Manufacturing Industry as a Driver of Technological Development of the Russian Economy

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Abstract*: The paper substantiates the necessity of taking into account in the formation of the non-commodity model of the economy of the advanced development of the manufacturing industry as a driver of economic growth in Russia. To determine the conditions under which the manufacturing industry of Russia is a driver of economic growth. Research of economical and technological condition of Russia is carried out. Its comparison with the patterns of development of the manufacturing industry in the world economy shows the archaic nature of its technological structure. The directions of the advanced development of the manufacturing industry were determined, allowing it to generate synergistic effects for the development of the economy as a whole. Practical application of the research results will contribute to the validity of assessments of the effectiveness and sustainability of the sectoral complex of the country, and will allow to identify the potential opportunities and reserves for the development of industries and sectoral complexes based on the results of a multi-criteria evaluation, as well as minimize risks.

***Keywords*: gross value added, industry analysis, level of imbalance, OECD, sustainability coefficient, sustainable development, volume indices of output.**

I. INTRODUCTION

In business circles and the expert community, representatives of the executive and legislative branches widely discuss the conceptual provisions of the investment and innovation development model. The paper substantiates the necessity of taking into account in the formation of the non-commodity model of the economy of the advanced development of the manufacturing industry as a driver of economic growth in Russia.

In Russia, a consensus has emerged that sustainable socio-economic development of the country, ensuring its defense capability in the context of growing geopolitical tensions can be realized only within the framework of the investment innovation model of the Russian economy. At the same time, when solving its structural problems, it is necessary to take into account the factors determining the dynamics of the global economy. System studies have shown that at various stages of development of the national economy [1], the manufacturing industry is the driver of its development. This is evidenced by the following statistics:

- A marked increase in the contribution of manufacturing value added in manufacturing to world GDP. In 2014, this contribution reached a record level of more than 9 trillion dollars.
- The manufacturing industry is the main driver of growth in world export, in 2013, world trade reached a peak of more than $ 18 trillion, of which 84.0% are manufactured goods.
- The development in the manufacturing sector of the high-tech sector has contributed to the active introduction of telecommunications and information technologies into the economic turnover, which determine the functional appearance of many sectors of the economy. Studies initiated by UNIDO have shown that the manufacturing industry is the engine of economic growth. At the same time, depending on its technological structure, the mechanisms of its impact on the economic development of the country change [2].

II. PROPOSED METHODOLOGY

The paper formulates a methodology for assessing the influence of various factors on the development of the manufacturing industry in Russia and the mechanisms of its impact on the domestic economy. Using the methods of systemic, functional-structural and logical analysis, the features of the influence of the manufacturing industry on economic growth depending on the income level of the population have been revealed [2].

With low incomes of the population, the dominance of low-tech industries in the structure of the manufacturing industry becomes an impetus for the accumulation of labor, which contributes to increasing the level of employment and improving the quality of life. The maximum value of the share of low technologies in the structure of the manufacturing industry reaches 39%. However, the potential for economic growth due to the development of low technologies is limited; it does not exceed the income level of the population of $ 8,000. For the further development of the

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economy, it is necessary to change the technological structure of the manufacturing industry due to the priority development of the high-tech sector [3]. At the same time, at the initial stage, there is an increase in employment growth and a rapid growth in value added. This growth provides an active impact on the economic growth of related technologies and contributes to an increase in the income of the population from 8,000 to 14,000 US dollars (Fig. 1).

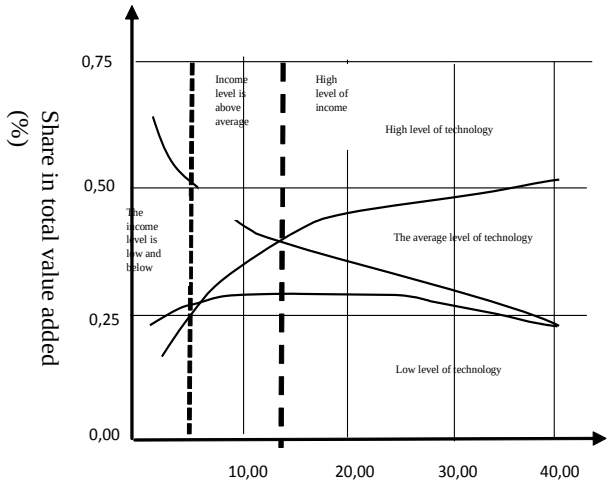

Fig. 1. Dynamics of the technological structure of the manufacturing industry depending on the level of income of the population*[1]

With incomes of more than $ 18,000, the high-tech sector, which provides a significant increase in incomes of the population, becomes the dominant sector in the structure of the manufacturing industry. Increasing the share of the high-tech sector to more than 50% contributes to raising the income of the population to 40,000 or more dollars. The leading industries in this sector are the production of chemicals, which reproduce $ 500 of value added and the production of electrical machinery and equipment (production of value added $ 300). It should be noted that the industries related to medium and low technologies have maxima in the production of value added below $ 100. This indicates a limited opportunity to influence the economic growth of these industries. The reasons lie in the lower sensitivity of these industries to the replacement of labor with capital in relation to branches of the high-tech sector. It should be noted that significant synergistic effects of increasing the share of high technologies in the structure of the manufacturing industry. If at the initial stage of the development of high technologies the growth of the economy is due to the increase in the value added of the products produced, then at the next stage economic growth occurs due to synergistic effects of manufactured products. For example, the use of computers in many sectors of the economy has increased labor productivity noticeably, the range of services provided has expanded, new market segments have appeared [4]. To a certain extent, this causes a slight decrease in the contribution of domestic manufacturing to the national GDP, and contributes to an increase in the contribution of the services sector. With a high level of economic development (more than $ 15,000 per capita), spheres of interaction between segments of the economy and the manufacturing industry (for example, services related to the manufacturing industry) are formed. The economic growth of developed countries is due to investment and innovation in high-tech industries. This leads to an increase in employment in the services sector related to these sectors and contributes to the development of knowledge-intensive industries and an increase in the quality of life [5].

