the learning effect, there is an increase in the demand for highly qualified workforce. When there are wage inequalities between the skilled and less-skilled workforce, there will be a decline in the share of labor in GDP. Eventually, the development of innovations leads to the concentration of companies in many industries (Autor, Dorn, Katz, Patterson, & Van Reenen, 2017).

There are close interdependencies between innovation and economic growth. Innovation is endogenous to the future profits of firms (Melitz, 2021). International trade increases the size of the domestic market, competitiveness on international markets, and as a result of the process of creative destruction according to Schumpeter's theory leads to the replacement of new technologies with the latest advanced

ones creating benefits from trade. According to Schumpeter's theory, larger companies have a greater ability for innovation processes (Schumpeter, 1942).

Melitz and Redding (2021) state that protectionism in the state's trade policy increases incentives for domestic companies to innovate. Increasing the size of the international market as a result of the liberalization of international trade leads to the development of innovation as well (Burstein & Melitz, 2011). The liberalization of international trade increases competition in domestic markets, stimulating innovation (Akcigit, 2018). Subsequent scientific studies have confirmed the enormous importance of foreign competition for the development of innovation and increasing the number of patents (Coelli et al., 2022; Aghion et al., 2005). The number of inventions depends on the size of the market (Coelli et al., 2022). Opening international markets, and greater access to markets lead to an increase in the effects of innovation processes.

3. INNOVATION POLICY OF THE EUROPEAN UNION AND ENTREPRENEURSHIP: CHALLENGES

The main objective of the European Union's innovation policy is to increase business entrepreneurship as a result of the increase in the level of innovation of the countries. Implementation of the innovation policy to increase the competitiveness of the economies of the European Union countries and to achieve specific social goals.

The European Union countries began to apply an innovation policy oriented towards missions necessary to solve social challenges related to climate change, the development of science, technology and innovation (Kattel & Mazzucato, 2023). In 2021, the European Union launched the Europe Horizon program, which finances research and development in response to challenges resulting from the challenges related to the growth of competition in the global economy and the development of entrepreneurship.

As a result, there is an urgent need to implement the EU's innovation policy and to increase the role of regulation and economic interventionism. In the New European Agenda, the European Commission called for greater coherence and synergy between EU policies and innovation support mechanisms.

The European Union, by creating the Horizon Europe program, began implementing a synergy policy, where innovations were to contribute to economic, social, and territorial cohesion and convergence of EU regions. Synergy between the Horizon Europe program and the structural funds enabled the creation of conditions for enabling the regions to create clusters of excellence in specific sectors of the economy (European Commission, 2021c).

EU innovation policy of creating clusters of excellence responding to the challenges of the global economy related to increasing the competitiveness of the economy, climate change and technological transformation. Clusters in the Member States have not played a significant role in creating innovations in the regions and have not facilitated entrepreneurship of small and medium-sized enterprises (European Cluster Observatory Report, 2015).

In 2021, the European Commission published a report of The European Expert Group on Clusters, which presented the assumptions for implementing cluster policy, enabling the acceleration of the dual green and digital transformation and building resilience. The creation and financial support of clusters enables the development of the ICT industry to a large extent and the creation of digital innovation centers and allowing to meet social challenges, increasing the entry of small and medium-sized enterprises into global value chains (Piro, Seeber, & Wang, 2024). The creation of clusters in the EU Member States creates conditions for providing financial assistance in solving contemporary challenges for economies, in particular economic growth, environmental challenges and health care. In addition, the EU's innovation policy enables diversification in the industrial sector through a mission-oriented policy (Haus-Reve & Asheim, 2023).

4. EU INNOVATION POLICY AND CHINA'S ECONOMIC GROWTH

China has a competitive advantage in low-tech industries and ranks second in the world in terms of R&D expenditure. China's economy is on the rise, while the United States, Japan and the EU have reduced the number of patent applications. In 2019, the patent offices of China, the United States, Japan, South Korea and the EU collected the largest

number of patents in the world (Table 1), accounting for 84.7% of the global total. China ranked first in the world in 2022 in terms of patent applications (46.8%), followed by the United States (17.2%) and Japan (8.4%). South Korea ranked fourth in terms of patent applications. (6.9%), while the fifth place goes to the European Union (5.6%).

Table 1. The European Union's share in the number of patents on a global scale

	Country	2019 [%]	In the world total in 2022 [%]
1.	China	43,4	46,8
2.	USA	19,3	17,2
3.	Japan	9,6	8,4
4.	Republic of Korea	6,8	6,9
5.	European Union	5,6	5,6
6.	India	2,1	2,2
7.	Germany	2,1	1,6
8.	Canada	1,1	1,1
9.	Australia	0,9	0,9
10.	Russian Federation	1,1	0,8

Source: https://www.wipo.int/en/ipfactsandfigures/patents (accessed on 18th September 2024).

5. ASSUMPTIONS AND EFFECTIVENESS OF THE EUROPEAN UNION'S INNOVATION POLICY

The effectiveness of EU innovation policy results from the interaction of many factors. One of the key elements of the effectiveness of innovation development in EU regions is the increase in the competitiveness of exports and trade, which translates into economic growth and the implementation of social challenges and missions.

