

# Modern Globalization-Innovative Challenges of Industrial Production of the Countries of the World

Baula Olena, Liutak Olena, Yaroslava Stoliarchuk

**Abstract:** *Innovative development of the countries of the world is based on the use of conditions of development and a set of measures technical, industrial and commercial in nature, which are emerging or improving existing industrial processes and equipment. The level of such development can be estimated using international indices. Assessment of their dynamics, variations, calculated coefficients of differentiation determined the need to align models of regulation of the economy, which, as the experience of highly developed countries, should be based on maintaining a high level of innovation of the economy. The purpose of the research is to study the world innovation development and develop recommendations for enhancing innovation activities of countries in the context of modern globalization transformations. The study used the dialectical method of scientific knowledge, as well as general scientific and special methods of research: methods of theoretical use of the generalized and abstract-logical state - for the current state of modern innovative development of the industrial level; statistical methodology of systematization, grouping, methods of the Commission of Variants, Concentrations and Technologies - to select the code and unevenness of innovative development of the world for the value of the GII index; systematic approach - for specific tasks of international innovation activity and sending recommendations for activation of innovative activity in the field of modern global transformations. The tasks of international innovation activity in the context of modern globalization transformations should be based on human capacity building in the sphere of innovations, technological modernization of key sectors of the economy, introduction of innovations in all spheres of public administration, increase of openness of national innovation system, development of interstate innovation clusters. It is proved that in comparison with the national economies that do not pay attention to the development of innovations, the innovative developed countries show higher economic growth in the long-term trend. The practical significance of the obtained results is that the conducted research will contribute to the improvement of directions of further development of international innovation activity and industrial production of the countries of the world in the conditions of global innovation challenges. Further research is advised as this study was having limitations.*

**Keywords:** *innovations, innovative activity, innovative development of countries.*

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## I. INTRODUCTION

In modern conditions of world economy development, significant competitive advantages are obtained by those national economies that are able to ensure sustainable economic growth based on the development, implementation and effective use and transfer of innovations. Currently, the world is experiencing uneven development of the innovation sphere in various countries, which indicates a shortage of their own resources to push their innovative development. That is why it is important to study the innovative development of countries in order to identify characteristic features in the creation of an innovative economy in countries with different levels of economic development.

The purpose of the research is to study the world innovation development and develop recommendations for enhancing innovation activities of countries in the context of modern globalization transformations.

## II. DATA SOURCE AND METHODOLOGY

The study is an trying to see the current state of global industrial innovation by assessing the possibility and unevenness of world innovation development by the important GII index, separating information on international innovation production and interest in innovative issues related to contemporary global international transformations. The data used during the survey used only global data used to prevent the Global Innovation Index. Theoretically and methodologically, there is a basic scientific work that deals with modern economic theories, researchers of well-known domestic and foreign in other economic services engaged in local innovation business. For their consideration used their own graphic. The study used the dialectical method of scientific knowledge, as well as general scientific and special methods of research: methods of theoretical use of the generalized and abstract-logical state - for the current state of modern innovative development of the industrial level; statistical methodology of systematization, grouping, methods of the Commission of Variants, Concentrations and Technologies - to select the code and unevenness of innovative development of the world for the value of the GII index; systematic approach - for specific tasks of international innovation activity and sending recommendations for activation of innovative activity in the field of modern global transformations.

III. RESULT AND DISCUSSION

I. Schumpeter is one of the first in the early XX century, who studied and justified the importance of innovation for the economic development of the country. The scientist saw in innovations the first introduction of inventions, as well as changes in not only technological, but also economic content [1]. He was the first to classify innovation.

Currently, there are many definitions of the category "innovation". For example:

- the English scientist J. Bernal considers innovation as a prerequisite for the existence and development of the economy [2];

- German researcher F. Haberland, notes that innovations cover scientific and technical, technological, economic and organizational changes that occur in the process of reproduction. Innovation is characterized by qualitative novelty, economic efficiency, and social consequences [3];

- F. Nixon considers innovation as a set of measures of technical, industrial and commercial nature, through which new or improved existing industrial processes and equipment [4];

- H. Barnett considers innovations as a certain idea, action or result that differ in quality from existing forms [5];

- K. Poznanskyi considers innovations as any changes in production methods and labour products that are based on knowledge that have not been used before [6];

- M. Porter refers to innovations as new technologies and new ways of working. In addition, the researcher believes

that not only the results of scientific and technological progress determine innovation. It can also be minor product improvements, such as changes in design or production organization [7];

-V. Thompson describes innovation as the process of developing and implementing new ideas, methods, products or services [8].

