“Estimation of transport industry’s economic sustainability as an element of strategic management: case of Poland and Ukraine”

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ESTIMATION OF TRANSPORT INDUSTRY'S ECONOMIC SUSTAINABILITY AS AN ELEMENT OF STRATEGIC MANAGEMENT: CASE OF POLAND AND UKRAINE

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Abstract

The transport sector's economic sustainability is an important factor in economic development, trade, quality, and safe transportation of goods and passengers, and regional and international integration. The tools of the transport sector's strategic management should be based on assessing its current economic stability. Applying statistical and regression analysis of Ukraine and Poland's transport sector, an approach to assessing the level of economic stability is formulated based on a system of integrated indicators of elementary, general, and specific stability. The integrated indicator of elementary economic stability considers the dynamics of the number of economic entities in the industry and their profitability. In Ukraine in 2018, this figure is –0.042, in Poland – 3.37. The integrated indicator of overall economic stability considers the number of employees in the industry, the gross domestic product created by enterprises in the industry, and the number of enterprises. In Ukraine, it is equal to –0.049, in Poland – 3.71. The integrated indicator of the transport sector's specific economic stability takes into account the volume of passengers, freight, and cargo handling, and in Ukraine, it is –0.040, in Poland – 3.38.

Keywords stability, estimation, sustainability, transport industry, Ukraine, Poland

JEL Classification O18, O11, L91

INTRODUCTION

The transport industry is a significant factor in the development of both the economy of individual regions and the country as a whole, as well as interstate entities. The development of all sectors of the economy depends on its efficient and sustainable work, as it is a means of communication between commodity producers and consumers in the domestic and foreign markets. Therefore, its economic stability is the object of national and international security and should be permanently under the strict control of state authorities, one of the important stages is the assessment and monitoring of its current state. Strategic management of the transport industry's innovation development should also be based on a defined assessment system that will allow monitoring the current state of the industry and tracking changes in its economic sustainability as a result of management decisions.

1. LITERATURE REVIEW

The study of existing approaches to estimating the level of the transport sector's economic sustainability still not enabled to unequivocally establish and assess its economic sustainability, due to the lack of a mod-

el for assessing economic sustainability (Babina & Shulyarenko, 2015; Bakaev, & Kononchuk, 2016; Kovbatyuk & Shklyar, 2015).

Many studies of domestic and foreign scientists have been devoted to the study of various methods of assessing the stability and efficiency of the transport industry in its various aspects (Bonyar, Valiavska, & Korniiko, 2016; Dorofeeva, 2016; Karpenko, Palyvoda, & Bondarenko, 2018; Koba, Babina, & Karpenko, 2013; Preiger, Sobkevich, & Yemelianova, 2011; Shklyar, 2014; Yanovska, Pylypenko, Tvoronovych, & Bozhok, 2018) and others, which are mainly devoted to assessing the economic efficiency of different types of transport at the level of large enterprises in the industry. For example, Babina and Shulyarenko (2015) proposed calculating the transport capacity of the economy as one of the indicators for assessing its development. This allowed determining the transport sector's total contribution to the GDP of the country, but it did not enable to assess the sustainability of the transport sector itself. A system for assessing the quality of transport and forwarding services has been developed (Bakaev & Kononchuk, 2016), which also does not fully assess the stability of the transport industry. Karpenko, Palyvoda, and Bondarenko (2018) also failed to develop a model for assessing sustainability in the conditions of the proposed simulation of the transport industry's strategic development models. Kovbatyuk and Shklyar (2015) used only traditional methods of analysis to outline the trends that have been developed in the industry but do not enable them to determine its sustainability.

It is worth noting the proposal to evaluate enterprises in a cost-effective approach based on the use of 5D actuarial reporting, analyze net assets and ability of the enterprise to generate cash flows, the ability to increase market value in the future (Fomina, Moshkovska, Luchyk, Manachynska, & Kuzub, 2020). However, to assess the transport industry's sustainability, it is necessary to take into account the specific indicators of transport enterprises: the volume of transportation and cargo handling, profitability, number of enterprises, and the number of employees in the transport sector.

The stability of enterprises is mostly considered through indicators of financial stability and external and internal environmental factors that affect market conditions. In the economic literature, there are integrated approaches to the assessment of sustainability, but it must be understood that on the one hand, the concept of sustainability is debatable and multifaceted. It can be economic, financial, investment, credit, innovation, environmental, social sustainability of the enterprise. Moreover, in any case, it is necessary to take into account several factors, because a combination of factors influences the manifestation of stability.

To assess the economic stability of enterprises, some authors identify financial, production, technological, organizational, market, socio-environmental, and investment subsystems (Shmygol & Kasianok, 2020). The need for an integrated assessment of the impact of these subsystems on cash flows and opportunities for companies' sustainable development is emphasized. However, the proposed qualitative assessment is subjective and does not reveal industry specifics, which is one of the key factors influencing enterprises' economic stability.

The assessment of the enterprises' economic stability differs significantly from the assessment of a particular industry, country, or region. For example, in assessing the economic stability of regions, indicators such as political stability, open markets, and economic development are taken into account (Sweidan, 2019).

A literature review showed the focus of theoretical developments on the formation of added value, integration of resources, interests, and services to create value and achieve sustainable development. The basis for ensuring the enterprise's sustainability is the creation of value (Brozovic, D'Auria, & Tregua, 2020) while distinguishing between economic, social, and environmental value. Collaboration for sustainability must distinguish between value to create utility and value to create sustainability. However, the proposed approach is based on a study of leading large and most successful companies, does not take into account industry and regional characteristics, the specifics of small and medium-sized businesses. All this indicates the need to take into account additional factors in finding an effective model for assessing the industry's sustainability, taking into account the peculiarities of the transport enterprises.

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In general, sustainable development as an object of study is mainly considered due to a set of socio-economic factors that affect it (Ambika & Krishnamoorthy, 2019). However, the literature does not sufficiently disclose the tools of an integrated or quantitative assessment of economic sustainability.

