DESIGN AND EVALUATION OF EFFICIENCY OF MACRO - LOGISTIC SYSTEMS FOR COUNTRIES WITH DEVELOPING ECONOMY

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Abstract. In modern conditions, improving the efficiency of logistics is of particular importance, especially for countries with developing economies. The development of logistics acts as a driver of the competitiveness of the country's economy, improving the quality of life of the population, and rational integration into the world economy. Therefore, the states of countries with developing economies face the global task of becoming a certain transit and logistics hub of the region, a "bridge" between Europe and Asia, the implementation of which directly depends on the development of transport logistics, the main factor in stimulating sustainable rates of industrial growth and the formation of competitive advantages of the economic system. The toolkit developed by the author and the results obtained can be used by state and local authorities in the development of strategies for the development of macrological systems in countries with developing economies for the medium term.

Keywords: logistics; macro-logistic systems; material and intangible logistics flows; logistics infrastructure; the mechanism of functioning of the macro-logistic system

1. Introduction

Analysis of the state and development trends of logistics in the world economy shows that in many respects the state of logistics and supply chain management (SCM) is a key factor in increasing the competitiveness potential. The global economic crisis, which over the past decades, has clearly demonstrated how important is the ability of macrologistic systems not only to reduce costs, but also to find new innovative solutions to maintain business stability in difficult and poorly predictable macroeconomic conditions. Those systems that were able to correctly assess the situation and reorganize in time to new rails of integration and coordination, both of internal logistics

business processes and relationships with counterparties in supply chains, were able not only to maintain their positions, but also to achieve significant results in increasing competitiveness and strengthening market positions. In a modern economy, the use of the principles of integrated logistics is one of the basic sources of sustainable competitive advantage for logistics systems. That is why the world's leading companies are making significant efforts to improve the efficiency of supply chains, focusing on the active involvement of logistics providers, the globalization of the location of production and logistics facilities and the implementation of the principles of integrating logistics business processes in building a business.

An effective logistics system is capable of speeding up the industrialization of the country through convergence within industrial centers, as well as creating a basis for deepening regional and Eurasian economic cooperation and further integration of countries into the world economy. Moreover, the strategically advantageous geographic location of the country allows you to receive a significant source of income through the active implementation of transit opportunities.

The intensive development of the logistics services market, the creation of a competitive environment in the field of commodity circulation and international transportation of goods, the strengthening of integration trends in the world economy make it necessary to search for adequate market mechanisms to ensure the effective functioning of the transport complex, which are considered logistics and logistics management. Hence follows the high urgency of solving problems aimed at the development of transport and logistics infrastructure, in particular, at the formation of transport and logistics hubs, as an integral and key component that ensures an increase in the efficiency of the transport complex. In the Kazakh economy, as in a country with a developing economy, logistics is a fairly young industry and, following the example of foreign countries, is only turning into a practical tool for a market economy.

2. Research background

To position and use the best practices of leading companies and countries in the field of logistics, special analytical tools are needed, in particular international ratings, which have become a source of information for analytics.
The analysis of approaches and ratings of logistics efficiency assessment at the country level existing in the world practice is presented in separate publications of such authors as V.I.Sergeev, D.I. Zinina (2016), A.P. Dolgov (2015, 2016), and others.

Professor A.P. Dolgov (2016), who studies the problems of assessing logistics in international rankings, identifies the following key points of a methodological nature:
- selection of a set of indicators that most fully characterize the evaluated phenomenon or process;
- the choice of a rational ratio between objective indicators and subjective assessments of quality characteristics;
- determination of weight coefficients characterizing the significance of certain particular indicators, estimates.
Until now, no single, well-established definition of the logistics system has been formed. According to E. Yu. Alekseycheva (2015), quite often in the economic literature there is a definition according to which a logistic system is understood as an adaptive system with feedback, which performs certain logistic operations and functions. Moreover, such a system consists of several subsystems, has developed connections with the external environment. In addition, there is another definition of V.V. Gabbasova (2016), who claims that the logistics system is a system for managing logistics processes that have feedback. These processes operate in a single multi-level structure, with a single center for the distribution of resources according to established criteria for the effectiveness of their use. This means that the system makes it possible to ensure the implementation of logistics

operations with optimal costs for moving products throughout the supply chain. Therefore, an enterprise that has organized a logistics service is able to effectively solve problems associated with reducing costs, distributing and storing products, and reducing inventories. The saved costs allow to reduce the production cost. Some researchers, such as O.S. Damdyn (2015) notes that transport logistics is understood as the organization of functioning and management of material flows, as well as the corresponding supporting and accompanying flows in the process of goods movement. Other scholars, like B. Galstyan (2018), give a broader definition of the term. They emphasize that transport logistics is the movement of products by vehicles using a specific technology, specific routes in the supply chain. Such logistics consists of logistic, technological operations and functions. At the same time, it includes forwarding, cargo handling, packaging, transfer of ownership of the cargo, prevention of threats, insurance of risks, customs procedures, etc.

Analysis of the points of view of foreign authors made it possible to single out three definitions of the logistics infrastructure:

- according to D. Greenwald (1973) - this is a set of service industries, the list of which varies depending on the object and the operational composition of the activities of service subjects;

- W. Stanton (1978) claims that this is a set of material and technical means that provide normal conditions for the activities of economic entities;

- research of W. Rostow (1960) They agree that this is a set of conditions that create favorable preconditions for the development of commodity circulation in industries that meet the needs of the population.

According to A.M. Gadzhinsky (2018), the specificity of logistics consists in the allocation of a single function of management of previously disparate material flows; in the technical, technological, economic and methodological integration of individual links of the material-conducting chain into a single system that ensures effective management of end-to-end material flows.

Well-known approaches to assessing and predicting the effectiveness of logistics systems under given conditions, set forth in the works of the following domestic and foreign researchers (Table 1).

Table 1. Approaches to assessing and predicting the effectiveness of logistics systems in given conditions

Author	Approaches to assessing and predicting the effectiveness of logistics systems
Anikin B. (2016)	Criteria for the level of service in logistics are stated, where two areas of global importance are considered, associated with global logistics and logistics of "slender" production, as well as the problem of integrating organizations into the global logistics network
Gutthorna J. (2018)	Shows production and logistics activities in a smooth integration into supply chains of key business processes: production, distribution, transportation, forecasting and planning of demand, inventory management, service management and supply of spare parts, controlling and management of return material flows
Dolgov A. (2015)	The modern economic problems of regulation of flow processes and inventories in macrologistic systems of various hierarchical levels are considered
Dybskaya B. (2015)	A detailed analysis of the logistics process in a warehouse based on functional modeling is given. Specific recommendations for practitioners on the effective design and use of warehouse systems, optimization of the choice of technological and handling equipment for warehouses, planning of warehouse areas and other urgent problems of warehousing logistics are given
Kurenkov P. (2016)	The research focuses on warehouses in logistics, which perform the function of accumulating reserves, which are necessary to mitigate and damp fluctuations in the volume of demand and supply, thereby allowing the use of these resources in the event of a shortage of products on the market
Levkin G. (2019)	A comprehensive understanding of the features of material flow management in industry and trade is considered
Shulzhenko T. et al. (2017)	The classification of models and methods used in the theory of logistics is considered; analyzed

