

**UDC 338.012**  
**JEL: F63, L52, O11**

**ENSURING GROWTH IN INTERNATIONAL  
COMPETITIVENESS OF NATIONAL INSTRUMENT  
PRODUCTION**

**Ganna Duginets**

Doctor of Economics,  
Associate Professor,  
Department of World Economy,  
Kyiv National University of Trade  
and Economics,  
Kyiv, Ukraine  
E-mail: g.duginets@knu.edu.ua  
orcid.org/0000-0003-3708-3666

**Viacheslav Kotlubai**

PhD in Economic Sciences,  
Associate Professor,  
National University "Odessa Law  
Academy",  
Odessa, Ukraine  
E-mail: v.o.kotlubay@gmail.com  
orcid.org/0000-0002-4560-7063

**Introduction.** Mechanical engineering and instrument-making is one of the most science-intensive industries and the level of development of instrument-making directly depends on the main indicators of socio-economic development of the state. At the same time, in Ukraine this industry and its products lag behind the world level due to a number of objective reasons, which are of economic, political and technological nature. Lagging in technologies, lack of domestic innovations and high cost of new equipment make it necessary for enterprises to replace the main production assets, as well as to complete the final reorientation of the economic model of development.

**Aim and tasks.** Study the state of instrument-making products of Ukraine, with subsequent identification of areas to improve its competitiveness.

**Results.** The dynamics of indices of industrial production during 2015-2019 was analyzed and the share of instrument-making in industry from 2015 to 2019 was identified. PEST-analysis of domestic instrumentation was carried out to identify economic, political, social and technological factors affecting its competitiveness. The sufficient efficiency of instrument-making enterprises is justified taking into account methodological postulates of the theory of effective competition. Certain fluctuations can be explained firstly by the presence of crisis phenomena in the Ukrainian economy in 2014-2015. And secondly, the dynamics of indicators is closely related to the processes within the company. On the other hand, the analysis of the export structure indicates a decrease in the volume of high-tech products due to the lack of international competitiveness of the industry.

**Conclusions.** It is proved that the development of instrument-making enterprises is cyclical. The main directions of increasing the competitiveness of domestic instrument-making enterprises and their products on world markets are proposed, namely: updating of the entire technological platform of instrument-making; launching production of new high-tech products that are more innovative and knowledge-intensive, development of international cooperation and cooperation, a course to develop the scientific environment in the field of instrumentation.

**Keywords:** product competitiveness, instrument-making products, instrument-making industry, innovative products.

**Received:** July, 2020

**Accepted:** August, 2020

DOI:10.31520/2616-7107/2020.4.3-7

© Economics. Ecology. Socium, 2020  
CC BY-NC 4.0 license

УДК 338.012  
JEL: F63, L52, O11

## ЗАБЕЗПЕЧЕННЯ ЗРОСТАННЯ МІЖНАРОДНОЇ КОНКУРЕНТОСПРОМОЖНОСТІ НАЦІОНАЛЬНОГО ПРИЛАДОБУДУВАННЯ

### Ганна Дугінець

Доктор економічних наук, доцент,  
завідувач кафедри світової  
економіки,  
Київський національний  
торговельно-економічний  
університет,  
Київ, Україна  
E-mail: g.duginets@knu.edu.ua  
orcid.org/0000-0003-3708-3666

### Вячеслав Котлубай

Кандидат економічних наук,  
доцент,  
Національний університет  
«Одеська юридична академія»,  
Одеса, Україна  
E-mail: v.o.kotlubay@gmail.com  
orcid.org/0000-0002-4560-7063

**Отримано:** Липень, 2020

**Прийнято:** Серпень, 2020

DOI:10.31520/2616-7107/2020.4.3-7

© Економіка. Екологія. Соціум, 2020  
CC BY-NC 4.0 ліцензія

**Вступ.** Машинобудування та приладобудування є однією з найбільш наукомістких галузей промисловості та від рівня розвитку сфери приладобудування безпосередньо залежать основні індикатори соціально-економічного розвитку держави. Водночас, в Україні дана галузь та її продукція відстає від світового рівня в силу ряду об'єктивних причин, які мають економічну, політичну і технологічну природу. Відставання в технологіях, нестача вітчизняних інновацій та висока вартість нового обладнання продукують необхідність для підприємств заміну основних виробничих фондів, а також завершення остаточної переорієнтації економічної моделі розвитку.