EU innovation policy financing was focused on "mission-oriented" activities, where states financed specific goals. A similar policy was pursued by the United States through the activities of the Defense Advanced Research Projects Agency (DARPA). Industrial policy is playing an increasingly important role in the economic policy of states. By using specific economic tools, states can develop specific missions to address growing social and economic challenges and influence the direction of economic growth by defining strategic investments in the economy (Mazzucato, 2018, p. 101; World Trade Organization, 2021).

Mission-oriented innovation policy has been included in the literature in many publications (Fagerberg, 2017, Fagerberg, 2018). The EU's mission-oriented innovation policy should ensure finding and meeting new challenges: (1) adaptation to climate change; (2) combating cancer; (3) restoring oceans and waters by 2023; (4) 100 climate-neutral and smart cities by 2030; (5) governance for healthy European soils. The tasks of mission-oriented innovation policy are included in the Horizon Europe program, and concern investments in research and development. The EU innovation policy based on the idea of mission orientation is fundamentally linked to societal challenges (Mazzucato, 2018). Mazzucato's work for the European Commission focused on formulating the objectives of a mission-oriented innovation policy: (1) pursuing bold and socially relevant goals, (2) setting time-bound verifiable results, (3) developing R&D activities at the interface of high risk and technical feasibility, (4) leveraging the knowledge of many learners and moving between several policy sectors, and (5) providing space for bottom-up experimentation involving multiple actors from different backgrounds.

The first Strategic Plan for Horizon Europe assumed the development of geographical clusters. The European Union adopted priority solutions related to the development of innovation. In 2015, it was emphasized that the European Union is facing an "innovation crisis" (European Commission, 2015). The development of innovation requires the functioning of an entrepreneurial state, thus companies in the European Union should operate in the so-called entrepreneurship ecosystem. Economic growth depends on the development of innovations created by entrepreneurs, whose activity results from the size of the ecosystem including entrepreneurs conducting business in a specific institutional environment (Elert, Henrekson, & Stenkula, 2017). The entrepreneurship ecosystem is a network of collaborating entities including inventors creating inventions, managers, skilled labour, venture capitalists.

The European Union has increased spending on successive innovation policy programmes (Table 2). The EU Member States have received higher funding under Horizon 2020 (implemented in 2014–2020) compared to the 7th Framework Programme for Research (2007–2013). The funding for Horizon Europe (for the period 2021–2027) is to exceed the amounts under Horizon 2020 by 30%.

Table 2. Horizon Europe expenditure for Member States, in billion Euros

	Horizon Europe (The First Strategic Plan 2021–2024)	Horizon 2020 (2014–2020)	7th Framework Programme for Research (2007–2013)
Germany	6,2	10,06	7,25
France	4,3	7,33	5,44
Spain	4,2	6,35	3,34
Netherlands	3,5	5,37	3,44
Italy	3,4	5,67	3,72
Belgium	2,5	3,39	1,85
Greece	1,5	1,73	1,03
Sweden	1,3	2,31	1,78
Austria	1,2	1,96	1,19
Denmark	1,2	1,76	1,08
Finland	1,1	1,54	0,9
Portugal	0,9	1,16	0,5
Ireland	0,8	1,2	0,6
Poland	0,5	0,7	0,4
Czechia	0,4	0,5	0,3
Slovenia	0,3	0,4	0,2
Cyprus	0,3	0,3	0,09
Romania	0,3	0,3	0,2
Estonia	0,2	0,3	0,1
Hungary	0,2	0,4	0,3
Luxembourg	0,2	0,2	0,06
Lithuania	0,1	0,09	0,05
Bulgaria	0,1	0,2	0,09
Croatia	0,1	0,1	0,09
Slovakia	0,1	0,1	0,08
Latvia	0,08	0,1	0,05
Malta	0,04	0,4	0,02
United Kingdom	0,26	7,79	7,12

Source: Horizon Europe. Country Profile. https://research-and-innovation.ec.europa.eu/statistics/framework-programme-facts-and-figures/horizon-europe-country-profiles_en (accessed on 12th December 2024).

The new European Innovation Agenda has identified 149 Regional Innovation Valleys (RIVs), which belong to 25 actions of the New European Innovation Agenda. In the New European Innovation Agenda, which is focused on solving social problems using advanced technologies, some regions in the European Union Member States have been classified as having comparative advantages (Table 3).

