Relationship Between International Trade and Logistics: An Evaluation on Countries of Shanghai Pact and the Belt and Road Initiative

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Abstract: Although some of the resources required to meet human needs can be provided by a country, the rest must be supplied from other countries because not every country has all resources. Therefore, the demand for international trade emerges. A country earns incomes by selling its surplus and obtains scarce resources from other countries with these incomes. In this context, some political and economic initiatives have been established by countries, which work in harmony to facilitate and regulate international trade and create a common market. Two of them are Shanghai Pact and the Belt and Road Initiative (BRI). However, even if the initiatives meet certain common needs, it is very important to carry out logistics activities correctly in order to ensure effective and efficient foreign trade. If planned and correctly carried out, logistics activities are expected to make both import and export processes efficient and reduce resource usage. In this study, it is aimed to examine the effects of logistics performance in international trade in countries of Shanghai Pact and the BRI. In order to measure logistics performance in the research, two kinds of data are used, namely, the Logistics Performance Index (LPI) data, published by the World Bank every two years, and the import and export data, also published by the World Bank. With six sub-criteria of LPI modeled as independent variables and import and export as dependent variables, Tobit analysis is made by using EViews 10 software package. According to the analysis results, customs clearance, logistics quality and traceability have effects on export, and infrastructure, customs clearance and logistics quality have effects on import.

Keywords: Logistics performance; Import, Export; Shanghai Pact; One Belt One Road

1. Introduction

Countries need to meet the needs of their citizens, but they cannot do this on their own. Along with the globalization, countries have resorted to international trade with other countries for scarce or insufficient resources, thus meeting the needs of their people and further increasing their quality of life. In order to facilitate the international trade in a more effective, efficient and timely manner, logistics infrastructure and services must be developed.

In this context, countries interacting with each other have created many economic integration projects. For example, Shanghai Cooperation Organization (SCO), also known as Shanghai Five, was founded with Kazakhstan, Kyrgyzstan and Tajikistan under the leadership of Russia and China in 1996. Later, SCO became what it is now with the participation of Uzbekistan in 2001, and with that of Pakistan and India in 2007. Establishment of the organization aims at trying to resolve border disputes between member states, ensuring mutual border security and preventing activities that may endanger each other's national security, such as radicalism, separatism, terrorism and fundamentalism in member states [1].

Another example is the BRI, which was first mentioned by Xi Jinping, the Chinese President, in 2013. The

Initiative aims at comprehensive cooperation in development strategies, economic growth, commercial activities, financial cooperation, and cultural and social enterprises. It aims to revive the old Silk Road project under the name of "the Belt and Road" or "Modern Silk Road". China carries out dialogue with other Asian countries by exporting local development policies based on political and economic considerations, such as eliminating regional and maritime problems, providing access to Asian countries, reducing economic stagnation, taking advantage of new growth sources, including coastal and western countries. In addition, the BRI is characterized as a geopolitical and strategic initiative because it affects not only China but also a large part of the world [2].

In this study, it is aimed to determine the relationship between the LPI and foreign trade in the countries of Shanghai Pact and the BRI. However, due to lack of data, several countries are not included in the analysis, namely, Tajikistan, Iran, Bangladesh, Myanmar, Turkmenistan, Azerbaijan, Laos, Vietnam, Georgia, Iraq, Israel, Syria and Yemen. The data used in the analysis are obtained from the World Bank and analyzed with Tobit method by using EViews 10 software package. Export is used as dependent variable in the first analysis and import as dependent variable in the second one. And the six sub-criteria of LPI are used as independent variables in both analyses. Analysis results are given in detail in the findings section.

In order to examine previous studies on the subject, a literature search was conducted on Shanghai Pact, the BRI and LPI.

2. Literature Review

The article of Norling and Swanström [3] aims to explore the consequences of SCO's relations with India, Pakistan and Iran. The co-authors indicate that significant potential gains will be achieved if coordination is improved.

The study of Akal et al. [4] aims to test whether defense expenditures of Iran and Turkey affect each other in the 1988-2008 period. In addition, the study tests whether the formation process of SCO and Iran's observer status in the organization have effects on Turkey's increasing defense expenditures. According to the results, the defense expenditures between Turkey and Iran have a two-way causality relationship. After the establishment of SCO and Iran's observer status, Turkey's defense expenditures have increased.

Yao and Whalley [5] aim to explore the differences between the Shanghai Free Trade Zone (FTZ) and other FTZs and the development of the Shanghai FTZ over the past years. According to the study results, successful implementation of FTZs and lasting pilot policies in China will lead to a more balanced economy in the next decade.

