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Assessment of Cross-sectoral Relations of Polish Mechanical Engineering

Abstract. As a result of the conducted research, it was found that the sectors of Polish mechanical engineering are not sufficiently interconnected. This is determined and caused by the insufficient level of technology, innovation, machine-building products, and the predominance of assembly plants. At the same time, on the other hand, the revealed interconnections of Polish mechanical engineering reflect those sectors in which significant business activity takes place in Poland. This is explained by the fact that in modern business conditions without the use of the necessary tools, devices, vehicles, it is difficult to achieve significant economic results. Therefore, the sectors that consume the most machine-building products can be considered the basic centers of the Polish economy. According to the obtained analytical results, agriculture, production of food products, rubber and plastic, metal products, all machine-building industries, energy sector, construction, trade sector, sphere of transport, telecommunications, information technologies, etc. can be attributed to them.

Keywords: mechanical engineering, intersectoral relations, structure, industry
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1. Introduction

Mechanical engineering is the most important center of intersectoral relations and the economic basis of developed economies. This follows from the fact that on the one hand mechanical engineering creates fixed assets and intermediate goods (raw materials, materials, etc.) for all sectors of the economy (agriculture, species, industry, IT, trade, transport, construction, medicine, defense, etc.), and consumer goods (household items and tools, means of transportation). On the other hand, mechanical engineering is interconnected with almost all types of economic activity through the use of their products in their production activities.

In this regard, the assessment of intersectoral relations, product structure in the areas of consumption of machine-building industries indirectly reflects the state and challenges of socio-economic development of the country.

The problems of Polish mechanical engineering are the current topic of many studies, which reveal various aspects of the functioning of this segment of the industry In particular, since the 2000s, with the accession of Poland to the EU, new trends in Polish engineering have begun, processes that almost determine the current state of this industrial sector of the country and are ambiguous. In particular, on the one hand, in the period after joining the EU, Poland rapidly increased the volume of machine-building products (Rogiński, 2010). Today, Poland's automotive industry is one of the largest in the EU. The volume of products of the Polish automotive industry in 2018 amounted to more than 37 billion. euro or 13% of the processing industry (Zduniuk, 2019). The Polish automobile industry employs more than 180,000 people, and about the same number in related industries, and the average wage of an employee is 8% higher than in the economy as a whole. However, on the other hand, the last Polish car (Polonez) was manufactured in 2002 (Raporty specjalne, 2018) and still does not have its own car brand in Poland. Instead, Poland ranks fifth in the EU in terms of production of various parts, spare parts for cars. In 2018, 59% (compared to 41% in 2005) of the Polish automotive industry accounted for spare parts and car accessories. At the same time, about 80–85% (or 32 billion euros) of automotive products produced in Poland are exported to European countries. markets or enterprises located there. The main place in the development of the Polish automotive industry is occupied by foreign companies. They account for 95% of the largest companies in the sector (Zduniuk, 2019). Polish companies involved in the automotive industry are increasingly specializing in the production of metal products, electrical appliances and various parts and are gradually increasing their participation in product design and development. At the same time, experts believe that in order to rise above the level of suppliers of spare parts and accessories, Poland needs to start producing its own cars (Raporty specjalne, 2018). Instead, Polish national car companies suffer from a lack of investment, low innovation, technology and digitalization of production processes (Ostrowski, 2021), high competition, car overproduction, lower prices with increasing material costs (Włodarczyk & Janczewski, 2014). The considered results of the study of the problems of Polish mechanical engineering determined the relevance of this study.

The purpose of the article is the analysis of functioning trends and assessment of inter-branch relations of Polish mechanical engineering in the period of strengthening European integration.