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	the most famous approaches used in procurement, production and distribution logistics
Mirotin L., Levin, B. (2015)	The issues of innovative processes in the field of transport management are considered, such as trends in the development of the transport industry and the development of concepts, models and mechanisms of logistics management of an intelligent transport system
Myasnikova L. (2016)	Examines modern problems of logistics management as the most important tool for increasing the competitiveness of companies in the market
Prokofieva T., Lopatkin O. (2017)	The problems of formation and development of regional logistics transport and distribution systems are investigated
Sergeev V., Zinina D. (2016)	Analysis of the approaches and ratings of logistics efficiency assessment at the country level existing in the world practice. It is shown that the objectivity of assessing the effectiveness of logistics can be increased using regression models that reveal the relationship between macroeconomic indicators and the level of development of logistics in a particular country. The proposed models help to minimize the impact of subjective expert assessments on the final ratings
Scherbakov B. (2018), Jiao et al. (2019); Adeniran, A.O., Obembe, O.E. (2020); Mader Michelle, M., Suski Cássio, A. (2019)	Shows a view of logistics as a field of entrepreneurial activity in the management of material, information, financial and other flows. Covers the basic concepts of logistics, substantiates the functional unity and efficiency of logistics solutions

Thus, in the development of the transport and logistics system, an important place is occupied by the formation of a logistics infrastructure, regarding the essence and content of which there are different points of view and components of the infrastructure of logistics processes. Investigating the management of integrated logistics systems in the digital economy, N.A. Gvilia, A.V. Parfenov, T.G. Shulzhenko (2019) established a relationship between the level of logistic integration and the form of intercorporate logistic formations, which made it possible to select management tools for certain forms of intercorporate logistic formations, including those based on the use of digital technologies. In the work of M. Adamczak, R. Domanski, L. Hadas, P. Cyplik (2016) aspects of the formation of integration relationships between production and logistics systems and elements of the external environment are considered. O. Mortansen, O. Lemoine (2008) investigates the system integration relationships between manufacturing enterprises and 3PL logistics providers.

Questions about measuring the strength of integration relationships between elements of intersystem logistics education are considered in the works of P. Cyplic, L. Hadas, M. Adamczak, R. Domanski, M. Kupczyk, Z. Pruska (2014), where an approach to measuring the level of integration in supply chains is proposed based on the ranking of local levels of integration in the implementation of integration processes in the supply chain.

At the same time, the development of digital technologies is of great importance, including in the management of logistics activities, which makes it possible to form tools for increasing the efficiency of the activities of both individual entities and the intersystem entities formed by them. In his scientific works, Y. Kayikci (2018) just describes the depth of interorganizational logistic integration, which is determined by the form of intercorporate interaction.

C. Wong, S. Boonitt, C. Wong (2011) investigated the principles of information integration of elements in supply chains, which make it possible to assert that for the forms of interorganizational interaction, estimates can be made that characterize the levels of logistic integration, which will differ significantly. V. Lukinskiya, V. Lukinskiya, T. Shulzhenko, T. (2017) describes logistic systems that are formed with the help of various types of logistic integration, which are considered as a combination of activities, complex implementation of functions and management influences, interaction of participants in the process.

Cluster forms of the logistic system, which are reflected in the works of L. Rivera, Y.Sheffi, D. Knoppen (2016) have been studied more deeply.

Thus, in the development of the transport and logistics system, an important place is occupied by the formation of a logistics infrastructure, regarding the essence and content of which there are different points of view and components of the infrastructure of logistics processes.

3. Research questions

To assess the effectiveness of macrological systems for countries with emerging economies, authors had determined the rating of the EAEU member states by logistics efficiency sub-indices among the CIS countries.
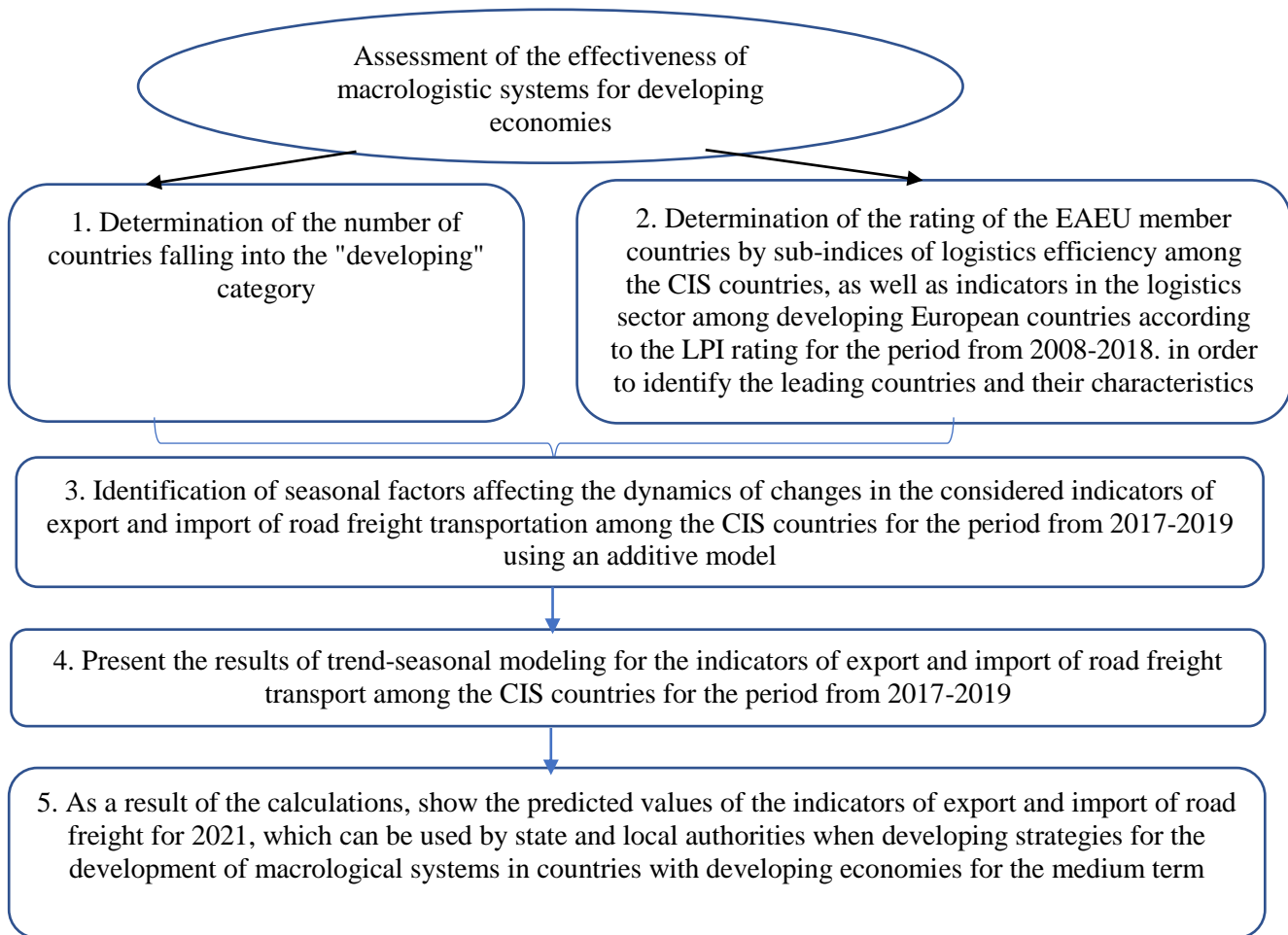

