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Problems of ensuring innovative development of the Ukrainian industry

Abstract. *The article provides a comparative assessment of innovation undertaken by the industrial sector in Ukraine, Poland and Germany in domestic and foreign markets. The authors point out that in the conditions of global instability caused by Russia's military aggression against Ukraine, innovation is not only a requirement for socio-economic development, but also a prerequisite for security. The key reasons for low innovativeness of industrial products in Ukraine are identified. The authors identify the structure of value added of domestic industrial production and the place of Ukraine and the EU countries in the global ranking according to the globalization index. The authors justify their proposals concerning regulations and ways of rationalizing the activity of innovation parks as an effective means of increasing the level of innovation and the growth of industrial production.*

Keywords: *product innovation, industry, production, development of innovation*

1. Introduction

High innovation activity is one of the most important conditions for effective socio-economic development of the country. This is due to the fact that innovation, especially technological, determines the level of wages and productivity, as well as the dynamics of gross value added, profit and cost of production. Indirectly, the innovative development of the economy can affect the trends of economic migration from the country, dependence on the inflow of funds from international financial funds, the competitiveness of domestic products in foreign and domestic markets. In general, the level of innovation of the economy can be reflected in the technological structure of production, exports, the role of the country in global

value chains, the dependence of the economy on imported high-tech products, fixed assets. In addition, the innovation of the economy can affect the level of economic security of the country. This is primarily due to the level of technological innovation in such strategic sectors of the economy as mechanical engineering and the chemical industry. It is safe to say that a high level of innovation and technology in the defense industry of the mechanical engineering sector can be one of the important tools for ensuring the country's security. Thus, in the context of global aggravation of instability caused by the full-scale military aggression of the Russian Federation against Ukraine, innovative economic development is not only a need of socio-economic development of the country, but also one of the important means of security.

2. Analysis of recent research and publications

Problems of innovative development are the subject of research by many scientists. In particular, current barriers to the successful implementation of industrial innovation policy in Ukraine, as well as the role of government, business, basic and applied research in overcoming negative trends that slow or impede economic development, including the industrial sector of the national economy, covered in (Heyets, 2015). The innovative development of Ukraine's industry under the influence of the processes of transformation of the institutional environment and the prospects of reindustrialization is scientifically substantiated in Valeriy M. Heyets (2014). In Iryna Yu. Pidorycheva and Larysa I. Kovchuha (2019) the correlation-regression analysis substantiates the author's hypothesis that the value of such indicators as the total volume of innovative products, the share of innovative products new to the market, and the volume innovative products sold outside Ukraine depend on the types of innovation costs. Thus, influencing the structure of costs for innovation, the company can achieve maximum economic return and significantly increase the level of competitiveness of its products. Differences between ecosystems and innovation systems, the advantages of the ecosystem approach, compared with the traditional systematic view of innovation, the properties of innovation ecosystems and modern innovation processes are discussed in Pidorycheva (2020).

Problems of functioning of innovations of the Polish economy at the micro level are considered in Renata Lisowska (2020), Anna Wziątek-Kubiak (2019), Izabella Steinerowska-Streb and Grzegorz Głód (2020), Przemysław Zbierowski (2020), Edward Stawasz (2019).The objects of these studies are entrepreneurial innovation, propensity for risky investments and innovations, ways to stimulate innovation, regulatory and legal and mental aspects of innovation development. Joanna Kotowicz-Jawor et al. (2019) raises the issue and explains the reasons for

the ineffectiveness of EU structural fund programs aimed at supporting the innovation of the Polish economy. In addition, exogenous and endogenous factors of innovation in the Polish economy are considered and recommendations are proposed to remove barriers to innovation and more rational use of EU funds for innovation development programs. Considerable attention is paid to the problem of secular stagnation, which in the context of globalization can create serious challenges for the Polish economy, its innovation, increase unemployment and negative demographic trends.

In general, innovation development is a multifaceted economic category and a dynamic process that raises the issue of research in this area, especially in Ukraine.

The aim of the article is to diagnose problems and develop proposals to stimulate the innovative development of the national economy and, in particular, its industrial sector.