2. Results of the Research

In 2020, the total output of Polish engineering amounted to 81.1 billion euros (Table 1). This is 4 times more than in 2000 and 2.2 times more than in 2005. It is worth noting that for twenty years the Polish engineering industry has been characterized by a steady growing trend. The decline in output occurred only in 2009 by 16.9% (due to the global financial and economic crisis) and in 2020 by 5.7% (due to economic changes caused by the pandemic COVID-19). The largest increase in Polish engineering output occurred in the period 2004–2008. In particular, in 2004 this output of mechanical engineering increased by 31%, in 2006 — by 26%. However, in the period 2011–2020, the largest increase in the indicator (by 8.6%) was recorded in 2015. It follows that over the past ten years, the growth rate of mechanical engineering output has been declining or has had a volatile trend.

Table 1. Production of mechanical engineering in terms of Polish production, billion euros

Production	2000	2005	2010	2015	2016	2017	2018	2019	2020
Mechanical engineering, incl.	20.1	35.9	55.7	68.7	70.0	76.2	80.6	86.0	81.1
Manufacture of computer, electronic and optical products (C26)	3.1	4.7	10.1	8.8	8.9	9.7	9.6	10.0	10.2
Manufacture of electrical equipment (C27)	3.7	5.1	10.0	13.3	13.0	13.5	15.3	17.4	19.7
Manufacture of machinery and equipment nec (C28)	4.3	7.2	9.1	10.9	10.5	11.9	13.0	13.3	11.4
Manufacture of motor vehicles, trailers and semi-trailers (C29)	7.1	16.2	23.5	30.5	32.5	35.7	36.6	37.8	32.8
Manufacture of other transport equipment (C30)	1.8	2.5	3.0	5.3	5.1	5.4	6.0	7.5	6.9

Source: Formed according to CSOP (2023)

In general, similar trends took place in five machine-building industries. In particular, in 2020, output (C26) and (C27) output increased by 2.5% and 13.1%, while the other three — decreased, in particular (–14.1%) and (–13.2) %) in production (C28) (C29), respectively and by (–7.9%) in production (C30).

During 2000–2020, the importance of mechanical engineering in the Polish processing industry increased significantly. Thus, the share of mechanical engineering (C26-C30) in the output of Polish processing industry in 2020 was 25.3%, while in 2000 only 19.6%. In 2004, Poland's share in EU engineering output was 1.7%, and today it exceeds 3.0%. Over the last twenty years, the largest share in the structure of Polish engineering is the production of vehicles, trailers and semi-trailers (Table 2).

Table 2. Structure of Polish mechanical engineering output in terms of production, %

Production	2000	2004	2014	2020
Mechanical engineering, incl.	100.0	100.0	100.0	100.0
Manufacture of computer, electronic and optical products (C26)	15.5	13.7	13.6	12.6
Manufacture of electrical equipment (C27)	18.4	14.0	18.8	24.3
Manufacture of machinery and equipment nec (C28)	21.4	18.8	16.0	14.1
Manufacture of motor vehicles, trailers and semi-trailers (C29)	35.5	45.9	44.1	40.5
Manufacture of other transport equipment (C30)	9.2	7.5	7.5	8.5

Source: Formed according to CSOP (2023)

However, the share of this production in the structure of Polish engineering is variable. In particular, in 2020 this production accounted for 40.5% of the country's mechanical engineering output, in 2004 this figure was 45.9% and in 2000 — only 35.5%. The shares of the other four industries in the structure of Polish mechanical engineering are unstable in terms of value, but relatively stable in terms of weight. The considered structural changes are signs of formation, transformation of the Polish mechanical engineering according to global tendencies and challenges.

