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Assessment of The Impact of International Trade Intensity on Logistics Efficiency: A Case Study of The EAEU Countries

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Abstract. Kazakhstan and the Eurasian Economic Union countries play an important role in international trade with those participating in the Chinese Silk Road Economic Belt Initiative (SREB), providing trade, transport, and transit flow for China, Asia, and Europe. This study aims to assess the intensity of international trade between the countries participating in the Silk Road Economic Belt, with particular emphasis on the Eurasian Economic Union (EAEU) and its impact on logistics efficiency. The study uses a method for assessing bilateral trade flows between countries and a regression model. Analyzing the relationship between trade intensity indicators and logistics components, the study establishes the nature and direction of this relationship. The results obtained demonstrate a positive correlation between an increase in the intensity of trade and an increase in logistics efficiency. The study reveals the positive effect of logistics efficiency on the macroeconomic indicators of foreign trade and the intensity of trade between groups of countries with varying levels of trade integration. In general, these findings highlight the need for more collaborative planning and regulation of logistics activities in the EAEU countries than in the CARs, in order to benefit from the positive effects of increased trade intensity.

Keywords: Trade Intensity Index (TII), Logistics Performance Index (LPI), bilateral trade, Silk Road Economic Belt (SREB), Eurasian Economic Union (EAEU), Central Asian Republics (CAR), international trade, logistics, One Belt One Road (OBOR)

1. Introduction

Increasing the level of international trade is closely interrelated with an integrated logistics approach in managing trade flows to maintain high quality of service and reduce logistics costs. The results of the Gani (2017) study lead to the conclusion that the quality of logistics is an essential factor in determining international trade.

Modeling the potential of foreign trade of the Eurasian Economic Union (EAEU) countries with 40 leading trading partners shows the absence of noticeable changes in the structure of its directions. Foreign trade turnover continues to grow at an insufficient pace (Ginoyan and Tkachenko, 2022), which requires significant changes in the foreign economic orientation of the EAEU countries, modification of foreign trade policy, and modernization of trade logistics.

The volume of mutual trade of the EAEU countries in 2022 reached a maximum during the period of operation and amounted to 80.6 billion US dollars. That is 11.1% more than in 2021 and 31.3% higher than in 2020.

The study of the impact of logistics on the intensity of trade and their mutual impact on economic growth is related to the following circumstances for countries with a common economic union.

Firstly, the global supply chain (GCC) is mainly managed from a logistics perspective more than traditionally considered factors such as distance, geographical proximity, and others. (Maswana, J.-C., 2020). Naturally, the volume of goods sold between the two countries largely depends, among other factors, on the availability and quality of logistics services. Despite the integral role of logistics in supporting trade activities, there is very little research and such analysis. There are practically no studies on the correspondence of trends and intensity of the development of international trade to the state of logistics.

Secondly, most of the empirical literature examines the impact of the trade flows of one country on the trade flows of another country but does not show an impact on logistics components or product categories (Wiederer, 2018; Katrakylidis and Madas, 2019; Sénquiz-Díaz, 2021). Nevertheless, in order to develop a policy in the field of trade logistics, it is crucial to assess these effects of the growth of bilateral trade due to changes in logistics components by product categories and what role the identified main constraint in logistics plays in this process.

In this regard, the important problem is to study the overall impact of the logistics performance index and its individual components on bilateral trade and their contribution to the economic growth of the country.

The EAEU countries, including Kazakhstan, as well as the Central Asian Republics (CAR), can benefit from participating in the implementation of integration associations, such as the Silk Road Economic Belt Project (SREB).

Firstly, opportunities are being created for integrating the Kazakh transport system into the transport and logistics network of the Eurasian region, thereby providing additional prerequisites for both transit and the provision of related logistics services and for entering the growing markets of the region's countries. The development of transit potential will ensure the integration of Kazakhstan into the global transport system, accelerate the growth of the country's GDP, as it will reduce travel time and reduce the transport component in the price of products, will help to implement coordinated development between the regions of the country located along the route of the One Belt, One Road Initiative (OBOR) (Ma et al., 2021; Raimbekov, 2022).

Secondly, the SREB will help strengthen industrial cooperation between neighboring countries and create opportunities to form several new industrial clusters and free economic zones (Selishcheva, 2017; Cheng et.al, 2019).

Thirdly, China has a trade surplus and current account that forces it to export capital, which is very important for the EAEU countries trying to attract Chinese long-term investments in logistics

infrastructure and services and could have a positive impact on international trade (Gani, 2017; Madkour et al., 2020).

There are numerous studies of bilateral trade between the EAEU countries and the CAR. However, a limited amount of research allows us to get a holistic view of trade within the EAEU, on the impact of logistics components on trade intensity, and the contribution of trade intensity and logistics to the economic growth of the country.

This study focuses on the intensity of bilateral trade between Kazakhstan and other EAEU countries (Russia, Belarus, Kyrgyzstan, Armenia) and the Central Asian Republic (Uzbekistan, Tajikistan, Turkmenistan); logistics factors affecting exports, imports, and GDP, as well as their contribution to the economic growth of Kazakhstan.

In this regard, an attempt was made to solve the following research tasks:

a. to assess the impact of the intensity of Kazakhstan's bilateral trade with the EAEU and CAR countries;

b. to study the effectiveness of logistics development in the EAEU and Central Asian countries and assess the impact of individual logistics components on foreign trade and GDP;

c. to assess the contribution of trade intensity and logistics efficiency to the foreign trade of the EAEU countries, the Central Asian Republic, and the economic growth of Kazakhstan, to give suggestions for their improvement.