In the modern sense, innovations are considered more broadly, namely, innovations are understood as any changes in the final product or services; creation of new and improvement of existing technological processes and equipment, tools, materials, etc.; organizational and structural innovations (new methods and management tools); innovations in the sphere of personnel and socio-psychological relations [9, p. 118].

According to international standards, innovation refers to the result of innovation, embodied in a new and/or improved product, a new and / or improved technological process of practical activities or social services [10].

From the above interpretations, it is clear that in the conditions of modern globalization transformations, one of the main conditions for achieving sustainable economic development of the country is to establish an effective innovation policy.

The main indicators that determine the level of innovative development of countries are shown in Fig. 1. The given indicators of innovative development allow us to systematically and comprehensively consider the country's innovative activity and take into account all its determinants.

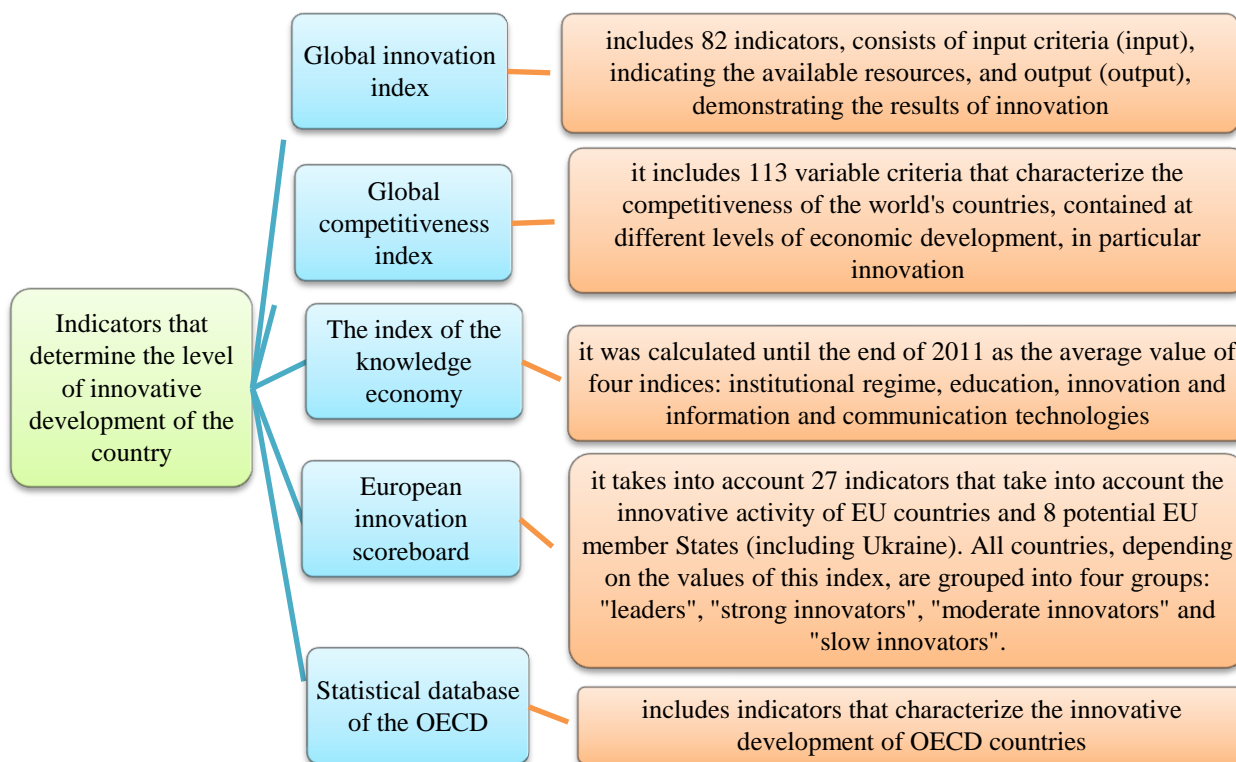


Fig. 1. Modern international indices for determining the level of innovative development industry of the country, compiled by the authors