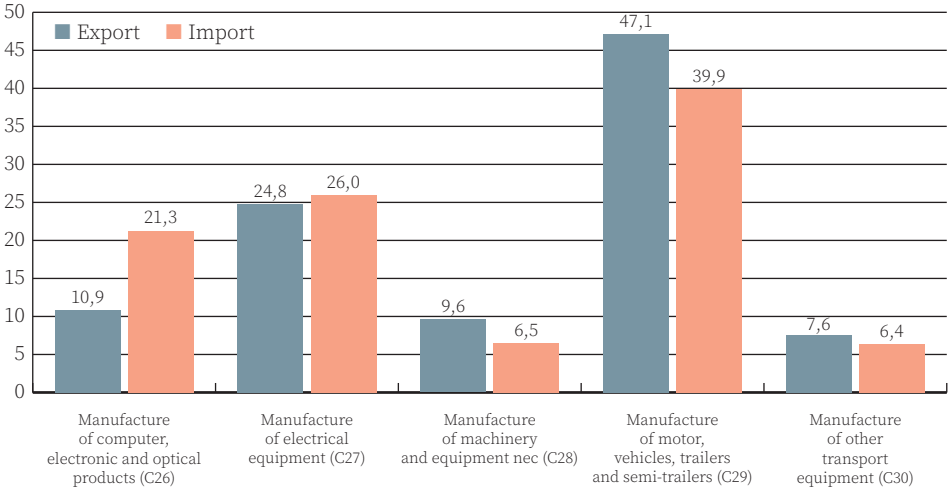

Figure 1. Shares of machine-building industries in exports and imports of machine-building (C26-C30) of Poland in 2020,%

Source: Formed according to CSOP (2023)

Mechanical engineering occupies a significant share in the export and import of the Polish processing industry. According to the CSOP (2023) , in 2020 mechanical engineering accounted for 41% of exports and 43.4% of imports of the Polish

processing industry. The vast majority of the country's machine-building products are exported to EU countries. In 2020, 76.5% of the country's machine-building products were exported to the EU. Among machine-building industries, the most exported products in the EU were manufactures of motor vehicles, trailers and semi-trailers (C29), in particular in 2020 this figure was 83.8%. At the same time, EU countries account for 49.8% of the country's imports of machine-building products.

In the structure of exports and imports of mechanical engineering in Poland, the share of products of motor vehicles, trailers and semi-trailers predominates (C29). In 2020, this production accounted for 47.1% of exports and 39.9% of imports of mechanical engineering (Figure 1).

Among the EU countries, Poland ranks high in terms of exports and imports of machine-building products. In particular, in 2019, according to Eurostat (2022), Poland ranked 7th in terms of exports of machine-building products, and 4th in terms of imports in the EU.

Absolute indicators of production, exports and imports of mechanical engineering are only a quantitative reflection of the movement of engineering products. At the same time, they do not reflect the substantive part, the probable economic effects of mechanical engineering on the country's economy. It should be emphasized that mechanical engineering is ideally a type of economic activity that, in addition to the potential for creating and implementing innovations, a multiplier effect on the economic and social spheres, also unites all sectors of the economy. Thus, in addition to quantitative indicators of the functioning of this sector, it is important to determine how much the country's mechanical engineering plays the so-called role of the building economy. In other words, it is important to determine whether Polish engineering acts as a hub for cross-sectoral relations, or is only an intermediate link, a separate element of global supply chains or value formation. One of the most important ways to answer this question is to assess the cross-sectoral links of mechanical engineering. The state of intersectoral relations from the standpoint of the use of machine-building products by the country's economy reflects the sectoral structure of consumption of intermediate products of machine-building industries (table 3). According to this structure, the following analytical conclusions can be drawn.

Products of intermediate consumption of computer, electronic and optical equipment (D26) are most (41.67%) consumed by the same sector of mechanical engineering. In Germany, on the other hand, the figure is 27.91% . The high value of this indicator is an indication that the products of computer, electronic and optical equipment (D26) are relatively less used in other sectors, and thus there are indications of intersectoral imbalances in this segment of the Polish economy.