The study was conducted in the following sequence. The introduction discusses the relevance and problems of trade intensification and its connection with logistics. The literature review provides conceptual foundations and assumptions that comprehensively study development in this direction. The methodology section describes the study design, data sampling and collection, and research methods. The results section presents conclusions with an emphasis on hypotheses. The results are compared with some of the most recent studies in the discussion section. Based on the data obtained, the "Conclusion" section describes the purpose of the study and presents the significance of the study, limitations, and suggestions for future research.

2. Literature Review

The importance of international logistics as a means of facilitating trade and the assessment of the impact of logistics efficiency on trade volume, economic growth, and job creation is the focus of many studies.

The intensity of international trade and the impact of logistics are studied by Hausman et al., 2013; Siddiqui and Vita, 2019; Madkour et al., 2020; Ma et al., 2021; the relationship between logistics and trade and their contribution to economic growth - Ojenya and Mohammadreza, 2013; Hayaloglu, 2015; Katrakylidis and Madas, 2019; Maswana, 2020.

The trade intensity index data showed large bilateral trade flows between the BRICS countries (Zuev, 2023). The necessity of closer cooperation for developing trade within the BRICS and structural transformations in the basket of trade products is emphasized.

The study of trade intensity using the Trade Intensity Index (TII) (Islam and Nath, 2023) between South Asian countries (India and Bangladesh) before and after joining the free trade zone showed that the value of TII is greater than one for both countries during the study period, which means that bilateral trade flows are very intensive by compared to their trading partners from the rest of the world.

Maswana (2020) investigated the impact of the intensity of bilateral trade by export categories of trade relations between China and African countries on Africa's economic growth. The data suggest that, depending on the level of logistics and Chinese direct investment in Africa, economic growth tends to be higher in countries with a higher trade intensity index in exports of manufactured goods to China. African countries are restrained in expanding trade with China due to the poor quality of logistics.

As a result of the rational operation of the logistics system, socio-economic processes, GDP growth, and foreign trade turnover are optimized; employment and labor productivity are increased; production costs are reduced, and competitiveness is increased, which leads to positive effects (Chow et al., 1994; Vilko et al. 2011; Kokurin 2011; Soroshian et al., 2013; Nguyen et al., 2021).

To increase their competitiveness in the global market, exporters actively support logistics through technological innovation or optimization of work and the introduction of best practices in logistics operations such as transportation, packaging, and supply chain design (Salawu and Ghadiri, 2013).

Some aspects of logistics for countries and regions of the developing world still pose significant difficulties in facilitating the flow of goods in a cost-effective and timely manner (Gani, 2017): geographical obstacles, burdensome customs management with excessive and opaque procedural requirements, and physical inspection of goods, corruption of state border control officials, and others.

Keebler (2009), Marti et al. (2014) studied the impact of LPI and each of its components on trade in developing countries with a common maritime border using a gravity model, as well as to identify possible advances in logistics in these countries, which are grouped into five regions (Africa, South America, Far East, Middle East and Eastern Europe) by comparing LPI data. Cross-country data studies for a large sample of countries Gani (2017); Jouili and Khemissi (2019) show that logistics efficiency and their components are statistically significantly related to the volume of bilateral trade.

Martí et al. (2014) showed that logistics efficiency is more critical in exporting than in importing countries. However, this trend differs in different countries due to different levels of economic development, but the impact of logistics components has not been studied (Sawhney, U., Kiran, T. 2019). Ueasangkomsate and Suthiwartnarueput (2018) showed that the higher the level of use of green logistics management (GLM) in terms of six logistics components, the higher the export intensity.

As for LPI components, in recent years, due to weak domestic demand in European countries and the search for new international markets, logistics competence and control of international transportation have become more important (Marti and Puertas, 2017).

Using LPI and its sub-indices as the main explanatory variables, Zaninović et al. (2021) showed that differences in LPI values have a heterogeneous effect on bilateral trade between countries, especially when considering trade in different classes of goods.

International trade and logistics efficiency are driving economic growth (Katrakylidis and Madas, 2019). It is established that the causal relationship going from the logistics and transport sector to trade investments in logistics and transport will contribute to economic growth by expanding trade.

However, the direction of the causal relationship between transport infrastructure, international trade, and economic growth is insufficiently studied in the existing literature, although there are studies for China (Hooi Lean et al., 2014) and Kazakhstan (Raimbekov and Syzdykbayeva, 2021). Nevertheless, these works do not address the issues of the influence of the causal relationship of logistics on international trade.

The results of studying the impact of the Logistics Performance Index (LPI) on international trade and their relationship using the gravity model show that there is a positive statistically significant impact of logistics on bilateral trade between the countries of Central and Eastern Europe (Bugarčić et al., 2020), China with countries and Asia (Ma et al., 2017), Sunaoğlu, 2022).

The types of supply chain objects and relationships in traditional production-oriented supply logistics are different from the supply chain logistics, which is service-oriented (Kim and Ha, 2022). The logistics supply chain is affected by production and services.

In addition to trade logistics, bilateral trade is influenced by specific components of logistics: transport and information infrastructure, information and communication technologies (ICT) (Tay, 2020), blockchain technologies (Goyat, et al., 2019), digitalization and technology startups (Jaruwanakul, 2023).

The following indices were used to analyze bilateral trade: the index of revealed comparative Advantages (RCA), the Trade Intensity Index (TII), and the Trade Complementarity Index (TCI). The value of the TII index is more significant than one for both countries during the study period, which means that bilateral trade flows are very intensive compared to their trading partners from the rest of the world (Islam and Nath, 2023).