Rahman and Shurong [6] aim to analyze China's economic and geostrategic objectives within the framework of the CPEC (China-Pakistan Economic Corridor), which is being discussed under the BRI. The co-authors state that a win-win situation is expected to occur in partners within the BRI. According to the conclusion, if expected objectives are achieved, it will be a "game changer" for the region and the whole world, marking a new era in world development led by China.

Liu et al. [7] aims to identify the main determinants of China's Foreign Direct Investment (FDI) activities by focusing on the BRI countries in the 2003-2015 period. The study creates a panel data set containing 93 countries (49 BRI countries and 44 non-BRI countries). According to the analysis results, China's FDI in BRI countries is highly sensitive to the exchange rate level, market potential, openness and infrastructure of the host countries.

Based on Turkey's logistics position in the international market, Ünalan and Yapraklı [8] analyze the global logistics situation and take into account the six LPI sub-criteria, published by the World Bank between 2007 and 2016. The findings show that Turkey has made progress in both overall logistics performance and sub-components in the last decade. However, there has been no significant change in its position in the logistics sector.

By comparing trade and logistics performance of Turkey and EU countries, Danacı and Nacar [9] aim to reveal Turkey's position relative to EU members. In the study, LPI and import/export data are evaluated with hierarchical clustering analysis. The analysis also includes international trade volumes consisting of import and export and calculates export-import ratio of all countries. According to the results, there is a significant and strong relationship between the logistics performance and per capita income in those countries.

Sarker et al. [10] conduct a literature review on the subject to explore the impact of the BRI on future global development. The co-authors argue that partners and organizations will derive economic and political benefits from the BRI. According to the results, several elements are essential, such as strong coordination among BRI partners, supporting laws, policies, rules, regulations, appropriate strategic practices, a transparent procurement system, and sincere consideration of political, financial, environmental and social factors.

The article of Sarker et al. [11] examines the oil, gas and energy sector and China's related risks within the scope of the BRI. The co-authors suggest that China should actively implement the BRI strategy to create viable investment opportunities especially in countries, such as Saudi Arabia, Russia, Kazakhstan and Pakistan.

After the restructuring of international logistics networks arising from the BRI, Sheu and Kundu [12] use a multi-method approach to address the dynamic and stochastic challenges. An integrated spatial and temporal logistics interaction model with Markov chains is applied to predict the time-varying logistics distribution flow of a three-layer supply chain framework. In addition, based on two examples of China's oil supply chain, numerical

estimates are made to demonstrate the effectiveness of the applied model. The analysis results reveal various development strategies for practitioners and policy makers to optimize logistics and transportation decisions in the context of the BRI.

Wong and Tang [13] aim to disclose and understand the main determinants of LPI, thus further improving the logistics performance index of 93 countries. Due to limited data, static panel data method is used in the model estimation. According to the analysis results, LPI is more likely to increase in countries with low-level corruption and stable political environment.

By using causality analysis, Karaköy and Üre [14] reveal the relationship between gross fixed capital formation (GFC), FDI and LPI in high- and middle-income countries. According to the analysis results, there is reciprocal causality between GFC and LPI, and FDI increases with an increase in GFC.

Ulutaş and Karaköy [15] propose a simple and low process step MCDM model, consisting of SD and WASPAS methods, to rank G20 countries based upon their LPI values. The SD method is used to obtain standard weights in the study. According to results of the proposed method, the top five countries are Germany, Japan, the United Kingdom, the United States and France. By measuring the correlation between the ranking of the proposed method and the original ranking, it is concluded that the two rankings have a very high correlation and the proposed method is confirmed to have achieved correct results.

By taking into account current LPI values in OECD member countries, Atalan [16] aims to calculate the LPI values for the next period. In the study, a series method based on estimation with nonlinear equations is developed. Based on the equations, estimated LPI data range from 2,869 to 4,206, with an average value of 3,611. Sweden has the highest LPI value and Slovenia the lowest.

By using Tobit analysis, Demir et al. [17] examine the effects of gross fixed capital formation on logistics performance index in Emerging Markets. According to the analysis results, gross fixed capital formation, unemployment and export have positive effects on logistics performance. It is concluded that import has negative affects on logistics performance.

By using multiple linear regression analysis, Widayat et al. [18] examine the effects of logistics performance on global competitiveness and economic growth in 17 countries, including ASEAN countries, several South Asian countries, and several East Asian countries. According to the analysis findings, exchange rates, interest rates and net exports simultaneously affect global competitiveness.

