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DEVELOPMENT TREND ANALYSIS OF MACHINE-BUILDING ENTERPRISES IN UKRAINE

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АНАЛІЗ ТЕНДЕНЦІЙ РОЗВИТКУ МАШИНОБУДІВНИХ ПІДПРИЄМСТВ УКРАЇНИ

The issue of analysis of trends in the development of machine-building enterprises in Ukraine is concerned within the current article. The system generates a complete dossier for each company in Ukraine based on open data, monitors changes in state registers and visualizes relations between affiliates. Machine building is traditionally considered as the driver of Ukrainian economy development, with trends characterizing the machine-building industry being downward and negative. In spite of the fact that machine building ranks third by the share in the total volume of industrial production, the trend allows us to characterize the situation as critical. As a result of the research, trends and structural characteristics of industrial development are analyzed. One of the main reasons for the downward trends in the development of domestic machine building is the critically low domestic demand for equipment manufactured in Ukraine. During the 2000s, a large part of major equipment was purchased from European manufacturers Danieli and Siemens in order to modernize domestic metallurgy. In particular, the shares of products by the most powerful types of industrial activity in the total volume of industrial production of Ukraine were studied. Indicators of net profit (loss) of machine-building enterprises in our country are given, the share of value added in the costs of domestic machine-building enterprises is determined. Attention is paid to the dynamics of changes in the profitability of machine-building enterprises and trends in their sales in recent years. In general, it should be noted that the sales structure of machine-building products indicates the dominance of the third technological paradigm, which makes it impossible to reckon Ukraine among the countries characterized by high potential for efficient development in the future. The critically low share of machine-tool products draws attention in the sales structure of machine-building products. A study of changes in the volume of exports of Ukrainian enterprises in the field of mechanical engineering, the functional structure of export products of this industry. Conclusions are made regarding the place and role of Ukrainian machine-building enterprises in global markets. In accordance with experts, one of the critical problems of domestic machine-building enterprises is the outdated technological infrastructure. Despite the fact that Ukrainian machine-building enterprises became attractive investment targets for European investors in 2015–2016, it is still worth noting that the "raw material orientation" is associated with domestic manufacturers, as machine-building enterprises sell man-hours even in the high-tech industrial sector instead of intelligence. In general, there were no significant changes in the export structure

of machine-building products in terms of manufacturability during 2010–2016; the products of the third technological paradigm remain the priority.

У статті підіймається питання аналізу тенденцій розвитку машинобудівних підприємств в Україні. У результаті дослідження обґрунтовано тренди та структурні характеристики розвитку промисловості. Зокрема, досліджено частки продукції за найпотужнішими видами промислової діяльності в загальному обсязі промислового виробництва України. Наведено показники чистого прибутку (збитку) машинобудівних підприємств в нашій країні, визначено частку доданої вартості у витратах вітчизняних машинобудівних підприємств. Звернуто увагу на динаміку зміни показників рентабельності машинобудівних підприємств та тенденції їх продажів протягом останніх років. Проведено дослідження змін обсягу експорту продукції вітчизняних підприємств галузі машинобудування, наведено функціональну структуру експортної продукції представників цієї галузі. Зроблено висновки стосовно місця та ролі вітчизняного машинобудування на глобальних ринках.

Keywords: *machine-building, industrial production, export-import, value added, profitability, investment.*

Ключові слова: *машинобудування, промислове виробництво, експорт-імпорт, додана вартість, прибутковість, інвестиції.*

Introduction. In modern economic researches, scientists emphasize that one of the priority factors that determine the quality of economic growth of any country is the advanced development of innovation sectors of economic activity and industries, and, above all, machine building. Machine building ranks first in the world among other industries by the number of employees. Machine-building products account for 38% of the value of world industrial production [3]. The leading countries, which account for 80% of world exports of machine-building products, are the most economically developed countries in the world: the USA, Japan, Germany, France, Great Britain, Italy, and Canada [3].

