

# Analysis of the Development of the Industrial Sector in the Context of Global Transformation of Economic Processes

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## Abstract.

**Research background:** In the modern world the rate of global transformation of economic processes is constantly increasing, while stimulating the growth of industrial production in the countries of the world. The industrial sector plays an important role in achieving stable growth in national wealth indicators, as well as in ensuring national security. Accelerating the pace of industrial development, especially high-tech, contributes to an increase in employment and the transition to a balanced economic development of the country.

**Purpose of the article:** The main purpose of the publication is to study the current state and structural transformations in industry in the world economy, to analyze the level and dynamics of the main indicators of industrial development.

**Methods:** Using statistical analysis of time series and dynamics indicators, the authors have evaluated the development trends of the industrial sector, based on the methods of scientific knowledge, a comparative analysis of the systematic results of development indices characterizing the functioning of industry around the world.

**Findings & Value added:** A statistical analysis of the development of the industrial sector in the context of globalization allows the authors to determine the exact number of enterprises, the costs of the industry and their income, as well as the contribution made to the development of both region and the country as a whole. In this research the authors have considered the main economic indicators of industrial development in the world. The authors have systematized the main measures aimed at the development of the industrial sector.

**Keywords:** *industrial development; level of business activity; globalization; macroeconomic indicators*

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## 1 Introduction

The balance and efficiency of the national economy, the presence of economic growth, significantly depend on the development of the industrial complex, its specialization in the international system of division of labor. Numerous conditions and factors of the global transformation of economic processes, among which technical-technological and institutional ones are of the greatest importance, determine the peculiarities of the implementation of transformational changes in the world economy. Modern production chains are changing: production is getting closer to final consumers, logistics and technological costs are being reduced, the social component of projects is changing, and all this contributes to the development of local economic systems.

The transformation of the development of the country's industrial complex in the context of globalization is a multifaceted process that relies on the operational efficiency of industrial enterprises, digital transformation of the industry, cultural transformation (new cultural values, a new model of leaders' behavior), organizational transformation (flexible teams, changed processes, a project approach, creation of a new ecosystem, increase in the number of external and internal partners).

At the moment, industrialized countries have moved to a state where technologies are being scaled up, and not only the introduction of these technologies is scaled, but also a change in the management system that allows companies to operate in a new mode of mass functioning of these technologies. In particular, there are three blocks of such technologies:

1. the use of network integration, which makes it possible to link organizations and almost all units,
2. the use of human capital through a data exchange system;
3. the use of artificial intelligence technologies, which include digitalization and flexible automation technologies.

## 2 Methodology and background

The world leader in terms of industrial production is China, accounting for 28.4% of world industrial production. The second and third places are occupied by the USA and India. The third place is occupied by Russia, so in 2019 industrial production increased by 2.3%.

Scientists from the entire world community are actively studying the features of the transformation of the development of the industrial complex in the context of the digitalization of the economy. In general, the analysis of economic growth in industry and the study of changes associated with the spread of the concept of Industry 4.0 were carried out by Castiglione, C., Infante, D., Smirnova, J. [1], Chen, J.-H., Chen, Y. [2], Dowlah, C. [3], Vertakova, Y., Polozhentseva, Y., Klevtsova, M. [4], Kuladzhi, Tamara ;Babkin, Aleksandr; Murtazaev, Said-Alvi [5]. Problems associated with the differentiation of the levels of spatial concentration of industrial sectors are considered by such economists as Ács, J. Z., & Varga, A.[6], Thissen, M., van Oort, F., Diodato, D., & Ruijs, A. [7], Tregenna, F. [8], Weiss, J. [9], Bodrunov, S., Plotnikov, V. and Vertakova Yu. [10]. Some authors research not only the possibilities of improving and creating new sectors and technologies in industry, but also analyze the possibility of expanding existing ones, including those based on digital technologies (Tregenna F. [11], Westkampter E. [12], Xu, Li Da; Xu, Eric L.; Li, Ling [13], Mueller, J. M.; Kiel, D.; Voigt, K.-I. [14], Dalenogare, L. S.; Benitez, G. B.; Ayala, N. F., Frank, A. G. [15]).

The methodological basis of this study was such general scientific and specific methods as: comparative analysis of sources; analytical method to identify trends in the development

of Industrial Sector; synthesis method, which allowed to obtain reasonable conclusions; and the inductive method.