To study the intensity of bilateral trade between countries, the Trade Intensity Index (Islam and Nath, 2023), the Index of Revealed Comparative Advantages (RCA) (Maryam, 2018), gravity models (Izotov, 2021), cluster analysis and tree diagrams (Chang, 2020) are used. The methodology of the World Bank (World Bank, Logistics Performance Index, 2023) has become widely used in assessing the effectiveness of logistics.

Although the basic theory of trade and the empirical literature discussed above show problems regarding the intensity of trade and its relationship to the economic growth of a country, studies empirically studying the direct impact of logistics and its components on international trade are still rare.

That primarily concerns integration associations, such as the EAEU, with common borders and a foreign trade policy.

The difference of our study was that we supplemented the assessment of the impact of LPI on GDP, exports, and imports with new studies of the impact of individual components of LPI on GDP, exports, and imports, the intensity of international trade in countries with a trade and economic union (EAEU) and not having such a union - the CAR countries (Uzbekistan, Tajikistan, Turkmenistan).

The purpose of the article is to assess the impact of logistics efficiency on the volume of trade in the EAEU and CAR countries; to identify logistical factors that hinder trade flows between Kazakhstan and the EAEU and CAR countries; to assess the impact of trade intensity and logistics efficiency on economic growth.

3. Research Methods

To assess the intensity of bilateral trade, the widely used trade intensity index, regional trade intensity index, and others were used. We applied the most widely used indicator – the intensity index of bilateral trade flows, known as the Trade Intensity Index (TII). This coefficient shows the degree of preference of a particular trading partner compared to the average level of preference of other trading partners, which is equal to 1. If the coefficient is greater than 1, then the degree of preference of the chosen partner is higher than the average, and vice versa. A coefficient above 3 indicates a high intensity of bilateral trade flows.

The studies were carried out in the following sequence.

a) The intensity of trade was studied according to the initial data of The International Trade Centre (ITC) (Trade Map, 2023) based on formula 1. The intensity index of bilateral trade flows of the EAEU countries and the CAR with Kazakhstan was calculated for 2008-2022.

b) The logistics performance (LPI) was studied according to the initial data of the World Bank for 2008-2022. To analyze LPI, the World Bank reports for 2007-2022 on LPI (Logistics Performance Index, World Bank) with the participation of more than 160 countries were used.

LPI represents the weighted average value of logistics components according to a five-point system. The score for each element is from 1 to 5 points, where 1 is the lowest and 5 is the highest.

c) The influence of LPI components on GDP, exports, imports, and trade intensity was studied according to the results obtained based on regression models 2 and 3.

a) In general, the trade intensity index (the intensity index of bilateral commodity flows between countries) is calculated based on the trade of country “i” with its partner “j” according to formula 1:

$$I_{ij} = \frac{X_{ij}}{X_I} : \frac{M_j}{(M_w - M_i)} = \frac{X_{ij} \times (M_w - M_i)}{X_i \times M_j}, \quad (1)$$

where I_{ij} – index of intensity of bilateral trade flows from country I to country j;

Xi — total exports of the country i; Xij – export of country i to country j; Mj – the total volume of imports of the country j; Mi – the total volume of imports of the country i; Mw – total world imports.

TII shows the dynamics and speed of trade and the direction of its change (more, less, or average) relative from one country to another. This coefficient is of greater interest, both in terms of the impact on the dynamics of trade changes and the impact of logistics or its components.

International trade data obtained from the open website of the International Trade Centre (ITC) was used to calculate I_{ij} (Trade Map, 2023).

d) Analysis of the Logistics Performance Index (LPI) and its components according to the World Bank.

The World Bank defines the Logistics Performance Index (LPI), which includes six components (Arvis et al. 2016):

1) "Customs" (efficiency of customs control and border clearance at the border);

2) "Infrastructure" (the quality of trade and transport infrastructure related to transportation, for example, ports, railways, roads, and information technology);

3) "International transportation" (simplicity and ease of organizing deliveries at competitive prices);

4) Competence and quality of logistics services (e.g. transport operators, customs brokers);

5) Ability to track and control shipments;

6) Timeliness of delivery (frequency of delivery of goods to recipients on planned or expected delivery dates).

These components can be divided into two main categories (Arvis et al., 2016):

– areas of policy regulation indicating the primary inputs to the supply chain (customs, infrastructure, and services);

– the supply chain results (corresponding to the LPI indicators of time and reliability: timeliness, international deliveries, cargo tracking control).

г) the empirical model of the influence of logistics on trade is represented by equation 2; the effect of individual components of logistics on macroeconomic parameters - according to formula 3:

$$\boldsymbol{TII_{it} = \alpha X_{it} + \beta LPI_{it} + \varepsilon_{it}} \quad (2)$$

$$\boldsymbol{KP\_LPI_{it} = \alpha X_{it} + \varepsilon_{it}} \quad (3)$$

where TII_{it} – index of the intensity of trade between countries for a certain period of time (t); X_{it} – dependent variables: export, import, GDP; LPI_{it} – logistics performance index; KP_LPI_{it} – key parameters *LPI*; ε — error rate.

4. Results and Discussion

4.1. Analysis of the intensity of Kazakhstan's foreign trade with the EAEU countries

There is a stable intensity of trade relations between Kazakhstan and the EAEU countries, as evidenced by the trend of growth in bilateral trade. Analysis of the dynamics of the intensity of bilateral trade between Kazakhstan-EAEU and EAEU-Kazakhstan indicates an increase in TII in all groups of

countries. A slight increase is observed in the trade of the EAEU countries with Kazakhstan - from 27.0 to 30.3 (an increase of 1.1 times), the CAR with Kazakhstan - from 60.1 to 109.2 (a rise of 1.8 times). Kazakhstan's trade with the EAEU - from 9.9 to 15.0 (an increase of 1.5 times) and with the Central Asian Republic - 2.5 times (Table 1).