Analysis of recent research and publications. Recently, researchers have shown an increased interest in machine building trends and the branch profitability. In particular, the attention should be paid to a great measure of analytical reports on industrial development, including: Statistical reports on industry development in Ukraine [4; 9] YouControl [2] that is an analytical system for compliance, market analysis, business intelligence, and investigation. The system generates a complete dossier for each company in Ukraine based on open data, monitors changes in state registers and visualizes relations between affiliates. The unique technology allows to obtain up-to-date (at the time of request) information about the company or FLP from more than 50 official data sources.

Formulation of the objectives. Recent developments in the field of Ukrainian industry have led to a renewed interest in machine-building. Thereby, the development trend analysis of machine-building enterprises in Ukraine is considered as the main objective of the current research.

Results of the research. In Ukraine, machine building is traditionally called the driver of Ukrainian economy development, with trends characterizing the machine-building industry being downward and negative. In spite of the fact that machine building ranks third by the share in the total volume of industrial production (Figure 1), the trend allows us to characterize the situation as critical.

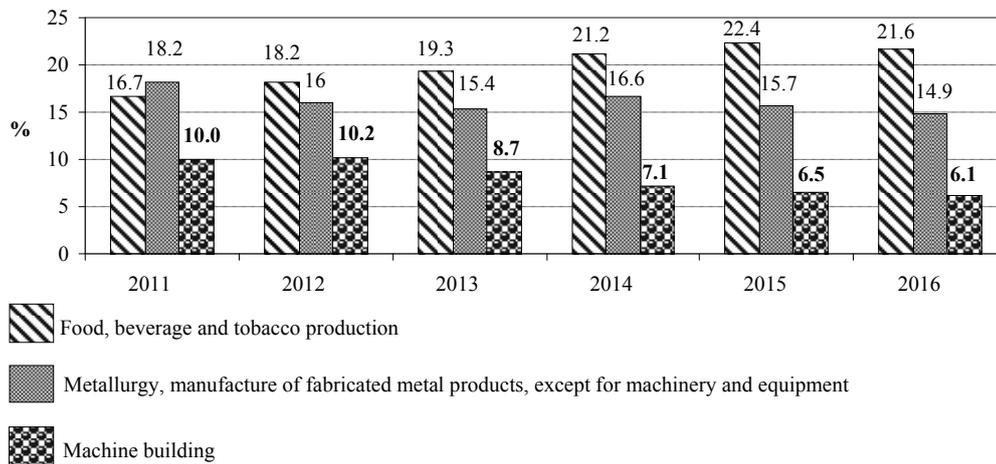


Figure 1. Shares of products by the most powerful types of industrial activity in the total volume of industrial production of Ukraine in 2011–2016

Source: Calculated in accordance with the data [10; 11]

In 1990, the share of machine-building products was 30.5% in the total volume of industrial production; it was 10.0% in 2011 and 6.1% in 2016. For reference, this indicator ranges from 30% to 55% in economically developed countries [4].

One of the main reasons for the downward trends in the development of domestic machine building is the critically low domestic demand for equipment manufactured in Ukraine. During the 2000s, a large part of major equipment was purchased from European manufacturers *Danieli* and *Siemens* in order to modernize domestic metallurgy. For example, USD 600 million was spent on imported machinery for the modernization of Donetskstal PrJSC. The TIS infrastructure company ordered equipment from the Chinese corporation *ZPMC* and paid EUR 26.5 million. In 2014, DTEK Group purchased 30 road headers worth USD 700 thousand from *SANY Heavy Equipment*. However, similar equipment is manufactured by Yasynuvata Machine Building Plant OJSC. The customers state that the lifetime of domestic machines is less than 20%. In addition, the foreign manufacturers offer more attractive terms of warranty and service [1].