There is research that sustainability behavioral control and stability are important predictions of sustainable entrepreneurship (Kimuli, Orobia, Sabi, & Tsuma, 2020). Sustainable development directly depends and mediates the relationship between sustainability behavioral control and the sustainability of entrepreneurship.

Aspects of assessing the economic sustainability of the transport industry remain little studied. Modeling methods are often used to assess economic sustainability. In particular, quantitative and qualitative methods are used to model logistics' economic sustainability based on system dynamics (Arya, Srivastava, & Jaiswal, 2019). However, the main purpose of the developed model is to support the decision to invest in environmental logistics technology without violating the current financial and economic situation.

A statistical regression model is also used to assess the economic sustainability of transport, namely urban rail transport, on the example of Perugia in Italy (Chirieleison, Montrone, & Scrucca, 2019). It is necessary to note a reasonable approach to combining public transport's economic sustainability with the environmental and social sustainability of events. However, when assessing the economic sustainability of the entire transport sector, several factors need to be taken into account, as it combines all types of transport services, their risks, and features.

When assessing the transport industry's economic stability, it is necessary to take into account the characteristics of small businesses, the share of which is the vast majority in the number of economic entities (Kovova & Semenova, 2015). Also, the innovative development and economic sustainability of the transport sector is influenced by a public-private partnership (Budnik, 2015), especially in the field of financing infrastructure projects (Kravchenko, 2019), the formation of network organizational structures (Karpenko, Palyvoda, Bondarenko, Bonyar, & Bikfalvi, 2018).

Among foreign scientists, several economic models are considered to assess the effectiveness of individual transport projects, such as Todd Litman's VTPI (Litman, 2010), David Forckenbrocks and Glen Weisbrod's transport prediction model (Forckenbrocks & Weisbrod, 2001; Luskin, 1999) and others. Litman (2010) proposed assessing the impact of the economic development of public transport. Forckenbrocks and Weisbrod (2001) have assessed the economic benefit of transportation infrastructure investment in a sophisticated surface transportation system. All of these models are mainly based on an analysis of benefits and costs and are quite cumbersome in use. Thus, it should be noted that an effective system for assessing the transport sector's economic sustainability has not yet been developed. There is still insufficient research in assessing and managing the economic sustainability of transport at the micro and macro levels, which explains why the decisions made on business sustainability do not bring the expected results.

2. AIMS

The work aims to develop a mathematical apparatus for integrated assessment of the transport industry's economic stability and its testing in the assessment of transport industries in Ukraine and Poland.

3. METHODS

To determine the economic sustainability of the transport industry, it is appropriate to use the mathematical description of the definition of the category of economic sustainability, that is, the transport industry's ability to ensure sustainable, profitable development in a changing external and internal environment.

The ability to provide sustainable development should be evaluated by determining the growth of the number of transport enterprises that were formed compared to the previous period. In this sense, sustainable development will be marked by

a positive increase in the number of enterprises operating in this field; that is, the mathematical value of growth will be higher than one. At the same time, to ensure economic stability, development must still be profitable. That is, the totality of enterprises operating in the transport sector should work cost-effectively. In this sense, the profitability indicator's value for the display of profitable activities should be uniquely greater than zero, and ideally, be higher than one.

In general, the elemental indicator of economic sustainability of the transport industry can be described by the following formula (1):

$$I_{est} = \left(\frac{Q_n}{Q_{n-1}} \right) \cdot r_n, \quad (1)$$

where I_{est} – elemental indicator of economic sustainability of the transport industry; Q_n – the number of transport companies operating in the period for which the index is calculated; Q_{n-1} – the number of transport companies operating in the previous period; n – the period for which the index is calculated; r_n – the total profitability of all transport enterprises operating in the period for which the index is calculated.

The description of economic sustainability based on this model is the most elementary from a mathematical and economic point of view, but it only gives a general idea of the transport industry's economic sustainability. To assess economic sustainability in combination with macroeconomic indicators, it is expedient to supplement this index with the growth of the share of the country's gross domestic product (GDP), which is created in the field of transport and growth of the number of workers employed in this sector. Mathematically, incremental data for an economically stable sector should be larger units, indicating that there is economic growth in it. Then, the general economic sustainability of the transport industry will be as follows:

$$I_{gest} = \left(\frac{Z_n}{Z_{n-1}} \right) \cdot \left(\frac{H_n}{H_{n-1}} \right) \cdot \left(\frac{Q_n}{Q_{n-1}} \right) \cdot r_n, \quad (2)$$

where I_{gest} – general indicator of economic sustainability of the transport industry; Q_n – the number of transport companies operating in the period for which the index is calculated; Q_{n-1} – the number of transport companies operating in the previous period; Z_n – GDP created in the transport sector in the period for which the index is calculated; Z_{n-1} – GDP created in the transport sector in the previous period; H_n – the number of employees in the transport sector in the period for which the index is calculated; H_{n-1} – the number of employees in the transport sector in the previous period; n – the period for which the index is calculated; r_n – the total profitability of all transport enterprises operating in the period for which the index is calculated.

Considering the specificity of statistical indicators in the transport sector, the above integral index (1) should be interpreted according to the specified features. In this sense, sustainable development will be marked by a positive increase in the transport of passengers and goods in the transport sector. Besides, it is advisable to evaluate the rate of handling of goods (cargo turnover) as a product of the weight of transported cargoes per distance of transportation:

$$I_{sest} = \left(\frac{P_n}{P_{n-1}} \right) \cdot \left(\frac{C_n}{C_{n-1}} \right) \cdot \left(\frac{CO_n}{CO_{n-1}} \right) \cdot r_n, \quad (3)$$

where I_{sest} – specific indicator of economic sustainability of the transport industry; P_n – the volume of passenger traffic in the period for which the index is calculated; P_{n-1} – the volume of passenger traffic in the previous period; C_n – the volume of cargo transportation in the period for which the index is calculated; C_{n-1} – the volume of cargo transportation in the previous period; CO_n – the volume of cargo handling (cargo turnover) in the period for which the index is calculated; CO_{n-1} – the volume of cargo handling (cargo turnover) in the previous period; n – the period for which the index is calculated; r_n – the total profitability of all transport enterprises operating in the period for which the index is calculated.