**Мета і завдання.** Дослідження стану приладобудівної продукції України, з подальшою ідентифікацією напрямів підвищення її конкурентоспроможності.

**Результати.** Проаналізовано динаміку індексів промислової продукції протягом 2015-2019 років та ідентифіковано частку приладобудування у промисловості з 2015 по 2019 роки. Здійснено PEST-аналіз вітчизняного приладобудування з метою виявлення економічних, політичних, соціальних та технологічних факторів, що впливають на її конкурентоспроможність. Обґрунтовано достатню ефективність діяльності приладобудівних підприємств враховуючі методологічні постулати теорії ефективної конкуренції. Певні коливання можна пояснити по-перше, наявністю кризових явищ в економіці України в 2014-2015 роках. А по-друге, динаміка показників тісно пов'язана з процесами всередині підприємства. З іншого боку, аналіз структури експорту свідчить про зменшення обсягів високотехнологічної продукції за рахунок недостатнього рівня міжнародної конкурентоспроможності галузі.

**Висновки.** Доведено, що розвиток приладобудівних підприємств має циклічний характер. Запропоновано основні напрями підвищення конкурентоспроможності вітчизняних приладобудівних підприємств та їх продукції на світових ринках, а саме: оновлення всієї технологічної платформи приладобудування; започаткування виробництва нових високотехнологічних видів продукції, які є більш інноваційними та наукомісткими, розвиток міжнародної співпраці та кооперації, курс на розвиток наукового середовища галузі приладобудування.

**Ключові слова:** конкурентоспроможність продукції, продукція приладобудування, галузь приладобудування, інноваційна продукція.

**Introduction.** In the 21st century, constant assimilation of new technologies allows states to remain leaders, and less developed countries to join the group of these leaders. Mechanical engineering in general, and instrumentation is one of the most knowledge-intensive industries. It is one of the most science-intensive industries. Since it primarily implements the achievements of scientific and technological progress. The main indicators of socio-economic development of the state directly depend on the level of development of this sphere.

The main purpose of instrument-making enterprises is to provide high-precision devices for various industries and, which is also important for the military and industrial complex of the state. Despite its manufacturability and the need for software, this industry is associated with the industry of information technology, and in terms of material intensity has common features with the industry of mechanical engineering. At the same time, in Ukraine this industry and its products lag behind the world due to several objective reasons. They are of economic, political and technological nature.

Economic reasons include the fact that many companies need to replace their fixed production assets and complete the final reorientation of the economic model of development. The "legacy" from the USSR plays a major role in the technological gap: the technological gap, the lack of domestic innovations and the high cost of new equipment. As a result of the above, the issue of increasing the international competitiveness of domestic instrument-making products becomes more important.

**Analysis recent research and publications.** Recent research and publications analysis indicates the lack of research on the state of instrument engineering in Ukraine as a whole, as well as on improving its competitiveness. In particular, the research of such scientists as Pokras A.S. is devoted to the main problems of instrument engineering in Ukraine, modern possibilities for instrument engineering [16].

A considerable number of scientists are engaged in questions of general competitiveness, in particular, Boltianska L. O., Andreieva L. O., Lysak O. I. [1] provide definitions of this economic category, but Perminova S. O. and Krutko D. Yu. [15] highlight the conditions under which it is possible to achieve competitiveness. As for foreign scientists, competitiveness studies are carried out in quite different approaches. For example, Zhou, L. F., & Ming, C. Y. suggest using innovation clusters as the main mechanism to improve the competitiveness of the industry [22]. Other scientists are investigating the impact of R&D costs as one of the main instruments for the development of high-tech industries [22]. There is also a group of studies aimed at identifying country factors of competitiveness in high-tech industries [5; 21]. However, the results of processing of the existing scientific heritage show that some theoretical, methodological and practical issues remain unresolved in the chosen plane of scientific research.

**Aim and tasks.** The purpose of the article is to study the state of instrument-making products of Ukraine, with subsequent identification of areas to improve its competitiveness.

**Results.** The concept of "competition", which was first mentioned back in the XVII century, was most actively used in the English-language economic literature in the 70s of the XX century, as it became one of the main elements in the system of economic relations. The problem of ensuring the competitiveness of the enterprise and its products is still relevant for any economic entity in various fields of activity. There are different approaches to the interpretation of competitiveness. For example, according to E. Chamberlin and J. Robinson, competitiveness is not only the ability to fight with competitors, but also to bypass the confrontation with them through the development of new markets for differentiated products [2; 17]. J. Schumpeter defines the competitiveness of a company as the ability to create new ideas, technologies and markets [4].