The global index rating was used to analyse the dynamics of innovative development of the world's countries innovation (GII), whose indicators are indicated in points

from 0 to 100 (table I, figure 2) [11]. The GII-2019 rating includes 129 countries from all

regions of the world, which together produce 98% of the world's GDP and are home to 92% of the world's population. For the period, 2015-2019 Switzerland was the world's innovative leader. In 2019, its score was 67.2 (1.2 points less than in 2018).

The second place in 2019 was taken by Sweden; the third place was taken by the United States (+3 steps in the rating relative to 2018r.). On the fourth position, the Netherlands (-2 positions in the ranking relative to the previous year, but + 5 positions relative to 2016) overtook the UK by only 0.1 points. Paying attention to the top five leading countries, it can be noted that during the analysed period, only two countries show a slight change in the GII score and place in the ranking, namely Switzerland and Sweden. In general, assessing the value of GII 2015-2019 it can be argued that the innovative leaders are the EU countries, in 2019, they make up 40% of the top twenty of the GII rating.

European countries were ahead in almost half of the indicators used to calculate the GII, including the share of highly qualified specialists in total employment, cooperation between University and industry research structures, the number of patents and patent applications, scientific and technical articles, and the quality of scientific publications. Also in 2019, among the 20 innovative leaders, North American countries are represented – the United States and

Canada with a GII of 61.7 and 53.9 points, respectively. They have achieved high results in terms of innovative entry-market stability, infrastructure, business sustainability, and institutions. It is worth noting the high innovation jump of Asian countries, namely Singapore and South Korea, which rose in the 2019 ranking in the 8th and 11th positions, respectively. It should also be noted that during the study period, China demonstrated a steadily rapid rate of increase in the level of innovation: from 29th place in 2015 to 14 in 2019. In 2019, China is performing well on a number of indicators, including the presence of Research and development (R &d) companies, the number of research staff in enterprises, the number of patent applications, and other variables in the field of innovation. Among the leaders GII 2019 four countries – Japan, USA, UK and Germany stand out in terms of "quality of innovation", an important indicator reflecting the level of development of higher education, the number of scientific publications and the number of filed international patent applications.

Among the features of innovative development in Central and South Asia, we should mention the emergence of India as an innovation centre.

Table I - TOP 20 countries by Global innovation index value in 2015-2019

Country	2019		2018		2017		2016		2015	
	value	rating place	value	rating place	value	rating place	value	rating place	value	rating place
Switzerland	67,2	1	68,4	1	67,7	1	66,3	1	68,3	1
Sweden	63,7	2	63,1	3	63,8	2	63,6	2	62,4	3
USA	61,7	3	59,8	6	61,4	4	61,4	4	60,1	5
Netherlands	61,4	4	63,3	2	63,4	3	58,3	9	61,6	4
United Kingdom	61,3	5	60,1	4	60,9	5	61,9	3	62,4	2
Finland	59,8	6	59,6	7	58,5	8	59,9	5	60,0	6
Denmark	58,4	7	58,4	8	58,7	6	58,5	8	57,7	10
Singapore	58,4	8	59,8	5	58,7	7	59,2	6	59,4	7
Germany	58,2	9	58,0	9	58,4	9	57,9	10	57,1	12
Israel	57,4	10	56,8	11	53,9	17	52,3	21	53,5	22
South Korea	56,6	11	56,6	12	57,7	11	57,2	11	56,3	14
Ireland	56,1	12	57,2	10	58,1	10	59,0	7	59,1	8
Hong Kong	55,5	13	54,6	14	53,9	16	55,7	14	57,2	11
China	54,8	14	53,1	17	52,5	22	50,6	25	47,5	29
Japan	54,7	15	55,0	13	54,7	14	54,5	16	54,0	19
France	54,2	16	54,4	16	54,2	15	54,0	18	53,6	21
Canada	53,9	17	53,0	18	53,7	18	54,7	15	55,7	16
Luxembourg	53,5	18	54,5	15	56,4	12	57,1	12	59,0	9
Norway	51,9	19	52,6	19	53,1	19	52,0	22	53,8	20
Iceland	51,5	20	51,2	23	55,8	13	56,0	13	57,0	13
Austria	50,9	21	52,0	20	53,1	20	52,7	20	54,1	18