Assessment of the effectiveness of macrologistic systems for developing economies

1. Determination of the number of countries falling into the "developing" category

2. Determination of the rating of the EAEU member countries by sub-indices of logistics efficiency among the CIS countries, as well as indicators in the logistics sector among developing European countries according to the LPI rating for the period from 2008-2018. in order to identify the leading countries and their characteristics

3. Identification of seasonal factors affecting the dynamics of changes in the considered indicators of export and import of road freight transportation among the CIS countries for the period from 2017-2019 using an additive model

4. Present the results of trend-seasonal modeling for the indicators of export and import of road freight transport among the CIS countries for the period from 2017-2019

5. As a result of the calculations, show the predicted values of the indicators of export and import of road freight for 2021, which can be used by state and local authorities when developing strategies for the development of macrological systems in countries with developing economies for the medium term

Figure 1. Research questions
Source: compiled by authors

According to the opinions of international experts, in order to identify the efficiency of logistics in developing countries at the proper level, recommendations were made, on the basis of which the author of the article reviewed the monthly indicators of exports and imports using the example of road freight transportation among

the CIS countries for 2017-2019. To construct predicted values of export and import indicators using the example of road freight transport among the CIS countries, it is necessary to consider a trend-seasonal model, the results of which will allow us to draw conclusions about an increase in the volume of export of road freight transport among the CIS countries and make informed and effective logistics decisions (Figure 1).

The development of logistics and its investment is carried out in various countries according to individual scenarios, adjusted for the peculiarities of national economic policy, geographic, demographic characteristics, urbanization and the level of development of the general infrastructure of specific regions. This is evidenced by the predicted values of exports and imports of road freight for 2021 among the CIS countries, the conclusions of which will make it possible to adopt an effective strategy for the development of transport logistics based on the results of trend-seasonal modeling.

4. Methodological approach

In accordance with the current rules and requirements of the market, companies provide complex logistics services that are most beneficial for customers. The number of logistics providers is constantly increasing, therefore, the quality of the services provided is growing at the same time.
In the logistics service, there are five approaches, which represent different levels of provision of logistics services in the enterprise (Figure 2).
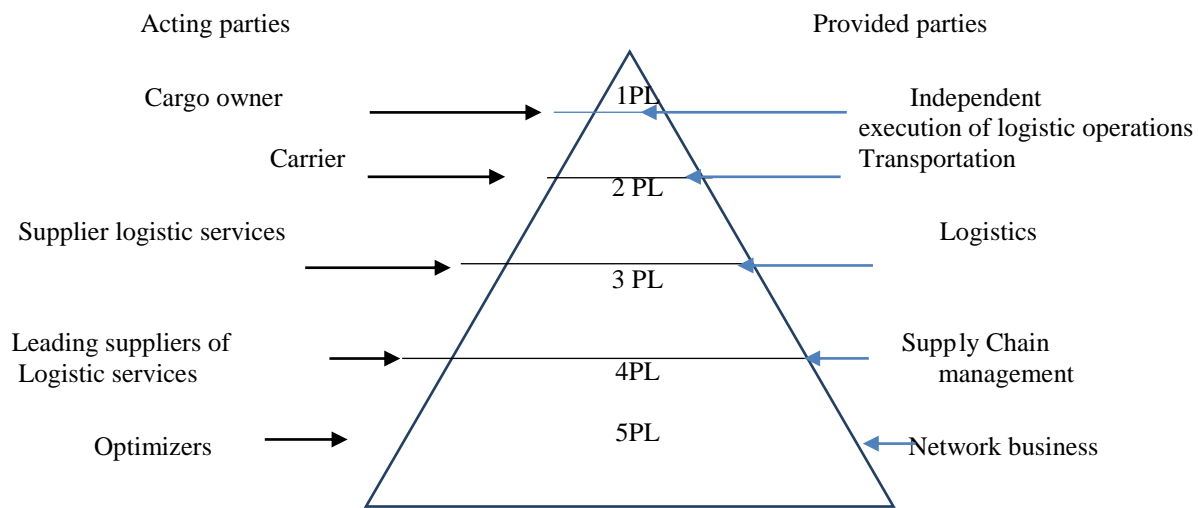

Figure 2. Concept 5- PL logistics
Source: compiled by authors

As you can see from Figure 2, there are currently five logistics concepts, which are also called PartyLogistic:
1) 1PL (First Party Logistic) - Autonomous logistics. This technology was formed back in the 70s-80s of the XX century. Its peculiarity lies in the fact that the cargo owner himself performs all the logistics operations.
2) 2PL (Second Party Logistic) - Traditional logistics. This is a partial outsourcing, in which the company takes on only a part of the logistics functions, such as planning, warehousing and the formation of supply chains, resorting to using a transport company, since it does not have the necessary own transport.
3) 3PL (Third Party Logistic) - Complex logistics outsourcing. 3PL is a system when a company for the most part or completely shifts external logistics operations to another company that will deal with this. The range of

services of a company that deals with logistics operations includes: transportation, warehousing, packaging and forwarding of goods. 3PL is used mainly by contracting companies that provide logistics and cargo transportation services.

4) 4PL (Fourth Party Logistic) - integrated logistics outsourcing. 4PL is a service where a manufacturer engages another company that will deal with full logistics, plan and design supply chains, and also transfer to it the capabilities to manage the logistics business processes of the enterprise. 4PL is used by such companies as: Toshiba, Sony, Ford and many other major companies.

5) 5PL (Fifth Party Logistic) - "virtual logistics". When a 4PL company has an opportunity to provide network business services, it becomes a 5PL company. These companies using the global information technology space are able to provide a full range of services. Striking examples are Amazon, eBay, Aliexpress (Official site of visa and transport data, 2018).

In Western countries, a classification has long been adopted, according to which 5 levels of logistics service are distinguished. The differences between them lie in the set and features of the provision of services, the level of technologies and tools used (Table 2).

Table 2. Classification levels of logistics services

Service	1PL	2PL	3PL	4PL	5PL
Service planning					+
Purchase of goods				+	+
Pick up the cargo from the supplier		+	+	+	+
Warehouse provision		+	+	+	+
Preparation of permits			+	+	+
Preparation of documents for customs			+	+	+
Calculation and payment of customs duties			+	+	+
Passage of customs clearance of cargo			+	+	+
Delivery of goods to the specified address	+	+	+	+	+

Source: compiled by authors

Continuous improvement of technological processes and the search for new opportunities make logistics more advanced and modern, as well as the possibility of designing and evaluating the effectiveness of a macrologistic system.