But the main definition is formulated by F. Kotler, Professor of International Marketing at the Graduate School of Management, Northwestern University of the United States: competitiveness is a property characterized by the degree of real or potential satisfaction of a specific need in comparison with similar objects represented on this market [7].

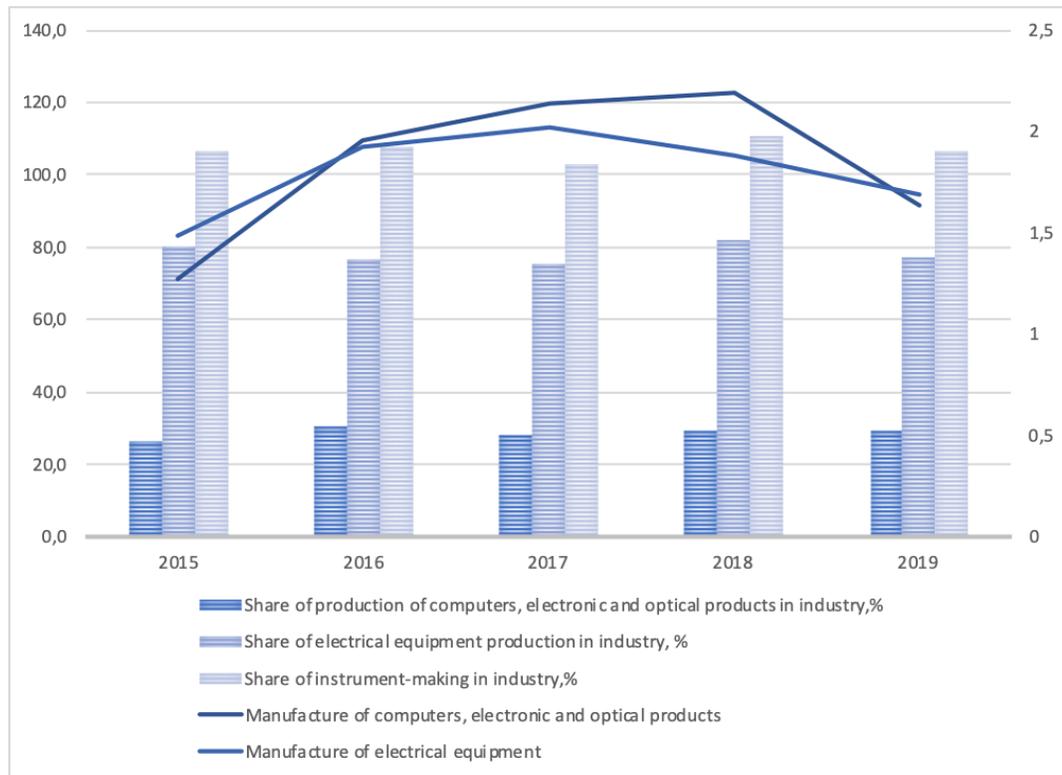
In the context of achieving the goal of the study, special attention should be paid to competitive advantages based on the use of innovative technologies and the production of knowledge-intensive products. This is explained by the fact that the development of economic systems, based primarily on the use of innovation potential, requires consideration of situations in which key assets are highly mobile and have the opportunity to change fundamentally quantitatively and qualitatively, even in the short term. On the one hand, a certain amount of knowledge can be used in different production processes, on the other - for the production of certain types of goods or services requires a combination of different types of intellectual capital, which is a fundamental difference from other forms of capital. In particular, because of the creation of two key tools of the modern economy (microchip and information systems), the semantic distinction between "low- and high-tech" industries has ceased virtually to exist. In terms of the use of new technological developments, traditional industries, such as textile and food industry, in many cases can be compared with "high-tech" enterprises of the aviation industry and instrumentation.

