


KNOWLEDGE - AND TECHNOLOGY-INTENSIVE INDUSTRIES: CASE STUDY OF THE EU AND THE POSITION OF POLAND

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***Abstract:** The article is devoted to industrialization, which continues its development in economically highly developed countries due to the release of high-tech products. Changes can be traced in the production of knowledge- and technology-intensive (KTI) industries in Europe and the EU countries in comparison with indicators in other regions of the world. The purpose of the article is to characterize modern processes in the EU manufacturing industry against the background of production in other regions of the world, to show and comment on Poland's positions in the global production of knowledge-intensive and high-tech industries with varying degrees of R&D intensity in comparison with the indicators of individual countries of Central and Eastern Europe (CEE). A content analysis of available sources is carried out, statistical data are used, a comparative analysis of indicators of industrial development of the regions of the world and EU countries is applied. The study compares the indicators of industrial development of the EU and individual CEE countries in dynamics since the beginning of the 21st century. The positions of these countries in the production of KTI industries ("high R&D intensive" industries and "medium-high R&D intensive" industries) have been identified. It is shown that Asia is the leader in the production of products of knowledge- and technology-intensive industries, but the positions of the developed EU countries are stable. It is concluded that in the production of all groups of high-tech goods and services with varying degrees of R&D intensity, Poland is the leader among the CEE countries.*

***Key words:** knowledge- and technology-intensive (KTI) industries, structural changes*

***JEL codes:** F29, O33, O52, O57*

1. Introduction

The current situation in the world economy is shaped by the processes of globalization, transnationalization and innovative development. These processes lead to profound changes in the architecture of the entire world economy. The characteristics of these processes are reflected in many scientific works (Rodionova & Kokuytseva, 2010; Rodionova et al., 2016; Kondrat'ev, 2017; "Na puti k Kitaiskomu miru", 2018; Varnavskii, 2019; Khusainov & Sultanov, 2020).

The development of knowledge-intensive industries, participation in the global technology market creates the preconditions for the formation of new centres of power in the modern world economy. Many countries have included the digitalization program in their economic development strategies (Industrial Development., 2020). At the same time, many economically highly developed countries are currently pursuing their strategies in the direction of restoring the role of industrial production (reindustrialization, neindustrialization). It is not only about the return from developing countries back to developed countries of TNC factories located there. It is also the formation of a new concept of industrial development ("Industry 4.0") (Kokuytseva et al., 2019; Industrial Development ..., 2020).

In 2011, The EU Framework Programme for Research and Innovation ("Horizon 2020") was adopted. "Horizon 2020" is the European Union's research and technology development program. It is a seven-year European Union funding program to support and encourage research in the European Research Area from 2014 to 2020. It is the largest framework program in the history of the EU, with a budget of 80 billion euros at 2011 prices. Recall that many EU countries are currently world leaders in the market for the latest technologies. But at present, the EU countries are facing competition from countries such as the United States and China. The European Commission published the Communication on industrial policy in 2012. In 2014, the Communication from the Commission to the European Parliament "For a European Industrial Renaissance" was adopted.

In other words, an understanding has been formed that the manufacturing industry and, first of all, the production of science-intensive and high-tech products with a high degree of R&D intensity is an increasingly powerful factor in the development of the world and European economy (Varnavskii, 2019; Kokuytseva et al., 2019; Industrial Development..., 2020).

Many studies by Polish authors are devoted to the development and transformation of modern manufacturing in their country. The research of the Industrial Geography Commission of the Polish Geographical Society is of great interest (for example, “Changes in industry and its environment in spatial systems”, Studies of the Industrial Geography Commission of the Polish Geographical Society. Kraków, 2019. Vol. 33 No. 4; “The role of industry in the development of spatial systems”, Studies of the Industrial Geography Commission of the Polish Geographical Society. Kraków, 2020. Vol. 34 No. 4.). So, P. Brezdeń's article examines the problem of spatial differentiation of the level of industrial innovativeness in the new EU member states from 2008 to 2017, with a particular focus on Poland. According to the author of the article, the innovation of the products offered has a diverse impact on the development of European countries' businesses. But there are significant differences among countries in terms of the innovation potential of industry (Brezdeń, 2020).