Since 2014, when Ukraine began to lose the Russian market due to the Russian-Ukrainian political relations, which was the main platform for the sale of machine-building products manufactured in Ukraine, the financial and economic performance of the machine-building enterprises in Ukraine became negative. For example, over the last four years, domestic car manufacturing companies have reduced the output of freight cars by 50 times [9], which has undoubtedly had a negative impact on both foreign exchange budget revenues and exports of machine-building products. Since 2014, the machine-building enterprises are characterized by unprofitability¹ (Figure 2). The share of value added decreased from 14.68% in 2012 to 9.94% in 2016 (Figure 3) in accordance with the expenses in the overall industrial value. Operating profitability had a positive trend during 2014–2016 but did not provide a positive profitability value for all activities in 2016 (Figure 4).

Net profit and loss in UAH thousand

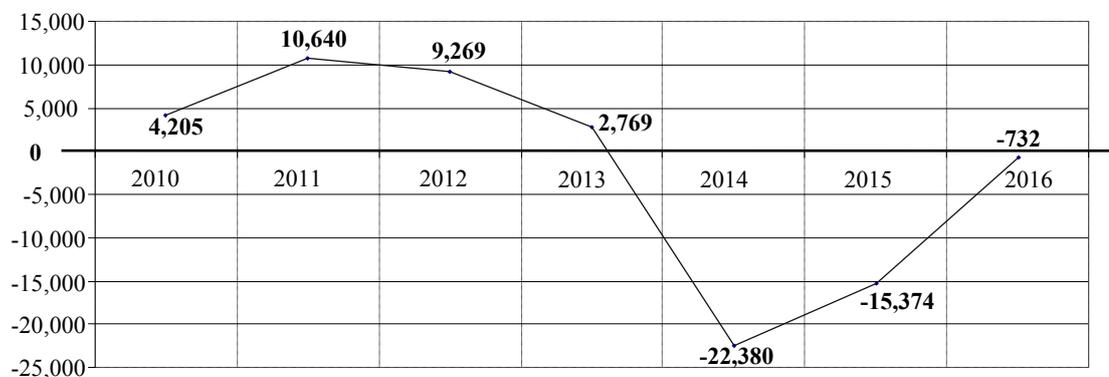


Figure 2. Indicators of net profit (loss) of machine-building enterprises in Ukraine in 2010–2016

Source: Formalized in accordance with the data [5]

¹ In accordance with a net profit

Value added in expenses,% in accordance with the overall industrial value

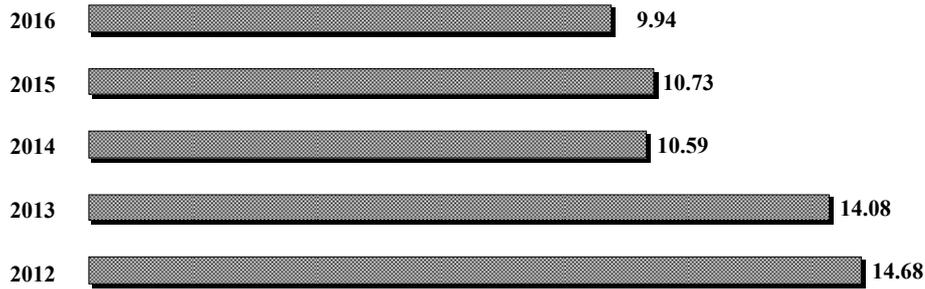


Figure 3. Indicators of the share of value added in the expenses of domestic machine-building enterprises in 2012–2016

Source: Formalized in accordance with the data [5]