3. Results of the research

In recent years, the strategic industrial sectors of Ukraine are undergoing transformational processes in the direction of increasing the innovation and manufacturability of their products, the growth of technological innovation. However, the achievement of tangible innovative results does not happen in a short time, due to many internal and external factors. Due to the innovation of Ukrainian industry is still the lowest in Europe. In particular, the share of innovative products in the volume of sold industrial products (or product innovation) in Ukraine in 2019 was 1.3% (compared to 3.3% in 2013), while in Poland the value of this indicator was over 9%, and Germany – 18% (Table 1). Among the industries of the processing industry, the highest product innovation is traditionally characteristic of mechanical engineering, printing and metallurgy. Instead, the least innovative products are low-tech industries, including food, light, wood and furniture industries. For comparison, in Poland and Germany these industries are also less innovative, but their level is significantly higher than in Ukraine. At the same time, it is worth noting that the raw material and resource potential of these low-tech industries in Ukraine and Poland is approximately the same.

In addition to the low level of product innovation, the problem of Ukrainian industry is the excessively high or extremely low export orientation of these products. Thus, the share of products sold outside the country in the volume of sold innovative products of Ukraine in 2019 was 54.2%, while in Poland – 46.2% (Table 2). In terms of manufacturing (based on available data), the highest export orientation of innovative products in Ukraine is characteristic of metallurgical

Table 1. The share of innovative products in the volume of products sold (goods, services) by industrial enterprises in 2019 (%)

Type of economic activity	NACE	Ukraine	Poland	Germany
Industry	B + C + D + E	1.3	9.3	18.0
Mining and quarrying	IN	0.2	0.4	3.2
Manufacturing industry	WITH	1.9	10.9	21.7
Food production	10	0.9	3.7	8.1
beverage production	11	2.3	7.3	2.8
production of tobacco products	12	…	7.9	12.1
textile production	13	0.4	13.1	12.3
clothing production	14	0.2	3.2	10.6
manufacture of leather, leather products and other materials	15	…	3.2	38.1
woodworking and manufacture of wood and cork products, except furniture; manufacture of articles of straw and of plaiting materials	16	0.1	6.7	6.3
production of paper and paper products	17	0.1	14.7	6.5
printing activity, reproduction of recorded information	18	6.3	6.3	10.5
production of coke and refined petroleum products	19	…	16.1	10.7
production of chemicals and chemical products	20	0.6	8.1	14.5
production of basic pharmaceutical products and pharmaceuticals	21	1.7	9.6	16.5
production of rubber and plastic products	22	1.8	6.5	11.0
production of other non-metallic mineral products	23	0.7	4.4	9.4
metallurgical production	24	3.2	5.1	11.9
manufacture of fabricated metal products, except machinery and equipment	25	0.7	7.0	5.6
manufacture of computers, electronic and optical products	26	6.3	23.2	26.5
production of electrical equipment	27	4.1	27.2	28.5
manufacture of machinery and equipment nec	28	8.1	15.2	16.0
manufacture of motor vehicles, trailers and semi-trailers	29	5.6	21.8	47.9
production of other vehicles	30	1.6	21.7	24.6
furniture production	31	1.0	5.9	12.2
production of other products	32	0.3	4.1	14.6
repair and installation of machines and equipment	33	0.4	6.9	7.7
Supply of electricity, gas, steam and air conditioning	D	…	0.5	3.3
Water supply; sewerage, waste management	E	…	1.5	3.5

Source: own elaboration according to the data OSSU, 2021.

Table 2. The share of products sold outside the country in the volume of sold innovative products in 2019 (%)

Type of industrial activity	Code by NACE-2010	Ukraine	Poland
Industry	B + C + D + E	54.2	46.2
Mining and quarrying	IN	…	43.8
Manufacturing industry	WITH	53.9	45.2
food production	10	18.1	21.6
beverage production	11	2.0	6.8
production of tobacco products	12	…	3.8
textile production	13	…	57.3
clothing production	14	…	75.0
manufacture of leather, leather products and other materials	15	…	65.6
woodworking and manufacture of wood and cork products, except furniture; manufacture of articles of straw and of plaiting materials	16	…	44.8
production of paper and paper products	17	…	37.4
printing activity, reproduction of recorded information	18	…	22.2
production of coke and refined petroleum products	19	…	1.2
production of chemicals and chemical products	20	11.5	60.5
production of basic pharmaceutical products and pharmaceuticals	21	…	20.8
production of rubber and plastic products	22	82.0	53.8
production of other non-metallic mineral products	23	…	43.2
metallurgical production	24	90.6	49.0
manufacture of fabricated metal products, except machinery and equipment	25	28.7	38.6
manufacture of computers, electronic and optical products	26	2.3	69.8
production of electrical equipment	27	49.6	52.9
manufacture of machinery and equipment nec	28	52.4	61.2
manufacture of motor vehicles, trailers and semi-trailers	29	6.7	77.1
production of other vehicles	30	45.8	61.8
furniture production	31	35.5	54.2
production of other products	32	29.2	63.4
repair and installation of machines and equipment	33	63.6	42.0
Supply of electricity, gas, steam and air conditioning	D	…	…
Water supply; sewerage, waste management	E	…	…