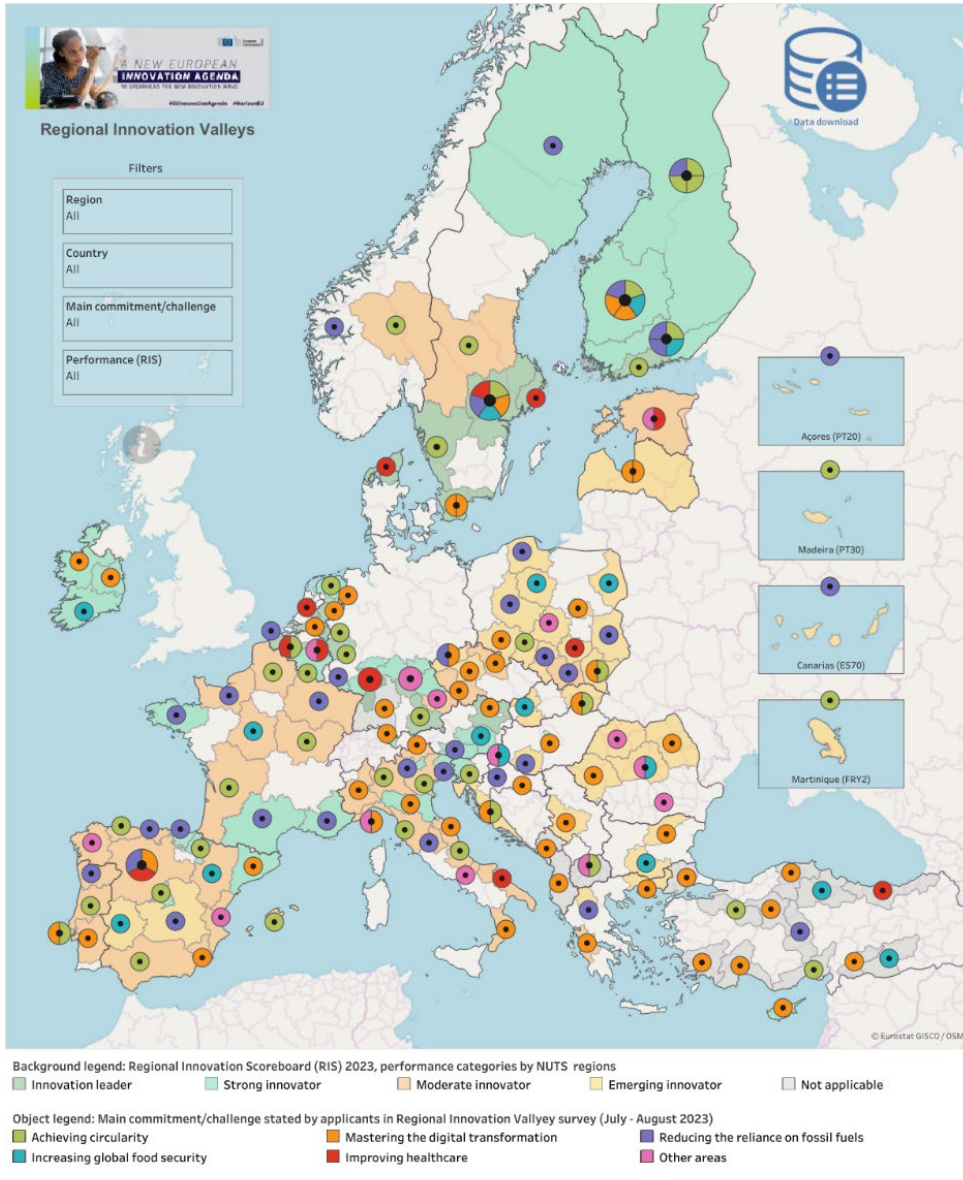
Clusters are key innovation policy tools for solving societal challenges. Interconnected companies with short geographical distances operating in specific institutional conditions bring many benefits related to the growth of innovation. In the European Union, there are huge inequalities in healthcare infrastructure, in healthcare services, and regional differences in the equipment of hospital beds. In the EU, there are also inequalities in average life expectancy, where regions of Central and Eastern European countries have lower life expectancy (Bayerlein, 2024; Eurostat, 2024).

The countries with the most hospital beds are Germany, France and Poland, while the fewest are Malta, Luxembourg and Cyprus. Cluster 1 "Health" adopted in the Horizon Europe program aims to promote and protect the health and well-being of people, prevent diseases and reduce the burden of diseases and disability on people and communities, support the transformation of health care systems in their efforts to provide equitable access to innovative, sustainable and high-quality healthcare for everyone and support an innovative, sustainable and globally competitive European health industry (European Commission, 2021c).

The innovation policy assumptions included in the Cluster 2 programme, entitled "Culture, Creativity and Inclusive Society", concern the implementation of the EU's objectives and priorities in the area of strengthening democratic governance and protecting and promoting cultural heritage. Research and innovation serve to achieve sustainable economic growth and job creation through industrial policy concerning the cultural and creative sectors. Cluster 3, entitled "Civic Security for Society", concerns the implementation of the objectives of protecting EU citizens from threats posed by crime and terrorism, in particular in the cyber environment). In turn, Cluster 4, entitled "Digital, Industrial and Space", concerns the development of key digital and space technologies, support for the transformation of the economy and the digitisation of European industry.

Cluster 5, entitled "Climate, Energy and Mobility", concerns the fight against climate change and improving the competitiveness of the energy and transport industry, counteracting the threats and effects of climate change. Cluster 6, entitled "Food, bioeconomy, natural resources, agriculture and environment", covered the issues of expanding potential and providing innovative solutions facilitating the transition towards sustainable management of natural resources (biodiversity, water and soil).

Map 1. Regional Innovation Valleys in European Union



Source: European Commission, 2023. https://ec.europa.eu/regional_policy/whats-new/newsroom/24-09-2023-regional-innovation-valley-matchmaking-map-now-available_en. (accessed on 18th September 2024)

6. RESEARCH RESULTS – BILATERAL TRADE FLOWS OF THE EUROPEAN UNION

The article uses numerical data on trade, both on the export side and on the import side from the UN Comtrade database. Based on HS designations and four-digit product labeling of the products of interest for cluster specialization in the European Union Member States, the competitiveness of countries was examined using the Revealed Comparative Advantage Index (RCA). The analysis covered products for which the European Union, as part of its mission-oriented innovation policy, created geographical clusters. In most industries included in geographical clusters selected in the New Innovation Agenda, the production of goods concerns similar goods that cannot be considered identical. Differences between goods will result from the innovativeness and adopted technological solutions as well as from the endowment of individual countries with production factors.