It should be noted that instrument-making enterprises are located in almost all economically important centers of our state and directly affect the socio-economic infrastructure of both the region and the state as a whole. The dynamics of industrial production indices during 2015-2019 is wavy (Fig. 1). The industrial production index according to NACE 26 (manufacture of computers, electronic and optical products) reached a minimum value in 2015 (71%), increased until 2018 (in 2016 it was 109.3%, in 2017 it was 119.6% and in 2018 it was 122.8%) and decreased again in 2019 (91.6%). The industrial production index according to NACE 27 (manufacture of

electrical equipment) has a similar trend, but changes in this area are not as rapid as in the previous case. Accordingly, in 2015 there was a decline in the index of industrial products of electrical equipment (83%), from 2016 to 2018 there was an increase (in 2016 it was 107.7%, in 2017 it was 113.0%, and in 2018 it was 105, 2%), and in 2019 there was a drop to 94.7%. The reasons for the decline in industrial production of instrument-making products in 2015 are, on the one hand, the currency crisis of 2014-2015, and on the other - the armed conflict in eastern Ukraine and the loss of Ukraine's territory, which led to a reduction in production and production and sales products. In 2019, the decline in industrial instrumentation is timed to the beginning of a new financial crisis, as well as changes in political power in the country.

Among the instrument-making enterprises of Ukraine it is offered to choose the technical and economic factors for the analysis of such enterprises as: JSC "Electron" Corporation (for more details see [10]), JSC Meridian n. S.P. Korolyov (for more details see [11]), PJSC AT Scientific Research Institute of RadioEngineering Measurements (PRJSC AT SRIRM) (for more details see [12]), LLC "UKRELEKTROAPARAT" (for more details see [13]). Using the data of financial statements (balance sheet and report on financial results) for 5 years the efficiency of instrument-making enterprises was identified taking into account methodological postulates of the theory of effective competition (Table 2).

The obtained results of a comprehensive assessment of selected enterprises in terms of efficiency of financial resources are useful for identifying development problems and solutions, finding investors, the feasibility of implementing certain management decisions to increase the competitiveness of products in world markets. The share of instrument-making in industry from 2015 to 2019 fluctuated, but not significantly, in the range from 1.84 to 1.98%, with a peak in 2018 and a decline in 2017 (Figure 1). In 2015, as in 2019, the figures were equal to 1.9%. At the same time, a significant role in the development of instrumentation continues to play the production of electrical equipment, which ranged from 1.35 to 1.43 from 2015 to 2019.



**Fig. 1. Share of instrumentation in industry and indices of industrial products of instrumentation**

Source: [9]

Accordingly, the share of production of computers, electronic and optical products in industry is in the range from 0.47 to 0.55% of the total industrial output.

Table 1 shows the results of PEST-analysis which helped to identify the main components of the state of instrument-making and its products in Ukraine.

**Table 1. PEST-analysis of instrument-making in Ukraine**

<i>Economic factors</i>	<i>Social factors</i>
high inflation rate; economic decline caused by the pandemic in 2020; decline in consumer demand for products due to lower purchasing power; high cost of loans and the difficulty of obtaining them; lack of own funds for development; seasonality of sales; existence of post-payment terms in most purchases and tenders.	low level of staff motivation (as compared to IT-sphere); intellectual migration of personnel; insufficient development of social infrastructure in the country; lack of financial resources at enterprises to attract highly qualified specialists.
<i>Political factors</i>	<i>Technological factors</i>
unstable political situation in the country; existence of a military conflict in the country; lack of a legislatively approved program to support instrument-making enterprises.	lack of state incentives for the industry development; lack of financial resources to acquire and implement modern technologies in production; lack of resources for obtaining international certificates, which give the right to enter international markets; wear and tear and technological obsolescence of fixed means of production.

Source: compiled by the authors

Among the instrument-making enterprises of Ukraine it is offered to choose the technical and economic factors for the analysis of such enterprises as: JSC “Electron” Corporation (for more details see [10]), JSC Meridian n. S.P. Korolyov (for more details see [11]), PJSC AT Scientific Research Institute of RadioEngineering Measurements (PRJSC AT

SRIRM) (for more details see [12]), LLC “UKRELEKTROAPARAT” (for more details see [13]). Using the data of financial statements (balance sheet and report on financial results) for 5 years the efficiency of instrument-making enterprises was identified taking into account methodological postulates of the theory of effective competition (Table 2).