The selection is made by defining a number of criteria and their specific combination. The most demanded qualities of services in logistics companies are the following (Figure 3).

In modern conditions, the development and implementation of a strategy for the development of logistics companies using design methods and based on this forecasting methods is the most important condition for increasing the efficiency of their activities, competitiveness and sustainability in the dynamically growing economic environment of the market.

Efficient logistics can help reduce sales costs, but the weakest link in supply chains is the strength. Developing countries need to improve their infrastructure, customs system, skills and regulatory frameworks to bring logistics efficiency up to par.
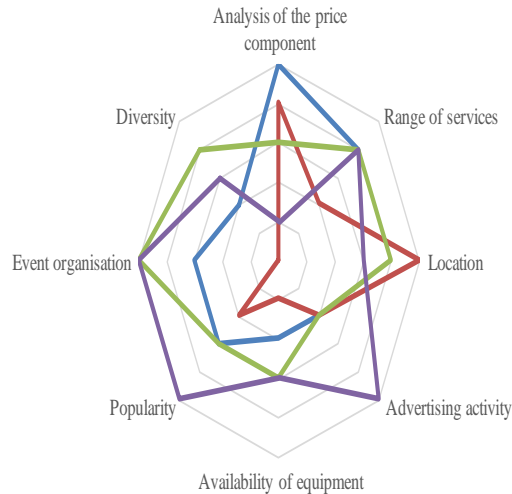
Figure 3. The most demanded quality of services of logistics companies by customers
Source: compiled by authors

The efficiency of supply chains that provide access for logistics systems of developing countries to national and international markets depends on a number of factors, which, first of all, include the sustainability of supply chains, their impact on the environment and the need for skilled workers. Particular attention should be paid to the problems faced by macrological systems of countries with developing economies:

1. Both developed and developing countries face the problem of labor shortages in the field of logistics. Developing countries need more executive managers, while developed countries face labor shortages.
2. Compared to low-income countries, high-income countries are much more likely to seek to improve their cyber preparedness.
3. High-income countries are much more likely to demand environmentally friendly logistics services than low-income countries. This is important because CO_2 emissions from vehicles are a significant source of environmental pollution.

Thus, examining the problems faced by the macrological systems of countries with developing economies, we can say that a macrological system is a large material flow management system that functions over several enterprises or firms and unites dissimilar production and trade enterprises, transport and others to achieve a single goal of intermediary firms. A systematic and comprehensive analysis of the macrological system will allow us to trace the tendency of its change, the achievement of planned and actual results of the indicator, and also will allow us to find out the trends in the change in the cost of a unit of transport services, fulfillment of the plan by its level, and reduce costs. To determine the influence of various factors on the change in the cost of logistics services, to establish reserves and assess the work of logistics companies in using the possibilities of reducing the cost of production, visualization of the relationship of production processes aimed at increasing economic efficiency and help to optimize logistics companies.

The use of information technology in logistics allows us to solve a whole range of tasks with minimal costs, which encourages the development of information products, relying on the most unexpected and original ideas.

As part of modern transformations in the economic and social life of individual states, a global consumer society is being formed, in which the interests of consumers of goods and services occupy the main place in the market, where manufacturers, suppliers and sellers in such a market are obliged to satisfy the needs and requests of buyers in the shortest possible time.

Such interconnection and interaction can be achieved with the help of well-functioning logistics that ensures the efficient use of time, financial and material resources in the production and consumption of goods and services. This is evidenced by data on the number of global mergers and acquisitions in the transport and logistics industry for the period from 2013-2017, with an upward trend by 2020 (Figure 4).
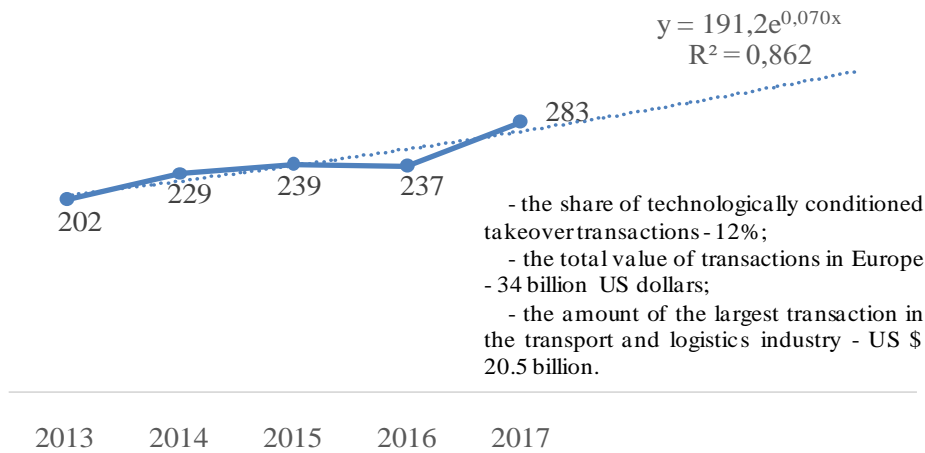

$$y = 191{,}2e^{0{,}070x}$$
$$R^2 = 0{,}862$$

- the share of technologically conditioned takeover transactions - 12%;
- the total value of transactions in Europe - 34 billion US dollars;
- the amount of the largest transaction in the transport and logistics industry - US $ 20.5 billion.

Figure 4. The number of global M&A transactions in the transport and logistics industry for the period from 2013-2017, with an upward trend by 2020
Source: compiled by authors according to PwC Transport and Logistics Practice Report in Central and Eastern Europe

Assessing the effectiveness of macrological systems for countries with developing economies, we note that in 2020 the number of countries that fall into the category of "developing" reached 132. All of them occupy a special place in the world economy, are in different ways connected with capitalist countries, the world economic system and market. Because of this, a multi-structured economy has long been formed in such states, depending on developed and advanced countries.

But the situation that developed at the beginning of 2020, due to the pandemic, which caused negative changes in the entire global economy, led to the fact that the market of transport and logistics services is currently experiencing ups and downs: there has been an adaptation to the sanctions regime, prices for oil and the national currency rate (Bykova, Pustokhina, 2020).

To transform the market of transport and logistics services, due to its underdevelopment, mechanisms are needed to increase the competitiveness of logistics companies and maneuver in a crisis and political tension (Repnikova, Bykova, Skryabin, Morkovkin, Noval, 2019).

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The World Bank classifies countries as developing countries with low and middle income (low and middle income). Income is measured by gross national income (GNI) per capita in US dollars. Low income is $ 1.045 or less, medium income is $ 1.045 to $ 12.746.

The International Monetary Fund classifies countries into advanced countries and developing countries. As a criterion, the level of per capita income, export diversification, and the degree of integration into the world financial system are used.

Consider the rating of the EAEU member countries by logistics efficiency sub-indices among the CIS countries in 2008-2018, which looks like this (Table 3).