The Balassa index is based on Balassa (1965). The RCA index has been used in the literature in empirical studies (Adigwe, 2022; Cieślik, 2017; Rytko, 2017):

$$RCA_{ij} = \frac{\Sigma_{ij} / \Sigma_{j}}{\Sigma_{ic} / \Sigma_{c}}$$

Σ_{ij} – export value of commodity group *i* from country *j*
Σ_{j} – total exports of country *j*
C – reference country
Σ_{ic} – export value of the commodity group from reference country
Σ_{c} – all exports of the reference country *c*

The Balassa index takes positive values, up to infinity. A country is characterized by a revealed comparative advantage if RCAij > 1. If RCAij < 1 then the country does not have a comparative advantage in the examined product group.

Based on the New Innovation Agenda data, groups of goods were identified by six geographical clusters, analyzing the trade of the European Union with China, EU Member States with China, the United States, and Japan. Within cluster 1, the following products were qualified for analysis:

HS 9018 Instruments and appliances used in medicine, surgery, dentistry or veterinary medicine, including scintigraphic equipment, other electromedical equipment and vision testing devices

HS 9022 12 Computed tomography scanners (ICT)

HS 9018 12 Ultrasound devices

HS 9018 11 Electrocardiograph

HS 9018 19 Multiparametric patient monitoring devices

HS 9018 90 Stethoscopes

Due to the specific nature of their economic activity, clusters 2 and 3 were not included in the analysis. Within cluster 4, 5, 6, the following products were qualified for analysis, including: HS 8541 Diodes, transistors and similar semiconductor devices, photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light-emitting diodes (LED), mounted piezoelectric crystals; and HS 8471 automatic data processing machines and units thereof; magnetic or optical readers, machines for transcribing data on to data media in coded form and machines for processing such data, not elsewhere specified or included; HS Codes 01, 02, 03, 04.

The implementation of innovation development and increased investment in cluster 1 will allow for the provision of public health goods on a global scale and reducing the differences in the equipment of medical technologies in the regions of the European Union.

A higher RCA index means greater competitiveness in the export of a given product. The European Union maintained its competitiveness in the export of healthcare products to China (HS 9018). The lowest competitiveness of exports to China in this product group was recorded by countries such as: Croatia, Hungary, Portugal, Spain. The highest export competitiveness was characteristic of most European Union countries (Germany, France, Ireland, Luxembourg). The export competitiveness of the entire European Union, Great Britain and the United States clearly exceeded the competitiveness of China in the field of technologically advanced products. Maintaining the competitiveness of the European Union allows the application of mission-oriented innovation policy (Table 3).

Table 3. RCA index of the European Union member states, EU, USA, Japan in trade with China and China in trade with EU in the HS 9018 commodity group

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Austria	15	20	25	23,3	20	16,66	20	10	5	5
Belgium	15	15	13,3	20	2	7,5	4	6,6	10	2
Bulgaria	15	15	10	30	26,6	16,6	50	66,6	33,3	25
Croatia	nd		7,77	30	50	50	10	10	nd	0,7
Cyprus	nd	0,2	15	75	600	625	1285	250	600	600
Czech	0,25	10	11,11	8,75	3,75	6,25	6	6	4	2
Denmark	80	57,14	50	62,5	66,66	444	50	40	40	80
Estonia	250	1000	1750	1500	625	5000	3000	2000	1000	20
Finland	50	37,5	77,77	87,5	75	62,5	85,71	116,66	112,5	80
France	2,5	2,5	2,5	2,5	2,5	1,25	6,66	1,66	2	2
Germany	5	6	6	3	3,5	4	4,5	4,5	8	4
Greece	0,25	0,3	11,11	12,5	12,5	2	20	10	8	9
Hungary	1,5	1,25	1	1,25	0,8	0,8	0,33	1,11	1	0,6
Ireland	5000	12500	2500	2500	2500	1500	800	700	700	2000
Italy	2,25	2,5	2,5	2,5	2,5	2,5	1,42	1,66	2	2
Latvia	7,5	7,5	17,5	50	50	233,33	133,33	83,33	80	125
Lithuania	15	13,33	6,66	20	22,5	25	33,33	33,33	5	35
Luxembourg	nd	15	26,66	nd	0,5	2,5	0,2	nd	1,2	2
Malta	nd	3,5	1,11	2	6	2,5	166,66	nd	nd	nd
Netherlands	7,5	10	20	12,5	6,25	12,5	14,2	11,11	10	7,5
Poland	2,5	3	3	3,33	2,5	5	2	2,5	2,5	2
Portugal	0,2	0,33	0,15	0,33	0,25	1,66	0,33	0,33	0,35	1
Romania	2	2	1,75	1	0,1	0,01	0,04	0,1	5	7
Slovakia	0,5	0,25	2,5	2,5	2,5	2,5	3,33	1,66	4	10
Slovenia	75	125	222	250	100	50	200	300	100	100
Spain	1,5	1,5	1,5	3	1,66	0,66	1	0,66	1	1
Sweden	20	50	22,22	12,5	25	12,5	20	16,66	8	8
United Kingdom	25	50	75	25	25	25	40	11,11	10	10
European Union	1,4	1,6	1,6	1,4	1,4	1,7	1,3	1,7	1,8	1,5
United States	2	1,66	1,42	1,42	1,66	1,66	2,85	2,85	1,42	1,66
China	0,71	0,63	0,8	0,7	0,7	0,58	0,69	0,89	0,64	0,64
Japan	4	4,5	5	5	5	5	20	5	10	10

nd – no data

Source: Own calculations based on UN Comtrade. Note: the RCA was calculated based on Balassa, 1965; Cieślik, 2017.