Based on the aggregate of components included in the calculation of the overall sustainability indicators, I_{est}, I_{gest}, and I_{sest}, it is only possible to assert the economic sustainability of the transport industry when these data are larger than one. That is, the available growth of all indicators will form a value greater than one, and the profitability of the activity will be positive.

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The boundaries of these indicators for the overall assessment of the economic sustainability of the transport industry are given in Table 1. Also, to assess the positive dynamics of economic sustainability, the values of indicators should increase compared to the previous period, indicating that there are positive dynamic changes in the transport sector.

Table 1. The boundaries of indicators of economic sustainability of the transport industry

Source: Compiled by the authors.

Indicators value	Characteristics of economic sustainability
I_{est} (I_{gest}, I_{sest}) < 0	Sector is economically unstable
0 < I_{est} (I_{gest}, I_{sest}) < 1	Low level of sustainability
1 < I_{est} (I_{gest}, I_{sest})	Sector is economically stable

Using the proposed indices and methods for assessing the functioning of the transport industry, one can investigate the state and trends of the formation of economic sustainability of transport companies in a separate region and the country as a whole, as well as in certain modes of transport.

4. RESULTS

Using the traditional data analysis apparatus, the main trends in the transport sector over the past five years from 2013 to 2018 in Ukraine and Poland were identified in the following areas: number of enterprises, number of employees, gross domestic product generated by enterprises in the industry, and indicators of passenger and cargo transportation. The identified trends are presented in Figures 1-6.

Figure 1 illustrates the dynamics of the number of enterprises in the field of transport.

It is established that there is no clear trend in the dynamics of the number of enterprises in Ukraine. Over the past two years, there has been an increase in the number of enterprises in the transport sector, but their number has not yet reached the pre-crisis state of 2013 and is only 90% of the 2013 level. The number of transport companies in Poland is also fluctuating and tends to increase by an average of 10% over the past two years. Polynomial trends illustrate changes in the number of enterprises in the industry in both countries. It is worth noting that in the transport industry in Poland, there are ten times more enterprises than in Ukraine.

Despite fluctuations in the number of transport companies in both countries in Figure 2, there is a gradual increase in the gross domestic product. In Ukraine, a slight drop was observed in 2014 and was caused by the crisis after the temporary annexation of the Autonomous Republic of Crimea and the occupation of some parts of Donetsk and

Source: Authors, compiled based on Statistics Poland (2019), State Statistics Service of Ukraine (2019).

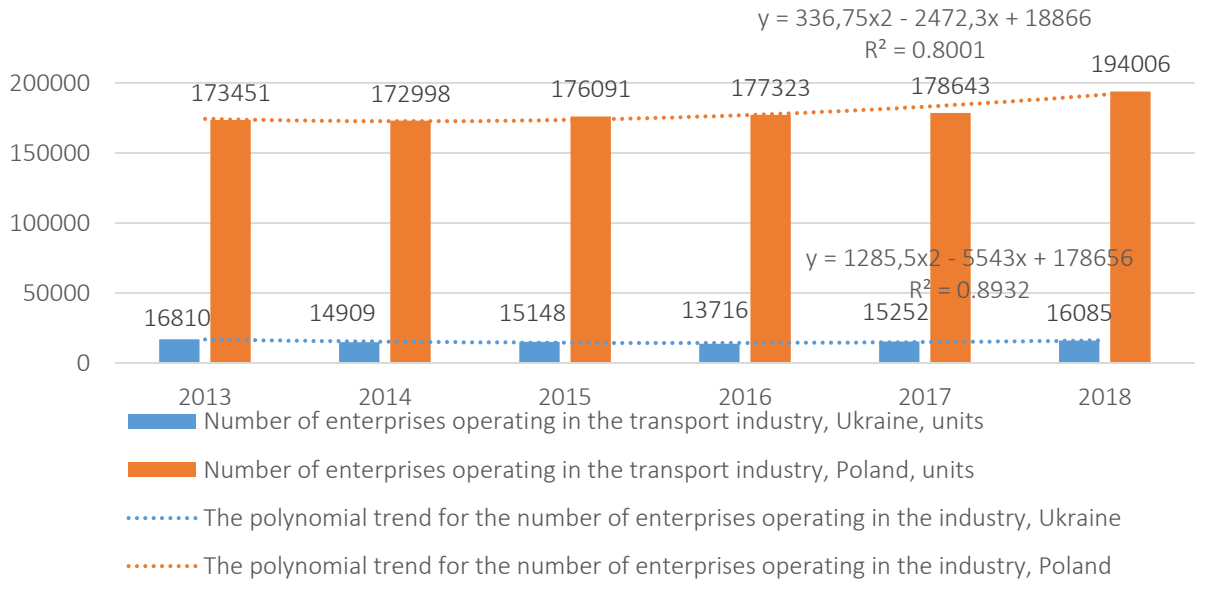

Figure 1. The dynamics of the number of enterprises operating in the transport industry in 2013–2018 in Ukraine and Poland, units

Source: Authors, compiled based on Statistics Poland (2019), State Statistics Service of Ukraine (2019).