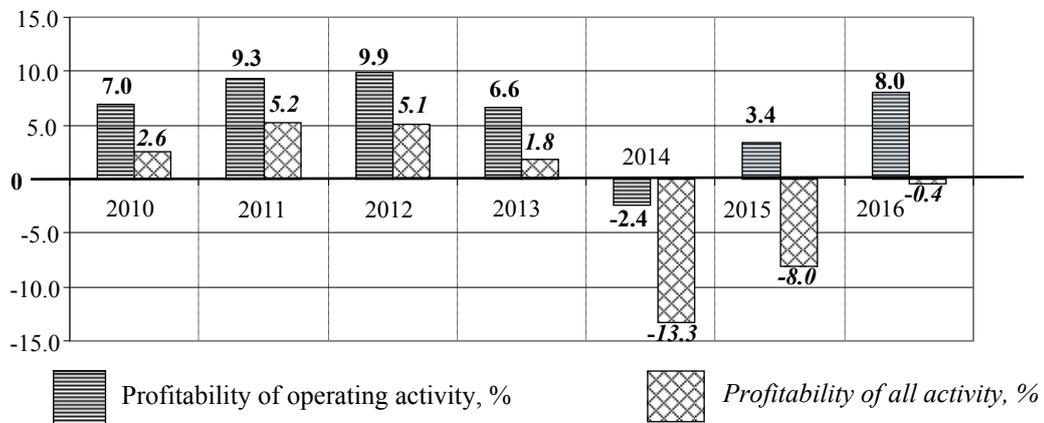


Figure 4. Profitability indicators of machine-building enterprises in Ukraine in 2010-2016

Source: Formalized in accordance with the data [5]

If we analyze the sales structure of machine-building products made by domestic enterprises during 2010–2016 (Table 1), we can say that no significant changes occurred, except that the share of locomotive and rolling stock manufacture decreased from 23.36% in 2010 to 4.33% in 2016. The decreased sales of related products by 74.19% in 2016 compared to 2010 are primarily due to the loss of the CIS market that was the main consumer of these products. The share of equipment repair and installation services increased from 14.61% in 2010 to 16.29% in 2016.

Table 1. Sales figures of machine-building enterprises in Ukraine in 2010-2016

Year	Manufacture of computers, electronics, and optical products	Manufacture of electrical equipment	Manufacture of general-purpose machinery and equipment	Manufacture of agriculture and forestry machinery and equipment	Manufacture of metal-working machines and equipment	Manufacture of vehicles, cars, and trailers	Manufacture of locomotives and rolling stock	Manufacture of aircraft, spacecraft, and related equipment	Manufacture of military vehicles	Equipment repair and installation
Sales, million UAH										
2010	8,090	17,218	11,261	4,525	760	10,012	25,200	7,663	X	15,762
2011	12,739	19,185	14,402	5,541	857	14,128	49,450	9,985	106	18,084
2012	9,621	24,557	15,597	7,201	525	15,306	52,234	13,553	953	18,655
2013	8,499	23,672	15,394	4,796	421	11,488	27,340	13,429	1,321	20,991
2014	9,067	22,646	14,300	5,375	635	12,573	11,751	15,434	1,812	19,370
2015	9,402	25,589	18,242	9,841	649	13,903	6,280	19,408	2,523	18,730
2016	14,130	29,965	19,441	12,763	738	16,901	6,504	16,238	4,578	24,440
Share in the sales volume of machine-building products, %										
2010	7.50	15.96	10.44	4.20	0.70	9.28	23.36	7.10	X	14.61
2011	8.49	12.78	9.59	3.69	0.57	9.41	32.94	6.65	0.07	12.05
2012	5.86	14.95	9.50	4.38	0.32	9.32	31.80	8.25	0.58	11.36
2013	6.50	18.11	11.77	3.67	0.32	8.79	20.91	10.27	1.01	16.06
2014	8.01	20.02	12.64	4.75	0.56	11.11	10.39	13.64	1.60	17.12
2015	7.32	19.91	14.20	7.66	0.51	10.82	4.89	15.10	1.96	14.58
2016	9.42	19.97	12.96	8.51	0.49	11.27	4.33	10.82	3.05	16.29
Growth rate (decrease), % before previous year										
2011	57.47	11.42	27.89	22.45	12.80	41.11	96.23	30.29	X	14.73
2012	-24.48	28.00	8.30	29.94	-38.83	8.34	5.63	35.73	801.42	3.15
2013	-11.66	-3.60	-1.31	-33.40	-19.75	-24.95	-47.66	-0.92	38.64	12.52
2014	6.68	-4.33	-7.11	12.07	50.89	9.44	-57.02	14.94	37.13	-7.72
2015	3.70	13.00	27.57	83.09	2.19	10.58	-46.56	25.75	39.27	-3.30
2016	50.28	17.10	6.57	29.70	13.64	21.56	3.56	-16.34	81.44	30.48

Source: Calculated in accordance with the data [5].