**Table 2. Technical and economic indicators of instrument-making enterprises**

<b>JOINT STOCK COMPANY «ELECTRON» CORPORATION</b>					
<i>Year</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>
1. Production activity efficiency indices of the enterprise					
Yield of capital investments	0,04	0,04	0,04	13,72	0,03
Rate of return (return on assets)	-0,01	0,00	0,00	0,04	0,09
2. Indices of the financial state					
Fixed assets wear rate, %	32,89	33,60	35,97	38,53	39,53
Usability rate of fixed assets, %	67,11	66,40	64,03	61,47	60,47
Absolute liquidity ratio	226,62	110,10	0,50	2,91	5,72
3. Efficient organization of sales and product promotion					
Profitability of sales	-8,97	0,73	1,45	0,08	88,29
<b>JOINT STOCK COMPANY MERIDIAN n. S.P. KOROLYOV</b>					
<i>Year</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>
1. Production activity efficiency indices of the enterprise					
Yield of capital investments	0,31	0,39	0,48	0,79	0,71
Rate of return (return on assets)	0,01	0,00	0,00	0,01	0,01
2. Indices of the financial state					
Fixed assets wear rate, %	75,63	77,34	77,34	79,83	79,96
Usability rate of fixed assets, %	24,37	22,66	22,66	20,17	20,04
Absolute liquidity ratio	0,12	0,15	0,13	0,07	0,03
3. Efficient organization of sales and product promotion					
Profitability of sales	0,07	0,01	0,03	0,04	0,05
<b>PRIVATE JOINT-STOCK COMPANY AT SCIENTIFIC RESEARCH INSTITUTE OF RADIOENGINEERING MEASUREMENTS (PRJSC AT SRIRM)</b>					
<i>Year</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>
1. Production activity efficiency indices of the enterprise					
Yield of capital investments	0,78	0,88	0,01	0,14	0,00
Rate of return (return on assets)	-0,10	-0,24	-0,09	0,00	-0,27
2. Indices of the financial state					
Fixed assets wear rate, %	65,47	66,77	61,61	57,96	55,98
Usability rate of fixed assets, %	34,53	33,23	38,39	42,04	44,02
Absolute liquidity ratio	0,31	0,00	0,06	0,00	0,00
3. Efficient organization of sales and product promotion					
Profitability of sales	-0,46	-0,90	-62,03	0,00	-
<b>LIMITED LIABILITY COMPANY “UKRELEKTROAPARAT”</b>					
<i>Year</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>
1. Production activity efficiency indices of the enterprise					
Yield of capital investments	8,71	10,65	6,32	5,21	6,65
Rate of return (return on assets)	0,64	0,70	0,26	0,14	0,28
2. Indices of the financial state					
Fixed assets wear rate, %	51,55	52,77	52,56	56,63	54,50
Usability rate of fixed assets, %	48,45	47,23	47,44	43,37	45,50
Absolute liquidity ratio	0,77	1,30	0,16	0,28	0,33
3. Efficient organization of sales and product promotion					
Profitability of sales	0,32	0,36	0,13	0,08	0,14

Source: compiled by the authors [14]