The analysis of the factors influencing the development of the industrial sector in the context of global transformation of economic processes showed that it is necessary to consider the development of the spatial potential of the country in the interaction of several groups of factors. Now the main scientific and practical task is the development of methods for assessing the industrial sector in the country. An integral component of the assessment is the system of indicators. For a deeper analysis, we investigated purchasing managers' indexes (PMI) are economic indicators derived from monthly surveys of private sector companies.

### 3 Results

The authors suggest analyzing the development of the industrial sector of the countries worldwide in the context of the global transformation of economic processes based on the study of the dynamics of the main indicators reflecting its development.

First of all, it should be noted that the main and most important indicators when analyzing the industrial sector of both a separate region and the state are gross domestic product (GDP) and gross value added (GVA).

Table 1 shows the dynamics of the gross domestic product of the G7 countries and the Commonwealth of Independent States for 2019, as well as the economic growth rate for the year in review. Also, Table 1 shows the predicted values of the indicators under consideration for 2020, developed by the Institute of Scientific Communications.

**Table 1:** Real and projected gross domestic product and growth rates of the countries of G7 and the Commonwealth of Independent States

Country	Growth rate, %		GDP, billions of dollars	
	2019	2020	2019	2020
Armenia	3.000	3.100	11.778	12.369
Azerbaijan	3.071	2.760	45.553	48.823
Belarus	0.818	2.127	58.171	60.357
Canada	1.843	1.800	1719.451	1783.360
France	1.749	1.796	2562.275	2650.237
Germany	1.415	1.290	3617.086	3727.659
Italy	0.800	0.800	1879.410	1922.214
Japan	0.846	0.210	5085.741	5163.766
Kazakhstan	2.815	3.210	188.502	204.602
Kyrgyzstan	5.211	4.952	7.629	8.073
Republic of Moldova	3.800	3.800	8.104	8.565
Russia	1.500	1.500	1654.091	1712.024

Tajikistan	5.500	6.000	8.220	8.908
Turkmenistan	5.121	5.007	52.086	57.669
The United Kingdom of Great Britain and Northern Ireland	1.606	1.909	2607.850	2689.841
The United States of America	2.121	1.825	21239.303	22063.044
Uzbekistan	6.000	6.000	75.553	79.742

Sources: Institute of Scientific Communications, Access mode: <https://www.archilab.online/>

According to the data presented in table 1-2, it can be seen that the three leaders in terms of Gross Domestic Product are the following countries: the United States, Japan, and Germany. The most lagging behind countries among the considered ones are: Tajikistan, the Republic of Moldova and Kyrgyzstan. In predicted values compiled by the Institute of Scientific Communications, the situation with the leading and off-track countries under consideration remains at the same level.

**Table 2** Indicators of the value added of the manufacturing industry in % to GDP by countries for the period from 2010 to 2018

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018
Azerbaijan	4.81	3.99	4.24	4.22	4.71	4.99	4.93	4.70	4.82
Belarus	22.51	26.42	24.78	22.00	21.09	20.64	20.15	21.63	21.26
France	10.33	10.40	10.36	10.35	10.28	10.43	10.28	9.99	9.71
Germany	19.70	20.23	20.16	19.93	20.22	20.38	20.74	20.56	20.40
Italy	14.23	14.21	13.85	13.88	13.98	14.40	14.80	14.95	15.05
Japan	20.83	19.67	19.73	19.44	19.73	20.81	20.68	20.73	..D)
Kazakhstan	11.32	11.09	11.08	10.63	10.32	10.28	11.33	11.28	11.43
Kyrgyzstan	16.86	18.27	12.07	15.77	13.68	14.05	15.43	14.99	15.16
The Republic of Moldova	9.95	10.56	10.65	11.19	11.60	11.96	11.90	11.55	11.27
Russia	12.82	11.58	11.80	11.32	11.48	12.48	12.01	12.22	12.31
Tajikistan	-	9.66	9.47	9.23	7.62	8.70	9.72	10.00	10.50
The United Kingdom of Great Britain and Northern Ireland	9.55	9.47	9.37	9.58	9.38	9.30	9.10	8.98	8.84
The United States of America	11.93	11.95	11.85	11.81	11.64	11.62	11.12	11.15	NA

Sources: The World Bank Group, Access mode: <https://www.worldbank.org/>

Analyzing the indicators of the added value of the manufacturing industry as a percentage of the gross domestic product during the study period, all the countries under review have an ambiguous development tendency. The highest values of the studied indicator can be traced in the following countries: Belarus, Germany, and Japan. This suggests that the manufacturing sector makes a significant contribution to the development of the country's gross domestic product. The Russian Federation, in turn, has a stable development situation for the indicator under study. Its values during the study period have minor fluctuations in indicators. Thus, the added value of the manufacturing industry in 2018 amounted to 12.31% of the gross domestic product.