In general, it should be noted that the sales structure of machine-building products indicates the dominance of the third technological paradigm, which makes it impossible to reckon Ukraine among the countries characterized by high potential for efficient development in the future. The critically low share of machine-tool products draws attention in the sales structure of machine-building products, as it was 0.7% in 2010 and 0.49% in 2016. It is worth mentioning that the machine-tool industry of Ukraine is ranked 11th in the world, and 25 years ago, the products made by domestic machine-tool enterprises were exported to almost 40 countries of the world [7]. The destruction dynamics of this industrial activity can be illustrated by the following statistics: in 1990, almost 37 thousand machine tools were manufactured, 10.9 thousand pieces of forging and pressing machines, the corresponding figures reached 1.2 thousand pieces and 400 pieces in 2001. There is no official data for 2016. In 2013, the World Machine Tool Output & Consumption Survey – 2013 prepared by Gardner Business Media, Inc. (USA), the annual overview of world's manufacture and consumption of metalworking equipment for 2012, did not mention Ukraine. However, in 2012, export revenues amounted to USD 16.5 million for 927 pieces of metalworking equipment, while imports of 603,652 pieces of this equipment cost Ukraine 10 times more — USD 165.062 million [7].

If we analyze the export-import dynamics of machine-building enterprises during 2010–2016, the largest volume of both exports and imports was seen in 2012. In 2016, compared to 2012, the volume of exports and imports decreased by 48.23% and 40.14% (Figure 5) respectively. During 2012–2016, there was a decreased export share of machine-building products in the total volume of export of goods (Figure 6). In addition, the export share of machine-building products is smaller than the share of corresponding imports, and the import share of machine-building products is growing.

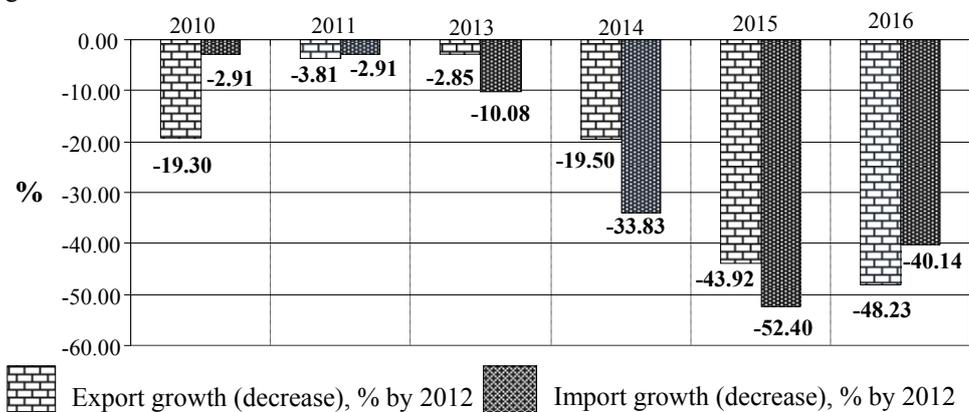


Figure 5. Indicators of changes in exports/imports of machine-building products² by domestic enterprises in 2010–2016

Source: Calculated in accordance with the data [4; 6; 7; 9]

