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Investment Potential of the Manufacturing Industry*

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ABSTRACT

The article considers investment in fixed assets of the manufacturing industry as one of the main factors of its development. The manufacturing industry is shown to be the growth driver of national economy for developed and developing countries. The analysis of exports and imports of the first 15 countries in the ranking in terms of gross domestic product calculated at purchasing power parity (GDP at PPP) shows the leading role of the manufacturing industry in the global economy. At the same time, competitiveness in the global market is determined by high-tech products. Therefore, for the sustainable development of the Russian economy, it is necessary to create investment conditions for the advanced development of high-tech segments of the manufacturing industry. However, the current structure of investments in fixed assets contributes to the development of such services sector segments as "Transportation and storage", "Real estate operations". In the structure of investments in fixed assets, the largest share belongs to investments in buildings and structures, and intellectual property items account for no more than 10%. It is shown that the lack of investment resources is the main reason for the reduction (by 1.5 times) of the contribution to the value added of the manufacturing industry in Russia, production of machinery and equipment. This leads to an increase in dependence on imports, a fall in the share of products from high-tech sectors. To analyze the development potential of manufacturing industries, the authors introduced an indicator of investment intensity per 100 rubles of shipped industrial products. It was determined that enterprises with a joint Russian and foreign form of ownership lead in terms of investment intensity. At the same time, private enterprises, leading in terms of output, demonstrate weak investment activity. The low investment attractiveness of high-tech manufacturing sectors is shown. The regional structure of the manufacturing industry was analyzed. There is a high level of regional concentration of the manufacturing industry in Russia. At the same time, the authors show its relatively weak significance in the structure of the gross regional product in the majority of the constituent entities of the Russian Federation. It has been proposed to develop a program at the federal level for the advanced development of production in the high-tech and medium-technology high-level sectors for 10–15 years. It is proposed to create a supra-departmental executive authority to manage this program.

Keywords: manufacturing industry; high-tech sector; investment; GDP; fixed assets; financial performance; productivity; exports; imports; competitiveness in the labor market

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INTRODUCTION

According to economic science, today investment is one of the main factors in the development of the national economy in both developed and developing countries, and the manufacturing industry is its growth driver[1] [1, 2]. This statement is confirmed by the World Bank statistics. In countries leading by GDP at PPP and steadily developing countries such as China, India, Korea, Turkey, the share of investment in fixed assets is 41.9%, 28.5%, 31.1% and 30% respectively. At the same time, in 2017, the economic growth rates were 106.9%, 106.7%, 103.1% and 107.4% respectively.

In the eurozone countries, the share of investments averaged 20.4%, while the growth rate was 102.4%. The economic growth leaders in the Eurozone are the countries with a large share of investment in fixed assets. It should be noted that in developed countries economic growth rates on par with Russia are achieved with lower share values of investments in fixed assets in GDP, for example, 17.5% in Italy. There are few cases when high rates of economic growth were achieved with relatively small share values of investments in fixed assets [3].

The contribution of the manufacturing industry to Russia's GDP is only 13.5%. At the same time, in the economies of Germany, China and South Korea, this value is 20%, 30% and 28% respectively. Moreover, the economies of these countries are developing steadily, despite the turbulent dynamics of the global economy. In 2014–2017, GDP growth rates, on average, were 2%, 7% and 3%[2] respectively. There was a decline during this period in Russia, and in 2017–2018, the growth rate was approximately 1.5%[3].

[1] United Nations Industrial Development Organization, 2013. Industrial Development Report 2013. Sustaining Employment Growth: The Role of Manufacturing and Structural Change. Vienna. URL: https://www.unido.org/sites/default/files/2013–12/UNIDO_IDR_2013_main_report_0.pdf (accessed on 22.04.2019).

[2] World Bank national accounts data, and OECD National Accounts data files. URL: https://databank.worldbank.org/data/source/world-development-indicators/preview/on (accessed on 06.05.2019). Rosstat official website. URL: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/accounts/# (accessed on 06.05.2019).

[3] Rosstat official website. URL: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/accounts/# (accessed on 06.05.2019).

Table 1 presents the data on the manufacturing industry contribution to the total exports of the 15 top countries in the ranking by GDP at PPPs.

It should be noted that together these countries produce 75% of the world GDP. Industrial products play a major role in their total exports. The analysis shows that in eight countries, manufactured products make up more than 80% of exports, in three countries they exceed or equal to 70%, and in the United States they are 62%. Only in three countries (Russian Federation, Brazil and Indonesia) industrial products do not make up the bulk of total exports.

High-tech and mid-tech manufacturing sectors account for 40–60% of the manufacturing exports of leading countries. The main share in the import of goods of these countries (60–80%) is also made by the manufacturing industry products. Thus, the manufacturing industry makes a major contribution to the world trade structure.