III. RESULT ANALYSIS

Attention is drawn to the significant effect of the growth of the high-tech sector on the level of specific production of leading manufacturing industries (Table I). With an increase in GDP per capita by 4 times, there is an increase in the specific production in the industries of "production of chemicals", "production of electrical machines and equipment", "engineering and equipment production" in 7-8 times the size. At the same time, in industries related to medium and low technologies such as “food and beverage production” and “metallurgical industry”, their specific production levels are saturated (the value added values in the interval from 30,000 to 40,000 GDP remain almost unchanged per capita).

Table I: Value added per capita (US $)

Sectors / GDP per capita, US $	**10 000**	**20 000**	**30 000**	**40 000**
Chemical production	70	200	350	500
Food and beverage production	150	250	300	320
Manufacture of electrical machinery and equipment	50	150	270	340
Machinery and equipment manufacturing	25	100	160	195
Metallurgical industry	50	90	110	112

Studies show that the development of the manufacturing industry contributes to the redistribution of jobs among the various segments of the manufacturing , in particular, for each workplace in the manufacturing industry there are 2-3 working places in other industries [6].

Arguably, the line between manufacturing and related services has become more blurred. This is due to the fact that all large-scale industrial enterprises outsource functions that are not related to the main operating activities. The development of the high-tech sector contributes to the competitiveness of manufacturing products in global markets. In countries leading in economic

[1] CIC (Center for International Comparisons), 2009. Penn World Table 6.3. Database. Philadelphia, PA. Access mode <http://pwt.sas.upenn.edu>. Circulation date: September 2013

development, 16 to 26% of manufactured manufacturing products are exported to world markets for high-tech products (Table II).

Table II: Exports of high-tech goods (% of products of the manufacturing industry)

Country	2012	2013	2014	Place in the ranking
China	26,274	26,965	25,372	1
France	25,367	25,897	26,093	2
Great Britain	21,739	21,865	20,647	3
USA	17,777	17,819	18,229	4
Germany	15,976	16,080	16,002	5
Russia	8,375	10,006	11,452	10

In world exports of medium and high-tech products of the manufacturing industry is 58%. This leads to the fact that in the structure of the total exports of these countries, manufacturing products account for at least 60% (Table III). The high level of competitiveness of manufacturing products produced by the high-tech sector leads to the fact that its products are the dominant contribution to the overall national exports of the leading countries.

Table III: The share of exports of processed products in total exports by countries of the world (%)

Country	2011	2012	2013	2014	2015	2016
China	93	94	94	94	94	94
Germany	83	84	83	84	84	84
France	76	77	77	78	79	80
Great Britain	63	66	69	74	78	79
Japan	89	90	88	88	88	89
Russia	13	16	17	17	21	22
USA	64	63	62	62	64	63

This circumstance is a factor in the sustainability of the economic development of the countries of the leaders.

The above-noted patterns of the effect of changes in the technological structure of the manufacturing industry on the economic growth of the national economy must be taken into account when forming the non-resource model of the Russian economy. It should be noted that there is a significant difference in the technological structure of the manufacturing industry in Russia and countries with per capita income close to Russia. On average, for countries with a per capita income equal to Russia, the share of high, medium and low technologies is respectively: 40% - high technologies, 29% - medium, 31% - low. In Russia, the technological structure of the manufacturing industry [1] is characterized as follows: 26.1% high technology[2], 50.2% average technology and 23.7% low technology.

The low level of development of the high-tech sector in comparison with the world level for countries with the same income level as Russia causes low competitiveness of the products of the processing industry of Russia in global markets. For the period 2011-2016 the contribution of the manufacturing industry to total exports does not exceed 22%, while in developed countries and China it exceeds 63% (Table III).

Thus, the key problem for the development of the Russian economy is the low level of contribution to the industrial production of the high-tech sector.

IV. CONCLUSION

As follows from the regularities of changes in the technological structure of the manufacturing industry with an increase in household incomes at lower income levels than in Russia, the share of high and medium technologies would have to be equal. Thus, we can conclude that the technological structure of Russia is archaic. At present, the high technology sector's contribution to manufacturing output is actually lower than the average contribution of poor countries with incomes of around $ 5,000 per year. This circumstance limits the ability of the manufacturing industry to be a driver in the development of the domestic economy.

Therefore, to ensure sustainable socio-economic development of Russia in the medium and long term the outpacing development of the high-tech sector and the high-level medium technology sector is necessary. The development of these industries will create a condition for improving the competitiveness and economic efficiency of industries related to the development of economic infrastructure and, above all, information and communication infrastructure (aviation, maritime, road transport, roads, ports, airfields, communications, navigation, and material and non-material resources of the digital economy). When forming a roadmap of changes in the technological structure of the manufacturing industry, it is necessary to take into account the laws and trends of the world economy.

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