Table 1. Index of intensity of bilateral trade flows between Kazakhstan and the EAEU and CAR states

	2008	**2010**	**2012**	**2014**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
EAEU countries											
Russia-Kazakhstan	16,9	12,8	10,4	11,6	12,2	16,1	18,2	20,1	21,2	20,4	22,5
Kazakhstan-Russia	3,5	4,7	4,3	5,7	4,3	8,5	8,1	7,3	7,0	8,6	9,7
Kazakhstan-Belarus	0,3	0,5	0,4	0,4	0,2	0,6	0,8	1,0	0,7	0,9	0,9
Belarus-Kazakhstan	11,7	8,8	7,2	9,3	10,9	10,7	11,3	12,3	14,0	13,1	13,0
Kazakhstan - Kyrgyzstan	35,2	31,9	26,9	32,7	41,3	46,1	44,3	43,1	42,2	47,3	48,9
Kyrgyzstan-Kazakhstan	77,8	82,6	99,9	95,3	90,6	86,1	82,7	80,4	78,5	82,0	83,4
Kazakhstan-Armenia	0,5	0,4	0,2	0,5	0,6	0,8	0,7	0,5	0,5	0,6	0,6
Armenia-Kazakhstan	1,7	1,6	1,1	1,3	1,4	1,8	2,0	2,2	2,5	2,3	2,3
Kazakhstan- EAEU, average	9,9	9,4	8,0	9,8	11,6	14,0	13,5	13,0	12,6	14,4	15,0
EAEU- Kazakhstan, average	27,0	26,4	29,7	29,4	28,8	28,7	28,5	28,8	29,0	29,5	30,3
CAR countries											
Kazakhstan-Uzbekistan	35,5	29,6	24,3	28,4	30,3	31,8	31,4	31,2	31,5	31,0	30,3
Uzbekistan-Kazakhstan	44,9	46,3	51,4	55,7	59,3	61,3	62,7	62,1	60,2	67,4	68,0
Kazakhstan-Tajikistan	40,2	39,3	43,7	45,6	41,2	44,3	46,5	49,5	53,3	52,1	51,3
Tajikistan-Kazakhstan	75,3	69,4	79,5	81,6	85,3	88,8	96,5	135,6	168,2	148,8	150,5
Kazakhstan – CAR, average	37,8	34,5	34,0	37,0	35,8	38,0	39,0	40,4	42,4	41,5	40,8
CAR - Kazakhstan, average	60,1	57,9	65,4	68,7	72,3	75,1	79,6	98,9	114,2	108,1	109,2
Source: Authors' results. Data from the source ITC (https://www.trademap.org).											

The Russian-Kazakh commodity flow increased from 16.9 to 22.5 (an increase of 1.3 times) in 2008-2022. The Kazakh-Russian trade intensity index analysis shows that the "interest" of Kazakhstani suppliers in the Russian market increased from 3.5 to 9.7 (2.8 times) over the specified period.

The most significant interest in Kazakhstan's bilateral trade is observed with Kyrgyzstan (an increase in the coefficient from 35.2 to 48.9) and Tajikistan (a rise from 40.2 to 51.3), Kyrgyzstan with Kazakhstan (77.8 to 83.4), Tajikistan with Kazakhstan (75.3 to 150.5), Uzbekistan with Kazakhstan (from 44.9 to 68.0). There is a tendency to decrease the intensity of trade flows between Kazakhstan and Uzbekistan (from 35.5 to 30.3).

The average values of the trade intensity coefficient between Kazakhstan and the EAEU and CAR countries show that these countries are more interested in increasing trade with Kazakhstan. For example, the TII risen from 27.0 in 2008 to 30.3 in 2022 in the direction of the EAEU-Kazakhstan and from 9.9 to 15.0 in the direction of Kazakhstan-the EAEU countries (Figure 1), while the intensity of Kazakhstan's trade with these countries is almost 2 times less.