INVESTMENT POTENTIAL OF SEGMENTS OF THE RUSSIAN ECONOMY

Studying the conditions to build the investment potential of the manufacturing industry and its utility effectiveness will help to identify areas for improving the institutional support mechanisms for the sustainable and balanced development of the Russian economy. In this paper, for a quantitative analysis, the investment potential of various segments of the domestic economy will be estimated by the ratio of the value of investments in fixed assets of a certain segment of the economy to the gross value added produced in this segment. *Table 2* shows the corresponding values of this ratio for the segments of the economy, whose total contribution in 2016–2017 amounted to about 60–63% of the gross domestic product. This list includes segments of industry, construction and leading segments of the service sector.

Table 2 data analysis proves that the *Mining* is the most rapidly growing segment of the Russian economy in the reporting period. Its contribution to GDP increased by 1.1%. The contribution

Table 1

The contribution of the manufacturing industry to the export of goods and services of leading countries 2018

Place in the ranking of countries by PPP GDP	Country	Manufactures exports (% of merchandise exports)
1	China	93.6
2	USA	61.9
3	India	70.7
4	Japan	88.1
5	Germany	84.9
6	Russia	22.3
7	Indonesia	43.6
8	Brazil	37.6
9	Great Britain	76.7
10	France	80.3
11	Mexico	82.1
12	Italy	83.5
13	Turkey	80.2
14	South Korea	89.5
15	Spain	69.4

Source: compiled by the authors based on data from the International Monetary Fund and World Bank.

of remaining segments slightly changed. At the same time, the *Wholesale and retail trade; repair of motor vehicles and motorcycles* segment makes the greatest contribution. Thus, the Russian economy structure does not create conditions for sustainable development. The share of manufacturing industry is only 13.5%. It is mainly formed due to the production of medium-tech and low-tech level sectors [4]. This statement is correct for the *Transportation and storage* and *Real estate activities* segments. For this reason, the investment potential of these segments has little effect on the increase in value added.

The literature shows that in developed countries the investment potential is on average at the level of 20% [5]. It contributes to the formation of 2/3 of the GDP growth, since the high-tech and medium-tech high-level sectors contribute the most making up together about 47%[4] [6, 7].

As shown above, in the top 15 countries in the GDP ranking, medium and high technologies contribute more than 50% to the GDP of the manufacturing industry. In Russia they contribute no more than 25%, and the products of these sectors mainly build the export potential of developed countries.

It should be noted that a sufficiently high investment potential in the *Transportation and*

[4] United Nations Industrial Development Organization, 2015. Industrial Development Report 2016. The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development. Vienna. URL: https://www.unido.org/sites/default/files/2015–12/EBOOK_IDR 2016_FULLREPORT_0.pdf (accessed on 22.04.2019).

Table 2

The share of investment in GDP segments of the Russian economy

	Contribution to GDP, %		Share of investment in the sector's GDP, %	
	2016	2017	2016	2017
Mining and quarrying	9.6	10.7	36.4	33.9
Manufacturing	13.4	13.5	20.3	20.4
Construction	6.4	6.1	8.9	10.1
Wholesale and retail trade; repair of motor vehicles and motorcycles	14.7	14.5	5.6	5.4
Transportation and storage	7.2	7.1	43.3	45.0
Real estate activities	10.1	9.9	33.2	32.0

Source: Rosstat data and the authors' calculations.

storage and *Real estate activities* segments has little effect on the pace of their development. This is evidenced by the Rosstat data on investments and economic growth rates in 2014–2017 (*Table 2*). To a certain extent, this is due to the fact that the main focus of investments is not the acquisition of machinery and equipment, but the construction of buildings, structures, dwellings (*Table 3*).

The Rosstat data prove that the cost of machinery and equipment in the manufacturing industry is only 52% of the value of fixed assets. To be the growth driver of Russia's economic growth, it is necessary for the manufacturing industry that the cost of the machinery and equipment made a noticeably greater contribution to the total value of fixed assets of manufacturing industries. The opposite trend follows from the investment structure. It is aimed at increasing the value of buildings and structures. Moreover, only in 40% of organizations machinery and equipment are younger than 10 years; that is, the problem of production assets update is relevant. This conclusion is consistent with the survey of organizations on the objectives of investing in fixed assets. More than 60% of organizations use investments to replace worn-out machinery and equipment. In entrepreneurs' opinion, this is hindered by a lack of own financial resources, a high level of the commercial loan interest rate in the country and the uncertain economic situation. Besides, service enterprises are more economically efficient than manufacturing enterprises. There-

Table 3

Investments in fixed capital by types of fixed assets

	2010	2014	2015	2016	2017	2018
	Percent of total					
Total	100	100	100	100	100	100
including in:						
dwellings	12.2	14.5	15.6	15.4	14.3	13.6
buildings (except residential)and structures	43.3	40.8	43.7	45.2	45.2	43.8
machinery, equipment, means of transportation	37.9	36.3	31.5	30.6	31.8	33.7
other (including objects of intellectual property)*	6.6	8.4	9.2	8.8	8.7	8.9

* The share of investments in intellectual property does not exceed 3%.