Another author (G. Węgrzyn) also shows that, the process of transformation of industrial structures in Poland is largely achieved through the implementation of new technologies. This issue is studied in the article on the implementation of the concept of “Industry 4.0”. The spatial scope of this analysis covers seven EU member states (Czech Republic, Germany, Poland, Slovenia, Slovakia, Romania and Hungary). According to the author of this article, all new technologies that make up Industry 4.0 accelerate the processes of industrial transformation, further transforming the labor market, the employment structure, business management methods (Węgrzyn, 2020). The aim of other paper is to verify whether a change in innovation model by less-developed regions may speed up development processes and if innovativeness plays crucial role in these processes (Pylak & Wojnicka-Sycz, 2017).

In the article of Dziemianowicz et al., an attempt to assess Polish municipalities from the perspective of their potential for development of local innovative systems was made (Dziemianowicz et al., 2017). According to P. Chaplinsky, «an important factor of the transformation of industrial structures is the location of new forms of economic activity, which are carried out through the discovery and use of existing market niches» (Chaplinsky, 2020). The article of A. Tobolska is devoted to the analysis of foreign direct investment (FDI). The author of this paper seeks to analyse the sectional and spatial structure of the inflow of FDI to industry in Poland and to determine the extent of internationalisation of this sphere of the economy (Tobolska, 2013). The purpose of the Wiśniewski Szymon's article was to analyze the land transport accessibility of two trans-European corridors within the borders of

Poland, which is a very important factor for the development of industry and foreign trade of this country (Wiśniewski, 2017). The aim of the paper of D.Bole and other authors is to make a typology of industrial towns according to their economic performance. Authors of that article are relating the findings with overall transformation of industry in the post-socialist context, the re-industrialisation tendencies and place-specific factors such as peripherality and specific historic events (Bole et al., 2019). In the 21st century economy, referred to as the knowledge-based economy, the competitiveness of a business and its position depends, to a large extent, on innovations in the products and services it offers. M.Janas studies the competitiveness and the innovativeness of enterprises in Poland after the country's accession to the EU structures. According to the author of that article, in the EU countries, the "driving force" is the enterprises belonging to the SME sector (small and medium-sized enterprises) (Janas, 2019).

The purpose of our study is to characterize the processes in the knowledge- and technology-intensive (KTI) industries in Europe and the EU in comparison with indicators in other regions of the world, and is to compare the positions of Poland with the positions of other countries of Central and Eastern Europe in the production of high R&D intensive industries and medium-high R&D intensive industries.

2. Methodology and Data

Statistical data on the volume of manufacturing products by countries and regions of the world were analyzed. The data were presented in reports and analytical reports of various international organizations (UNIDO, UNCTAD, etc.). A content analysis of available sources is carried out, statistical data are used, a comparative analysis of indicators of industrial development of the regions of the world and EU countries is applied. It should be especially noted that a new classification of science-intensive industries is presented in the US Science Foundation database used for calculations (Science and Engineering Indicators 2020). The collections of the US Science Foundation provide statistical data by countries and regions of the world on the production of products in knowledge-intensive and high-tech industries, taking into account the intensity of the use of research and development (R&D).

Science-intensive industries are distinguished by indicators that characterize the ratio of R&D costs to the produced value added of goods and services. It is the levels of R&D intensity. The US Science Foundation presented statistics on indicators such as: "knowledge and technology-intensive (KTI) industries", "high R&D intensive" industries, "medium-high

R&D intensive” industries (Science and Engineering Indicators 2020). The “high R&D intensive” industries are: aircraft and spacecraft industry, pharmaceuticals, computer, electronic, and optical products, computer software publishing, scientific R&D services. The “medium-high R&D intensive” industries are: chemicals excluding pharmaceuticals, electrical equipment and other machinery and equipment, motor vehicles, railroads and military vehicles, weapons and ammunition industry, IT services.

In our article, we analyzed the statistics of production in countries in terms of manufacturing value added (MVA) at current prices in dynamics for the period 2002–2018. Calculations were made of the share of regions and countries in the production of goods and services in science-intensive and high-tech industries with different level of R&D intensity (“high R&D intensive” industries, “medium-high R&D intensive” industries). A comparison is made of the positions of Europe as a whole and the EU countries in all analyzed industries against the background of countries in other regions of the world. The situation was analyzed in the following regions: North America (USA, Canada, and Mexico), Central and South America, Europe (ES and other countries, including Russia), Asia, Africa, Oceania (including Australia and other countries).