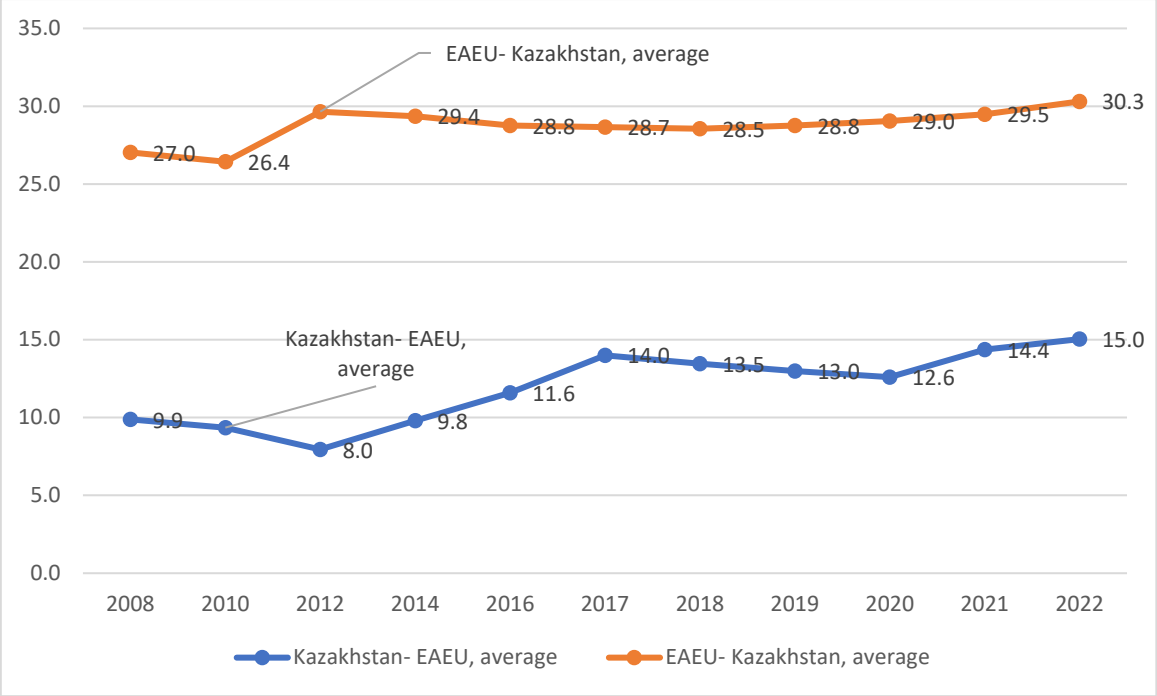

Fig. 1: Average values of the trade intensity ratio between Kazakhstan and EAEU countries
Source: own evaluation. The database is available on the website ITC (https://www.trademap.org)

The analysis of the intensity of trade for the period 2010-2022 shows that Russia, Belarus, Kyrgyzstan, and Tajikistan have a very high intensity of trade with Kazakhstan (coefficient above 3); the average intensity of trade (coefficient from 2 to 3) with Armenia.

The intensity of Kazakhstan's trade with Belarus and Armenia is less than 1. Considering the place of the EAEU in world trade, this indicates that the importance of Kazakhstan's trade turnover with these countries is less than expected. This situation means trade with Belarus and Armenia is more important for the Kazakh economy.

A detailed examination of the trade index by country shows a tendency to slow down the growth of trade turnover, as well as a decrease in the index in the following directions: Kazakhstan – Belarus, Kazakhstan-Armenia, Kazakhstan-Uzbekistan, which is not an indicator of a weakening of bilateral trade flows. These are typical annual fluctuations explained by the systematic smoothing of bilateral trade relations between the countries.

Calculations show that the effect of trade deviation is observed in Kazakhstan's trade with Belarus, Armenia. In cooperation with Russia, Kazakhstan creates trade (advantages due to the opening of markets and borders). Within the framework of integration around the EAEU, the intensity of trade has good prospects: Growth is observed in the Russian-Kazakh (average index value of 16.6), Kazakh-Russian (index 6.5), Belarusian-Kazakh (index 11.1), Kazakh-Kyrgyz (40.0), Kyrgyz-Kazakh (85.4) relations. Low trade relations in the direction of Kazakhstan-Belarus (0.6) and Kazakhstan-Armenia (0.5) (average index values between 1-5), Armenia-Kazakhstan (1.8).

The following conclusions could be drawn about bilateral trade within the EAEU.

Firstly, the assessment of the intensity of foreign trade within the EAEU between Kazakhstan, Russia, Belarus, and Armenia shows a gradual decrease in the effect of deviation and reorientation of trade flows both within the territory of the single EAEU and within the SREB countries. That is, there is protectionism against third countries and an increase in the cost of imported goods.

Secondly, the obtained indicators show that within the framework of trade within the EAEU, the most significant interest in bilateral cooperation is traced between the countries Kazakhstan-Russia,

Kazakhstan-Kyrgyzstan, and Belarus-Kazakhstan. There is great potential and interest in trade with Belarus and Armenia.

The intensification of trade flows of Kazakhstan with the EAEU countries and vice versa is influenced by the level of logistics development in these countries, as well as their joint development.

4.2. Analysis of the impact of LPI on the international trade of the EAEU and Central Asian countries

Table 2 shows the sub-indices of logistics efficiency of the EAEU countries with the main trading partners of the Central Asian Republic and Europe for 2022.

Table 2 Ratings and average values of the components of the logistics performance index of the EAEU and their main trading partners in the Central Asian Region, in points, 2022.

	Rank	**Score**	**C***	**I***	**IT***	**CL***	**ATG***	**CDT***	**GDP***
EAEU countries									
Kazakhstan	79	2,7	2,6	2,5	2,6	2,7	2,9	2,8	203,6
Russia	88	2,6	2,4	2,7	2,3	2,6	2,9	2,5	1703,6
Belarus	79	2,7	2,6	2,7	2,6	2,6	3,1	2,6	70,6
Armenia	97	2,5	2,5	2,6	2,2	2,6	2,7	2,3	15,1
Kyrgyzstan	123	2,3	2,2	2,4	2,4	2,2	2,4	2,3	8,9
average	93	2,56	2,46	2,58	2,42	2,54	2,8	2,5	400,3
Central Asian Republics									
Uzbekistan	88	2,6	2,6	2,4	2,6	2,6	2,8	2,4	72,7
Tajikistan	97	2,5	2,2	2,5	2,5	2,8	2,9	2	8,7
Turkmenistan (2018)	126	2,41	2,35	2,23	2,29	2,31	2,56	2,72	60,2
average	103	2,51	2,38	2,37	2,46	2,57	2,75	2,37	47,2
Worldwide average	66	3,00	2,80	2,92	2,93	3,03	3,24	3,05	

Notes:

* LPI indicators: C - Customs, I - Infrastructure, IT - International transport, CL - Competence in logistics, ATG - Ability to track goods, CDT - Compliance with delivery terms, GDP- gross domestic product, billion dollars

Source: http://lpi.worldbank.org/international

Table 2 shows that in terms of logistics development indicators (according to the LPI index and sub-indices) for 2022, the EAEU and CAR countries with an average LPI of 2.56 and 2.51 points lag far behind the global average LPI (3.0).