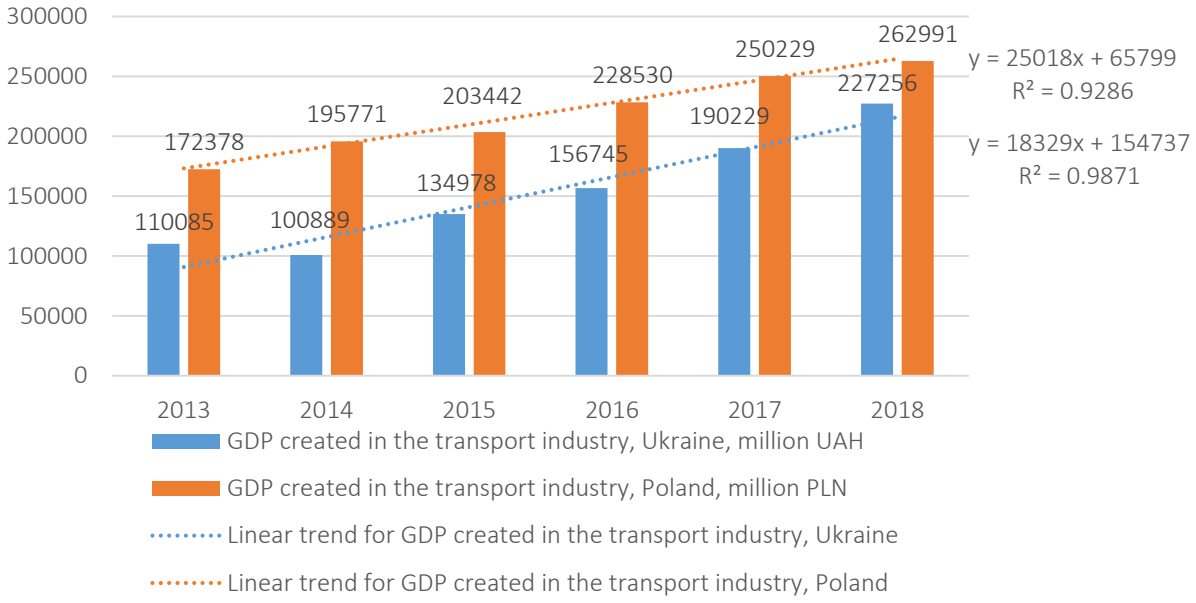

Figure 2. The dynamics of GDP created in the transport industry in 2013–2018 in Ukraine (million UAH) and Poland (million PLN)

Luhansk regions. Since 2015, a linear tendency has been formed for the growth of sectoral GDP, which is reflected by the line of a trend in Figure 2 with the approximation value $R^2 = 0.9286$.

Compared to 2013, the GDP of Ukraine's transport industry grew by 106% in 2018 and had an average annual increase of 16,4%. Taking into account that the inflation growth from 2013 to 2018 was 24.4% in 2013, 43.3% in 2014, 12.4% in 2016, 13.7% in 2017, 9.8% in 2018, real GDP growth is observed only from 2016 to 2018 years at 3.6% in 2016, 7.3% in 2017 and 9.2% in 2018.

Gross domestic product created by transport companies in Poland has a clear linear tendency to increase with the magnitude of approximation $R^2 = 0.9871$, with an average growth rate of 9.75% per year.

In Figure 3, there is a tendency to decrease the number of employees at the enterprises of the transport industry of Ukraine during the entire investigated period. Despite the volatility of the number of enterprises in the industry both in positive and negative terms, the number of employees has formed a linear tendency to decline with the magnitude of approximation $R^2 = 0.8019$, which is mainly due to optimization of the number of employees in the industry and outflow of personnel from Ukraine to which the transport industry was quite sensitive.

It should be noted that from 2013 to 2018, the number of people working in Ukraine's transport industry decreased by 20%.

The number of people working in the transport industry of Poland, on the contrary, grows annually with an average annual growth rate of 4.25% and has a clear linear tendency to increase with the approximation value $R^2 = 0.9414$. It should be noted that part of the labor resorces from the transport industry of Ukraine moved mainly to Poland due to the weakening of the visa regime.

The dynamics of passenger and cargo transportation by transport enterprises of Ukraine and Poland for 2013–2018 (Figures 4-6) shows a decrease in passenger traffic and cargo in Ukraine.

The number of passenger movements in Ukraine has decreased over five years and has a clear linear tendency to fall with the magnitude of approximation $R^2 = 0.9113$. It should be noted that the volume of passenger traffic in Ukraine decreased by

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Source: Authors, compiled based on Statistics Poland (2019), State Statistics Service of Ukraine (2019).

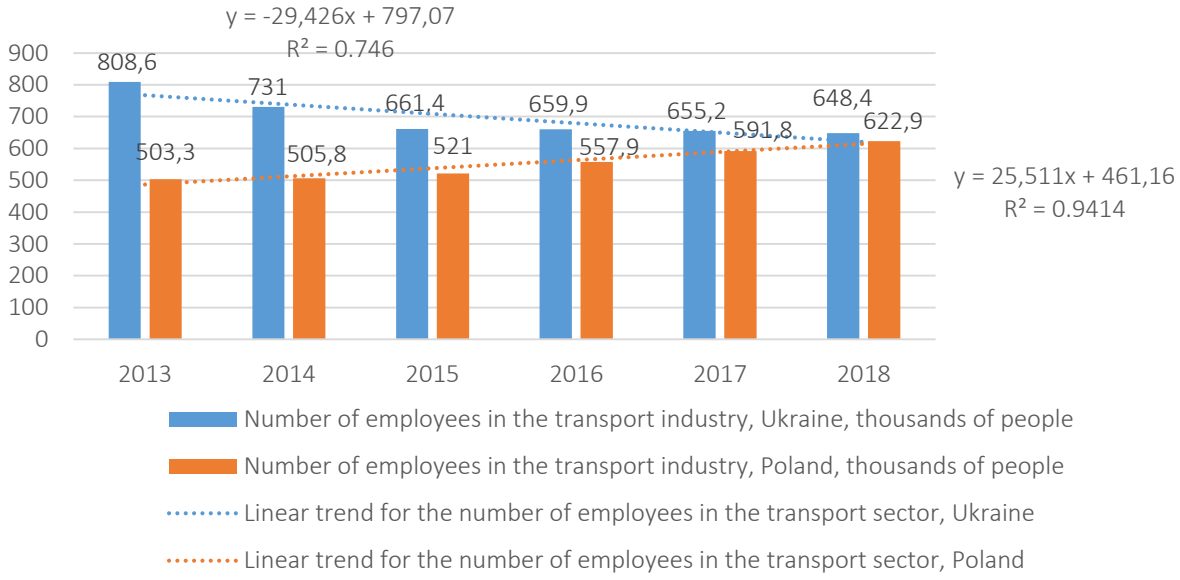

Figure 3. The dynamics of the number of employees in the transport industry during 2013–2018 in Ukraine and Poland, thousand people

30% in 2017 compared to 2013 and had an average rate of decline of 8% annually. And in 2018, there was a 32% reduction compared to 2013 and 4% compared to 2017.