Table 3. Sectoral structure of consumption of intermediate consumption of machine-building production by the Polish economy in 2018, %

To industry / sector	D26	D27	D28	D29	D30	D26–D30
D01T02: Agriculture, hunting, forestry	0.31	0.73	4.64	0.56	1.07	1.43
D03: Fishing and aquaculture	0.00	0.01	0.01	0.00	0.05	0.01
D05T06: Mining and quarrying, energy producing products	0.09	0.36	1.11	0.07	0.67	0.38
D07T08: Mining and quarrying, non-energy producing products	0.15	0.42	1.86	0.29	0.83	0.65
D09: Mining support service activities	0.00	0.00	0.00	0.00	0.00	0.00
D10T12: Food products, beverages and tobacco	0.45	0.74	2.43	0.72	1.06	1.06
D13T15: Textiles, textile products, leather and footwear	0.11	0.17	0.94	0.13	0.14	0.30
D16: Wood and products of wood and cork	0.14	0.24	0.63	0.23	0.36	0.31
D17T18: Paper products and printing	0.40	0.32	1.52	0.19	0.43	0.54
D19: Coke and refined petroleum products	0.26	0.59	1.55	0.10	0.47	0.54
D20: Chemical and chemical products	0.38	0.37	1.13	0.24	0.42	0.48
D21: Pharmaceuticals, medicinal chemical and botanical products	0.05	0.04	0.09	0.03	0.07	0.05
D22: Rubber and plastics products	0.54	0.94	1.06	1.42	0.86	1.08
D23: Other non-metallic mineral products	0.26	0.77	0.91	0.33	0.43	0.53
D24: Basic metals	0.35	2.04	1.64	0.28	0.71	0.95
D25: Fabricated metal products	1.19	2.05	6.20	1.29	1.76	2.47
D26: Computer, electronic and optical equipment	**41.67**	10.28	1.39	0.34	0.34	8.81
D27: Electrical equipment	5.49	**24.69**	4.74	0.95	0.90	7.06
D28: Machinery and equipment, nec	1.57	6.24	**13.18**	1.25	0.94	4.71
D29: Motor vehicles, trailers and semi-trailers	3.32	7.02	12.07	**56.39**	2.47	25.95
D30: Other transport equipment	0.41	1.06	2.60	0.59	**35.60**	3.38
D31T33: Manufacturing nec; repair and installation of machinery and equipment	2.32	2.64	8.82	4.32	4.88	4.65
D35: Electricity, gas, steam and air conditioning supply	1.38	3.57	2.66	0.24	0.75	1.59
D36T39: Water supply; sewerage, waste management and remediation activities	0.17	0.42	1.00	0.48	0.32	0.52
D41T43: Construction	3.22	12.89	9.20	2.46	2.69	6.02
D45T47: Wholesale and retail trade; repair of motor vehicles	4.47	6.43	6.94	6.30	1.94	5.89
D49: Land transport and transport via pipelines	1.53	3.85	2.01	15.87	23.44	8.98
D50: Water transport	0.06	0.08	0.07	0.02	1.29	0.13
D51: Air transport	0.27	0.32	0.43	0.09	5.12	0.56

To industry / sector	D26	D27	D28	D29	D30	D26–D30
D52: Warehousing and support activities for transportation	0.41	0.38	0.71	0.67	0.89	0.60
D53: Postal and courier activities	0.07	0.04	0.06	0.08	0.16	0.07
D55T56: Accommodation and food service activities	0.11	0.21	0.33	0.12	0.36	0.19
D58T60: Publishing, audiovisual and broadcasting activities	0.44	0.09	0.30	0.08	0.10	0.18
D61: Telecommunications	11.21	0.90	0.33	0.18	0.18	2.04
D62T63: IT and other information services	6.15	0.66	0.64	0.26	0.30	1.32
D64T66: Financial and insurance activities	0.93	0.39	0.55	0.67	0.18	0.60
D68: Real estate activities	0.40	0.66	1.04	0.22	0.35	0.51
D69T75: Professional, scientific and technical activities	2.25	1.14	1.61	0.58	0.78	1.17
D77T82: Administrative and support services	0.94	0.66	1.58	0.82	0.76	0.96
D84: Public administration and defense; compulsory social security	1.32	1.48	0.64	0.39	5.02	1.10
D85: Education	0.76	0.78	0.28	0.17	0.16	0.40
D86T88: Human health and social work activities	2.81	1.68	0.52	0.27	0.38	0.99
D90T93: Arts, entertainment and recreation	0.35	0.17	0.28	0.09	0.25	0.19
D94T96: Other service activities	1.29	1.48	0.33	0.21	0.11	0.64
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: Calculated according to OECD data (2023)

It is also necessary to take into account that the use of computer, electronic and optical equipment (D26) in modern conditions is one of the conditions for innovation and technological development. Therefore, sectors that use it relatively less may be at risk of declining competitiveness of their products or services.