The volume of foreign trade in EAEU goods with countries outside this union and the relationship with the level of efficiency development clearly show the general upward trend and correlation dependence (Fig.1).

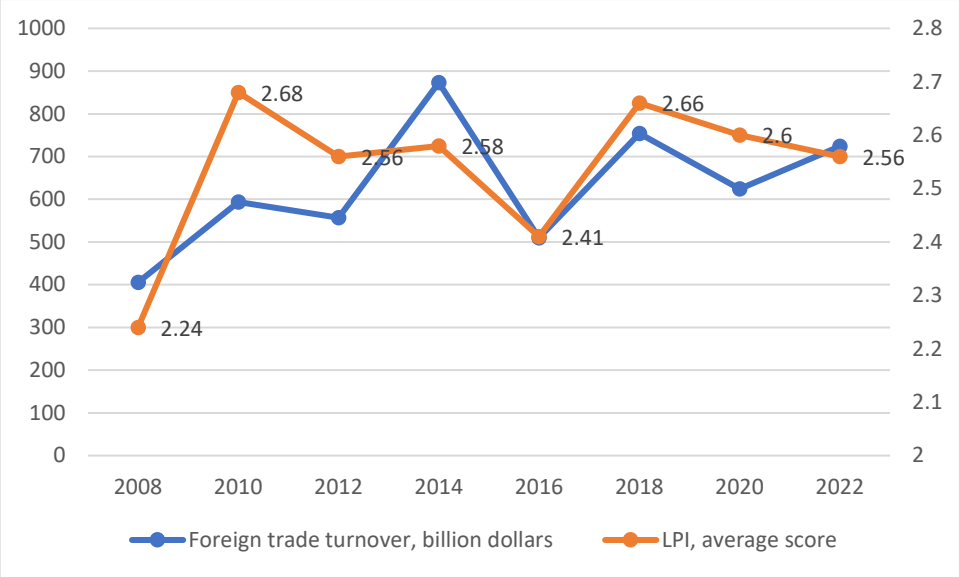

Fig.2: Dynamics of foreign trade turnover (billion dollars) and average LPI (in points) of the EAEU.

The influence of LPI on the international trade of the EAEU countries has been studied. There is a positive relationship between LPI and the intensity of trade, exports, and imports of countries. At the same time, the intensity of trade and exports have a more substantial impact on the development of logistics than imports (Table 3).

Table 3 The impact of the LPI of the EAEU countries on trade and GDP indicators in Kazakhstan

variable X	Constant coefficient (α) (t -statistics)	Variable coefficient (β) (t - statistics)	Determination coefficient
EAEU countries' trade intensity index, average	2.70* (9,61)	0.043** (4,53)	54.5%
Export of goods and services from the Republic of Kazakhstan, million dollars	2.74* (3.82)	0.052** (1.82)	46.2%
Import of goods and services from the Republic of Kazakhstan, million dollars	2.73** (3.43)	0.0079*** (1.71)	38.2%
The GDP of the EAEU countries, billion dollars	2.69** (5.02)	0.0054*** (1,98)	62.3%
The GDP of the CAR countries, billion dollars	1,32** (2,37)	0,0012*** (1,42)	69,7%
Notes: *significant at 10%, **significant at 5%, ***significant at 1% К - regression coefficient, Student's t-statistics. *Source:* own research			

As can be seen from Table 3, for all macroeconomic variables, there are links between logistics efficiency and the variables under consideration, where all regression coefficients are statistically significant.

A higher coefficient of determination indicates a stronger dependence on the independent variable. In our case, the GDP of the EAEU countries (62.3%) and the CAR (69.7%) have a good relationship with the LPI index. The determination coefficients of 54.5, 46.2%, and 38.2%, show a positive relationship between LPI and the intensity of countries' trade, exports, and imports.

At the same time, the intensity of trade and exports have a more substantial impact on the development of logistics than imports. The contribution of the GDP of the EAEU countries with an economic union is more significant (0.0054) than the GDP of the CAR countries (0.0012) to Kazakhstan. Table 4 shows the impact of individual LPI components on the macroeconomic indicators of trade and GDP of Kazakhstan.

Table 4 Influence of LPI parameters on the foreign trade of the EAEU countries, according to 2008-2022 data.

Key LPI Parameters	**Export**		**Import**		**GDP**	
	K	**t**	**K**	**t**	**K**	**t**
Permanent	-381.3**	-1.91	-2.24*	-2.24	-1438.8*	-1.70
Customs	-483.9**	-2.98	-3.26*	-3.26	-18224.1*	-2.64
Infrastructure	153.1**	0.97	0.89**	0.89	609.8**	0.91
International transportation	22.4**	0.13	0.25**	0.25	-16.0***	-0.02
Competence in logistics	467.6*	3.52	3.95*	3.95	1877.5*	3.32
Ability to track the goods	2.1***	0.03	-0.01*	-0.01	8.5**	0.03
Compliance with delivery terms	-17.7**	-0.20	-0.07*	-0.07	-103.4**	-0.27
Notes: *significant at 10%, **significant at 5%, ***significant at 1% K – regression coefficient, Student's t-statistics. *Source:* Calculation based on World Bank data. Logistics Performance Index and The International Trade Centre (ITC)						

Regression coefficients show that components such as "Customs" (-483.9) and "Compliance with delivery terms" (-17.7) have a more substantial negative impact on trade. "Competence in logistics" (467.6) and "Infrastructure" (153.1) have a positive effect. Exports and imports are also negatively affected by "Customs" and "Compliance with delivery terms", while "Infrastructure" (609.8) and "Competence in logistics" (1877.5) have a strong positive impact.