Source: Rosstat data and the authors' calculations.

fore, the share of value added in the output for the manufacturing industry is 27%, and for the *Transportation and storage* and *Real estate activities* segments is 45% and 77% respectively. Thus, the current situation favors investment in the service sector to a greater extent than in the manufacturing industry.

Based on the results of the systematic studies initiated by the UNIDO, according to which the manufacturing industry is the growth driver of sustainable economic growth, it can be concluded that the domestic economy does not create conditions for sustainable growth and transition to a new technological structure[5] [8].

FINANCIAL AND ECONOMIC STATUS OF MANUFACTURING INDUSTRIES

Analysis of the investment distribution in fixed assets of the manufacturing industry by its various segments allows to identify the most attractive industries for the investor (*Table 4*) and thus, to determine their development potential.

The data in *Table 4* indicate that the investment attractiveness of manufacturing industries is practically correlated with the position of these industries in output. The sectors determining the technological development of the economy: production of computers, electronic and optical products; machinery and equipment; electrical equipment; medicines occupy positions below 10 out of 23 both in the ranking of investment and output. At the same time, investments in these sectors account for less than 2.5% of the total investment in the manufacturing industry. In general, the share of investments in the manufacturing industry in 1995–2017 was about 14.5%. Over this pe-

[5] United Nations Industrial Development Organization, 2013. Industrial Development Report 2013. Sustaining Employment Growth: The Role of Manufacturing and Structural Change. Vienna. URL: https://www.unido.org/sites/default/files/2013–12/UNIDO_IDR_2013_main_report_0.pdf (accessed on: 22.04.2019); United Nations Industrial Development Organization, 2015. Industrial Development Report 2016. The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development. Vienna. URL: https://www.unido.org/sites/default/files/2015–12/EBOOK_IDR 2016_FULL-REPORT_0.pdf (accessed on 22.04.2019).

riod, the share of investments doubled in such industries as production of coke and petroleum products, chemical production. The share of investments in metallurgy and the production of finished metal products almost did not change.

The share of investments in European industry is 15.3%, which is higher than the corresponding indicator in Russia, while in the countries of Eastern Europe (Hungary, Slovenia, Slovakia and the Czech Republic) it is about 25–28% [9]. It is not surprising that in developed countries with a stable economy, the contribution of the manufacturing industry into GDP is significant[6] [10].

Indeed, despite the global crisis of 2008, in Germany, France, Japan, South Korea in 2000–2012, the contribution to the value added of the manufacturing industry for the production of machinery and equipment increased respectively from 33% to 42%, from 26% to 31%, from 34% to 38% and from 41% to 48%[7]. In Russia, this indicator fell from 19 to 12% over the same period. Investments were directed mainly to the innovative development of production in the medium-tech low-level and low-tech sectors. Thus, the technological backwardness of the domestic economy from developed countries took place.

The analysis of the structure of the investments in fixed assets of the manufacturing industry by funding sources in 2016 shows that the organizations' own funds amounted to 70.3%, the attracted funds — to 29.7%, of which budget funds were 1.7%.[8]

The investments in fixed assets for the production of machinery and equipment (not including motor vehicles, trailers and semi-trailers), chemical and metallurgical industries in the total investment of the manufacturing industry are 6.8%, 19.9% and 13.2% respectively. Thus, the material and technical base of the manufacturing industry has the lowest level of investment.

However, the data on the specific balanced financial result (the balanced financial result per 1000 rubles of the shipped products cost) indicates that the production of computers, electronic and optical products and electrical equipment is quite efficient (*Table 4*). These industries occupy the 7th and the 9th places in the manufacturing industry, despite the fact that they are significantly inferior in terms of investment intensity. Production of tobacco products, metallurgical production and production of chemical products are leading in financial efficiency characterized by a specific balanced financial result.

Noteworthy is the relatively weak financial efficiency of the food industry. It is the 2nd in terms of cost of goods shipped.

Unprofitable manufacturing industries include, but are not limited to, production of machinery and equipment, vehicles and other finished products. Production of machinery and equipment is the most lagging behind, although its products largely determine the technological level of many segments in the Russian economy.