Compiled by the authors based on [12]

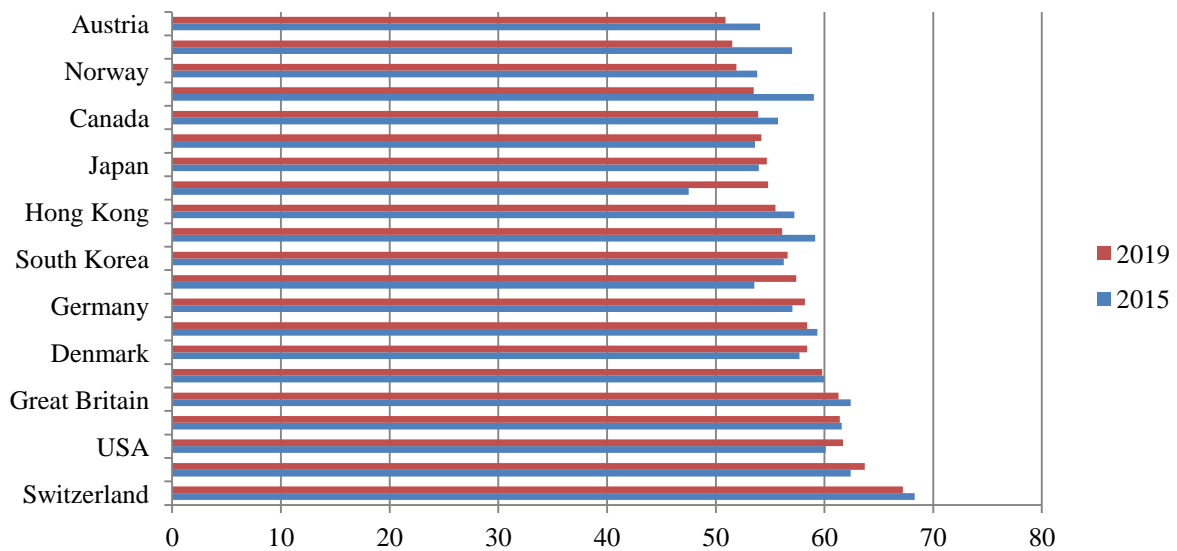


Fig. 2. Ranking of countries on the Global innovation index in 2015 and 2019, [12]

India ranks 14th in the world in terms of the presence of companies engaged in R &D on a global scale, well ahead of other groups of countries in the lower and upper segments of middle-income countries. In 2019, India ranked first in the world in terms of innovation drivers, such as ICT services,

2019, the positions of European countries, the United States, and Asian countries, especially Eastern ones, are rapidly strengthening as leaders in creating a knowledge economy. In other words, the world is seeing an increase in the knowledge intensity of GDP, primarily in developed countries, as well as in individual countries that are

science and technology graduates, University quality, and creative goods exports [12].

Having analysed the characteristic features of innovative development of the world's countries, it is reasonable to conclude that as of the end of developing. The variation and unevenness of innovation development in the world was also assessed.

The results of the analysis are presented in table II. The innovative development of the world's countries is relatively uniform in terms of GII, as evidenced by the coefficient of variation values that do not exceed 33.2% for the entire analysed period.