"Customs" (-3.26) and "Compliance with delivery terms" (-0.07) have a slight negative impact on imports. "Competence in logistics" (3.95) and "Infrastructure" (0.89) have a small positive effect. Almost all components affect GDP.

Thus, the EAEU countries should increase the efficiency of LPI components by 2.5 times to align mutual trade with Kazakhstan. That requires even more active reforms in the field of international trade and improving the quality of transport and logistics management.

The results of the LPI dependence on the intensity of trade of the countries in the directions Kazakhstan - EAEU and EAEU – Kazakhstan, Kazakhstan – CAR, and CAR - Kazakhstan are presented in Table 5. At the same time, the intensity of trade between Kazakhstan and the EAEU, between the CAR and Kazakhstan has a more significant impact than the intensity of trade between the EAEU and Kazakhstan, and between Kazakhstan and the CAR.

Table 5 Influence of LPI on the intensity of trade-by-trade directions

Exogenous variable, X	**Constant coefficient (α) (t -statistics)**	**Variable coefficient (β) (t -statistics)**	**Determination coefficient**
Trade intensity: Kazakhstan - EAEU	2.66*** (0.02)	0.0044** (0,001)	52.7%
Trade intensity: EAEU - Kazakhstan	2,67*** (0.02)	0.00149** (0.0005)	53.6%

Trade intensity: Kazakhstan - CAR	1,95** (0,06)	0,0019**	56,3%
Trade intensity: CAR - Kazakhstan	2,73*** (0,03)	0,0041** (0,021)	55,9%
Notes: *significant at 10%, **significant at 5%, ***significant at 1% *Source:* own research			

5. Discussion

In the future, there is a high integration potential for the economies of the EAEU countries (Panteleev et al., 2015). Increasing the intensity of trade positively affects the logistics efficiency of the EAEU countries. At the same time, the LPI depends on the direction of trade. Also, the intensity of trade in the direction of the EAEU-Kazakhstan has a greater impact on the growth of LPI than the intensity of trade between Kazakhstan and the EAEU countries. Moreover, in order to reach the global average LPI of 3.0 in 2022, Kazakhstan should increase the intensity of trade to 77.3 units, and the EAEU countries with Kazakhstan to 228.2 units, that is, to equalize the trade flow, the EAEU countries should increase trade with Kazakhstan 2.9 times. Accordingly, the costs of improving logistics efficiency should be greater than at present.

Thus, the assessment showed that the efficiency of logistics is greatly influenced by the export of goods and its components: “The state and quality of infrastructure”, “Competence of specialists”, and “Reduction of customs procedures”, which is consistent with the results of the work of Marti et al. (2014), Maswana (2020). To increase the attractiveness of logistics and its development in the future, it is necessary to invest in improving its components, such as the quality of infrastructure and the competence of specialists, tracking the passage of goods and timely deliveries, and reducing borders and trade barriers for the course of goods.

The average LPI value for the EAEU countries (2.66) is below the world level, which highlights the lag in the modernization and construction of transport infrastructure, reduction of customs barriers, lag in the organization of supplies at competitive prices, training and improving their competence, improving the quality of logistics services, the introduction of cargo control systems and timely delivery of goods, which is confirmed in works (Raimbekov et al., 2017).

In order to increase the mutual trade of partners, it is necessary to strive to coordinate the most essential components of logistics. For example, in Kazakhstan's trade with the EAEU countries, first of all, competence in logistics, the quality of customs services, and transport infrastructure. And to increase the intensity of trade, an important factor is increased exports.

Kazakhstan's trade with the EAEU countries is more influenced by individual components of the logistics efficiency of the EAEU countries than the logistics efficiency of Kazakhstan.

Four logistics components positively impact trade in the direction of exports, except customs and compliance with delivery conditions, which is consistent with the work of Puertas et al. (2013). In the import direction of delivery, three components (infrastructure, competence of specialists, international transportation) have a positive effect, and three have a negative impact (customs, the ability to track goods, and compliance with delivery conditions). Economic growth is positively influenced by the quality of infrastructure, logistics competencies, and the ability to track goods, but negatively by customs, international transportation, and compliance with delivery conditions. These results are generally consistent with the results of previous works (Martí et al., 2014; Gani. 2017; Raimbekov и Syzdykbayeva, 2021).

The positive dynamics of the trade intensity index for the EAEU countries does not give grounds to consider them focused mainly on trade within the union. At the level of individual member countries, a high degree of trade integration with union partners is observed only with Russia and Kyrgyzstan.

Still, the pace of intensity of its trade within the union tends to slow down. The high share of intraregional trade explains the high intensity of trade in goods within the EAEU, the inclusion of the EAEU countries in production chains, as well as existing trade agreements. That is, regional trade agreements increase trade efficiency and economic growth. This statement is consistent with the works of Ginoyan (2022); Katrakylidis and Madas (2019).

The effect of trade creation is manifested in the growth of imports from the member countries of the integration group (substitution of domestic goods with imported ones) due to the abolition of import duties.

The effect of diverting trade arises in the case of shifting trade flows from third countries to the member States of the Union, including as a result of the abolition of import duties.

The assessment of the intensity of foreign trade within the EAEU indicates the presence of deviation and reorientation of foreign trade flows within the three countries (Belarus, Russia, and Kazakhstan). To a certain extent, this indicates an artificial reorientation of foreign trade flows due to political considerations related to economic sanctions in some countries and the obligations of countries integrated into any unions to their partners. The effect of creating trade is manifested only in the foreign trade cooperation between Kazakhstan and Belarus.

The high level of LPI is ensured due to the intensity of trade, foreign trade turnover, and GDP. This conclusion is also confirmed by the studies of Gani (2017), Katrakylidis and Madas (2020).