Development prospects for the Russian economy sectors are mainly determined by its competitiveness in the domestic labor market, largely characterized by the relative level of wages of its employees. In terms of wages, production of coke and oil products and production of tobacco products are leading among manufacturing industries (*Table 4*). Wages in these segments exceed wages in the production of machinery and equipment and electrical equipment segments by 2.5 times, and in the production of computers, electronic and optical products by 2 times. It should be noted that in 2010–2017, the indicated difference in wages practically did not change.

Currently, in the Russian economy segments making the largest contribution to GDP, a con-

[6] Forschungsunion, Acatech. Securing the future of German manufacturing industry. Recommendations for implementing the strategic initiative INDUSTRIE 4.0. Final report of the Industrie 4.0 Working Group. April 2013. URL: https://www.acatech.de/Publikation/securing-the-future-of-german-manufacturing-industry-recommendations-for-implementing-the-strategic-initiative-industrie-4–0/ (accessed on 22.04.2019).

[7] World Bank data. URL: https://databank.worldbank.org/data/reports.aspx?source=2&series=NV.IND.TOTL.ZS&country= (accessed on 06.05.2019).

[8] Rosstat official website. URL: http://www.gks.ru/free_doc/doc_2017/invest.pdf (accessed on 06.05.2019).

Table 4

Financial and economic condition of manufacturing industries

No.		Rating of manufacturing industries			Specific net financial result*	Index of wages**	
		by investment in fixed assets	by volume of shipped own-produced goods, works done and services performed	by net financial result		2010	2017
I	Manufacturing including:				59,25	1	1
1	manufacture of food products	4	2	4	39.16	0.85	0.78
2	manufacture of beverages	16	15	9	64.39	1.23	0.99
3	manufacture of tobacco products	18	22	13	172.19	2.56	2.46
4	manufacture of textiles	17	21	16	37.74	0.58	0.58
5	manufacture of wearing apparel	22	23	15	56.29	0.52	0.53
6	manufacture of leather and related products	23	24	20	–27.59	0.6	0.52
7	manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	8	16	18	4.26	0.67	0.67
8	manufacture of paper and paper products	9	14	6	101.16	1.08	1.03
9	printing and reproduction of recorded media	19	18	14	41.69	0.98	0.8
10	manufacture of coke and refined petroleum products	1	1	2	89.48	2.2	2.49

End of Table 4

11	manufacture of chemicals and chemical products	2	4	3	109.93	1.17	1.19
12	manufacture of basic pharmaceutical products and pharmaceutical preparations	14	17	8	108.77	1.14	1.41
13	manufacture of rubber and plastic products	13	11	12	37.10	0.83	0.8
14	manufacture of other non-metallic mineral products	11	8	11	27.94	0.94	0.8
15	manufacture of basic metals	3	3	1	143.76	1.34	1.29
16	manufacture of fabricated metal products, except machinery and equipment	6	5	7	25.43	0.92	0.93
17	manufacture of computer, electronic and optical products	10	9	5	76.51	1.07	1.22
18	manufacture of electrical equipment	15	13	10	47.6	0.96	0.94
19	manufacture of machineryand equipment n.e.c.	12	10	23	–162.38	1	0.97
20	manufacture of motor vehicles, trailers and semi-trailers	7	6	22	–30.86	0.94	0.99
21	manufacture of other transport equipment	5	7	19	1.04	1.18	1.17
22	manufacture of furniture	20	19	17	19.24	0.65	0.58
23	other manufacturing	21	20	21	–26.70	0.79	0.72
24	repair and installation of machinery and equipment	–	12	–	–	1.22	1.09

Note: * – Net financial result per 1000 rubles of the cost of goods shipped;
** – Index of average monthly nominal accrued wages of employees of organizations of various manufacturing industries.
Source: Rosstat data and the authors' calculations.

stant value of the share of wages in gross value added (about 40%[9]) has been established. However, the actual average monthly wage shows a noticeable difference in the Russian economy segments. For further analysis, the values of the average monthly nominal wages of employees of organizations, the average monthly wages in various segments of the economy were compared with the average monthly nominal wages of employees of organizations in the economy (*Table 5*).

Table 5 indicates that the wages in the manufacturing industry are more than 2 times different from the wages of employees in the financial and insurance sectors and in mining operations; they are 1.5 times different from the information and communication sectors. Besides, they are less than the wages of employees in the "Public administration and defence, compulsory social security".

In the ranking of economic sectors in terms of average monthly wages, the manufacturing industry occupied the 9th place in 2010, and the 8th place in 2017. In general, wages in the manufacturing industry stand at the level of the average wage in the Russian economy.