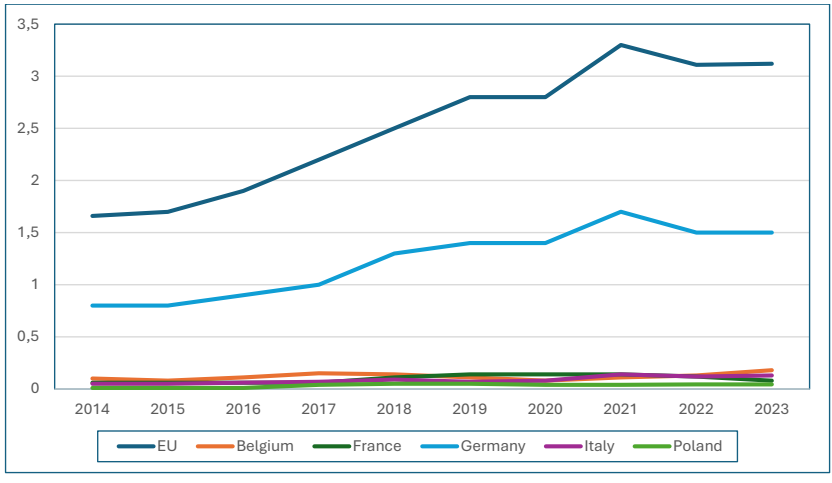
From the analysis of RCA indicators for the product groups that are the subject of specialization in industrial clusters in the European Union, the Member States demonstrate high competitiveness.

Regional policy oriented towards the mission of creating innovations in clusters allows for combining the implementation of two important goals, both the development of specific locations and human capital. The EU innovation policy oriented towards identifying technologically advanced industries has increased the competitive advantage of enterprises in specialist areas. The implementation of innovation policy allows for coherence between financial support for human capital and the competences and specialization of given locations in regions in the European Union. Innovation policy based on clusters in relation to all regions without division into the key core of advanced technologies in the EU and the periphery will support sustainable development and prevent the creation of income inequalities.

The loss of competitiveness of the European Union towards China in the product group HS 8541 of technologically advanced products (including semiconductors) justifies the need for further work on the continuation of the EU innovation policy.

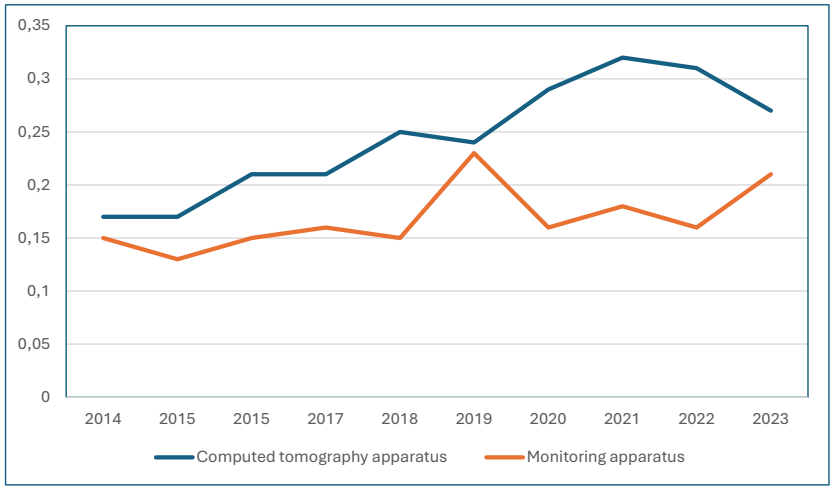
In 2014, the competitiveness index for the EU vis-à-vis China in the HS8541 commodity group was 0.15, and increased slightly to 0.71 in 2023. In the case of China, in the years 2014–2023 there was an increase in the competitiveness of China's exports vis-à-vis the EU, in 2014 the RCA in the HS8541 commodity group for China was 6.66, while in 2023 the RCA index was 14. The slight increase in the RCA index of the United States vis-à-vis China improved slightly from 0.5 in 2014 to 1.5 in 2023.

Figure 1. Export of HS 9018 medical products from the European Union to China, in billion USD



Source: Own calculations based on UN Comtrade.

Figure 2. Export, HS 9022 12 from the European Union China, USD billion, Computer Tomography Scanners (ICT)



Source: Own calculations based on UN Comtrade.

In the European Union, there was a huge growth dynamics of exports in the HS9018 product group to China in the years 2014–2023,

which exceeded 900%. The development of exports after 2020 for selected products from the HS9018 product group was limited due to the breakdown of global supply chains. The policy of creating specialized clusters within the EU innovation policy will allow for reducing disparities in health care and mortality rates between EU regions.