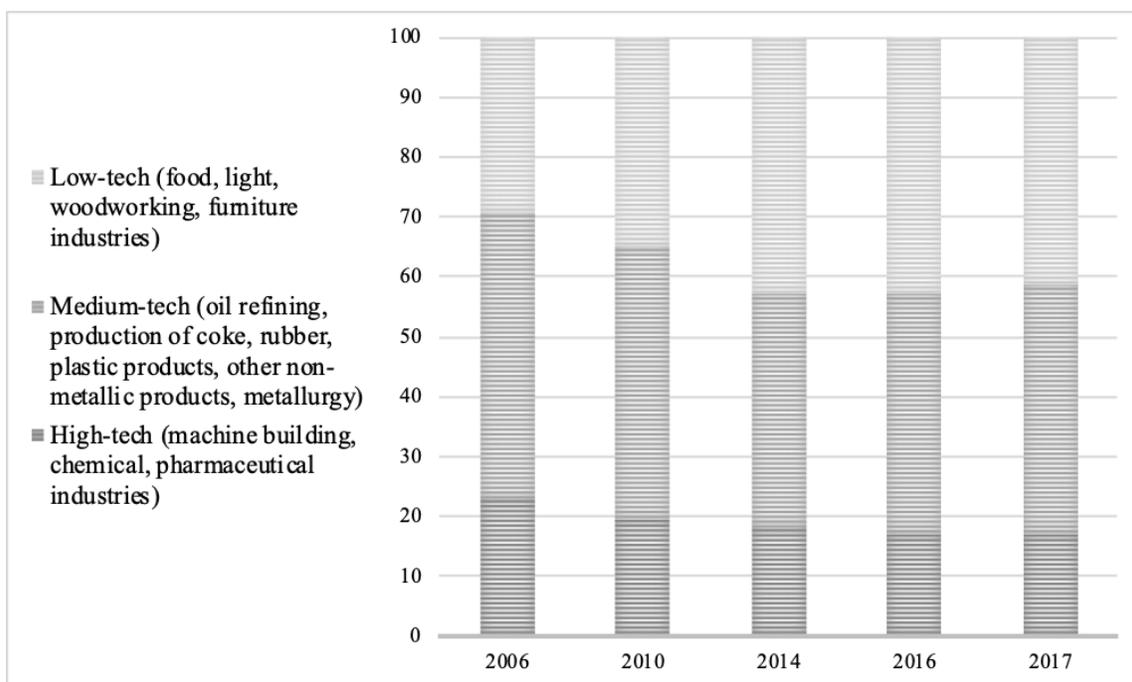
The obtained results of a comprehensive assessment of selected enterprises in terms of efficiency of financial resources are useful for identifying development problems and solutions, finding investors, the feasibility of implementing certain management decisions to increase the competitiveness of products in world markets. JSC “Electron” Corporation is characterized by fluctuations in yield of capital investments (a significant increase in 2016 to 13.72 and a decrease in the next year due to an increase in sales (income from sales this year amounted to 159.5 thousand UAH). Since the yield of capital investments is an indicator of the efficiency of use of fixed assets, it can be concluded that the capacity of the enterprise is not fully utilized. Instead, the depreciation rate of fixed assets tends to increase, which indicates the feasibility of the planned replacement of obsolete equipment. Accordingly, the coefficient of suitability of fixed assets increases to increase the wear and tear. The absolute liquidity ratio decreased significantly from 226.62 in 2013 to 5.72 in 2017 due to the growth of current liabilities and collateral, which means the company's ability to repay immediately its short-term accounts payable. Since the optimal value of the absolute liquidity ratio is 0.20-0.25, the indicators of JSC “Electron” Corporation indicate the ability to pay for liabilities despite the decrease in the value of this indicator. The profitability of manufactured products in 2013 due to the presence of losses in the company was negative (-8.97) and increased sharply in 2017 (88.29). The profit rate increased in 2017 to 0.09 due to an increase in net profit. Thus, 2017 was relatively successful for this company, and 2013 was the least successful as a pre-crisis year. JSC Meridian n. S.P. Korolyov is characterized by an increase in yield of capital investments: the minimum value in 2013 (0.31), and the peak value in 2016 (0.79), which indicates an increase in efficiency in the use of fixed assets of the enterprise. Depreciation of fixed assets increased in 2017 to 80%, which means the feasibility of urgent replacement of non-functioning equipment. The value of the absolute liquidity ratio tends to fall to 0.03 in 2017, which is a sign of the company's inability

to pay its obligations. In fact, the state of the enterprise can be considered as leading to bankruptcy. Profitability of production and the norm of JSC Meridian n. S.P. Korolyov is low: 0.01-0.07 and 0.0-0.01, respectively. Therefore, this company has problems that can be solved with an integrated approach. PJSC AT Scientific Research Institute of Radio Engineering Measurements (PRJSC AT SRIRM) has a level of yield of capital investments that decreases to zero in 2017 due to the lack of net income of the enterprise, which is a negative factor for the competitiveness of this enterprise.

The depreciation rate of fixed assets of the enterprise decreased from 65.47 in 2013 to 55.98 in 2017. This decrease was due to a decrease in the initial cost of fixed assets from UAH 49,501 in 2013 to UAH 10,281 in 2017. Accordingly, it can be concluded that the sale of fixed assets due to the inability of the company to keep them. The absolute liquidity ratio from 0.31 in 2013 decreased to 0.0 in 2017. The reasons for this decrease are the lack of the company's own funds as of 2017 and the increase in current liabilities to UAH 22,145, which is a sign of possible bankruptcy of the company. Indicators of profitability of manufactured products and assets indicate the lack of economic feasibility in the manufacture of products under existing conditions and the lack of profitability of assets (because the indicators are below zero). Therefore, under these conditions, the company should implement radical changes in the organization of production, attracting resources and more. Otherwise, the company may be declared bankrupt and liquidated. LLC “UKRELEKTROAPARAT” maintains the yield of capital investments at a sufficient level, which is a sign of effective use of fixed assets. The depreciation rate of fixed assets increased from 51.55% in 2013 to 56.63% in 2016 due to the increase of the effective volume of fixed assets (increased their initial cost) and decreased to 54.5% in 2017. The absolute liquidity ratio has a wave-like character: the peak value falls on 2014 (1.30), and the minimum - on 2015 (0.16). The rate of return (return on assets) has a similar trend, rising to 0.70 in 2014, falling to 0.14 in 2016 and falling to 0.28 in 2017.