Table 3. Rating of the EAEU member countries by logistics efficiency sub-indices among the CIS countries in 2008-2018

Country	Year	Subindex LPI					
		Efficiency of the customs clearance process	Quality of trade and transport infrastructure	Ease of organizing international supply of goods	Quality of logistics services	Cargo tracking	Compliance with the terms of delivery of goods
Kazakhstan	2008	50	54	127	120	66	78
	2010	79	57	29	73	85	86
	2012	73	79	92	74	70	132
	2014	121	106	100	83	81	69
	2016	86	65	82	92	71	92
	2018	65	81	84	90	83	50
Belarus	2008	112	92	134	85	109	78
	2010	50	54	126	120	66	78
	2012	121	65	107	89	98	114
	2014	87	86	91	116	113	93
	2016	136	135	92	125	134	96
	2018	112	92	134	85	109	78
Russia	2008	121	65	107	89	98	114
	2010	115	83	96	88	97	88
	2012	138	97	106	92	79	94
	2014	133	77	102	80	79	84
	2016	141	94	115	72	90	87
	2018	97	61	96	71	97	66
Armenia	2008	65	92	79	67	96	85
	2010	70	97	83	71	102	92
	2012	73	104	89	74	109	94
	2014	75	107	90	79	114	98
	2016	148	122	16	137	147	139
	2018	81	86	95	97	113	111
Kyrgyzstan	2008	128	126	114	137	129	131
	2010	139	135	118	145	135	141
	2012	143	142	123	148	138	148
	2014	145	147	127	151	145	155
	2016	156	150	152	151	115	126
	2018	155	103	138	114	99	106

Source: compiled by authors according to the source of Eurostat statistics www.eurostatica.com

Based on the values of the LPI logistics development indicator in 2018, Kazakhstan has the most developed logistics system among the EAEU member states, and Belarus and Kyrgyzstan have the least efficient ones.

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According to the LPI 2018 rating, among the EAEU member states, Kazakhstan has the best indicators in the logistics sector: 84th in the subindex "ease of organizing international deliveries of goods", 83rd - tracking the passage of goods, 50th - "meeting deadlines delivery of goods".
The state of the logistics system of the Republic of Belarus is affected by insufficient investment in this sector. In order to improve the situation, a set of measures should be implemented in Belarus both in the field of improving the logistics infrastructure and searching for new approaches to management, and in the field of automation of logistics processes.

Investigating foreign indicators, Western Europe and developed Asian regions occupy a confident leadership in terms of logistics development (Official site of World Bank, 2019). Among European countries, according to the LPI 2018 ranking, indicators in the logistics sector are occupied by the following countries for the period from 2008 to 2018 (Table 4).

Table 4. Indicators in the logistics sector among developing countries of Europe according to the LPI 2018 ranking for the period from 2008 to 2018

Country	2008		2010		2012		2014		2016		2018	
	Index LPI	Place in Rating LPI	Index LPI	Place in Rating LPI	Index LPI	Place in Rating LPI	Index LPI	Place in Rating LPI	Index LPI	Place in Rating LPI	Index LPI	Place in Rating LPI
Poland	3,04	40	3,44	30	3,43	30	3,49	31	3,34	33	3,54	28
Estonia	2,95	47	3,16	43	2,86	65	3,35	39	3,36	38	3,31	36
Lithuania	2,78	58	3,13	45	2,95	58	3,18	46	3,36	29	3,02	54
Latvia	3,02	42	3,25	37	2,78	76	3,4	36	3,33	43	2,81	70
Moldova	2,31	106	2,57	104	2,33	132	2,65	94	2,61	93	2,46	116
Ukraine	2,55	73	2,57	102	2,85	66	2,98	61	2,74	80	2,83	66

Source: compiled by authors according to the source of Eurostat statistics www.eurostatica.com

In order to bring logistics efficiency up to par, international experts recommended that developing countries improve their infrastructure, customs system, professional skills and regulatory framework. But in order to identify these criteria for the efficiency of logistics in developing countries, the author examined the monthly indicators of exports and imports using the example of road freight transportation among the CIS countries for 2017-2019 (Table 5).

Table 5. Indicators of export and import of road freight transportation of the CIS countries for 2017-2019
(tons)

Month	Export			Import		
	2017	2018	2019	2017	2018	2019
Russia						
January	677182	712823	787786	698465	771151	765893
February	754846	794575	887287	798905	823994	823599
March	848981	893664	1074552	879366	905264	876603
April	935232	984455	1040574	869254	878481	882853

May	889835	936668	954788	901867	935333	883421
June	902068	949545	843963	889176	914528	853635
July	969837	1020883	975106	902004	902004	958343
August	928625	977501	902890	898679	898638	903284
September	893922	940971	908831	814028	835823	911075
October	102403	1077940	1012707	916837	961215	1034072
November	90720	954990	916389	918672	959392	964403
December	828689	872305	831554	702498	723749	761391
Belarus						
January	354759	372780	430409	152987	165451	173575
February	329783	356933	424799	167109	182764	188152
March	361297	371639	459662	204928	212790	215343
April	352966	374460	460332	171958	188559	212070
May	404198	417104	456868	179287	188559	198956
June	405029	409757	406469	182495	197225	176339
July	412049	420178	467365	162108	174160	183435
August	417398	426066	430319	158109	162898	164322
September	406938	413337	445971	136287	148347	165251
October	475198	496212	454563	171308	180440	190495
November	442109	463088	408227	172109	188743	197823
December	346938	367675	346497	180157	195177	193609
Kazakhstan						
January	13124	19327	33700	34619	34619	38515
February	14946	19517	34328	41089	39458	55843
March	15075	23167	35592	64835	55424	60379
April	14397	20970	28439	58745	54766	67629
May	17348	19343	28846	60824	53268	66612
June	15627	17729	19354	59867	50870	51024
July	15969	15940	17356	43494	43496	50072
August	16296	14126	14258	41365	43369	47278
September	15091	13093	13146	37023	38023	45151
October	17492	21167	22920	51288	51288	54457
November	18397	25224	24016	49329	46881	51910
December	15017	25385	22185	39879	41050	45590
Ukraine						
January	381935	471895	467749	310207	388907	403005
February	490144	491952	519714	400025	420173	462856
March	493809	493809	534177	501521	466144	519316
April	490114	485817	521443	401253	433871	527224
May	505187	545811	586130	432286	470287	519728
June	490183	518096	492974	432286	481190	479909
July	485152	544654	598473	428725	493267	555809
August	472185	529628	496320	438912	522966	525896
September	483196	518973	534931	428286	479932	523935
October	522048	552048	510739	438912	517078	562275
November	491912	521912	465680	428041	67919	508889
December	390120	400120	410424	400031	386860	441141

Source: Source: compiled by authors according to the source of Eurostat statistics www.eurostatica.com

According to the data presented in table 5, the situation is as follows:
1 Kazakhstan
In 2019, 634 thousand tons of cargo were transported from the European Union to Kazakhstan by road, which is 14.8% more than in 2018. The increase in physical terms amounted to 82 thousand tons.

In 2019, 294 thousand tons of cargo were transported from Kazakhstan to the European Union by road, which is 24.5% more than in 2018.

2 Belarus

In 2019, 2,259.4 thousand tons of cargo were transported from the European Union to the Republic of Belarus by road, which is 3.6% more than in 2018. The increase in physical terms amounted to 77.7 thousand tons.