Table II - Estimation of variation and unevenness of innovative development of the world countries by the value of the GII index, compiled and calculated by the authors based on [12]

Indicators	2015	2016	2017	2018	2019
The maximum value of GII	68,3 Switzerland	66,3 Switzerland	67,7 Switzerland	68,4 Switzerland	67,2 Switzerland
The minimum value of GII	15,0 Sudan	14,6 Yemen	15,6 Yemen	15,0 Yemen	14,5 Yemen
Number of countries for which GII is calculated	141	128	127	127	129
The world average value of GII	37,0	36,7	37,1	36,7	36,3
Number of countries whose GII is above the world average	61	51	52	50	53
Proportion of countries whose GII is above the world average, %	43,26	39,84	40,94	39,37	41,09
Mean square deviation	11,65	12,02	11,97	12,13	12,06
The coefficient of variation	0,315	0,327	0,322	0,331	0,332
Differentiation coefficient	4,55	4,54	4,34	4,56	4,63
Decile coefficient of differentiation	2,38	2,42	2,37	2,38	2,38
1st decile	23,7	23,1	23,5	23,1	23,3
9th decile	56,3	56,0	55,8	55,0	55,5

The coefficient of differentiation has changed very slightly in dynamics; it shows that the highest score of the country (Switzerland) exceeds the lowest score of Yemen by 4.63 times (on average for the period by 4.52 times). The

number of countries whose GII exceeds the global average has decreased in absolute terms from 61 to 53 countries, and in relative terms from 43.26% to 41.09%. The calculated values of the first and ninth



deciles show that in 2019, the 10% of the lowest GII countries have a maximum GII volume of 23.3 points, and among the 10% of the largest countries, their minimum score is 55.5. The decile differentiation coefficient in 2019 remains at the level of 2018r and is 2.38. Its value indicates that the minimum GII score in 10% of the largest countries exceeds the maximum score for 10% of the smallest countries by 2.38 times, that is, the degree of concentration of GII is not high, which confirms the uniform nature of innovative development in the world. In general, it is reasonable to conclude that this uniformity of innovation development is caused not so much by the uniformity of the integrated assessment for GII, but it exists due to the fact that some indicators are dominated by one country, and others - by the second (which ensures the alignment of the integral level of assessment).

The period of the end of 2019 and the beginning of 2020 was marked by the corona virus pandemic, combined with the accumulated imbalances in the world economy in recent years, shortcomings in the institutional sphere, increased competition and interdependence of countries due to the acceleration of the processes of globalization, threatens humanity with a new large-scale global economic crisis. That is why the governments of countries face an urgent need to

bring into line the models of economic regulation, which, as the experience of highly developed countries shows, should be based on maintaining a high level of innovation in the economy.

The experience of the 2008 crisis shows the importance of developing international innovation. This is primarily due to the fact that investment in technological development is considered by developed countries (the US, Japan, the EU), as well as growing economies (India, Brazil) as a key anti-crisis measure.

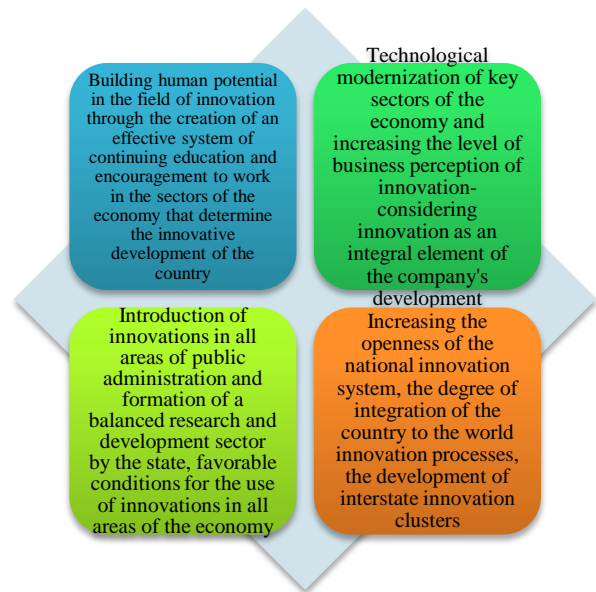
The challenges that humanity as a whole is currently facing – climate change, population ageing and health challenges, food security on a global scale-dictate the need for advanced development of certain specific areas of research and technological development (clean energy, gene medicine, new technologies in agriculture, etc.). In order to meet these challenges, it is necessary to integrate radically deeper into the global innovation system.

Based on the above, it is advisable to outline the key objectives of the state policy on determining strategic priorities for the development of industrial production (Fig. 3).