In Poland, volumes of passenger traffic remain almost stable over the past six years, at an average of 693 million persons.

It is advisable to consider in more detail the dynamics of freight traffic (Figure 5), as this is the most significant component in the company's income and the factor that provides economic sustainability of enterprises and their development.

Figure 5 presents the fluctuations in the total volumes of cargo transportation for 2013–2018 by all

Source: Authors, compiled based on Statistics Poland (2019), State Statistics Service of Ukraine (2019).

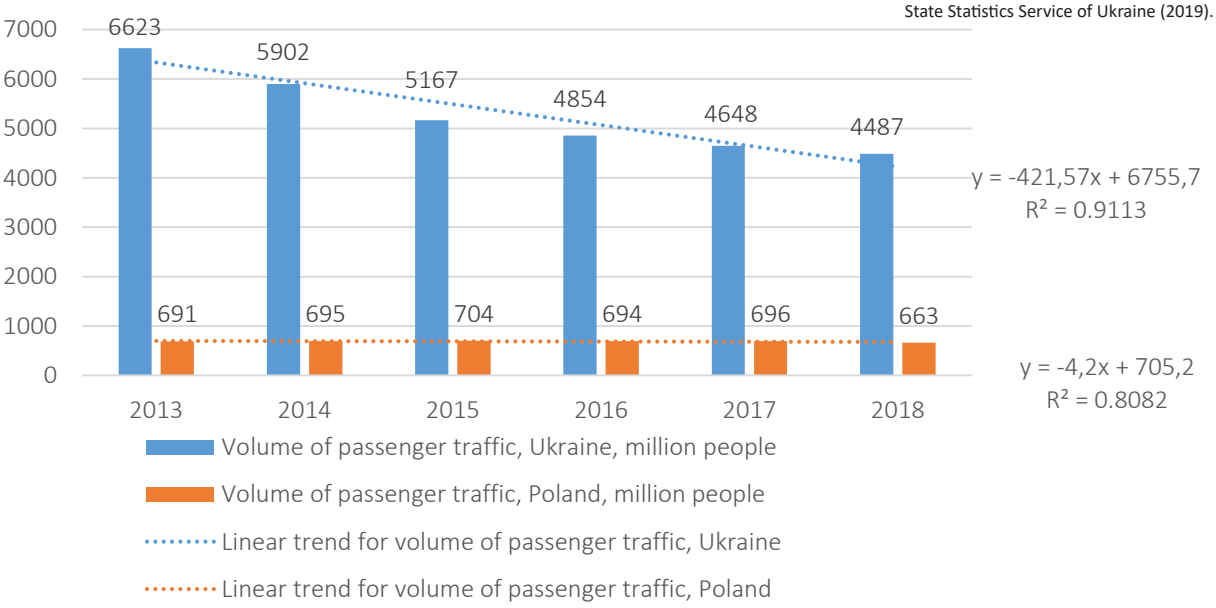

Figure 4. The dynamics of volume of passenger traffic in 2013–2018 in Ukraine and Poland, million people

Source: Authors, compiled based on Statistics Poland (2019), State Statistics Service of Ukraine (2019).

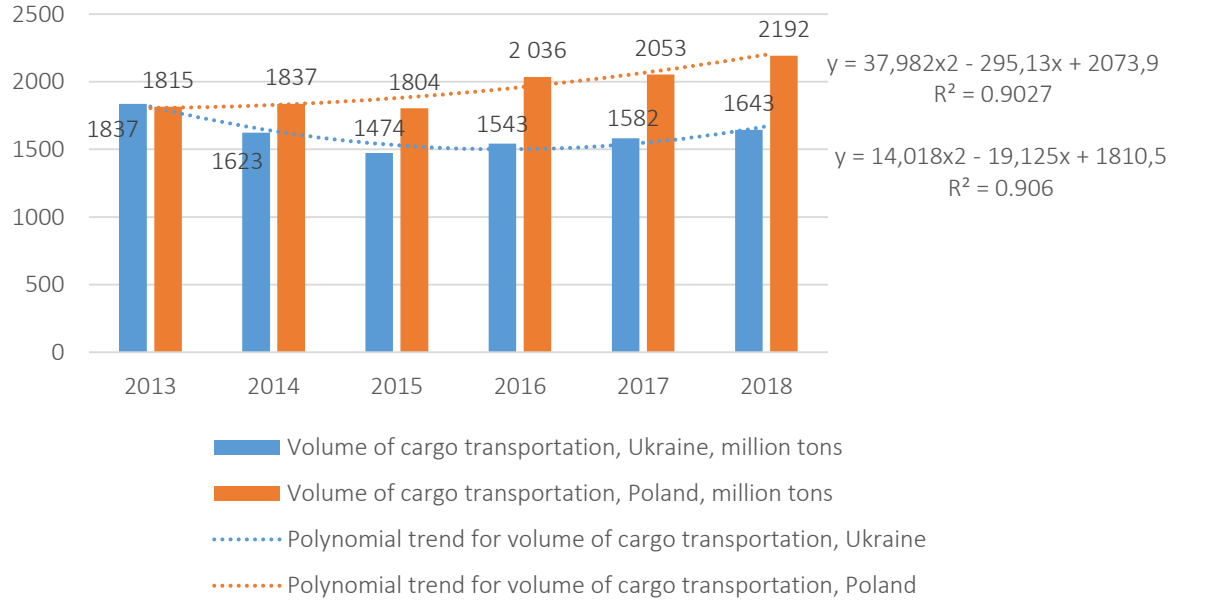

Figure 5. The dynamics of volume of cargo transportation in 2013–2018 in Ukraine and Poland, million tons

transport types in both countries. Reasons for reducing traffic volumes for the years 2013–2015 in Ukraine are related to the economy's crisis, loss of trade and industrial ties, rising fuel and energy costs. From 2015 there is a slight increase in the volume of cargo transportation, but by the end of 2018, this volume was only 89% of cargo volumes in 2013. It should be noted that the volumes of cargo transportation by Polish companies, although they experienced similar negative fluctuations in 2015, however, have more accelerated growth rates over the past two years.