In second place in terms of consumption of intermediate consumption of computer, electronic and optical equipment (D26) in Poland is the sector telecommunications (D61). The share of this sector in the sectoral structure of intermediate consumption of computer, electronic and optical equipment (D26) is 11.21%. In Germany, the corresponding figure is 3.19%.

The third place in the structure of consumption of products of this production with a share of 6.15% is occupied by the sector IT and other information services D62T63. A similar figure in Germany is 1.89%.

In fourth place in terms of consumption of intermediate goods in the computer, electronic and optical equipment sector (D26) in Poland is the Electrical equipment sector (D27), which accounts for 5.49% of these products. In Germany, on the other hand, the figure is 10.31%.

From the analysis of the sectoral structure of intermediate consumption of computer, electronic and optical equipment (D26) the following follows. In Poland, this sector is weakly diversified and therefore insufficiently linked to the rest of the economy. This is the result and reason for the relatively low innovation and technology of the Polish economy. In Germany, on the other hand, the key consumers of this sector are related machine-building industries (D27, D 29, D30, D31T33), as well as the public administration and defense sector; compulsory social security (D84). The differences between the sectoral patterns of consumption of intermediate consumption products in the computer, electronic and optical equipment sector (D 26) of Poland and Germany may be due to different operating cycles and manufacturability of industries interconnected with this sector.

Intermediate goods of the electrical equipment sector (D27) are one of the basic components of the vast majority of production processes of the real and financial sectors of the economy. In addition, this sector is ideally interconnected with related engineering sectors. Assessment of the structure of consumption of this, as well as the previously considered industrial sector is an indirect reflection of the level of manufacturability and innovation of the economy. In Poland, most intermediate goods are consumed by the electrical equipment sector (D27) consumed by the same sector (self-consumption). Thus, the electrical equipment sector (D27) accounts for 24.69% of the output of the same sector — electrical equipment (D27). Note that in Germany the same figure is almost similar and is 24.64%.

In second place in terms of consumption of intermediate goods of the electrical equipment sector (D27) in the Polish economy, as in Germany is the construction sector (D41T43). In Poland, the share of this sector in this structure is 12.69%, and in Germany — respectively 19.51%. The significant share of the construction sector (D41T43) in the consumption of intermediate goods of the electrical equipment sector (D27) is due to the fact that modern construction, construction, finishing, design work is impossible without the use of a significant amount of special electronic equipment. In addition, the importance of the identified indicator indirectly indicates the state of development and the construction sector. It can be hypothesized that the more electrical products of tools consumed in the construction sector, the more it develops. As you know, the development of the construction sector is one of the indicators of the functioning of the economic, financial and even social spheres of the country.

In third place in terms of consumption of intermediate goods in the sector electrical equipment (D27) is the sector of computer, electronic and optical equipment (D26), its share is 10.28%. In Germany, on the other hand, the machinery and equipment, nec (D28) ranks third in the structure of intermediate consumption of the electrical equipment sector (D27) with a share of 13.54%.

In general, it should be noted that the structure of intermediate consumption of electrical equipment (D27) in Poland and Germany is quite diversified. This is a justification for the fact that this sector is sufficiently interconnected with key sectors of the economy, in particular with related sectors of mechanical engineering, which, of course, is a positive moment in building cross-sectoral links. We emphasize that the intermediate consumption of the electrical equipment sector (D27) is a mandatory chain in the functioning of other sectors of mechanical engineering and economics. Therefore, the higher diversification of the structure of consumption of products in this sector is an indirect indicator of the manufacturability and innovation of the economy in general and individual sectors in particular.