Thus, with the distribution of wage levels by segments of the economy, including manufacturing industries, serious problems arise in the effective use of human capital. The solution to the problem lies in the rapid development of high-tech manufacturing industries [11]. This will increase the gross value added produced by the real sector of the economy. However, it requires a marked rise in investment potential, at least up to 40–50% of the gross value added.

Further analysis shows the investment attractiveness of enterprises with different types of ownership (*Table 6*).

Table 6 presents the data on the intensity of investment in fixed assets of manufacturing enterprises. This indicator is determined by the ratio of investments in fixed assets of enterprises to the volume of output. The indicator measures investments per 100 rubles of manufactured products.

Table 6 indicates that the tactics of expanding production through investment in fixed assets gives maximum results in the chemical production sector. At the same time, joint Russian and foreign ventures and domestic private enterprises are leading. It should be noted that they produce 14% and 57% of the production sector respectively. Thus, in the sector as a whole, output will increase.

It is noteworthy that the highest investment values per 1 ruble of the cost of shipped products are observed at enterprises with joint Russian and foreign ownership. At the same time, domestic enterprises of a private type of ownership, the leaders in the share of output in various segments of the manufacturing industry, do not lead by the indicator mentioned above. In the other sectors presented in *Table 6*, they take 4–5th places by this indicator, but the production of rubber and plastic products.

Thus, the existing structure of investments in fixed assets of manufacturing enterprises does not fully contribute to the development of its various segments. The relatively weak investment activity of domestic enterprises of private ownership is apparently due to the low profitability of production because of its technological backwardness. Apparently, the source of financing at enterprises of joint Russian and foreign ownership is the parent company of foreign business participants in Russia. However, their interest in business development varies in different sectors of industry. Thus, enterprises of the production of electrical equipment, electronic and optical equipment sector have the lowest rate value of investment for enterprises of this ownership type. At the same time, their share in the output of this segment of the manufacturing industry is only 3%. Thus, foreign capital has little interest in the development of high-tech manufacturing sectors.

Let us calculate the share of gross value added in the output to characterize the economic efficiency of the production in various segments of the manufacturing industry (*Table 7*).

[9] Rosstat official website. URL: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/wages/ (accessed on 06.05.2019).

Table 5

Index of average monthly nominal accrued wages of employees of organizations in various segments of Russian economy

No.		2010	2017	No.		2010	2017
I	Total economy	1.00	1.00				
1	Financial and insurance activities	2.39	2.17	10	Строительство / Construction	1.02	0.86
2	Mining and quarrying	1.90	1.90	11	Wholesale and retail trade; repair of motor vehicles and motorcycles	0.88	0.82
3	Information and communication	1.45	1.50	12	Human health and social work activities	0.75	0.82
4	Professional, scientific and technical activities	1.59	1.46	13	Education	0.67	0.77
5	Electricity, gas, steam and air conditioning supply	1.22	1.14	14	Real estate activities	0.85	0.77
6	Transportation and storage	1.19	1.12	15	Water supply; sewerage, waste management and remediation activities	0.78	0.74
7	Public administration and defence; compulsory social security	1.20	1.11	16	Сельское, лесное хозяйство, охота, рыболовство и рыбоводство / Agriculture, forestry and fishing	0.53	0.66
8	Manufacturing	0.91	0.98	17	Accommodation and food service activities	0.64	0.61
9	Arts, entertainment and recreation	0.73	0.98				

Source: Rosstat data and the authors' calculations.

Table 6

The intensity of investment in fixed assets of manufacturing enterprises, 1 ruble of investments per 100 rubles of issue 2017

No.		Russian including				Foreign	Joint Russian and foreign
		State	Municipal	Private	Mixed Russian		
I	Manufacturing	5.7	4.9	4.8	3.0	5.1	9.6
	Including:						
1	chemical products	7.2	14.1	14.4	7.2	8.2	20.8
2	rubber and plastic products	4.2	–	2.1	9.8	6.7	6.5
3	basic metals and fabricated metal products	9.3	3.8	3.6	4.7	2.7	11.0
4	machinery and equipment n.e.c.	1.2	8.4	3.1	3.9	6.4	9.2
5	electrical and optical equipment	6.2	2.2	2.4	4.2	2.0	3.8

Source: Rosstat data and the authors' calculations.

It is noteworthy that the lowest economic efficiency in non-financial corporations is observed in the *Manufacturing industries* segment. Note that it is in these corporations that the bulk of the products of the corresponding segment are produced. The noted feature of the relatively low economic efficiency of manufacturing industries is also observed for government enterprises, households, and non-profit organizations serving households. Thus, the manufacturing industry cannot become a growth driver of Russia's economic development without a noticeable increase in its economic efficiency.