Source: Authors, compiled based on Statistics Poland (2019), State Statistics Service of Ukraine (2019).

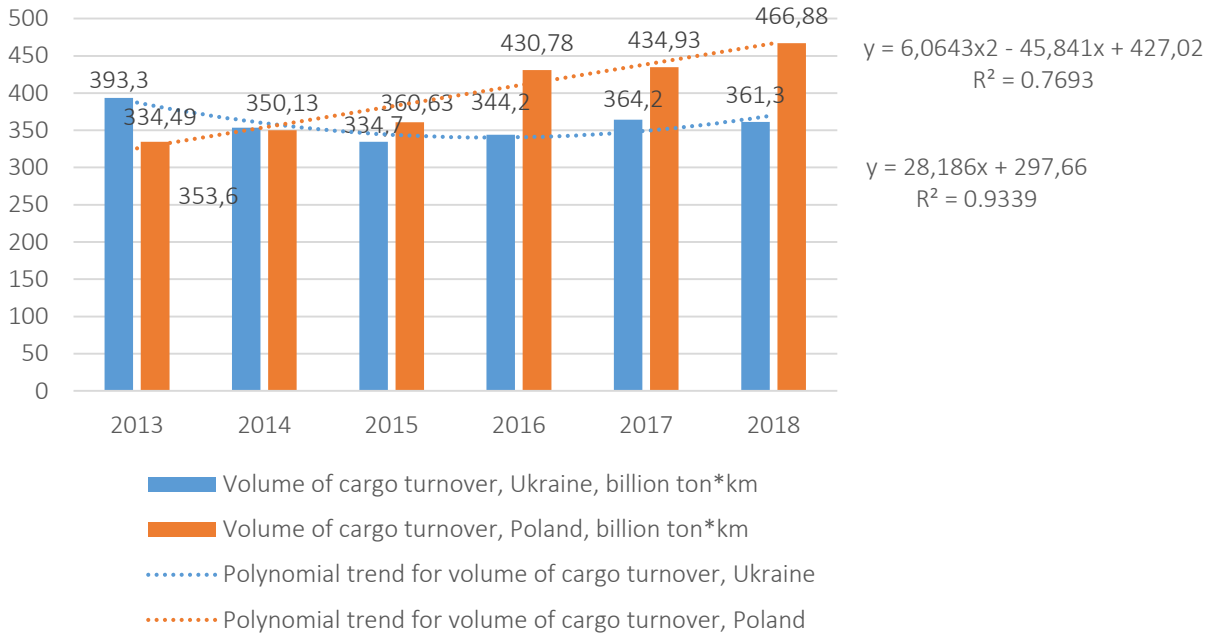

Figure 6. The dynamics of volume of cargo turnover in 2013–2018 in Ukraine and Poland, billion ton*km

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A similar situation of gradual growth occurs with the general values of cargo turnover in both countries (Figure 6).

However, in this case, growth is faster than the growth rate of freight traffic. So in Ukraine, at the end of 2018, the volume of cargo handling is 92% of the 2013 level. As for Poland, it is worth noting a clear linear tendency to increase the volume of cargo handling with an average annual increase of 7%.

Thus, summing up the results of the traditional analysis of the state of the transport industry in Ukraine, it can be argued that many negative trends can affect its stability, in particular, the volatility of the number of employees in the industry, the number of enterprises and the reduction of all volumes of transportation. Regarding the transport sector in Poland, then, on the contrary, there are positive trends that affect the strengthening of its economic sustainability. However, the analysis does not determine the level of economic sustainability of the transport industry of any country but only allows for outlining trends in the industry and affecting economic stability. Consider the application of the proposed indicators in assessing the state of economic sustainability of the transport industry in Ukraine for the same period in Table 2 and Poland in Table 3.

According to Table 2, the most negative impact on the indicators of economic sustainability is the negative value of profitability, especially in 2014, the index was −0.091, and in 2015 the index was −0.049, mainly due to the introduction of a military state in Ukraine, the annexation of the Crimea, the loss of economic ties and several other devastating factors. The index of elemental economic sustainability of transport industry enterprises was: −0.081, −0.050, −0.016, −0.038, −0.042, respectively, for 2014–2018.

The indicator of the industry's general economic sustainability takes into account the dynamics of GDP and the number of employees in transport enterprises. Favorable is the fact that GDP is increasing from 2015, but real positive shifts reduce the rate of inflation, as the number of employees in the industry is constantly decreasing: from 808.6

Table 2. Dynamics of indicators of economic sustainability of transport industry of Ukraine for 2013–2018

Source: Authors, compiled based on the State Statistics Service of Ukraine (2019).

No.	Indicators	Years					
		2013	2014	2015	2016	2017	2018
1	The number of enterprises operating in the transport industry	16810	14909	15148	13716	15252	16085
2	Index of growth (reduction) of the number of enterprises operating in the industry	x	0,89	1,02	0,91	1,11	1,05
3	The total profitability of all transport enterprises	−0.006	−0.091	−0.049	0.018	−0,.034	−0.040
4	**Elemental indicator of economic sustainability of the transport industry (I_{est})**	x	−0.081	−0.050	0.016	−0.038	−0.042
5	GDP, created in the transport industry, UAH million	110085	100889	134978	156745	190229	227256
6	Index of GDP growth (reduction) created in the transport sector	x	0,92	1,34	1,16	1,21	1,19
7	Number of employees in the transport industry, thousand people	808,6	731,0	661,4	659,9	655,2	648,4
8	Index increase (decrease) the number of employees in the transport industry	x	0,90	0,90	1,00	0,99	0,99
9	**General indicator of economic sustainability of the transport industry (I_{gest})**	x	−0.067	−0.060	0.019	−0.046	−0.049
10	Volume of passenger traffic, million people	6623	5902	5167	4854	4648	4487
11	Index of growth (reduction) of passenger traffic	x	0,89	0,88	0,94	0,96	0,97
12	Volume of cargo transportation, million tons	1837	1623	1474	1543	1582	1643
13	Index of growth (reduction) of cargo transportation	x	0,88	0,91	1,05	1,03	1,04
14	Volume of cargo handling (cargo turnover), billion ton*km	393,3	353,6	334,7	344,2	364,2	361,3
15	Index of growth (reduction) of cargo handling volume	x	0,90	0,95	1,03	1,06	0,99
16	**Specific indicator of economic sustainability of the transport industry (I_{sest})**	x	−0.064	−0.037	0.018	−0.035	−0.040