The growth rates of production volumes are characterized. And the comparison of Poland's positions against the background of other countries of Central and Eastern Europe (CEE) of all analyzed science-intensive and high-tech industries was carried out. Calculations are carried out and changes in the structure of knowledge- and technology-intensive industries in Poland in dynamics from 2002 to 2018 are characterized. Comparison of the structure of high R&D intensive industries and medium-high R&D intensive industries in Poland and other EU countries (Germany, Poland, and Hungary, Czech Republic) was carried out.

3. Results and Discussion

China currently ranks first in the global manufacturing industry (about 30% of the global indicator, 2019). The next positions are occupied by the USA (16.3%), Japan (7%), Germany (5.4%) and other countries. The share of the Top 15 countries is about 80% of world production (at current prices in 2015). There are many EU countries in the group of leaders in the global manufacturing industry (Industrial Statistics Database, 2020).

To identify the positions of regions and countries in the creation of knowledge and technology intensive industries (KTI industries), as noted in the section "research methodology", the statistical base of the US Science Foundation was analyzed. Experts note

that in 2018 the knowledge and technology-based industries (KTI industries) produced goods and services worth over \$ 9 trillion. This production volume corresponds to 11% of world GDP. At the same time, Medium-high R&D intensive industries produced products worth \$ 7 trillion, and High R&D intensive industries - \$ 4 trillion (Table 1).

Tab. 1 Global KTI industries, by output and share of global GDP: 2018 (billions of dollars and percent)

	Value added (\$ billions)	Share (%)	Share of global GDP (%)
Knowledge and technology-intensive (KTI) industries:	9 020.7		11.1
1. High R&D intensive industries:	3 241.8	100	4.0
Aircraft and spacecraft industry	243.1	7.5	0.3
Computer, electronic, and optical products	1 185.9	36.6	1.5
Pharmaceuticals	698.7	21.6	0.9
Scientific R&D services	652.5	20.1	0.8
Publishing (including software)	461.6	14.2	0.6
2. Medium-high R&D intensive industries:	5 778.9	100	7.1
Chemicals (excluding pharmaceuticals)	1 026.5	17.8	1.3
Electrical equipment	655.7	11.3	0.8
IT services	1 621.8	28.1	2.0
Other machinery and equipment	1 195.2	20.7	1.5
Motor vehicle	1 109.7	19.2	1.4

Source: Science and Engineering Indicators 2020, authors' calculations.

The author's calculations and the analysis of the data in the following table (Table 2) record the change in the share of regions in the creation of products of knowledge and technology intensive industries with an increase in absolute indicators in all regions due to an increase in prices and an increase in production volumes. Production volumes were estimated at current prices. And the growth rates of production in different regions varied greatly.

Let's pay attention to the following facts. The share of Asia increased from 30.6 to 43.7%, while the shares of other regions decreased: the countries of North America (from 36 to 28%) and Europe (from 30 to 24%). The EU's share also fell from 27.2% to 21.4%. The shares of countries in other regions are generally insignificant. At the same time, China's share in the world output of high-tech goods and services has quadrupled. Today, China

produces more than half of the production of Knowledge and Technology Intensive industries throughout the Asian continent (Table 2).

Tab. 2 Shares of regions in the world production of Knowledge and technology intensive industries, 2002–2018, percent

Region	2002	2005	2008	2011	2014	2018
North America	36.1	31.3	27.0	25.6	26.1	27.7
Central and South America	2.0	2.5	3.6	4.1	3.3	2.3
Europe, including EU:	29.7	32.3	33.7	28.9	27.5	24.4
<i>EU</i>	27.2	29.0	29.3	24.8	23.7	21.4
Asia	30.6	31.9	33.5	38.9	40.7	43.7
Africa	0.6	0.9	0.9	1.0	1.1	0.9
Oceania	0.6	1.2	1.2	1.5	1.2	1.0
World	100	100	100	100	100	100

Source: Science and Engineering Indicators - 2020, author's calculations.

The leaders in the production of this group of goods and services are the following states: USA (25% of the world indicator, 2018), China (24%), Japan (about 8%), Germany (7%), Republic of Korea (about 4%), France, United Kingdom, India, Italy, Taiwan (Science and Engineering Indicators – 2020) . The share of the EU is 21.4% of the world indicator, the share of Poland - 0.5%. At the same time, the volume of production of Knowledge and Technology Intensive industries) in Poland has quadrupled since 2002 (and only doubled in the EU).