This leads to the fact that even in the domestic market, most products of domestic manufacturing industries are not competitive with imported products. This is evidenced by the results of the data analysis from *Table 8* which presents the following indicators:

Table 7

Gross value added by industries and sectors / output by industries and sectors

	2015					2016				
	a	b	c	d	e	a	b	c	d	e
Mining and quarrying	66.4	–	46.4	–	66.4	64.8	–	45.2	–	64.8
Manufacturing	29.1	46.5	15.1	–	28.7	27.5	43.6	14.2	–	27.2
Construction	47.7	0.0	46.1	–	47.6	49.6	0.0	47.5	–	49.5
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	58.3	–	60.7	–	58.7	55.7	–	58.8	–	56.2
Transport, storage and communication	46.5	55.3	50.1	–	46.8	45.5	52.5	50.1	–	45.9
Real estate, renting and business activities	64.1	75.0	82.5	77.3	71.0	63.5	71.8	82.1	76.9	70.2

Note: a – non-financial corporations;

b – general government;

c – households;

d – non-profit institutions serving households;

e – total by sector.

Источник / Source: данные Росстата и расчеты авторов / Rosstat data and the authors' calculations.

1. *The share of the cost of domestic products of the i^{th} product group in the total value of these products sold in the domestic market defined as*

$$Qinside_i = \frac{P_i - E_i}{P_i - E_i + I_i},$$

where $Qinside_i$ is a share of the cost of domestic products of the i^{th} product group in the total cost of products sold on the domestic market; P_i is domestic production of the i^{th} product group; E_i is export of domestic products of the i^{th} product group; I_i is import of products of the i^{th} product group.

The indicator characterizes the competitiveness level of domestic products in the domestic market [12].

2. *The share of the value of export products of the i^{th} product group in the total value of these products* defined as

$$E\ potential_i = \frac{E_i}{P_i},$$

where $Э\ potential_i$ is a share of the value of export products of a particular commodity group of the manufacturing industry in the total value of this manufactured product; E_i is export of domestic products of the i^{th} product group; P_i is domestic production of the i^{th} product group.

The indicator characterizes the competitiveness level of domestic production on the foreign market for a particular product group and can take values from 0 (absolute dependence on imports) to 100% (absolute independence on imports) [12].

3. *The index of foreign trade turnover of domestic products in the foreign market calculated as*

$$I\left(for.turn.\right)_i = \frac{E_i - I_i}{E_i + I_i},$$

where $I\left(for.turn.\right)_i$ is the index of foreign trade turnover of domestic products of the i^{th} product group in the foreign market; E_i is export of domestic products of the i^{th} commodity group; I_i is import of products of the i^{th} commodity group.

The indicator characterizes the position of domestic products on the global market, its value ranges from –100% (absolute non-competitiveness) to + 100% (absolute competitiveness) [15].

The results of the analysis indicate that in the domestic market the provision of Russia's needs for machinery, equipment and vehicles, chemical products, plastics, elastic gum and rubber is carried out mainly due to imported products. On the contrary, the need for products from the *Metals and products made of them* commodity group in the domestic market is basically provided by domestic production. It should be noted that the provision of the first three of these product groups by domestic production is reduced by an average of 5%. The export potential of the Russian manufacturing industry increased. However, it happened mainly due to the products of industries included in the medium-tech segment of the low level (*Table 9*).

In the structure of exports, the products of industries included in the medium-tech low level and low-tech sectors are more than 80%. The low technological level of the manufacturing industry is evidenced by the cost structure for the production and sale of products. According to the Rosstat, material costs account for 75.3%, and for labor costs only for 8.7%. This does not allow the effective use of human capital to solve the problem of increasing the competitiveness of domestic industry.

In the context of the transition of the world economy to the sixth technological order to increase the competitiveness of domestic products in the global market, it is necessary to significantly change the cost structure for technological development presented in *Table 10*.

Table 10 data analysis shows that the cost of creating new technologies in Russia is only 25.2%, and in developed countries is more than 50%.[10] It can be concluded that innovative activity in manufacturing organizations aims at the reproduction of products using technologies borrowed from developed countries. Thus, to ensure a technological breakthrough in the manufacturing industry, it is necessary not only to increase the investment potential, but also fundamentally change its structure in terms of cost.

The Rosstat data analysis on the costs of organizations for technological innovations by funding sources in 2017 showed that 2/3 of the total costs are the organizations' own funds. The federal budget amounted to 12%, and the regional and local budgets totaled in 0.4%. Given the low profitability of the manufacturing industry (10.9%) and the high interest rate on commercial loans, it is difficult to expect an increase in the cost of technological development at the expense of or-

[10] Gorodnikova N.V., Gokhberg L.M., Ditkovskii K.A. and others. Indicators of Innovation: 2018. Statistical Book. National Research University I60 "Higher School of Economics". M.: NRU HSE; 2018. P. 344. URL: https://www.hse.ru/data/2018/03/23/1164003717/Indicators_of_Innovation_2018.pdf (accessed on 23.04.2019).