thousand people in 2013 to 648.4 thousand people in 2018. Thus, the indicator of the transport industry enterprises' general economic stability has a dynamics of –0.079, –0.060, –0.019, –0.046, –0.049, respectively, for 2014–2018. To assess specific economic sustainability, the index of passenger turnover changes, which is reduced throughout the study period, as well as cargo and freight traffic indices, which tended to decrease in 2013–2015 and growth in 2016–2017. Therefore, the indicator of the transport industry enterprises' specific economic stability was: –0.064, –0.037, –0.018, –0.035, –0.040, respectively, for 2014–2018.

Therefore, taking into account the assessment of the state of economic sustainability in Table 2, it should be noted that the economic sustainability of the transport industry of Ukraine in 2013–2018 ranges from an unstable state to a state of low stability in 2016 and again decreases in 2018, which essentially confirms the negative tendencies detected by traditional methods of analysis. It is worth noting that the main factor influencing the economic sustainability index's negative values is the loss-making of enterprises in the industry, which is the main indicator of the activity of the entire set of enterprises. It is necessary to emphasize that the lack of profitability makes it impossible for internal expansion of the industry's productive forces and indicates the impossibility of ensuring the industry's stability as a system in the current and future periods. In the absence of its own sources of expanded reproduction, the transport industry of Ukraine, as the economic system is in a "dampened" state and needs external investments in the form of investments or low-interest loans in the renovation of the infrastructure. The introduction of a strategy for innovation development of the industry should contribute to the enhanced reproduction. The development of infrastructure projects on the terms of public-private partnership, technology upgrading, and control of the activities of major infrastructure enterprises, to bring them to a profitable level of management, can form the basis of the strategy of ensuring the economic sustainability of the transport sector.

The opposite trends in the estimation of economic sustainability show all the proposed indicators of the calculations in Poland in Table 3. It is worth noting that all calculated indicators of economic sustainability are increasing each year and are greater than 1, which indicates the stability of the Polish transport sector. Given that some compo-

Table 3. Dynamics of indicators of economic sustainability of transport industry of Poland for 2013–2018

Sources: Authors, compiled based on Statistics Poland (2019)

No.	Indicators	Years					
		2013	2014	2015	2016	2017	2018
1	The number of enterprises operating in the transport industry	173451	172998	176091	177323	178643	194006
2	Index of growth (reduction) of the number of enterprises operating in the industry	x	1,00	1,02	1,01	1,01	1,086
3	The total profitability of all transport enterprises	1,9	2,2	3,5	4	4,1	3,1
4	**Elemental indicator of economic sustainability of the transport industry (I_{est})**	x	2,18	3,57	3,98	4,13	3,37
5	GDP, created in the transport industry, PLN million	172 378	195771	203442	228 530	250 229	262991
6	Index of GDP growth (reduction) created in the transport sector	x	1,14	1,04	1,12	1,09	1,05
7	Number of employees in the transport industry, thousand people	503,3	505,8	521	557,9	591,8	622,9
8	Index increase (decrease) the number of employees in the transport industry	x	1,01	1,03	1,07	1,06	1,05
9	**General indicator of economic sustainability of the transport industry (I_{gest})**	x	2,51	3,82	4,78	4,80	3,71
10	Volume of passenger traffic, million people	691	695	704	694	696	663
11	Index of growth (reduction) of passenger traffic	x	1,01	1,01	0,99	1,00	0,95
12	Volume of cargo transportation, million tons	1815	1837	1804	2 036	2053	2192
13	Index of growth (reduction) of cargo transportation	x	1,01	0,98	1,13	1,01	1,07
14	Volume of cargo handling (cargo turnover), billion ton*km	334 ,49	350,13	360,63	430, 78	434, 93	466,88
15	Index of growth (reduction) of cargo handling volume	x	1,05	1,03	1,19	1,01	1,07
16	**Specific indicator of economic sustainability of the transport industry (I_{sest})**	x	2,35	3,58	5,32	4,19	3,38

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Source: Developed by the authors.