Source: own elaboration according to the data OSSU, 2021.

production (90.6%), production of rubber and plastic products (82%), repair and installation of machinery and equipment (63.6%).

Excessively high export orientation of innovative products in conditions of socio-political instability and intensification of globalization processes creates potential risks to the economic security of the country. The fact that most innovative products are not sold in the domestic market of Ukraine indicates the presence of systemic problems associated with the impact of a number of macroeconomic factors (especially conditions in certain markets) and a weak system of stimulating and regulating innovation, as well as the protection of national economic interests. As a result, it leads to an imbalance of intersectoral ties in the economy.

Thus, domestic metallurgical and rubber industries, as well as most mechanical engineering industries (NACE codes 27, 28, 30), which are characterized by high export orientation of innovative products, are strategically important segments of the economy, have high potential for development and implementation of innovations., operational and economic processes need to be reorganized and modernized using innovative approaches. That is, the need for development and implementation of innovations for these industries is very high. Accordingly, the situation in which a relatively small number of innovative products produced in Ukraine are mostly exported, while the national economy and industry itself are in dire need of innovation, is extremely negative.

On the other hand, the level of export orientation of innovative products of some industries in Ukraine is excessively low. In particular, this applies to: production of chemicals and chemical products; beverage production; production of computers, electronic and optical products; production of motor vehicles, trailers and semi-trailers. The low export orientation of innovative products of these industries, along with a relatively low level of innovation in general, is a sign of non-competitive products of these industries in domestic and foreign markets.

The optimal level of export orientation of innovative products (~30% by world standards) are: production of finished metal products, except machinery and equipment; production of other products. However, the share of innovative products in the industrial volume of these industries is minimal – 0.7% and 0.3%, respectively.

The reasons for the low innovation of domestic industry products are interrelated. In general, there are three main groups of factors that affect innovation in Ukraine:

– the level of industrialization of the economy and manufacturability of industrial production;

– customs policy, foreign economic influence, economic globalization;

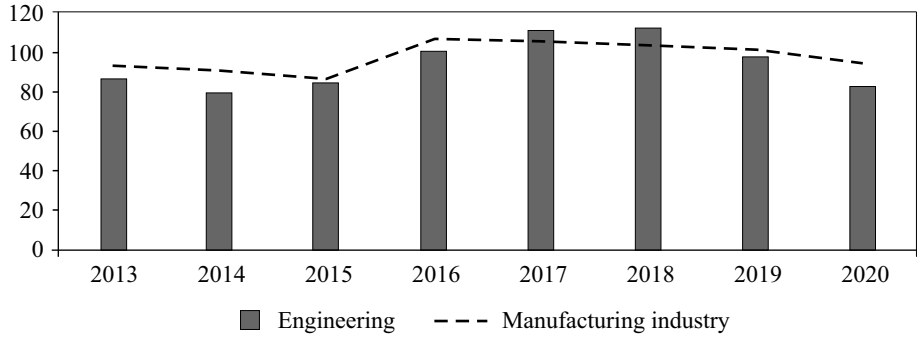
– institutional and macroeconomic environment, special legal framework, mental characteristics of entrepreneurial behavior, etc.