Profitability of production is the most important in 2014 (0.36) and the least in 2016 (0.08). Thus, LLC “UKRELEKTROAPARAT” operates at a level sufficient to maintain the competitiveness. Thus, technical and economic indicators in general reflect the sufficient efficiency of these enterprises. On the one hand, their optimization will increase the level of competitiveness [23]. On the other hand, for a complete analysis of the reserves to increase competitiveness is worth considering its determinants for a particular product. But this issue will be revealed in future studies. It should be noted only that, despite the results of the analysis, Ukraine remains in the outsiders of

innovation development, confirms the analysis of the structure of export of products. Thus, according to the World Bank, exports of the Ukrainian high-tech sector in 2015 amounted to 1.921 billion dollars. USA. This was the highest value of Index mundi - 6.51 for the last 18 years, the lowest - 3.29 was observed in 2008 [8]. But in the total volume of Ukrainian exports, the share of high-tech exports in 2015 was only 5.5%. In 2017, the share of high- and medium-tech industries in the structure of sold products of the processing industry is 17% and almost 42%, and the share of low-tech industries increased from 29% in 2006 to 41% in 2017 (Fig. 2).



**Fig. 2. Technological structure of sold products of processing industry of Ukraine \*, 2006-2017 years.**

\* Distribution according to UNIDO methodology [18]

Source: developed by the author according to the State Statistics Service [9].

Taking into account the above, we offer the main directions of increasing the competitiveness of domestic instrument-making enterprises and their products on world markets, namely:

1. Updating the entire instrumentation technology platform. Bringing the production of products with international quality standards, which, in turn, will contribute to the production of products that meet international requirements. As a result, such products will be

more competitive in the world market. Main tool is primarily the renewal of fixed assets at the enterprises [24-25].

2. Start of production of new high-tech products, which are more innovative and knowledge-intensive. To accomplish this task it is necessary to have highly qualified personnel and investments. Such additional technological competitive advantages, which contribute to the development of the national economy as a whole, is a key consequence of the hybrid

model of the "triple helix". That is, the main efforts of the state, business and higher education institutions should be aimed at creating business incubators, technoparks, as well as joint financing of fundamental research in the field both by business and the state.

3. Access to international cooperation and collaboration. Due to the effect of scale, multinational companies have a greater impact on the market as a whole, they set the changes in the segment. For many domestic companies, using their advantageous geographical location can be a first step towards international cooperation. The interstate partnership allows exchanging technological processes, innovative developments, attracting new equipment and highly qualified personnel.

4. A course on development of the scientific environment, which belongs to the field of instrument engineering. As part of this strategy, it is also advisable to focus on supporting and developing inter-industry system technologies that can provide an effect in many sectors of the economy, as well as on large-scale "breakthrough" industry projects. The optimal option is to implement 2-3 mega-projects (aerospace, biotechnology, etc.), which can justify a long-term vector of innovation development of the Ukrainian economy.

**Conclusions.** Summing up the conducted research, it should be noted that the development of instrument-making enterprises is cyclical. The analysis of technical and economic indicators of the main enterprises of the domestic sphere has provided an opportunity to identify sufficient efficiency of their activity. The existing fluctuations in the dynamics can be explained firstly by the presence of crisis phenomena in the Ukrainian economy in 2014-2015. And secondly, the dynamics of economic indicators is closely related to the dynamics of processes within the enterprise. On the other hand, the analysis of the export structure indicates a decrease in the volume of high-tech products due to the insufficient level of international competitiveness of the industry. Taking into account the results of the conducted research, the main directions of increasing the competitiveness of domestic instrument-making enterprises and their products in the world markets have been proposed, namely: the renewal of the entire technological platform of instrument-making; the beginning of production of new high-tech products, which are more innovative and knowledge-intensive; the development of international cooperation and cooperation; the course for the development of the scientific environment of instrument-making.