It should be noted that this is a significant reversal of the trend, since in 2018, compared to 2017, import road freight traffic from the EU to the Republic of Belarus decreased by 17%.

In 2019, 5191.5 thousand tons of cargo were transported from Belarus to the European Union by road, which is 6.3% more than in 2018.

In terms of countries, the largest increase in freight traffic in physical terms (tons) occurred in the direction of Lithuania, Poland and Latvia. Exports in physical terms decreased most of all to Germany.

3 Russia

In 2019, 10,610 thousand tons of cargo were transported from the European Union to the Russian Federation by road, which is 1.2% more than in 2018. The increase in physical terms amounted to 125.8 thousand tons. The positive dynamics at the end of the year was due to the growth in traffic in the second half of the year. In terms of countries, the largest increase in road transport in the Russian Federation in physical terms (tons) is noted from Poland, Finland, Italy, Hungary, Estonia. Freight traffic from Germany, the Netherlands and Romania has significantly decreased.

In 2019, 11,136.4 thousand tons of cargo were transported from Russia to the European Union by road, which practically corresponds to the level of 2018 (+ 0.15%). As a reminder, in 2018, the positive dynamics of exports was 12%). In terms of countries, the largest decrease in freight traffic in physical terms (tons) occurred in the direction of Hungary and Germany. Exports in physical terms increased most of all to Finland and Poland.

4 Ukraine

In 2019, 6,030 thousand tons of cargo were transported from the European Union to Ukraine by road, which is 9.3% more than in 2018. The increase in physical terms amounted to 511 thousand tons.

The increase in imports occurred from almost all EU countries (with the exception of the UK and Croatia), but the most significant increase in road transport to Ukraine in physical terms (tons) came from Poland (+288 thousand tons).

In 2019, 6139 thousand tons of cargo were transported from Ukraine to the European Union by road, which is 1.1% more than in 2018. The positive dynamics decreased due to the reduction in traffic in the second half of the year.

In terms of countries, the largest increase in freight traffic in physical terms (tons) occurred in the direction of the Netherlands, Bulgaria, Lithuania. Exports in physical terms decreased most of all to Germany, Hungary, Romania. In the context of cargoes from Ukraine to the EU by road transport in the export cargo traffic, the largest increase in the volume of animal and vegetable fats, household goods, glass and glass products, food industry waste and animal feed. There was a decrease in the export road transport of wood and wood products, iron and steel products, aluminum and products from it, and sugar.

Graphical analysis indicates the influence of seasonal factors on the dynamics of changes in the indicators under consideration (Figure 5,6).

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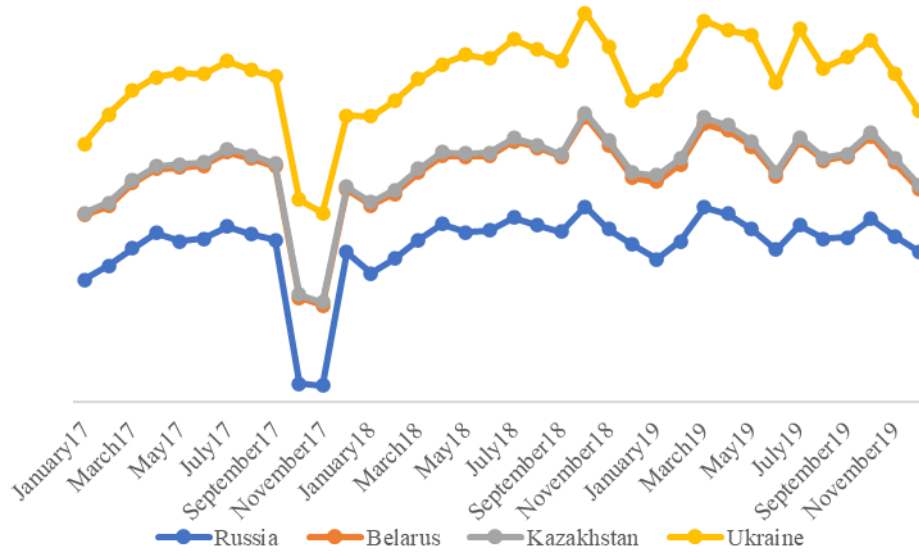

Figure 5. Dynamics of the export of road freight
for 2017-2019 among the CIS countries, in tons
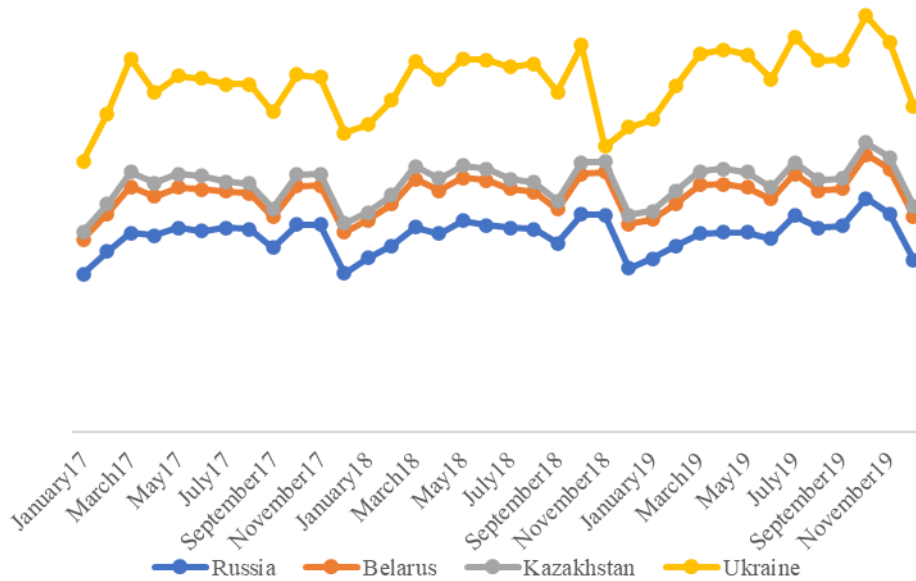*Source:* compiled by authors according to www.eurostatica.com

Figure 6. Dynamics of imports of road freight
for 2017-2019 among the CIS countries, in tons
Source: compiled by authors according to Eurostat statistics www.eurostatica.com

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5. Analysis and application functionality

As a result, to construct a forecast, it is advisable to use trend-seasonal models. The amplitude of seasonal fluctuations in our case is constant, therefore an additive model was used for the forecast, which is built by adding the components.

In our case, the equation of the time series, taking into account seasonal fluctuations, is represented by the formula:

$$Y = T + S + E, \qquad\qquad (1)$$

Where:
Y – time series level,
T – trend component,
S – seasonal component,
E – random component.

The construction of an additive model is reduced to calculating the values of T, S and E based on actual indicators for the previous period, namely, monthly indicators of the volume of exports and imports of road freight for 2017-2019.

The forecasting process includes the following steps:
1) Aligning the original series using the moving average method.
2) Calculation of the values of the seasonal component S.
3) Elimination of the seasonal component S from the initial levels of the series and obtaining the aligned data (T + E).
4) Analytical alignment of levels (T + E) and calculation of T values using the obtained linear trend equation.
5) Estimation of the absolute error to determine the degree of conformity of the model to the original data.
6) Building a forecast based on seasonal fluctuations (Hayaloglu, 2015).