Over the last 10 years, due to the influence of many external and internal factors, the share of industry in Ukraine's GDP has decreased by 4% (from 22.6% in 2010 to 18% in 2020). Such significant structural changes have been accompanied and/or caused by a number of processes, namely:

– long-term policy of agrarianization of the economy, which was reflected in the creation of favorable conditions (including government subsidies, export incentives, etc.) for the agricultural sector, especially crop products and, at the same time, lack of necessary conditions and support for high- and medium-high-tech industries. This was accompanied by favorable conditions in foreign markets for the export of agricultural raw materials, on the one hand, and inefficient regulation (from the standpoint of national economic interests) of such exports by the state – on the other;

– instability of the dynamics of development of domestic manufacturing - the index of manufacturing in 2020 was 94.1% against 105.6% in 2016 and 92.7% in 2013 (Chart 1), while the index of production mechanical engineering (as potentially the most important segment for the production and implementation of innovations) in 2020 decreased to 82.4% against 112.4 in 2018 and 86.4% in 2013.

Chart 1. Index of products of processing industry and mechanical engineering of Ukraine (%)



Source: own elaboration according to OSSU, 2021.

Due to the purposeful state policy of agrarianization of the economy and the lack of effective incentives for the basic economic principles of innovative industrial development there was a deterioration of the technological structure of industrial production. Thus, during 2013-2018, the share of productions using high technologies (NACE code: 21 + 26 + 30.3) in the structure of value added decreased by 4.5 p.p., and medium-high level technologies – by 8.84 p.p. (Table 3). Instead, at 7 p.m. the share of production using medium-low level technologies increased by 6.4 p.p. – using low-level technologies.

Table 3. Structure of value added (by production costs) of industrial productions of Ukraine (%)*

Year	Production using high technologies[1]	Production using medium-high level technologies[2]	Production using medium-low level technologies[3]	Production using low level technologies[4]
2013	11.2	27.3	31.0	30.5
2014	8.1	19.2	32.2	40.3
2015	8.5	20.6	29.6	41.5
2016	9.8	17.0	31.4	41.8
2017	8.0	16.0	36.2	39.8
2018	6.7	18.5	38.0	36.8
2019	6.8	21.9	31.5	39.8

* Grouped by special aggregation provided for in Regulation (EC) No. 251/2009 of 11.03.2009 concerning structural business statistics; [1] NACE code: 21 + 26 + 30.3; [2] NACE code: 20 + 25.4 + 27 + 28 + 29 + 30-30.1-30.3 + 32.5; [3] NACE code: 18.2 + 19 + 22 + 23 + 24 + 25-25.4 + 30.1 + 33; [4] NACE code: 10 + 11 + 12 + 13 + 14 + 15 + 16 + 17 + 18-18.2 + 31 + 32-32.5.

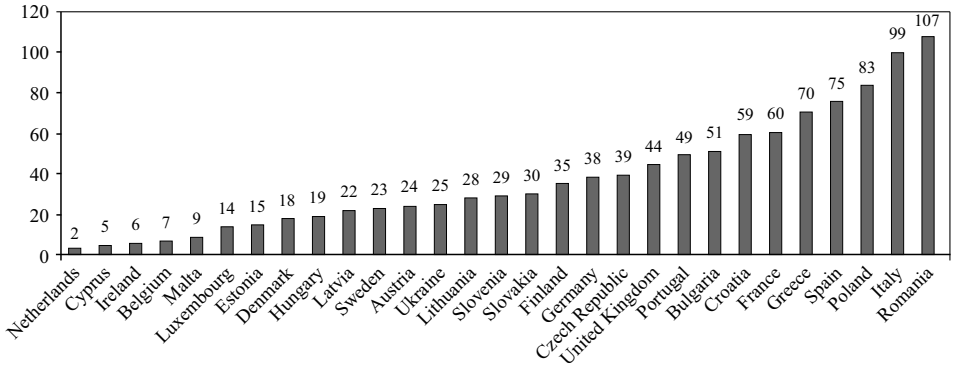
Source: own elaboration according to OSSU, 2021.

In 2019, the deterioration of the technological structure of industrial production in Ukraine has suspended and some positive trends have begun. In particular, the share of productions using high technologies in the structure of value added increased by 0.1 p.p., and the share of medium-high production – by 3.47 p.p.

In conditions of global instability in transition economies, the risks of losing production and innovation potential increase, and thus – the transformation of industrial enterprises into raw materials or low-tech centers of TNCs. As a result, it may lead to deteriorating socio-economic development, and in further threaten the country's economic security. One of the ways to avoid or minimize the impact of such threats and, at the same time, to promote industrial development and increase the innovation of the economy is the optimal customs policy. The latter is to determine the level of tariff and non-tariff barriers, import and export taxes, which will balance between the economic interests of the state (help increase the competitiveness and innovation of domestic producers) and the interests of foreign investors.