#### REFERENCES

1. Boltians'ka, L. O., Andreeva, L. O., Lysak, O. I. (2015). *Economy of Enterprise*, OLDI-PLYuS, Kherson, Ukraine.
2. Chamberlin, E. H. (1951). Monopolistic competition revisited. *Economica*, 18(72), 343-362.
3. Ministry of Economic Development and Trade of Ukraine (2016). Draft "Strategy for the development of high-tech industries until 2025". Retrieved from <http://www.me.gov.ua>.
4. Gilbert, R. (2006). Looking for Mr. Schumpeter: Where Are We in the Competition--Innovation Debate? *Innovation policy and the economy*, 6, 159-215.
5. He, Z., Drozdov, D., Wang, J., Shen, W., Li, C., & Li, W. (2020). Competitiveness of the wind power industry in China: An analysis based on the extended Diamond Model. *Journal of Renewable and Sustainable Energy*, 12(5), 052701.
6. Haleliuk, M. M. (2008), Enterprise competitiveness management system. *Bulletin of Economic Science of Ukraine*, vol. 2, pp. 15–21.
7. Kotler, P., Fahey, L., & Jatusripitak, S. (1985). *The new competition: What theory Z didn't tell you about marketing*. Prentice Hall.
8. National Science Board (2016). Science and Engineering Indicators. Retrieved from <http://www.nsf.gov/statistics/2016/nsb20161/#/data/appendix>.

9. State Statistics Service of Ukraine (2020). Retrieved from <http://www.ukrstat.gov.ua>.
10. Electron Corporation (2020). Areas of activity: materials for electronics. Retrieved from [http://electron.ua/el\\_materials](http://electron.ua/el_materials).
11. Catalog of Ukrainian enterprises (2020) Joint Stock Company Meridian n. S.P.Korolyov. Retrieved from <http://rada.com.ua/ukr/catalog/5182/>.
12. Public Joint Stock Company "JSC Research Institute of Radio Technical Measurements" (2020). Retrieved from <http://www.radmir.kharkov.com/about>.
13. Public Joint Stock Company "Ukrelektroaparat" (2020). Retrieved from <http://uea.com.ua/>.
14. SMIDA (2019). Retrieved from <https://smida.gov.ua/>
15. Perminova, S. O., Krutko, D. Yu. (2018), Conditions for increasing the competitiveness of export products of enterprises. *Modern approaches to enterprise management*. Retrieved from <http://conf.management.fmm.kpi.ua/proc/article/view/125299>.
16. Pokras, O. (2017). Analysis of the Ukrainian instrument-making industry international competitiveness using porter's diamond. *Technology audit and production reserves*, 4(5 (36)), 31-36.
17. Robinson, J. C., & Luft, H. S. (1987). Competition and the cost of hospital care, 1972 to 1982. *Jama*, 257(23), 3241-3245.
18. UNIDO (2016). Report "Industrial Development Report 2016: the Role of Technology and Innovation in Inclusive and Sustainable Industrial Development". Retrieved from <https://www.unido.org>
19. Volkova, O. D., Manaïenko, I. M. (2018). Trends, problems and prospects for the development of high-tech production in Ukraine. *Aktual'ni problemy ekonomiky ta upravlinnia* Retrieved from <http://ape.fmm.kpi.ua/article/view/130960/126689>.
20. Waddock, S. A., & Graves, S. B. (1989). Industry Competitiveness as a Function in R&D and Capital Goods. In *Academy of Management Proceedings* (Vol. 1989, No. 1, pp. 344-348). Briarcliff Manor, NY 10510: Academy of Management.
21. Xin, C., & Chengyu, Y. (2017). Romania Industrial Competitiveness and China-Romania Cooperation. *Global Economic Observer*, 5(1), 73.
22. Zhou, L. F., & Ming, C. Y. (2014). Industrial cluster competitiveness connotation and evaluation-A case study of Yulin city magnesium industry clusters. In *Applied Mechanics and Materials* (Vol. 602, pp. 3532-3535). Trans Tech Publications Ltd.
23. Pukała, R., Vnukova, N., & Achkasova, S. (2017). Identification of the priority instruments affecting regulations on the development of insurance in the framework of international requirements. *Journal of Insurance, Financial Markets and Consumer Protection*, 23(1), 28-40.
24. Pukala, R., & Petrova, M. (2019). Application of the AHP method to select an optimal source of financing innovation in the mining sector. In *E3S Web of Conferences*, 105, 04034.
25. Ishchuk, S., Sozansky, L., & Pukała, R. (2020). Optimisation of the relationship between structural parameters of the processing industry as a way to increase its efficiency. *Engineering Management in Production and Services*, 12(2), 7-20.