**Table 3** Indicator of industrial production by countries in the period from 2010 to 2018, billion US dollars

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018
Belarus	27.1	56.4	99.9	98.3	109.4	120.1	132.8	151.0	178.6
France	369.2	378.3	369.2	366.7	362.6	368.8	371.0	378.3	379.7
Canada	219.8	230.3	220.0	233.9	245.6	244.4	244.3	257.6	266.1
Italy	535.9	538.1	506.0	490.4	485.1	493.6	500.3	515.8	522.7
Germany	1094.6	1171.5	1162.6	1160.8	1176.5	1193.6	1209.4	1242.2	1254
Japan	1802.9	1750.2	1761.5	1735.8	1765.9	1743.5	1744.5	1793.8	1813.2
Kazakhstan	68.8	71.1	71.5	72.4	72.5	71.34	69.6	75.4	77.7
Moldova	1.8	1.9	1.9	2.10	2.3	2.27	2.3	2.37	2.5
Russia	503.0	528.5	546.7	556.4	569.8	565.10	577.6	589.5	606.6
The Unites States of America	2988.9	3082.0	3175.2	3239.6	3339.0	3305.7	3241.0	3316.2	3446
The United Kingdom of Great Britain and Northern Ireland	463.5	460.7	448.2	445.06	451.8	457.17	461.6	466.56	471.3

Sources: The World Bank Group, Access mode: <https://www.worldbank.org/>

On the basis of the data presented in Table 3, it is possible to draw the following conclusions:

- The following countries demonstrate the largest values of the studied indicator: Germany, Japan and the United States. In these countries the concentration of industrial production is significant, in contrast to the rest of the number of countries under consideration;
- The indicators of industrial production in the Russian Federation show a positive growth trend throughout the entire study period. So in 2018 this figure is 606.69 billion US dollars, which is 20.61% more than in the reference year 2010. In terms of the studied indicator The Russian Federation ranks next in a number of countries under review, immediately following the leaders.

Purchasing Managers' Index (PMI) considers the state of the economy in both the manufacturing and service sectors. This indicator is calculated based on the results of surveys of top managers of manufacturing companies and enterprises, business representatives, as well as purchasing managers in the service sector.

When analyzing the PMI indicator, it is possible to predict the dynamics of economic trends. The purchasing managers' index is studied both for assessing changes and for forecasting and planning in matters of new production orders, industrial production, employment, as well as wholesale stocks. Table 4 presents the current data on the purchasing managers' index for April-May 2020.

**Table 4** Purchasing managers' index by countries for April-May 2020

Country	May 2020	April 2020
Australia	28.1	21.7
Brazil	28.1	26.5
China	54.5	47.6
France	32.1	11.1
Germany	32.3	17.4
Ghana	46.7	31.7
India	14.8	7.2
Italy	33.9	10.9
Japan	27.8	25.8
Kazakhstan	15.3	42.1
Mozambique	40	37.1
New Zealand	38.2	23.8
Niger	40.7	40.7
Russia	35	13.9
Singapore	27.1	28.1
South Africa	32.5	35.1
Uganda	41.9	21.6
Great Britain	30	13.8
USA	37	27
Zambia	34.8	37.3

Sources: Ministry of Economic Development of the Russian Federation, Access mode: <https://www.economy.gov.ru>, Ministry of Economic Development of the Russian Federation, Access mode: <https://www.economy.gov.ru>

Based on the data presented in Table 4, it is clearly seen that today basically all countries have a negative downward trend in business activity, with the exception of China. In China, the May 2020 PMI shows positive growth compared to the previous month. Despite the negative trend of purchasing managers' index by countries, due to the current unstable economic situation amid the ongoing impact of the coronavirus disease 2019 (COVID-19) outbreak, it can be noted: in comparison with the considered indicator for April 2020 in May 2020, the majority countries demonstrate a significant increase in this indicator. This indicates an improvement in the current economic situation of industrial facilities.

When analyzing the purchasing managers' index, it is necessary to understand that its main drawback is that it is formed from the private opinions of individuals, and its data are not clear quantitative, but rather an estimate.

It should be taken into account that it is necessary to consider the purchasing managers' index in addition to other indicators. An important indicator in the analysis of the industrial sector of both separately considered enterprises and countries is the industrial production index.