KTI industries will certainly have a significant impact on the economy and society in the coming years. It is known that not only the USA, EU and China are investing very significant funds in scientific research, but also many countries of the world are developing R&D. Therefore, further it is necessary to dwell in more detail on the characteristics of the share of regions and leading countries in the global production of “high R&D intensive” industries (Value added of “high R&D intensive” industries at current prices, 2002-2018). As you know, it is in these sectors that the most significant funds are invested in R&D. And there - in these industries, they produce goods and services using advanced technologies.

The calculations performed by the author showed that only in the period from 2002 to 2018, the share of Asia (which is now the leader in the production of this group of high-tech goods and services) increased from 27 to 39% (mainly due to China). At the same time, the

total share of the countries of the North America region (USA, Canada, and Mexico) decreased from 43 to 34% (actually due to a decrease in the share of the USA - from 40 to 32%). And the share of the countries of the European region also slightly decreased - from 27 to 23%. At the same time, the share of the EU countries decreased from 23.7 to 19.1% (Table 3).

Tab. 3 Shares of regions in the world production of “High R&D intensive” industries, 2002–2018, percent

Region	2002	2005	2008	2011	2014	2018
North America	42.8	38.8	35.5	33.0	32.9	34.1
Central and South America	1.6	1.7	2.4	2.7	2.5	1.9
Europe, including EU:	26.6	28.7	30.5	27.4	25.8	23.2
<i>EU</i>	23.7	25.0	25.6	22.0	20.6	19.1
Asia	27.5	28.7	29.4	34.2	36.3	38.7
Africa	0.5	0.6	0.7	0.9	1.0	0.7
Oceania	1.0	1.3	1.5	1.9	1.5	1.4
World	100	100	100	100	100	100

Source: Science and Engineering Indicators - 2020, author's calculations.

The United States is the largest producer in the world, accounting for nearly a third of global production. China and the EU are the second largest producers of this type of products in the world (20% each). In China, at current prices, production increased by almost 9 times over the analyzed period.

Let us also designate a group of leading countries in the EU in this industry. These are Germany, France, Ireland, UK, and Switzerland. Among the leaders we see Ireland (now called the "Celtic Lion" by analogy with the "Asian Tigers"), which even outstripped of the UK. In the EU, product output (at current prices) has grown by almost - 2 times (in Germany - 2 times, in France - 1.7 times, in Ireland - 3.5 times, in the UK - 1.2 times , and in Poland - 2.7 times). The growth rates of production in the countries of Central and Eastern Europe were higher than in the countries of Western Europe. But production volumes in CEE countries are not significant. For example, the production of high-tech products in Romania increased 13 times, in Bulgaria - 9 times. At the same time, Poland (0.3% of the global volume, 2018) is the leader in the production of CEE countries.

Further, we found it interesting to identify the share of each of the industries included in the considered group of "high R&D intensive" industries in Germany, Poland, the Czech Republic and Hungary. In other words, it was important to characterize the structure of this

industry and identify the ongoing changes. The data in the table given in the article show the author's calculations of the structure of "high R&D intensive" industries in some CEE countries and Germany (Table 4).

Tab. 4 Germany, Poland, Czech Republic, Hungary: the structure of production of «High R&D intensive» industries (millions of current dollars and percent), 2018

	Germany	%	Poland	%	Czech Republic	%	Hungary	%
“High R&D intensive” industries:	143 944	100	9 202	100	7 504	100	6 054	100
Aircraft and spacecraft industry	15 581	10.8	984	10.7	319	4.3	21	0.4
Computer, electronic, and optical products	44 768	31.1	1 638	17.8	3122	41.6	2 078	34.3
Pharmaceuticals	38 077	26.5	1 568	17.0	1 022	13.6	1 947	32.2
Scientific R&D services	28 056	19.5	3 026	3.9	1 749	23.3	1 359	22.4
Publishing (including software)	17 462	12.1	1 986	21.6	1 292	17.2	649	10.7

Source: Science and Engineering Indicators - 2020, author's calculations.

Note that in the structure of “high R&D intensive” industries in the EU, the first positions are held by: Pharmaceuticals (29.6%), Scientific R&D services (23.8%), Computer, electronic, and optical products (19.3%). The share of Germany in the global production of High R&D intensive industries is 4.4%. At the same time, Germany is the leader in the EU (share - 23%). The structure of the high-tech industry of this country is dominated by production “computer, electronic, and optical products” - 31% and “pharmaceuticals” - 26.5%. The structure of the high-tech industry is somewhat different in Poland and other industrialized countries of CEE (Table 4).