Regional policy oriented towards the mission of creating innovations in clusters allows for combining the implementation of two important goals, both the development of specific locations and human capital. The EU innovation policy oriented towards identifying technologically advanced industries has increased the competitive advantage of enterprises in specialist areas. The implementation of innovation policy allows for coherence between financial support for human capital and the competences and specialization of given locations in regions in the European Union. Innovation policy based on clusters in relation to all regions without division into the key core of advanced technologies in the EU and the periphery will support sustainable development and prevent the creation of income inequalities.

The loss of competitiveness of the European Union towards China in the product group HS 8541 of technologically advanced products (including semiconductors) justifies the need for further work on the continuation of the EU innovation policy.

CONCLUSION

The article aimed to present the effectiveness of the European Union's innovation policy, taking into account the dynamics and growth of export potential and the competitiveness of exports of European companies and the level of entrepreneurship. As we have shown, the EU's mission-oriented innovation policy has allowed for an increase in the competitiveness of EU Member States' exports to China. The reduction in the EU's competitiveness in some industries offering technologically advanced products justifies the implementation of the European Union's innovation policy, in particular in the context of support for the development of innovations in companies in the United States and China.

The assessment of the effectiveness of the EU innovation policy is difficult due to the difficulties of measurement. Some scientific studies have presented positive effects of the application of the EU innovation policy. The implementation of mission assumptions allows for the adaptation of the socio-economic system to solve problems related to social challenges (Janssen et al., 2021). Innovation policy in the third decade of the 21st century should serve – in addition to accelerating economic growth – meeting social challenges.

Innovation policy provides specific financial resources for the implementation of scientific research and assistance in the technological development of specific projects, such as the fight against cancer, guaranteeing the avoidance of problems related to market imperfections.

Innovation policy has taken the character of investing and financing innovations based on the idea of place (location) in regions with a competitive position based on "unique competences" (Abbott & Fitjar, 2024). Industrial policy has been focused on the key role of an entrepreneurial state with the mission of accelerating economic development. Focusing the EU's innovation policy on the mission of selected regions with specific competences and resources of production factors allows to limit the spreading phenomenon of "Silicon Somewheres".

Schot and Steinmuller introduced the concept of "transformational innovation policy" to overcome poverty, climate change and create innovations. A significant turn of the innovation policy concerned the implementation of a mission oriented at the development of technological and organizational innovations (the second frame of innovation policies), enabling the increase of the competitiveness of the economies of countries and the acceleration of economic growth (Ranga & Kim, 2023).

A new approach to industrial policy emerged in the 21st century, concerning the strategic role of the state implementing the mission of developing innovation as a fundamental factor of economic development. Innovation policy concerns the implementation of specific social and economic goals in the area of climate change, in the context of challenges related to growing social inequalities (Lundvall, 2023). The adoption by the European Union of the approach of applying smart specialization changed the approach to interventionism of the

European Union within the framework of mission-oriented innovation policy based on the Horizon Europe program (Mazzucato, 2018). Innovation and industrial policy evolved from "fixing market failures" towards the implementation of social transformations (goals). First of all, political conditions were applied (Abbott & Fitjar, 2024).

Mission-oriented innovation policy based on the implementation of social challenges requires a longer time frame, technological diffusion will occur in the absence of a monopoly in the possession of a technical invention; and diversity of financing. Mission-oriented innovation policy pursued by the European Union serves to regulate markets by directing the activities of companies to meet social challenges (Cappellano et al., 2024). New innovation policy missions can be used to shape the structure of production in the economy and the structure of foreign trade of EU Member States. Critical assessments of interventionist industrial policy and specially adopted innovations to achieve defined social goals within the EU innovation policy were formulated by some scientists (Foray et al., 2012; Wemberg & Sandstrom, 2022).

The policy implications of this article cover EU support of more digital solutions for SME which will allow to shorten administrative procedures connected with running a business. In addition, the proposed unified tax administration could be implemented faster, which will promote cross-border expansion and increase tax fairness in the common market. Finally, improving SMEs' access to finance could help especially the firms in CEE countries in increasing innovativeness.

Literature

Abbott, C., & Fitjar, R.D. (2024). Missions, conditions and the policy transfer of Smart Specialisation in the European Union. *Regional Studies*, 1–12. DOI: 10.1080/00343404.2024.2377679.

Adigwe, E. O. (2022). Comparative Analysis of Competitive Trade in a Cluster Market of the European Union: The Revealed Comparative Advantage (RCA) Index. *Naše Gospodarstvo/Our Economy*, *68*(1), 14-24. DOI: 10.2478/ngoe-2022-0002.

Aghion, P., Bloom, N., Blundell, R., Griffith, R., Howitt, P. (2005). Competition and Innovation: An Inverted-U Relationship. *The Quarterly Journal of Economics*, *120*(2), 701–728.

Aglietta, M., Bai, G., Macaure, C. (2021). The 14th Five-Year Plan in the New Era of China's Reform. Asian Integration, Belt and Road Initiative and Safeguarding Multilateralism. *Policy Brief CEPII, 2020-36*.

Akcigit, U., & Kerr, W.R. (2018). Growth through Heterogeneous Innovations. *Journal of Political Economy*, *126*(4), 1374–1443.

Anvret, M., Granieri, M. & Renda, A. (2010). *A new approach to innovation policy in the European Union. Innovation Policy: Boosting EU Competitiveness in a Global Economy*, CEPS Task Force Report, 8 July.