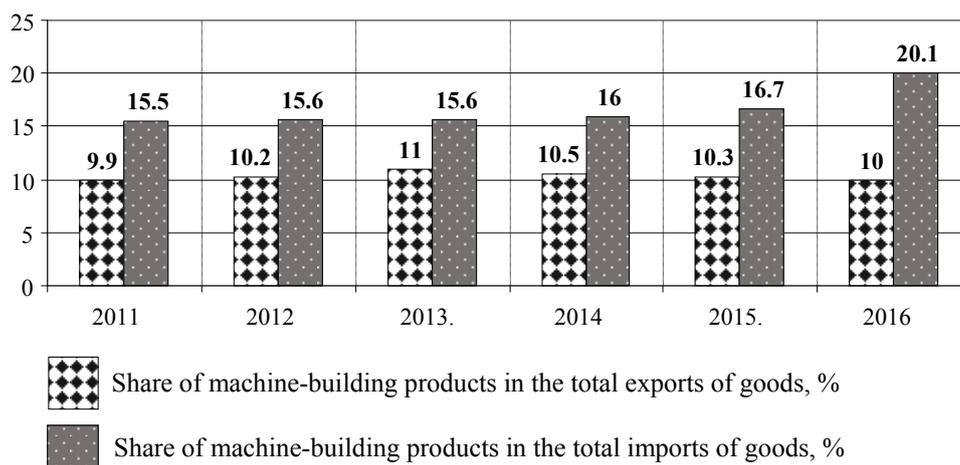


Figure 6. Indicators of the export-import structure of machine-building products³ in 2011–2016

Source: Calculated in accordance with the data [4; 6; 7; 9]

If we analyze the export structure of machine-building products, it has changed since 2014. Thus, automotive components and other types of machine-building products, which Ukrainian enterprises manufacture in accordance with tolling schemes (Fig. 7), have replaced cars in the rating. In accordance with the investment company Art Capital, in 2015, the export of spark plugs amounted to almost USD 1 billion or 22% of exported machine-building products that were shipped mainly to Hungary, Poland, and Germany [6]. Despite the fact that Ukrainian machine-building

² Including product groups 84, 85.

³ Including product groups 84, 85.

enterprises became attractive investment targets for European investors in 2015–2016, it is still worth noting that the "raw material orientation" is associated with domestic manufacturers, as machine-building enterprises sell man-hours even in the high-tech industrial sector instead of intelligence.

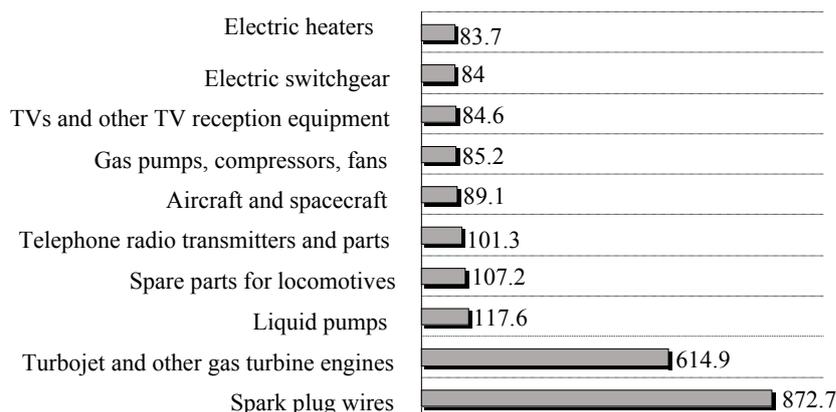


Figure 7. Rating of exported machine-building products of Ukraine, USD mln⁴

Source: Formalized in accordance with the data [4; 6; 7; 9]

In general, there were no significant changes in the export structure of machine-building products in terms of manufacturability during 2010–2016; the products of the third technological paradigm remain the priority.

The footprint of export-import operations has been gradually changing over the last three years, primarily due to the Russian-Ukrainian political relations. Thus, despite the fact that the Russian market remains the main export market for Ukrainian machine-building products, sales to Russia are characterized by a steady decline. During the first 11 months of 2015, 43% of machine-building products were exported to EU countries, 39% to CIS countries, 13% to Asia and Africa [6]. During the first 9 months of 2017, the main consumers of machine-building products included Germany (33% of exports) and Hungary (27% of exports) [6]. It should be emphasized that the increased export of machine-building products to the EU is a consequence of a lower price for machine-building products, which is ensured by cheap labor and cost savings in upgrading the technological infrastructure and implementing new technologies.

In accordance with experts, one of the critical problems of domestic machine-building enterprises is the outdated technological infrastructure. Wear and tear of the equipment is estimated at 60–80% with obsolescence reaching more than 50 years[4].