Machinery and equipment, nec (D28) is a sector of mechanical engineering that produces machines, tools, equipment, in general, fixed assets for most segments of the real sector of the economy. This sector includes the manufacture of machinery and equipment intended for mechanical or thermal treatment of materials, or other operations (lifting, transport, grinding, weighing, packaging, etc.), including production of their mechanical components that produce and apply force, and any specially manufactured main parts. This sector also includes the manufacture of fixed, mobile or hand-held devices, whether for industrial, construction, agricultural or domestic use. Production of special purpose equipment for passenger or freight transport is also included in this section. The structure of the sector distinguishes between the production of machinery and equipment for special purposes, ie equipment used exclusively in industry, as well as machinery and equipment for general purposes, ie equipment used for a wide range of industries. It follows that the analysis of the structure of consumption of products of this sector of the economy to some extent reflects the business activity of sectors of the economy as a whole. In Poland, the structure of consumption of products in this sector is diversified and almost corresponds to that of Germany. This is a sign that business activity in Poland is concentrated in many segments of the economy. Thus, the largest consumers of intermediate goods of this segment in Poland and Germany are the same sector machinery and equipment, nec (D28). It accounts for 13.18% in Poland and 47.17% in Germany.

In second place in this structure in both countries is motor vehicles, trailers and semi-trailers (D29). In Poland, the share of this sector in the structure of consumption of products of the sector machinery and equipment, nec (D28) is 12.07%, and in Germany — respectively 15.47%. In third place in both Poland and Germany is the construction sector with shares of 9.20% and 4.54%, respectively. Significant shares (over 4%) in the structure of consumption of intermediate goods of the sector machinery and equipment, nec (D28) of Poland are: agriculture, hunting, forestry (D01T02), basic metals (D24), electrical equipment

(D27), manufacturing nec; repair and installation of machinery and equipment (D31T33), Wholesale and retail trade; repair of motor vehicles (D45T47). In the same structure of Germany, these sectors occupy a much smaller share. It follows that the structure of intermediate consumption of the machinery and equipment sector, nec (D28) of Germany can be considered less diversified, while production in this segment is more innovative and technological.

The most important, largest, basic sector of the Polish machine building and Polish processing industry is the sector of motor vehicles, trailers and semi-trailers (D29) . In the output of Poland's processing industry, this sector accounts for 25.3% and the country's mechanical engineering output — respectively 40.5%. At the same time, as already mentioned, the activity of this sector significantly depends on external influences, in particular foreign enterprises and corporations, which is partly reflected in the structure of consumption of products in this sector. It is important to note that in accordance with its specialization, this sector, in contrast to those already considered, is more focused on the production of final consumption products, such as cars, and intermediate goods used in the production of the same cars. This feature of specialization is justified and explains that 56.39% of intermediate consumption products in this sector of Poland are consumed by the same sector m otor vehicles, trailers and semi-trailers (D29). In Germany, the corresponding figure is 77.35%.

The second largest intermediate consumption of this sector in Poland is the sector l and transport and transport via pipelines (D49) with a corresponding share of 15.87%. In Germany, the share of sector l and transport and transport via pipelines (D49) in the structure of intermediate consumption of the sector motor vehicles, trailers and semi-trailers (D29) is only 1.43%. On the other hand, the sector with the largest share with a share of 6.60% in the structure of intermediate consumption of the sector motor vehicles, trailers and semi-trailers (D29) is the sector machinery and equipment, nec (D28).

In third place in the structure of consumption of products of the sector motor vehicles, trailers and semi-trailers (D29) in Poland and with a share of 6.30% is the sector w holesale and retail trade; repair of motor vehicles (D45T47). In Germany, the third place and the mentioned structure of consumption is the same as in Poland, the sector (D45T47), but with a share of 3.80%. Considering the structure of consumption of intermediate consumption of vehicles, trailers and semi-trailers (D29) in Poland and Germany, the following follows. The intersectoral structure of consumption of this sector in Poland, in contrast to Germany, is more diversified. This is a sign of significant business activity in the sectors that use the products of this segment, including cars and related equipment. High self-consumption in this segment in Germany may be a sign of higher levels of technology and product

innovation, but in conditions of global instability, narrow specialization can lead to economic risks.