And the share of Poland in the global output of High R&D intensive industries is - 0.28% of world production, the Czech Republic - 0.23%, Hungary - 0.18%. But the rate of growth of production volumes is much higher than in the EU as a whole, and higher than in Germany, France and the UK. Since the early 1990s (after the collapse of the USSR and the

Socialist system), the countries of CEE have embarked on the path of independent development. But they still lag far behind their neighbors in Western Europe. CEE states develop their economies in their own way. They often differ from the developed countries of Western Europe in the openness of their economies. Foreign investors are opening new high-tech enterprises in Eastern Europe. Machine-tool manufacture and production of household and electronic appliances have been established in the Czech Republic. Good quality pharmaceutical products are created in Poland and Hungary. Much attention in these countries is paid to the development of scientific R&D services. These tables illustrate the change in the structure of high-tech production («high R&D intensive» industries) in Poland in 2002-2018 (Table 5).

Tab. 5 Poland: production of «High R&D intensive» industries (millions of current dollars and percent), 2002-2018

	2002	%	2010	%	2018	%	2018/2002
“High R&D intensive” industries:	3 467	100	8 954	100	9 202	100	2.7
Aircraft and spacecraft industry	140	4.0	399	4.5	984	10.7	7.0
Computer, electronic, and optical products	836	24.1	2 259	25.2	1 638	17.8	2.0
Pharmaceuticals	548	15.8	1 607	19.9	1 568	17.0	2.9
Scientific R&D services	785	22.6	2 151	24.0	3 026	32.9	3.8
Publishing (including software)	1 160	33.5	2 537	28.3	1 986	21.6	1.7

Source: Science and Engineering Indicators - 2020, author's calculations.

The balance of power in the global economy and in medium-high R&D intensive industries is changing. China has grown at a very rapid pace over the past decade. The share of this country in the world indicator is 26%. US production grew more slowly than China, but the US's global share remains very significant (22%). Production in Europe and the EU grew in the 2000s. And the shares of Europe and Asia were the same (about 36%, 2008). But

over the past decade, the EU's share in global production has been declining. The current situation in this industry in dynamics is reflected in the calculation data in the table (Table 6).

Tab. 6 Share of regions in world production of “medium-high R&D intensive” industries, 2002–2018, percent

Region	2002	2005	2008	2011	2014	2018
North America	31.8	26.5	22.0	21.4	22.4	24.1
Central and South America	2.3	3.0	4.3	4.9	3.7	2.5
Europe, including EU:	31.8	34.5	35.6	29.8	28.4	25.0
<i>EU</i>	29.4	31.6	31.6	26.3	25.4	22.7
Asia	32.6	34.0	35.9	41.6	43.2	46.6
Africa	0.7	1.0	1.1	1.1	1.3	1.0
Oceania	0.8	1.0	1.0	1.3	1.1	0.8
World	100	100	100	100	100	100

Source: Science and Engineering Indicators - 2020, author's calculations.

Asia is now the leader (almost 47% of the world indicator). However, the European region was ahead of Asia in the period 2003-2007, but since 2008 it has lost the primacy to Asia. At the same time, we observe a decrease in the share of North America from 32 to 24%. The leaders of medium-high R&D intensive industries in 2018 were: China (26%), USA (22%), Japan (10%), Germany (8%), Republic of Korea, India, UK, France and Italy.

In general, in Europe for the period 2002–2018 production output (at current prices) has approximately doubled. But in the countries of Central and Eastern Europe, production growth rates were significantly higher. So, for example, in Poland and the Czech Republic - there was a 4-fold increase in production. In Slovakia, production volumes increased 7 times, in Romania - 8 times. Although the shares of these countries are still much lower than the shares of Germany (8.4% of the world indicator), UK (2.4%), France (2.3%), Italy (2.2%) in the world production of this type of industrial products. The CEE countries are far behind the EU leaders. So, the share of Poland - 0.6%, Czech Republic - 0.5%, Hungary - 0.3%, Romania - 0.2%, Slovakia - 0.2%, Bulgaria - 0.05%). You can analyze the structure of "medium-high R&D intensive" industries in Germany, Poland, Czech Republic, and Hungary (Table 7).