In the world's machine building, the share of machinery in manufacture decreased from 70% in 1990 to 25–30% in 2013 [4]. However, this trend is not characteristic of domestic enterprises. One of the major problems of the Ukrainian machine-building industry is the cost savings of the owners and the state in R&D. In developed countries, the share of these costs in the total amount of financing is 8–10%, it is barely reaching 1.0% in Ukraine [4]. The USA spends 2.0–2.5% of GDP on machine-building researches, EU countries spend 3% of GDP, and Ukraine spends 0.1% of GDP (the best indicator of the mid-2000s) [4].

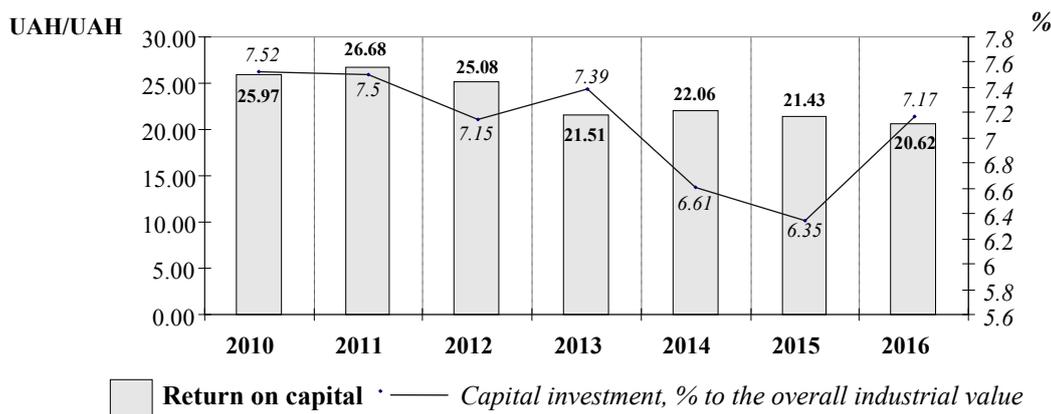


Figure 8. Indicators of investment activities of machine-building enterprises in Ukraine in 2010–2016

Source: Calculated in accordance with the data [8; 11]

During 2010–2016, the share of capital investments in the total volume of industry investments decreased from 7.52% in 2010 to 7.17% in 2016 (Figure 8). 2014 and 2015 were the most critical years in terms of reducing investment costs. In this case, it is worth noting that there was a steady decline in the return on capital, which was less by 20.6% in 2016 in comparison with 2010. In 2016, there were positive trends in investment attractiveness of Ukrainian machine-building enterprises for foreign investors. In the Lviv Oblast, the Japanese company Fujikura launched two factories

⁴ Based on the data for 11 months of 2015

that manufacture electrical equipment and plans to invest about USD 75 million in the business development of Ukraine. The German company Leoni AG started construction of a new machine-building plant in the Ivano-Frankivsk Oblast in 2017 with an initial investment of EUR 15 million [9]. The German company Kromberg & Schubert plans to build a plant to manufacture automotive components in Zhytomyr and create about 10,000 jobs [12].

Conclusions. The Ukrainian economic system is characterized by a trend of de-industrialization, which is confirmed by a decreased share of industrial production in GDP from 39.7% in 2001 to 16.7% in 2015. Domestic industry can be characterized as cost-intensive and geared towards raw materials. Thus, mining and low-tech industries account for about 60% of net sales revenues, and medium- and high-tech industries account for less than 15%. The level of technological backwardness of Ukrainian industry is evidenced by the fact that the share of Ukraine in the global market of high-tech products did not exceed 0.1% and 4% in the total export volume of industrial products. The dominant technological paradigm is mainly the 3rd one, the share of which reaches 60%. Instead, the share of the 4th paradigm is 35%, the 5th one is only 4.9%, the 6th one is 0.1%. Ukraine focuses on raw materials with regard to the export of products against the backdrop of reducing export-import operations for high-tech products.

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