Table 8

The share of provision of domestically produced products to the needs of the domestic market for various product groups, export potential and the index of international cooperation in the exchange of goods from various sectors of manufacturing industry

		2016			2017		
No.	**Product group**	**a**	**b**	**c**	**a**	**b**	**c**
1	Machinery, equipment and vehicles	24.9	36.9	–67.5	20.3	41.2	–69.6
2	Chemical industry products	52.7	34.6	–25.9	48.0	38.9	–26.0
3	Plastics, caoutchouc and rubber	49.1	32.6	–36.4	44.0	38.0	–35.0
4	Metals and products from them	88.1	25.4	43.1	83.0	32.5	40.5

Note: a – the share of the cost of domestic products of a particular commodity group in the total value of these products sold on the domestic market;

b – the share of the value of export products of a specific product group in the manufacturing industry in the total value of these manufactured products;

c – index of foreign trade turnover of domestic products on the foreign market.

Source: compiled by the authors based on data from Rosstat and the Federal Customs Service.

Table 9

The structure of the export potential of the manufacturing industry, %

	2016			2017		
	a	**b**	**c**	**a**	**b**	**c**
Manufacturing	22.8	24.9	100	23.1	24.9	100
High tech	23.7	15.0	4.3	5.6	6.1	1.0
Medium-high-technology	14.2	16.1	12.6	18.2	17.8	16.4
Medium-low-technology	27.1	36.7	70.4	30.2	34.1	74.4
Low-technology	17.4	8.9	7.9	26.0	10.2	7.8

Note: a – export potential of the innovation sector;

b – export potential of total production;

c – structure of total exports.

Source: compiled by the authors on the basis of data from the Rosstat Collection "Science. Technology. Innovations", 2017–2019.

Table 10

The cost of technological innovation of manufacturing organizations by type of innovation and economic activity in 2017

No.	Type of innovation and economic activity	bln roubles	%	No.	Type of innovation and economic activity	bln roubles	%
1	Acquisition of machinery and equipment	282.4	46.3	6	Design	9.4	1.5
2	R&D	144	23.6	7	Acquisition of new technology	9.5	1.6
3	Engineering	99.1	16.2	7,1	Of which acquisition of patent rights, licenses	5	0.8
4	Other expenditures	53.9	8.8	8	Personnel training	1.3	0.2
5	Acquisition of software	10.3	1.7	9	Market research	0.4	0.1
10	Total	610.2	100				

Source: Rosstat data and the authors' calculations.

ganizations' own and borrowed funds. In addition, the sanctions limit the increase in foreign direct investment in the manufacturing industry. Currently they make up 0.3% of organizations' costs for these purposes.

It should be noted that the production of machinery and equipment is also not given due attention in the constituent entities of the Russian Federation. Indeed, 63% of the total volume of manufacturing products is produced by 15 constituent entities of the Russian Federation (*Table 11*).

It is noteworthy that in five constituent entities of the Russian Federation listed above, the manufacturing industry contributes less than 20% to the gross regional product (GRP). At the same time, in eight regions, mechanical engineering contributes less than 10% to the value added of the manufacturing industry. As shown above, this figure exceeds 30% in the structure of the manufacturing industry of economically developed countries. Production of computers, computer technology, electrical equipment, electronic and optical equipment

Table 11

Main indicators of the state of manufacturing industry leading by the level of industrial development of regions of the Russian Federation

No.	Субъект РФ	a	b	c	d	e
1	Moscow	14.95	12.00	4.40	6.20	8.70
2	Moscow region	5.96	20.80	10.50	8.90	9.70
3	St. Petersburg	5.81	16.70	5.20	10.70	27.60
4	Sverdlovsk region	4.54	30.90	4.60	4.20	12.90
5	Republic of Tatarstan	4.02	18.70	18.90	4.80	20.90
6	Tyumen region	3.95	3.80	11.20	1.00	1.70
7	Chelyabinsk region	3.44	35.50	3.10	2.80	9.50
8	Nizhny Novgorod Region	3.20	30.70	9.20	5.60	20.70
9	Republic of Bashkortostan	2.79	27.50	18.30	2.10	14.10
10	KKrasnoyarsk region	2.62	31.80	2.60	1.10	2.40
11	Samara region	2.57	22.40	20.70	5.50	41.20
12	Perm region	2.48	31.80	26.00	5.00	8.90
13	Leningrad region	2.44	30.80	5.50	3.00	12.70
14	Krasnodar region	2.35	11.40	2.70	0.90	3.90
15	Omsk region	2.04	37.30	6.50	2.80	3.10