Tab. 7 Germany, Poland, Czech Republic, Hungary: the structure of production of « of «Medium-high R&D intensive» industries (millions of current dollars and percent), 2018

	Germany	%	Poland	%	Czech Republic	%	Hungary	%
“Medium-high R&D intensive” industries:	487 743	100	33 286	100	30 406	100	14 904	100
Chemicals (excluding pharmaceuticals)	54 102	11.1	4 433	13.2	1 934	6.4	1 623	10.9
Electrical equipment	51 443	10.6	3 991	12.0	4 184	13.8	1 273	8.5
IT services	106 949	21.9	10 259	30.8	6 176	20.3	3 544	23.8
Other machinery and equipment	122 236	25.1	5 644	17.0	5 338	17.5	2 483	16.7
Motor vehicle	147 349	30.2	8 036	24.2	11 751	38.6	5 731	38.4
Railroads and military vehicles	4 424	0.9	719	2.2	778	2.6	239	1.6
Weapons and ammunition industry	1 241	0.2	203	0.6	247	0.8	11	0.1

Source: Science and Engineering Indicators - 2020, author's calculations.

In general, the branches of the machine tool industry (electrical equipment, motor vehicle and other machinery and equipment) and the chemical industry are distinguished. Probably, this situation was influenced by the processes of return to the EU of certain industrial enterprises from developing countries. It is also influenced by the overall high level of industrial development in the CEE countries, including the level of qualifications of workers and the lower level of wages in those countries in comparison with the countries of Western Europe. Motor vehicle, other machinery and equipment and IT services, and chemicals lead the industry structure for this category of industries in Germany (Table 7).

The dynamics of this process in 2002-2018 in Poland is reflected in the data in the table. The rates of development of individual industries are shown in the last column of the table (Table 8).

Tab. 8 Poland: production of « Medium-high R&D intensive» industries (millions of current dollars and percent), 2002-2018

	2002	%	2010	%	2018	%	2018/2002
“Medium-high	7 440	100	21 908	100	33 286	100	4,5

R&D intensive”							
industries:							
Chemicals	1 608	21.6	3 664	16.7	4 433	13.2	2,8
(excluding							
pharmaceuticals)							
Electrical	1 224	16.4	3 193	14.6	3 991	12.0	3,3
equipment							
IT services	1 373	18.5	4 829	22.0	10 259	30.8	7,5
Other machinery	1 544	20.8	4 326	19.7	5 644	17,0	3,6
and equipment							
Motor vehicle	1 399	18.8	5 316	24,3	8 036	24.2	5,7
Railroads and	229	3.1	393	1.8	719	2.2	3,1
military vehicles							
Weapons and	62	0.8	187	0.9	203	0.6	3,3
ammunition							
industry							

Source: Science and Engineering Indicators - 2020, author’s calculations.

The IT service sector (“producer services”) has also moved to the first place in the structure of industries with a medium-high intensity of R&D in Poland. The second position in the structure is occupied by “motor vehicle”, and the third and fourth positions are occupied by the production of “other machinery and equipment” and “chemicals (excluding pharmaceuticals)”.

According to the opinion of Polish scientists, industry continues to play an important role in the country's economy and urban development, despite intense de-industrialization. The role of small and medium-sized cities depends on the processes of industrialization or reindustrialization taking place in them. And the development of large and medium-sized cities depends on knowledge-based services (May et al., 2020). We are convinced that “producer services” are among those services for industrial production that are important investments for the economy. The processes taking place in the Polish industry require further and deeper study.

4. Conclusions

Changes in the spatial organization of the world manufacturing industry occur under the influence of different rates of economic development of the countries.

The rating of the most "industrial" regions of the world in the manufacturing industry and in the knowledge and technology-based industries (high and medium-high R&D intensive industries) is currently headed by Asia. This region is ahead of North America and Europe in the production of goods and services of KTI industries. China has greatly strengthened its position over the past 15 years in the global high-tech industry with high and medium-high R&D intensity.

However, the highly developed countries (led by the USA and the EU) have not lost their important positions in the global manufacturing industry. These countries are still in the group of world leaders in many sectors of the global industry. To characterize the industry of this group of states, the term "highly developed postindustrial industry" is used. The leaders in the EU are Germany, France, UK, Italy, etc. Poland is the leader among the CEE countries. The structure of "high R&D intensive" and "medium-high R&D intensive" industries is changing in Poland, as shown by the analysis of statistical data.

At the same time, there is no doubt that the events of 2020 and 2021 (in connection with the global pandemic COVID-19) have seriously influenced and will still affect world history, production volumes and the balance of power in the world economy and the global high-tech industry.

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