The total value of tariff and non-tariff barriers to imports determines the level of openness of the economy, which is reflected in the index of economic globalization. The higher the value of this index, the more open the economy is to imports and foreign investment. Ukraine is de facto ranked 25th in the world in terms of economic openness, while Germany is 38th, Great Britain is 44th, France is 60th, Poland is 83rd and Italy is 99th (Chart 2). It follows that Ukraine's economy is significantly more open than the economies of highly developed EU countries. Given that many domestic goods (especially high-tech) are less competitive in

Chart 2. The place of Ukraine and EU countries in the world ranking of the index of economic globalization, de facto (Economic Globalization, de facto index) in 2018*



* Rating is calculated for 200 countries.

Source: own elaboration according to KOF, 2022.

foreign and domestic markets, such openness calls into question the optimality (from the standpoint of national economic interests) of domestic customs policy.

The positive effect of the openness of the economy, expressed by the potential attractiveness for foreign investment, can be offset by a decrease (or loss) as already mentioned (of the country's production and innovation potential). Low barriers to imports have some positive economic effects, but only if such preferential imports are selective and apply only to raw materials and components that are not manufactured (or potentially can not be manufactured) in the country.

One of the significant obstacles to the development of Ukrainian light industry, increasing innovation and price competitiveness of domestic products in the domestic market is a preferential duty on imports into Ukraine of used clothing and other worn items (UKT FEA: 630900). In particular, in the framework of the FTA between Ukraine and the EU (the largest exporter of such imports) for 2021 zero rate for used shoes (code: 63090010), used clothes and accessories for clothing and their parts (code: 63090020), other used textiles products (code: 63090030).

The current customs policy in this segment increases the import dependence of the national economy. Thus, in 2013, Ukraine ranked 5th in the world in terms of imports of used clothing (in monetary terms), while in 2020 it "rose" to 2nd, behind Pakistan. In 2020, the volume of used clothing imports to Ukraine amounted to 154.5 million dollars. USA, but as a result of measures to combat the pandemic COVID-19 decreased by 16% compared to 2019, but increased by 20% compared to 2013.

Favorable tariff and non-tariff barriers for import to Ukraine used cars from the EU and the US. In particular, according to the FTA with the EU, for 2021 customs duties on imports of passenger cars in Ukraine from the EU varies between 2.3 ÷ 4.5% (depending on the volume of the engine) and will continue to decrease, and the amount of excise tax ranges from 50 to 150 euros (according to the volume of the engine), multiplied by the number of years of the car, while the VAT rate is standard – 20%.

In Ukraine, there are virtually no restrictions on the age, actual technical condition and price of imported cars. On the other hand, EU countries, in particular Germany, are tightening bans on diesel cars, gradually restricting the circulation of cars with lower environmental standards, and promoting electric cars, which in turn is stimulating demand for the latter. At the same time, China, as one of the world leaders in the automotive industry, protects its market with a customs duty on car imports of 15%. In India, the rate is 125%, Thailand – 74.97%, and Mexico – 36.69%.

In general, countries can be divided into two conditional groups, which are used for the development of the most complete cycle of automotive industry (domestic or joint): a) tariff instruments (mainly Asian countries); b) non-tariff barriers, environmental standards (mostly European countries). It is worth noting that the automotive industry has the highest potential for increasing innovation and spreading the multiplier effect on the country's economy. Thus, a well-chosen customs policy is an effective tool that can both promote industrial development and increase the innovation of the economy.

Another important factor influencing product innovation is the institutional and macroeconomic environment of the country, the level of which reflects the *global innovation index.* In 2020, Ukraine ranked 45th in the world (against 47th in 2019), while Poland ranked 38th (against 39th) (GII, 2021). According to the results of the comparative assessment of the values of the components of this index in terms of innovation resources (conditions), the biggest barriers (obstacles) to innovation development of Ukraine, compared to Poland are:

– political instability,
– low government efficiency,
– low regulatory quality (an index that captures the government's ability to formulate and implement sound policies and rules that allow and promote private sector development),
– low level of rule of law,
– much higher degree of difficulty in resolving insolvency issues,
– significantly fewer researchers (per million population) and significantly lower R&D expenditures,
– low level of use of information and communication technologies (ICT),
– insufficient development of logistics,

– low market capitalization (market value of shares),

– lower level of competition in the domestic market,

– smaller scale of the domestic market (the size of the domestic market is measured by gross domestic product, GDP, based on the assessment of purchasing power parity in the country),

– relatively lower R&D expenditures in the business sector (gross R&D expenditures by private enterprises as a percentage of GDP).