The results of trend-seasonal modeling for the considered indicators are presented in Table 6.

The forecast values of the volumes of exports and imports of road freight transportation for 2021 are determined as the sum of the trend T and the corresponding seasonal S component (Table 7).

Table 6. Results of trend-seasonal modeling for the indicators of export and import of road freight transportation

Index	Trending component	Monthly seasonal components			
Russia					
Export	$T = 873948,10 + 2028,62t$	$S_1 = -181395,25$	$S_2 = -90342,37$	$S_3 = 53060,17$	$S_4 = 81391,96$
		$S_5 = 14649,92$	$S_6 = -34575,20$	$S_7 = 85666,02$	$S_8 = 38305,59$
		$S_9 = -4769,50$	$S_{10} = 121874,98$	$S_{11} = -1562,83$	$S_{12} = -82303,50$
Absolute error	$R^2 = 0,81$	Model explains 81% of total time series variation			
Import	$T = 838923,02 + 1676,68t$	$S_1 = -92898,63$	$S_2 = -38893,80$	$S_3 = 26125,45$	$S_4 = 11394,74$
		$S_5 = 36709,62$	$S_6 = 9234,45$	$S_7 = 42392,81$	$S_8 = 37128,10$
		$S_9 = -37061,80$	$S_{10} = 76812,95$	$S_{11} = 76919,93$	$S_{12} = -147863,84$
Absolute error	$R^2 = 0,89$	Model explains 89% of total time series variation			
Belarus					
Export	$T = 381586,28 + 1579,98t$	$S_1 = -19666,90$	$S_2 = -31817,00$	$S_3 = -8114,88$	$S_4 = -6752,67$
		$S_5 = 13973,10$	$S_6 = -14184,84$	$S_7 = 12366,27$	$S_8 = 14429,23$
		$S_9 = -1194,04$	$S_{10} = 70087,39$	$S_{11} = 33646,81$	$S_{12} = -62772,48$
Absolute error	$R^2 = 0,72$	Модель объясняет 72% общей вариации временного ряда			
Import	$T = 165602,18 + 783,25t$	$S_1 = -11065,19$	$S_2 = 4306,06$	$S_3 = 32181,70$	$S_4 = 17426,56$
		$S_5 = 9934,12$	$S_6 = 2142,66$	$S_7 = -8025,84$	$S_8 = -16523,65$
		$S_9 = -35365,52$	$S_{10} = -2861,17$	$S_{11} = 445,39$	$S_{12} = 7404,87$

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Absolute error	R^2=0,89	Model explains 89% of total time series variation			
		Kazakhstan			
Export	$T = 12975,40 + 376,57t$	S_1=4411,98	S_2=4834,54	S_3=7374,52	S_4=2626,96
		S_5=1786,81	S_6=-4032,58	S_7=-2807,54	S_8=-4383,50
		S_9=-6333,73	S_{10}=-1816,21	S_{11}=132,71	S_{12}=-1793,98
Absolute error	R^2=0,74	Model explains 74% of total time series variation			
Import	$T = 45808,82 + 180,50t$	S_1=-11397,34	S_2=-574,07	S_3=9384,41	S_4=12445,06
		S_5=11067,77	S_6=1902,02	S_7=-3579,17	S_8=-5095,71
		S_9=-10154,26	S_{10}=3518,49	S_{11}=29,83	S_{12}=-7547,03
Absolute error	R^2=0,82	Model explains 82% of total time series variation			
		Ukraine			
Export	$T = 471008,39 + 1431,16t$	S_1=-33650,42	S_2=-503,09	S_3=6076,29	S_4=-5128,92
		S_5=57993,69	S_6=-2318,31	S_7=23287,60	S_8=6887,27
		S_9=5608,23	S_{10}=40078,04	S_{11}=7603,04	S_{12}=-105933,42
Absolute error	R^2=0,75	Model explains 75% of total time series variation			
Import	$T = 399296,97 + 3367,69t$	S_1=-63881,43	S_2=-22782,68	S_3=24627,97	S_4=7882,72
		S_5=18088,32	S_6=1089,53	S_7=19975,36	S_8=36676,09
		S_9=8166,39	S_{10}=29057,26	S_{11}=3852,66	S_{12}=-62752,20
Absolute error	R^2=0,86	Model explains 86% of total time series variation			

Source: compiled and calculated by authors

Table 7. Forecasted values of export and import indicators of road freight for 2021

(tons)

Month	Export				Import			
	Russia	Belarus	Kazakhstan	Ukraine	Russia	Belarus	Kazakhstan	Ukraine
January	791955,35	439338,35	35839,08	507484,77	828181,52	192916,38	43255,87	500432,53
February	885036,85	428768,22	36638,21	542063,27	883863,03	209070,88	54259,63	544898,98
March	1030468,01	454050,33	39554,76	550073,80	950558,95	237729,78	64398,61	595677,31
April	1060828,43	456992,51	35183,76	540299,75	937504,92	223757,89	67639,75	582299,76
May	996115,01	479298,26	34720,18	604853,51	964496,47	217048,70	66442,96	595873,06
June	948918,50	452720,30	29277,35	545972,67	938697,98	210040,50	57457,71	582241,96
July	1071188,36	480851,39	30878,95	573009,75	973533,01	200655,25	52157,02	604495,48
August	1025856,54	484494,32	29679,56	558040,58	969944,98	192940,69	50820,97	624563,91
September	984810,08	470451,03	28105,90	558192,69	897431,76	174882,07	45942,93	599421,89
October	1113483,18	543312,45	32999,98	594093,67	1012983,19	208169,68	59796,18	623680,46
November	992073,99	508451,84	35325,47	563049,82	1014766,84	212259,49	56488,01	601843,55
December	913361,95	413612,53	33775,34	450944,53	791659,75	220002,22	49091,65	538606,39

Source: compiled and calculated by authors

Graphically, the forecasted values of the indicators of export and import of road cargo transportation for 2021 among the CIS countries are as follows (Figure 7,8).