Autor, D., Dorn, D., Katz, L.F., Patterson, Ch., & Van Reenen, J. (2017). Concentrating on the Fall of the Labor Share. *NBER Working Paper*, 23108.

Balassa, B. (1965). Trade Liberalisation and "Revealed" Comparative Advantage, *The Manchester School*, *33*(2): 99–123.

Balassa, B. (1986). Comparative Advantage in Manufactured Goods: A Reappraisal. *The Review of Economics and Statistics*, *68*(2), 315–319.

Bayerlein, M. (2024). Regional health care in the EU: ESI Funds as a means of building the European Health Union. SWP Research Paper 1/2024. Stiftung Wissenschaft und Politik Ger-man Institute for International and Security Affairs. Berlin.

Benner, M. (2022). An institutionalist perspective on smart specialization: Towards a political economy of regional innovation policy. *Science and Public Policy*, *49*(6), 878–889. DOI: 10.1093/scipol/scac035.

Bernard, A.B., & Jensen, J. (1999). Exceptional exporter performance cause, effect, or both?, Journal of International Economics, Elsevier, vol. 47(1), p. 1–25, February.

Bongardt, A., & Torres, F. (2020, 28th September). *The Lisbon Strategy and Europe 2020*. Oxford Research Encyclopedia of Politics. https://oxfordre.com/politics/view/10.1093/acrefore/9780190228637.001.0001/acrefore-9780190228637-e-1040 (accessed on 22th October 2024).

Burstein, A., & Melitz, M.J. (2011). Trade Liberalization and Firm Dynamics. *Working Paper, 16960*. Cambridge: National Bureau of Economic Research.

Cappellano, F., Molica, F., & Makkonen, T. (2024). Missions and Cohesion Policy: is there a match? *Science and Public Policy*, *51*(3), 360–374. DOI: 10.1093/scipol/scad076.

CICC Research, CICC Global Institute. 2024. Technological Innovation in China: Current State and Challenges. In *The Rise of China's Innovation Economy*. Springer: CICC Global Institute. DOI: 10.1007/978-981-99-8231-8_1.

Cieślik, E. (2017). Przewaga komparatywna i mapowanie grup produktowych polskiego i chińskiego eksportu kierowanego do wybranych krajów afrykańskich objętych Strategią Nowego Jedwabnego Szlaku. *Studia Ekonomiczne. Economic Studies*, *4*(XCV). ss. 432–451.

Coelli, F., Moxnes, A., & Ulltveit-Moe, K.H. (2022). Better, Faster, Stronger: Global Innovation And Trade Liberalization. *The Review of Economics and Statistics*, *104*(2), 205–216.

Elert, N., Henrekson, M., & Stenkula, M. (2017). Institutional reform for innovation and entrepreneurship: An agenda for Europe. *IFN Working Paper*, *1150*. Stockholm: Research Institute of Industrial Economics (IFN).

European Commission (2015a). European Cluster Observatory Report. European Cluster Trends. Executive Summery. Prepared by Kincsö Izsak, Technopolis Group, Gerd Meier zu Köcker. VDI/VDE-IT, February.

European Commission (2015b). *Why do we need an Innovation Union?* http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=why (accessed on 18th September 2024).

European Commission (2021a). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and The Committee of The Regions. Trade Policy Review – An Open, Sustainable and Assertive Trade Policy. Brussels, 18.2.2021. COM(2021) 66 final.

European Commission (2021b). *European Expert Group on Clusters Recommendation Report*. Luxembourg: Publications Office of the European Union.

European Commission (2021c). *Horizon Europe Strategic Plan (2021–2024)*. Brussels.

European Commission (2023). *Regional Innovation Valley – Matchmaking map now available*. https://ec.europa.eu/regional_policy/whats-new/newsroom/24-09-2023-regional-innovation-valley-matchmaking-map-now-available_en (accessed on 18th September 2024).

European Union: The Revealed Comparative Advantage (RCA) Index. *Naše Gospodarstvo/Our Economy*, *68*(1), 14–24. DOI: 10.2478/ngoe-2022-0002.

Eurostat (2024). Healthcare resource statistics – beds. Statistics Explained. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Healthcare_resource_statistics_-_beds

Fagerberg, J. (2017). Innovation Policy: Rationales, Lessons and Challenges. *Journal of Economic Surveys*. DOI: 10.1111/joes.12164

Fagerberg, J. (2018). Mobilizing innovation for sustainability transitions: A comment on transformative innovation policy. *Research Policy*, *47*(9), 1568–1576.

Fielke, S.J., Lacey, J., Jakku, E., Allison, J., Stitzlein, C., Ricketts, K., Cooke, A. et al. (2023). From a land 'down under': the potential role of responsible innovation as practice during the bottom-up development of mission arenas in Australia. *Journal of Responsible Innovation*, *10*(1). DOI: 10.1080/23299460.2022.2142393

Foray., D., Goddard, J., Goenaga, Beldarrain X. et al. (2012). Guide to Research and Innovation Strategies for Smart Specialisation (RIS 3). Luxembourg: Publications Office of the European Union.