Note: a – the average share of volume of shipped own-produced goods, works done and services performed by the manufacturi ng industry enterprises of regions of the Russian Federation in the total cost of the relevant goods, works and services of the manufacturing industry of the Russian Federation in 2015–2017, %;

b – contribution of the manufacturing industry to the gross regional product, %;

c – the share of production of chemicals and chemical products and production of medicines and materials used for medical purposes in the products of the manufacturing industry, %;

d – the share of production of computers, electronic and optical products and production of electrical equipment in manufacturing products, %;

e – the share of production of machinery and equipment not included in other groups; the production of motor vehicles, trailers and semi-trailers; production of other vehicles and equipment in manufacturing products, %.

Source: Rosstat data and the authors' calculations.

play an insignificant role in the structure of the manufacturing industry of these subjects of the Russian Federation. Thus, it can be concluded that in Russia low-tech industries play a leading role in the manufacturing industry.

CONCLUSIONS

The dynamic analysis of the economies of developed countries shows the significant role of investments in fixed assets of the manufacturing industry in creating conditions for sustainable development.

The study results indicate that the manufacturing industry is not the dominant factor in economic growth in Russia. It takes the 2nd place in terms of the share of contribution to GDP and the 4th place in the rating of investments in the gross value added produced there. The leading positions in terms of the share of contribution to Russia's GDP belong to services industries.

The low investment potential of the manufacturing industry preserves the lack of competitiveness of its products not only in the external, but also in the domestic markets, especially in the segments of high-tech products.

The structure analysis of investments in fixed assets of the manufacturing industry shows that they do not contribute to technological development. The main focus of investments is buildings and structures, and not intellectual property and the acquisition of machinery and equipment. As a result, the machinery and equipment are older than 10 years in 40% of organizations. Entrepreneurs note that they do not have the opportunity not only to introduce innovations, but also to replace the worn-out equipment. Consequently, the contribution of machinery and equipment to the gross value of manufacturing fell by 30% in 2000–2012. In contrast, in countries such as Germany, Japan, South Korea, France, it increased by an average of 10%.

The technological backwardness of the Russian manufacturing industry is being preserved, since innovation activity is mainly aimed at the development of the low-tech mid-level and low-tech manufacturing sectors and production using technologies borrowed from developed countries.

The actual wages in the manufacturing industry is 2 times less than in the sectors of finance, insurance, mining and few other industries. This determines the low competitiveness of the manufacturing industry, especially its high-tech segments in the labor market in Russia. As a result, the use of human capital faces serious problems.

Today, the own funds of organizations are the main source of investment in fixed assets of the manufacturing industry. The low profitability of its production and the high interest rate of loans limit the possibility to significantly increase investment in fixed assets. Chemical industry enterprises are most attractive for investors among other manufacturing industries. Among enterprises of various types of ownership in all sectors of the manufacturing industry, enterprises with foreign and joint Russian and foreign ownership are attractive for investors, although most of the output is provided by Russian private companies. It should be noted that foreign capital is not interested in the development of industries that determine technological progress in the Russian economy.

It is noteworthy that enterprises producing computers, electronic and optical products, electrical equipment with a specific balanced financial result are quite effective. However, in terms of the share of investments in fixed assets of the manufacturing industry, they have the lowest values of the share of gross value added in output among all economic segments in Russia.

National project "Labor Productivity and Employment Support" is implemented in the constituent entities of the Russian Federation. However, the structure of the manufacturing industry in the regions shows that the leading positions belong to low-tech and low-tech industries. This significantly limits the ability of the constituent entities of the Russian Federation to ensure the implementation of the Strategy for the scientific, technological and socio-economic breakthrough of Russia.

Thus, at the federal level it is relevant to lay out a priority development program of production in the high-tech and medium-tech

high-level sectors with a 10–15-year horizon, indicating the following objectives:

- the contribution of high-tech and medium-tech high-level products to the total volume of shipped products should be at least 50%; 20% of them should be products of high-tech industries;
- the share of the manufacturing industry in Russia's GDP should be at least 20%;
- the share in the export of manufacturing products should be at least 60%, with at least 20% of high-tech products;
- the domestic market should be supplied with high-tech domestic products by at least 50%.

To manage and coordinate this program implementation, it is advisable to create an overseas executive body. It will accumulate all necessary financial resources to carry out the tasks for Russia to move to the next stage of technological development. The positive experience of creating such an authority has been demonstrated in the military-industrial complex.

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