One of the most important segments of any economy is the sector other transport equipment (D30). Age includes the production of strategically important vehicles, including ships and boats, trains and locomotives, aircraft and spacecraft, military vehicles, as well as spare parts and related equipment for these vehicles. The main consumers of intermediate goods of this sector in the Polish economy are the same sector with a share of 35.60%, l and transport and transport via pipelines (D49) with a share of 23.44%, as well as to transport (D51) and public administration and defense; compulsory social security (D84) with corresponding shares at the level of 5%. In Germany, in the sectoral structure of intermediate consumption of this sector, the most important place is occupied by the sector other transport equipment (D30) with a share of 62.02%, public administration and defense; compulsory social security (D84) with a corresponding share of 13.66%, as well as manufacturing nec; repair and installation of machinery and equipment (D31T33) with a share of 9.58%. Thus, in other words, the products of the considered sector other transport equipment (D30) in Poland are mostly of a consumer nature, ie they are mostly used in the same sector, as well as in the field of land and air transport. In Germany, on the other hand, the products of the other transport equipment sector (D30) are used to manufacture products in the same sector, to ensure the country's technical defense capability, and to repair and restore manufactured vehicles of strategic importance to the country.

3. Conclusions

The main consumers of intermediate consumption of mechanical engineering in general (D26-D30) in Poland and Germany are all sectors of mechanical engineering, including motor vehicles, trailers and semi-trailers (D29), as well as metallurgy, construction, trade and transport. Thus, the review of the structure of intermediate consumption of mechanical engineering in general and in terms of its production justifies the importance of this industry segment as a key center of intersectoral relations and an indicator of the main centers of business activity of the economy. According to the obtained analytical results, it can be stated that the sectors of Polish mechanical engineering are insufficiently interconnected. This is due to the insufficient level of manufacturability, innovation, machine-building products, the predominance of assembly production. At the same time, on the other hand, the identified relationships of Polish engineering reflect those sectors in which there is significant business activity in Poland. This is due to the

fact that in modern business conditions without the use of the necessary tools, devices, vehicles it is difficult to achieve significant economic results. Therefore, the sectors that consume the most machine-building products can be considered the basic centers of the Polish economy. These, according to the calculated data include agriculture, food production, rubber and plastics, metal products, all machine-building industries, energy sector, construction, trade, transport, telecommunications, information technology, etc. .

Prospective research in this direction will consist in the study of the influence of the closeness of intersectoral connections of mechanical engineering on the socio-economic indicators of the country.

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Ocena powiązań międzysektorowych polskiej inżynierii mechanicznej

Streszczenie. W wyniku przeprowadzonych badań stwierdzono, że sektory polskiej inżynierii mechanicznej nie są ze sobą dostatecznie powiązane. Jest to spowodowane niewystarczającym poziomem technologii, innowacyjności, produktów budowy maszyn oraz przewagą zakładów montażowych. Jednocześnie ujawnione powiązania polskiej inżynierii mechanicznej uwidoczniają sektory, w których w Polsce prowadzona jest znacząca działalność gospodarcza. Tłumaczy się to tym, że we współczesnych warunkach biznesowych bez użycia niezbędnych narzędzi, urządzeń, pojazdów trudno jest osiągnąć istotne wyniki ekonomiczne. Za podstawowe ośrodki polskiej gospodarki można zatem uznać sektory zużywające najwięcej produktów budowy maszyn. Zgodnie z uzyskanymi wynikami analiz można do nich zaliczyć rolnictwo, produkcję artykułów spożywczych, branżę gum i tworzyw sztucznych, wyrobów metalowych, wszelkie gałęzie przemysłu maszynowego, energetykę, budownictwo, handel, sferę transportu, telekomunikację, technologię informatyczną itp.

Słowa kluczowe: inżynieria mechaniczna, powiązania międzysektorowe, struktura, przemysł