Greenwald, B., & Stiglitz, J.E. (2013). Industrial Policies, the Creation of a Learning Society, and Economic Development. In J.E. Stiglitz, J.Y. Lin (eds.), *The Industrial Policy Revolution I. International Economic Association Series*. London: Palgrave Macmillan. DOI: 10.1057/9781137335173_4

Haus-Reve, S., & Asheim, B.T. (2023). The role of clusters in addressing societal challenges in European regions. *European Planning Studies*, *32*(9), 1927–1942. DOI: 10.1080/09654313.2023.2273317

Henrekson, M., Sandström, C., Stenkula, M. (2024). Moonshots and the New Industrial Policy: Questioning the Mission Economy. In M. Henrekson, C. Sandström, M. Stenkula (eds.), Moonshots and the New Industrial Policy. *International Studies in Entrepreneurship*, *56*. Cham: Springer. DOI: 10.1007/978-3-031-49196-2_1

International Monetary Fund (2024). *Fiscal Monitor. Fiscal Policy in the Great Election Year*. Washington D.C.: International Monetary Fund.

Janssen, M.J., Torrens, J., Wesseling, J.H., & Wanzenböck, I. (2021). The promises and premises of mission-oriented innovation policy – A reflection and ways forward. *Science and Public Policy*, *48*(3), 438–444. DOI: 10.1093/scipol/scaa072

Kattel, R., & Mazzucato, M. (2023). Mission-oriented innovation policies in Europe: From normative to epistemic turn? UCL Institute for Innovation and Public Purpose. *Working Paper Series*, *2023-09*.

Leblond, P., & Viju-Miljusevic, C. (2019). EU trade policy in the twenty-first century: change, continuity and challenges. *Journal of European Public Policy*, *26*(12), 1836–1846. DOI: 10.1080/13501763.2019.1678059

Lucas, D. & Boudreaux, C. (2024). When 'what works' does not work: The United States' mission to end homelessness. International Studies in Entrepreneurship. In M. Henrekson et al., *Moonshots and the New Industrial Policy* (pp. 145–168). Cham: Springer.

Lundvall, B.Å. (2024). Transformative innovation policy – lessons from the innovation system literature. *Innovation and Development*, *14*, 297–314.

Luttwak, E.N. (1990). From Geopolitics to Geo-Economics. Logic of Conflict, Grammar of Commerce. *Center for the National Interest*, *20*, 17–23.

Manchester School, *33*(2), 99–123.

Mazzucato, M. (2018). Mission-oriented innovation policies: challenges and opportunities. *Industrial and Corporate Change*, *27*(5), 803–815. DOI: 10.1093/icc/dty034

Melitz, M. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica*, *71*(6), 1695–1725.

Melitz, M.J., Redding, S.J. (2022). Trade And Innovation. *NBER Working Paper Series*, *28945*. Cambridge.

Nelson, P. (1974). Advertising as Information. *Journal of Political Economics*, *82*, 729–753. DOI: 10.1086/260231

Owen, G. (2012). Industrial policy in Europe since the Second World War: what has been learnt? *ECIPE Occasional Paper*, 1. Brussels: The European Centre for International Political Economy.

Piro, F.N., Seeber, M. & Wang, L. (2024). Regional and sectoral variations in the ability to attract funding from the European Union's Seventh Framework Program and Horizon 2020. *Scientometrics*, *129*, 1493–1521. DOI: 10.1007/s11192-024-04942-3

Ranga, M., Kim, S.Y. (2023). Next-generation innovation policies: Promoting systemic socio-economic transformative change. *Frontiers in Research Metrics and Analytics*, *8*. DOI: 10.3389/frma.2023.1146039

Rytko, A. (2017). Konkurencyjność polskiego eksportu rolno-spożywczego na rynku światowym i krajów V4. *Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu*, t. XIX, z. 5, 191–196.

Schumpeter, J.A. (1976). *Capitalism, Socialism, and Democracy*. New York: Harper and Brothers.

Sultanuzzaman, M.R., Fan, H., Mohamued, E.A., Hossain, M.I., Islam, M.A. (2019). Effects of export and technology on economic growth: Selected emerging Asian economies. *Economic Research – Ekonomska Istraživanja*, *32*(1), 2515–2531. DOI: 10.1080/1331677X.2019.1650656h

UN Comtrade Database, https://comtradeplus.un.org/ (accessed on 18th September 2024).
Veugelers, R. (2021). Research and innovation policies and productivity growth', *Working Paper, 08/2021*. Bruegel.
Wales J.W., Covin, G.J., Monsen, E. (2020). Entrepreneurial orientation: The necessity of a multilevel conceptualization. *Strategic Entrepreneurship Journal*, *14*(4).
Wennberg, K., & Sandström, C. (Eds.) (2022). *Questioning the Entrepreneurial State: Status-quo, Pitfalls, and the Need for Credible Innovation Policy*. Cham: Springer.
Wigger, A. (2018). The new EU industrial policy: authoritarian neoliberal structural adjustment and the case for alternatives. *Globalizations*, *16*(3), 353–369. DOI: 10.1080/14747731.2018.1502496
Wirkierman, A.L., Ciarli, T., Savona, M. (2023). A taxonomy of European innovation clubs. *Economia Politica*, *40*, 1–34. DOI: 10.1007/s40888-022-00289-1
World Bank Group (2019). *Innovative China. New Drivers of Growth*. Washington D.C: World Bank Group.
World Trade Organization (2021). *World Trade Report 2020. Government Policies to Promote Innovation in the Digital Age*. Geneve.