A higher level of economic growth facilitates the transition to a more favorable logistics operation, especially in the joint planning of the development of transport infrastructure and infrastructure in supply chains, training in the field of international logistics (Marti et al., 2014; Maswana, 2020).

The negative impact of customs and supply conditions on trade has been established, in addition, to the duration of international transportation on GDP. This conclusion is confirmed by the measures taken in trade policy (customs) and improving its interaction in logistics, which gives the best result in countries with a high level of logistics and economic growth (Marti et al., 2014; Ginoyan, 2022).

It could be concluded that the high intensity of trade within the EAEU with the effect of creating trade will require a focus on improving the efficiency of logistics within the union. Conversely, the relatively low intensity of trade in countries with a trade diversion effect will need the EAEU group of nations to focus on developing mutual logistics and improving efficiency in third countries.

Kazakhstan's cooperation with the EAEU countries is mainly based on the interest of Belarus, Kyrgyzstan, and Russia. Whereas the CAR countries are more interested in trade with Kazakhstan. Thus, we can say that of the three EAEU countries, Kazakhstan carries out the most differentiated foreign trade, which expands cooperation not only within the EAEU but also with other countries of the SREB. On the other hand, in bilateral cooperation, there is an effect of trade deviation, indicating the priority of the EAEU countries in implementing foreign trade operations. The only exception is the bilateral foreign trade cooperation between Belarus and Kazakhstan, Kazakhstan and China, Kazakhstan, and Armenia.

It is established that the economic union significantly impacts Kazakhstan's bilateral trade with the EAEU and the bilateral trade agreement between the CAR and Kazakhstan. This statement is confirmed by studies (Zuev et al., 2023), where trade agreements allow countries to ensure a high volume of foreign trade.

The data obtained are limited by various institutional, transport, and trade barriers.

It is evident that the level of internal trade and logistics cooperation of the participating countries is seen as the most interesting in the activities of the EAEU. Quite a lot of diverse research is being carried out in this direction. Still, to date, no systematic and integrated understanding of measuring the quality of mutual penetration in the field of trade ("integration's depth finder") has been proposed due to joint

logistics projects. To do that, a future study will need to develop a generalizing indicator measuring an integrated index that considers trade and logistics.

In our understanding, it is this integrated index, which takes into account trade and logistics, that shows the quality of cooperation between the participating countries in the direction of creating a genuinely single economic space.

6. Conclusion

The EAEU countries and Kazakhstan are important trading partners for each other. The intensity indices of Kazakhstan's mutual trade with the EAEU countries and the EAEU foreign trade are more than 1, which indicates the significant importance of the markets of both sides for each other.

Econometric analysis has shown that the growth of foreign trade and the country's economic development depends on the direction of trade, the state of logistics, and its individual indicators. The improvement of the LPI components of the countries of Russia, Armenia, Belarus, and Kyrgyzstan by 2.5 times leads to the alignment of mutual trade with Kazakhstan. It is necessary to improve the quality of infrastructure and train specialists in international logistics and trade, reducing customs restrictions (cost and time of customs clearance). To align the trade flow with Kazakhstan, the EAEU countries should increase logistics costs.

The improvement of particular logistics indicators leads to an increase in foreign trade volume. Institutional enhancements are needed to increase the level of integration and regulation of the industry, accessibility, and security of the transport and logistics services market. These measures should be carried out according to the priority of Kazakhstan’s trade, primarily with the EAEU countries. At the same time, the analysis of the situation presented in this study showed that to increase the volume of bilateral trade between Kazakhstan and the EAEU countries, it is necessary to bring specific logistics components in line with the intensity of bilateral trade. To do that, it is essential to take the following priority measures.

The EAEU countries should increase the volume of trade, primarily through the export of goods; improve the quality of infrastructure; jointly train specialists and improve their competence. In order to eliminate negative impacts on international trade, it is necessary to improve the quality of customs work; observe the conditions for the supply of goods. Raising the LPI to the global average level will require leveling the trade flow of Kazakhstan with the rest of the EAEU countries. At the same time, they should increase the intensity of international trade by three times.

Increasing the attractiveness of Kazakhstan and the development of logistics in the future should be carried out by improving its components, such as the quality of infrastructure and the competence of specialists, tracking the passage of goods and timely deliveries, and reducing border and trade barriers for the course of goods.

One of the apparent directions is the reduction of customs barriers at the border, compliance with the conditions and terms of delivery of goods, improving the quality of infrastructure, and the competence of specialists.

According to the study results, Kazakhstan, among the EAEU countries, is the most attractive for export and transit cargo shippers. Kazakhstan, together with the EAEU countries, should strive to improve logistics performance indicators to the level of developed countries.

Achieving this goal involves the implementation of a set of measures to introduce increased requirements for infrastructure modernization, training, improvement of legal norms, introduction of digital technologies, and harmonization of national and international standards, as well as the application of the best foreign practices of logistics and trade management, taking into account the requirements of national customs and traditions. In order to improve cooperation between countries, it

is necessary to create logistics links and alliances, create uniform service standards, and improve the quality of transport and logistics services for international trade flows.

7. Limitation and Future Research

It is necessary to make some explanations of the limitations of our study. Firstly, the analysis focused on using only Kazakhstan's data with trading partners in the EAEU and the CAR. Each country has differences in trade and logistics, so in the future, it is necessary to conduct research on each of these countries and summarize the results. Secondly, it is necessary to use other indicators in the model to assess trade's impact on economic growth and logistics. We believe that other theoretical models can be combined for a better, more complete explanation. In addition, there are opportunities for further research of the trade and logistics potential of countries and their impact on the economy using specific product groups and directions of movement (export, import).

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