World experience shows that in developed countries-the world's innovation leaders-public policy provides for direct funding of research and tax measures to stimulate spending on R & d in the private sector. In developed OECD countries, the ratio of public and private sector spending on R & d is 1:3 and 1:4 [13, p.45-46].

Developing countries use a more favourable formula for calculating the tax credit based on the current volume of investment in R & d companies. This allows them to return significantly large amounts of funds invested in research to companies.

Not only governments, but also enterprises should invest in the creation and promotion of new technologies (in developed countries – up to 65-70% of the total amount of R & d).



**Fig. 3. Strategic priorities for the development of industrial production in the context of globalization and innovation challenges of the world economy, compiled by the authors**

There are three types of innovation strategies of enterprises: the strategy of determining innovation needs (involving consumers in the process of determining the main parameters of a new innovative product, service, or technological process); the strategy of market research (monitoring its market niche and focusing on continuous improvement of the product); technology leadership strategy (solve innovative problems and requests that are not clearly defined by consumers and customers, thereby creating so-called "breakthrough innovations"). The experience of leading international TNCs proves that there is no most effective innovation strategy. It all depends on how closely the innovation program is linked to the overall development strategy of the Corporation and the nature of the competitive environment in which it has to operate. The only thing that unites all strategies is the most strict and effective continuous management of the innovation process [14].

Building human potential in the field of innovation is possible through international innovation cooperation in the higher education system, which forms a platform for building people's relationships, social and cultural exchange and strengthening business ties with other countries [15].

One of the main opportunities for rapid innovative development of the country is participation in international innovation clusters. The application of cluster policy will help to increase the competitiveness of business entities by realizing the potential for effective interaction of its participants, associated with their close geographical location, providing increased access to innovations, technologies and highly qualified personnel, as well as reducing transaction costs. Clustering is also an effective mechanism for attracting foreign direct investment.

The inclusion of national clusters in global value chains allows us to significantly raise the level of the national technological base, increase the speed and quality of economic growth by increasing the international competitiveness of enterprises that are part of the cluster. A special sphere of this type of relationship is the tourism

industry, which accumulates financial, labour, information and innovative technologies in new formats [16].

#### IV. CONCLUSION

The study systematized international indices that characterize the level of innovative development of individual countries. Analyzing the tendencies of innovative development of the countries of the world, it was concluded that today the positions of the European countries, the USA, the countries of East Asia as innovative leaders are rapidly increasing. But, as the analysis of the differentiation of innovative development showed, the innovation innovation uniformity of the countries development by the integral index of GII is inherent in the world, and it exists because one indicators can lead one country and the other, which now ensures the equalization of the integral level of assessment.

Analysis of the practice of stimulating innovation activity in foreign countries makes some suggestions for improving these processes: increasing the orientation of innovation activity to market demands; adapting a new approach to the allocation of funds depending on the results of innovation; applying different tax incentive schemes for innovative institutions and ways of raising interest in the results of the work of the main subjects of industrial-innovation activity; the construction of an adequate innovation infrastructure that allows communication not only with subjects directly engaged in scientific and innovation activity, but also with entities carrying out the functions of mediators; working out pilot models of international partnership and cooperation with new industrialized countries in the field of technology commercialization and inter-firm cooperation through the organization of joint high-tech industries.

Thus, innovative activity helps a country at any stage of development to neutralize the negative aspects associated with the cyclical nature of economic development in the context of modern global transformations. Compared to national economies that do not pay attention to the development of innovation, innovative developed countries show higher rates of economic growth in the long-term trend. This is especially clear in those countries that are building their own national innovation system based on a combination of stimulating state innovation policy, science, education, the business community and the country's participation in international innovation clusters in order to create and implement innovations as a priority for economic development. Of all these determinants, joint innovation is not only a tool for the country's economic growth through labour productivity growth, but also creates opportunities for innovative novelty in the global aspect. Joint innovations make it possible to create a completely new product, the promotion of which in the global innovation market ensures the growth of the competitiveness of the national economy on a global scale. The practical significance of the obtained results is that the conducted research will contribute to the improvement of directions of further development of international innovation activity and industrial production of the countries of the world in the conditions of global innovation challenges.

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