At the same time, the most significant advantages in providing innovative resources (conditions) of Ukraine, compared to Poland, are:

– higher degree of ease of starting a business and protecting minority investors,

– higher spending on education (in % of GDP) and general government funding per student (on average),

– higher provision of graduates of technical specialties (share of graduates of technical specialties (manufacturing, mechanical engineering and construction) among all graduates of higher educational institutions),

– a higher percentage of firms offering formal training (percentage of firms offering formal training programs for their permanent staff).

4. Conclusions and suggestions

One of the key ways to stop or eliminate the influence of factors formed under the influence of declining industrialization and technology and at the same time increasing the import dependence of the national economy in the segment of high- and medium-high-tech industries. and the effective functioning of innovation parks.

Today in Ukraine there are several sites called "innovation parks." These are, in particular, UNIT.City in Kyiv, Kharkiv and Ivano-Frankivsk, and under construction in Lviv LvivTech.City. All of these parks specialize primarily in manufacturing and providing services to multinational corporations (TNCs) on an IT outsourcing basis. However, there is no clear definition of the term "innovation park" in Ukrainian legislation. Accordingly, it is difficult to determine whether business centers with IT outsourcing export-oriented specialization activities can be identified as innovation parks. The latter, for example, in Poland in their functionality correspond to several categories, which in Ukrainian law are reflected in the terms "science park," "industrial park" and "technology park."

A necessary condition for the effective operation of innovation parks in Ukraine in achieving their goals – promoting innovative development of industry and the national economy in general – is the synergy of sectors with the highest innovation potential, ie high- and medium-high-tech industries (engineering,

chemical and pharmaceutical industries) and IT. However, according to the World Economic Forum, Ukraine ranks 92nd among 100 countries in terms of the contribution of the IT sector to domestic industry. Under such conditions, the functioning of organizational structures, which are now called innovation parks and specialize in IT outsourcing for TNCs, and in which the share of exports in products or services exceeds 70%, should not be considered innovation parks. Moreover, these organizational structures cannot claim state funding, tax or any other benefits.

Financing of innovation projects in innovation parks may be carried out in full or in part by domestic private enterprises and/or the state. In some cases, foreign investors or participants may be allowed to participate in projects that do not involve the release of innovative products containing elements of state secrets (military-industrial complex production), but their share in financing and, consequently, in ownership of the results should not exceed 30% of the cost of such a project. In order to protect national economic security in innovation parks, any participation (as an investor, supplier or participant) of those countries that do not recognize or respect economic and territorial sovereignty and pursue a hostile policy (aggression) against Ukraine is inadmissible. Promising research in this direction will be aimed at developing economic incentives to increase the innovation of domestic industry.

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Problemy zabezpieczenia innowacyjnego rozwoju przemysłu Ukrainy

Streszczenie. *W artykule dokonano analizy porównawczej działalności innowacyjnej podejmowanej w sektorze przemysłu na rynkach wewnętrznych i zewnętrznych w Ukrainie, Polsce i Niemczech. Autorzy zwracają uwagę, że w warunkach globalnej niestabilności, spowodowanej przez militarną agresję Rosji przeciwko Ukrainie, innowacyjność jest nie tylko koniecznym warunkiem rozwoju społeczno-ekonomicznego, ale także jednym z głównych czynników wpływających na bezpieczeństwo kraju. Przedstawiono przyczyny niskiej innowacyjności produkcji przemysłowej w Ukrainie. Określono strukturę wartości dodanej krajowej produkcji przemysłowej oraz miejsce Ukrainy i krajów Unii Europejskiej w światowym rankingu według indeksu globalizacji. Uzasadniono propozycje dotyczące krajowych regulacji prawnych oraz racjonalizacji działalności innowacyjnych parków jako skutecznego sposobu podwyższenia poziomu innowacyjności i wzrostu produkcji przemysłowej.*

Słowa kluczowe: *innowacyjność produkcji, przemysł, produkcja, rozwój innowacji*