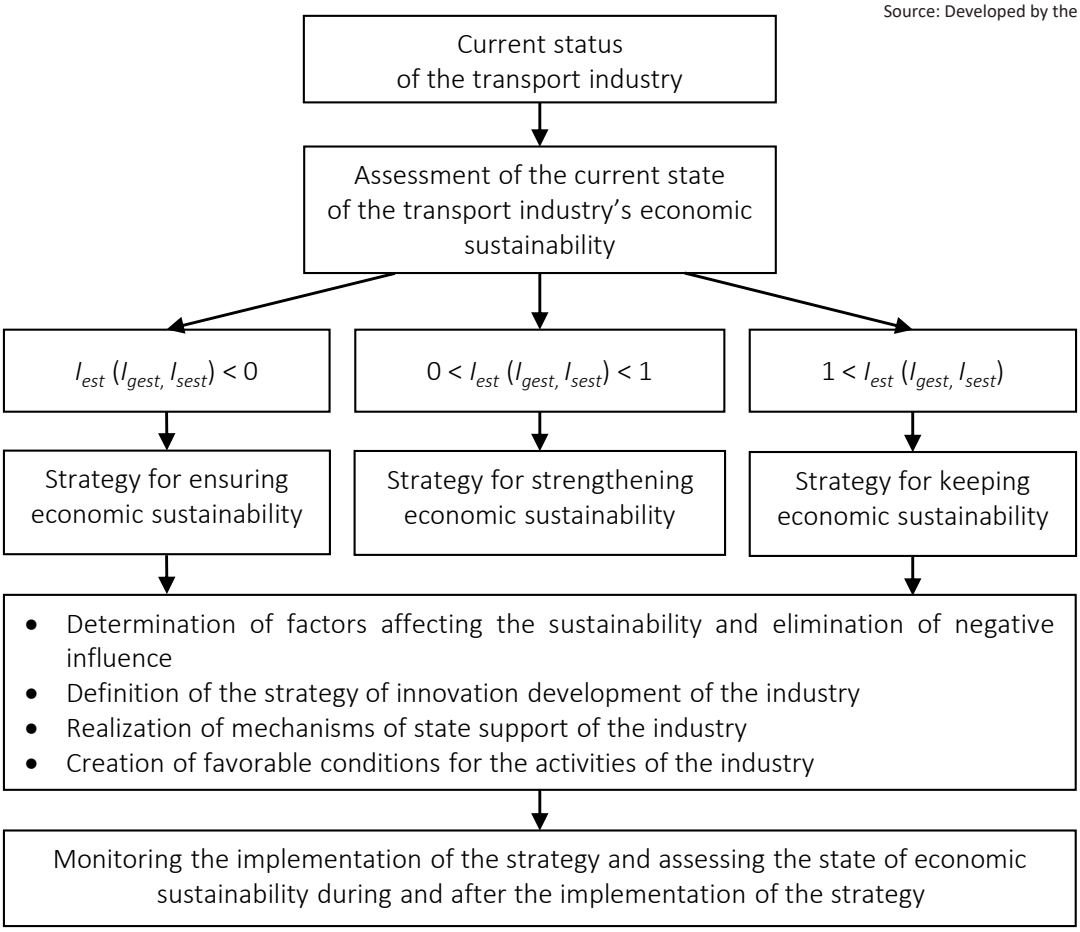

Figure 7. Structural-logical scheme of ensuring the economic stability of the transport industry

nents of the index sometimes had negative fluctuations, however, the decisive role in the calculation of sustainability indicators was played by the fact that in all the years studied, the profitability of enterprises in Poland was positive, which indicates the efficient functioning of the transport industry and the possibilities of the industry as a system for expanded reproduction. Thus, it is demonstrated that the proposed system of indicators of economic sustainability of the transport industry allows it to reliably assess and confirm the general tendencies formed in the transport industry of any country.

Based on the fact that the assessment of the economic sustainability of the transport industry is only one of the stages of its control, the structural and logical framework of ensuring economic stability in Figure 7 was determined.

Thus, the assessment of the transport sector's current economic sustainability requires an appropriate adjustment of the strategy in the scenario of implementation (achievement), strengthening (stabilization), or maintaining a sufficient level of economic stability.

5. DISCUSSION

The content of strategies for ensuring, strengthening, and keeping the economic sustainability of the transport industry and their tactical content should be in line with the overall strategy for developing the national economy and the infrastructure capacity of the country for which such an assessment is made.

Thus, for Poland, according to the calculations, the strategy of maintaining economic sustainability will be relevant, which will be reflected in further infrastructure development and revitalization of the state policy on increasing the environmental and energy efficiency of transport, etc.

In the main features of the strategy of ensuring the economic sustainability of Ukraine's transport industry, according to the domestic scientists, should primarily include the following measures:

- creating a favorable investment climate by combating corruption and introducing tax incentives (Kovova, Malyshkin, Vicen, Shulyarenko, Semenova, & Shpyrko, 2018);
- provision of preferential loans to transport enterprises under state guarantees (Ministry of Infrastructure of Ukraine, 2016; Preiger, Sobkevich, & Yemelianova, 2011);
- redistribution of the capacity of state transport enterprises to the places with the greatest demand for transport services (Andreeva, 2012);
- activation of mechanisms of a public-private partnership with the purpose of effective use of state property in the field of transport (Budnik, 2015);
- development of transport infrastructure (Shpak, Dvulit, Luchnikova, & Sroka, 2018);
- promotion of the integration of Ukraine's transport system into the EU (Mykhailychenko, 2017);
- intensification of state policy on increasing the environmental and energy efficiency of transport (Valiavska, 2016);
- strengthening scientific work to find optimal and cost-effective technical, operational, organizational, and marketing decisions to increase the profit of transport enterprises.

Many factors ensure economic stability. The economic growth of the regions needs to invest in the development of transport infrastructure. Therefore, the transport industry's stability and the quality of infrastructure, in turn, significantly affect the acceleration of the flow of goods, passengers, and labor, contribute to the growth of production and trade, integration processes, elimination of geographical disparities, competition development, and optimization of structural relationships of different industries (Ben, 2019).

Thus, each country's strategy to ensure the transport industry's economic sustainability will depend on assessing its level and the main objectives that need to be addressed in the industry and will be developed on a case-by-case basis. The developed system of indicators for assessing the level of economic sustainability of the transport industry is one of the instruments of industry control and control of the implementation of the National Transport Strategies in particular. It can be used for any country or interstate entities (for example, the European Union, etc.).

CONCLUSION

Summarizing the study results, it should be stated that the developed mathematical apparatus of the integrated estimation of the economic sustainability of the transport industry allows estimating the industry's economic stability and is convenient and not cumbersome in its application. Conducting the proposed mathematical apparatus's approbation in assessing the economic sustainability of transport industries in Ukraine and Poland showed the correspondence of data calculated by integral indicators to the main trends in the transport industries of the selected countries and were determined by the traditional method. Considering the proposed methods of estimation as a stage of control of the transport industry's economic stability, a structural-logical scheme of ensuring its sustainability was formed. The content of sustainability strategies in this scheme will depend on assessing each country's economic sustainability. Apply developed integral indicators of the assessment of the economic sustainability of the transport industry appropriate in either interstate entities or individual countries in general, as well as in separate regions, as well as in certain modes of transport. The proposed system is convenient for determining the current economic sustainability of the industry and monitoring the changes that occur as a result of making managerial decisions regarding its innovative development.

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