The industrial production index is a macroeconomic indicator that characterizes the change in the production process with a set of services and goods grouped according to the following types of the all-Russian classifier of economic activities: "Manufacturing", "Mining Operations", "Production and distribution of electricity, gas and water."

Table 5 below shows the indicators of the industrial development index by country from 2010 to 2019.

**Table 5** Industrial development index by countries in the period from 2010 to 2019, 2010 = 100.

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Azerbaijan	100	95.0	92.8	94.5	93.8	96.1	95.6	92.4	93.4	95.0
Germany	100	107.1	106.2	106.1	107.5	109.0	110.5	113.5	114.6	109.5
Israel	100	102.1	106.2	106.7	108.0	110.4	112.2	116.3	120.4	123.4
Italy	100	100.4	94.4	91.5	90.5	92.1	93.4	96.2	97.6	96.6
Kyrgyzstan	100	111.9	94.1	121.0	119.1	113.8	119.4	133.2	140.4	150.0
Lithuania	100	106.6	110.9	114.2	114.5	119.5	122.8	131.4	137.8	142.4
Poland	100	106.7	108.0	110.6	114.4	119.9	123.3	131.4	139.2	145.0
Republic of Moldova	100	113.4	110.7	120.2	129.0	129.7	130.9	135.4	140.4	143.2
Russian Federation	100	105.0	108.5	110.5	113.2	114.8	116.3	117.2	120.6	123.7
The United Kingdom of Great Britain and Northern Ireland	100	100.0	97.6	96.6	98.1	99.1	100.3	102.3	102.7	101.7
The United States of America	100	103.1	106.1	108.2	111.6	110.8	109.4	106.5	..1)	..1)
Uzbekistan	100	106.5	114.8	125.7	136.2	146.9	156.0	168.5	196.5	..1)
Ukraine	100	108.0	107.2	102.6	92.2	80.2	82.5	82.9	84.2	82.7

France	100	102.6	99.9	99.0	97.9	99.6	100.3	102.4	103.1	103.2
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Sources: Compiled using the statistical database of the United Nations Economic Commission for Europe. Access mode: <https://w3.unece.org/PXWeb/en>

Based on the data presented in Table 5, it can be seen that for each separately considered country, the industrial production index (adopted in 2010 as 100) has an ambiguous trend of both growth and decline. From the list of countries under consideration, it is clearly seen that the studied indicator in 2019 in comparison with 2010 has a negative downward trend in the following countries: Azerbaijan, Italy, and Ukraine. It is also worth noting that the following countries have the greatest growth in the index of industrial development in the period under study: Kyrgyzstan, Lithuania, Poland, the Republic of Moldova and Uzbekistan. This indicates a positive tendency in the industrial development of the countries and contributes to their further economic growth or to covering a possible decrease in volumes in other sectors.

## 4 Discussion and Conclusion

It should be noted that in order to timely identify a negative trend in the development of industry, it is necessary to conduct a general analysis of the main indicators of the industrial sector of the state in question in the context of other countries. When it comes to macroeconomic indicators affecting the development of Russian industry, it seems appropriate to compare such indicators as gross domestic product, purchasing managers' index and industrial production index. If the studied indicators have a positive development tendency and the industrial output itself appears to be promising, then the current development trend contributes to economic growth and independence of the state.

In general, Industry 4.0 and digitalization include the following components: smart sensors, 3D printing, big data analysis and the use of branched advanced algorithms, multi-level customer interaction, augmented reality (including using conventional client gadgets), various cloud services, mobile devices, IoT (Internet of Things), location technologies, improved human-machine interfaces, authentication and fraud detection. The introduction and use of all these technologies is reflected in the formation and development of the digital potential of an industrial enterprise and a cluster.

However, in the context of the digitalization of the economy, new models are needed for assessing the capabilities of enterprises to use advanced information and communication technologies, taking into account ensuring accessibility of these technologies, the skills of their application, the communication capabilities of networks and the qualifications of IT departments. In this regard, the study of economic relations between economic entities on the use of digital technologies in the framework of the activities of individual enterprises is of particular importance.

Thus, technology can have an important positive impact on national economies and their ability to achieve sustainable development goals, through effective governance mechanisms to integrate technology with three major stakeholder groups: individuals, businesses and governments. This factor is directly related to the development of Industry 4.0, which implies the modernization of production based on modern digital solutions and the creation of "smart" production that integrates individual objects into a coherent whole, which is the main stage for the subsequent automation and robotization of production.

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