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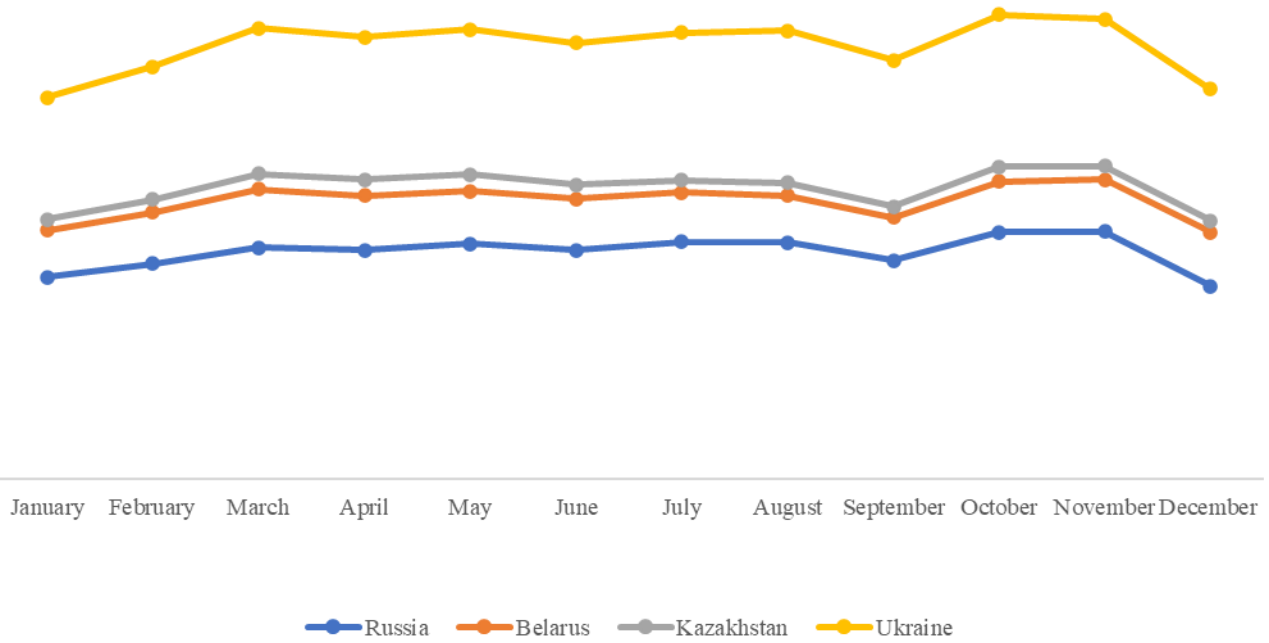

Figure 7. Forecasted values of indicators of imports of road freight for 2021 among the CIS countries
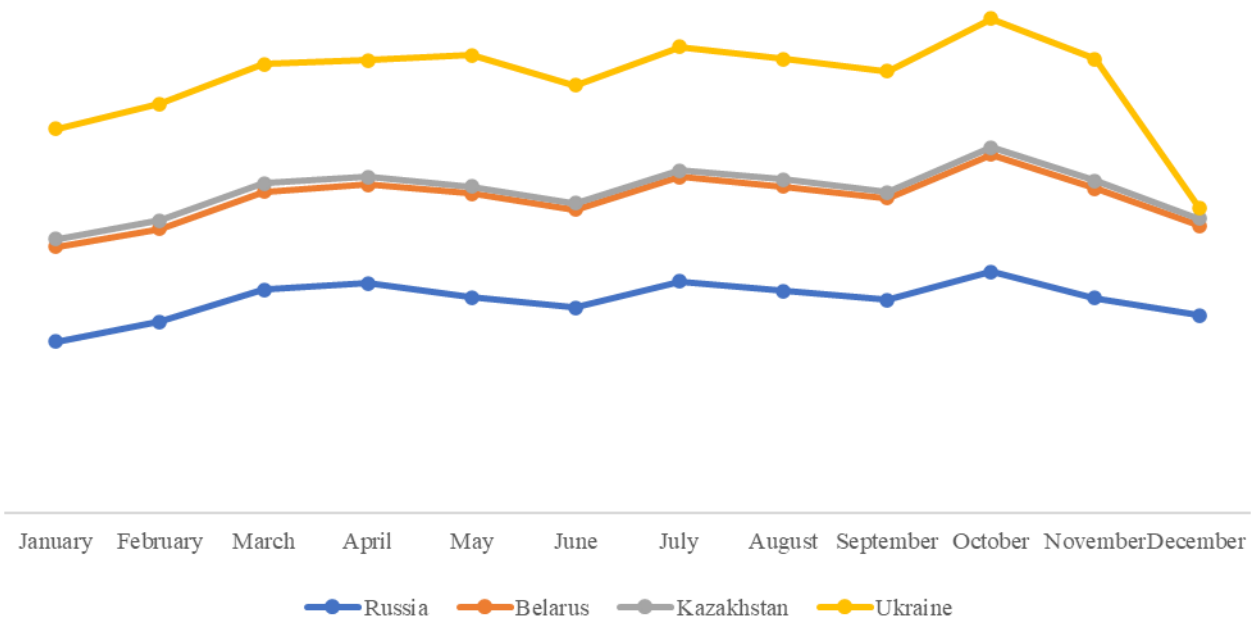*Source:* compiled and calculated by authors

Figure 8. Forecasted values of export indicators for road freight for 2021 among the CIS countries
Source: compiled and calculated by authors

1078

The obtained forecast indicators for the export and import of road freight for 2021 among the CIS countries indicate that the most stable dynamics is observed in Kazakhstan, while in other countries - Ukraine, Russia, Belarus, there is a certain decline. Although the indices of imports and exports in Kazakhstan are much lower, perhaps in other CIS countries. This allows us to draw conclusions that it is necessary to increase the volume of export of road freight in Kazakhstan.

6. Conclusion

The global trends of global world economic development indicate that the formation of markets for needs leads not only to the development of the market of producers. The consequence of this process, under the influence of a number of reasons and factors, is the development of logistics and logistics systems in general.
The development of logistics and its investment is carried out in various countries according to individual scenarios, as shown to us by the forecast values of exports and imports of road cargo transportation among the CIS countries, adjusted for the peculiarities of national economic policy, geographic, demographic characteristics, urbanization and the level of development of the general infrastructure of specific regions. A common feature of the logistics systems of developed European, American and Asian markets is an orientation towards modernization through the introduction of modern information technologies and an expansion of the range of IT services.

Focusing on the processes of functioning of logistics systems and supply chains of industrial enterprises, it is important to note that due to the circumstances of the development and dissemination of information technologies within the framework of the digitalization of the economy, new opportunities open up for the exchange of information between individual production, logistics and auxiliary systems and their elements, as well as produced and serviced. within the latest products and the external environment. From the standpoint of business, logistics is an integral management tool that contributes to the achievement of strategic, tactical or operational goals of its organization through effective (in terms of reducing overall costs and meeting the requirements of end users for the quality of products and services) management of material flows, service flows, and related them flows of information and finance.

Thus, in modern conditions, logistics and logistics systems are becoming important elements of the development potential of a market economy in any country, an important production segment of the economy. Logistics is more and more clearly outlining its specific role as an energetic locomotive that drives the transport conveyor for the supply of services, the transportation of goods, the organization of flows in the production of products, thereby ensuring progress towards achieving the goals of increasing the well-being of all citizens, national and economic independence.

Summing up, it should be noted that increasing competitiveness in the transport and logistics sector is always a set of measures, including the development of the material and technical base of the transport system, and the improvement of technologies with a regulatory and legal framework, as well as the development of human potential. These areas are appropriately assessed in the annual DOMESTIC LPI survey, and deserve maximum attention and decisive action from the involved government authorities and representatives of the transport business. The information obtained as a result of the study signals the presence of certain barriers hindering the development of the country's transport and logistics complex, noted by more general trends in the World Bank's LPI-2018 report. Developing economies face a wider range of transport logistics challenges that need to be addressed. An effective tool in this regard can be the adoption of a state strategy for the development of transport logistics based on positive international experience.

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