3. Data

By using the LPI sub-criteria and the ratio of exports and imports to gross domestic product, this study examines the effects of logistics performance index on import and export in countries of Shanghai Pact and the BRI. Due to lack of data, several countries are not included in the analysis, namely, Tajikistan, Iran, Bangladesh, Myanmar, Turkmenistan, Azerbaijan, Laos, Vietnam, Georgia, Iraq, Israel, Syria and Yemen. Therefore, there are 23 countries in the data set. Import and export rates of these countries are given in Table 1.

Table 1. 2018 import and export rates of BRI and Shangai Pact countries

Countries	Export	Import
Chinese	19.07	17.96
Russia	28.44	20.79
Kyrgyzstan	33.70	65.93
Kazakhstan	35.49	26.25
Uzbekistan	25.38	38.68
India	19.14	22.30
Pakistan	8.73	18.60
Mongolia	58.85	63.38
Armenia	39.65	52.28
Bahrain	77.17	68.03
Malaysia	67.94	60.91
Cyprus	74.87	74.53
Jordan	35.34	52.79
Kuwait	54.00	45.72
Lebanon	21.13	45.44
Oman	48.61	39.63
Qatar	53.73	37.49
Saudi Arabia	36.33	27.41
Turkiye	29.93	30.38
UAE	96.50	70.98
Cambodia	61.12	63.29
Thailand	63.67	53.46
Singapore	174.42	146.42

Another kind of data used in the study is LPI, which is published by the World Bank every two years since 2007 and takes values between 1 and 5. After logistics service providers and stakeholders in the countries have been given a 33-question questionnaire, LPI is evaluated in six sub-criteria. After taking the average of these sub-criteria, the LPI score is determined. The sub-criteria of logistics performance are as follows:

Customs Clearance: In addition to the productivity and effectiveness of customs processes, it emerges as a result of evaluation of many criteria, such as delivery and control of foreign trade transactions, transparency of customs control.

Infrastructure: Respondents are asked to evaluate the land, sea, rail and aviation infrastructure, information communication and telecommunication infrastructure of their countries. With the development of technology around the world, this criterion is developing in almost every country.

International Shipping: Respondents are asked to evaluate their costs incurred during transportation, storage and loading. This criterion evaluates the adequacy of countries in setting competitive prices.

Logistics Quality: It is the criterion by which the quality and competence of agencies and services are evaluated, such as transportation, storage, loading, customs clearance authorities, customs brokers, forwarders, buyers and forwarding agents.

Tracking and Traceability: It is the criterion by which the traceability of goods and their movement along the supply chain are evaluated. With technology development, the development of smart systems makes this standard even more important.

Timing: One of the most important issues in current logistics activities is timing. It is created to evaluate the timely delivery of goods to the destination.

Table 2. 2018 LPI sub-criteria scores of BRI and Shanghai Pact countries

Countries	Traceability	Infrastructure	Timing	Customs Clearance	International Shipping	Logistics Quality
Chinese	3.65	3.75	3.84	3.29	3.54	3.59
Russia	2.65	2.78	3.31	2.42	2.64	2.75
Kyrgyzstan	2.64	2.38	2.94	2.75	2.22	2.36
Kazakhstan	2.78	2.55	3.53	2.66	2.73	2.58
Uzbekistan	2.71	2.57	3.09	2.10	2.42	2.59
India	3.32	2.91	3.50	2.96	3.21	3.13
Pakistan	2.27	2.20	2.66	2.12	2.63	2.59
Mongolia	2.10	2.10	3.06	2.22	2.49	2.21
Armenia	2.51	2.48	2.90	2.57	2.65	2.50
Bahrain	3.01	2.72	3.29	2.67	3.02	2.86
Malaysia	3.15	3.15	3.46	2.90	3.35	3.30
Cyprus	3.15	2.89	3.62	3.05	3.15	3.00
Jordan	2.77	2.72	3.18	2.49	2.44	2.55
Kuwait	2.66	3.02	3.37	2.73	2.63	2.80
Lebanon	2.80	2.64	3.18	2.38	2.80	2.47
Oman	2.97	3.16	3.80	2.87	3.30	3.05
Qatar	3.56	3.38	3.70	3.00	3.75	3.42
Saudi Arabia	3.17	3.11	3.30	2.66	2.99	2.86
Turkiye	3.23	3.21	3.63	2.71	3.06	3.05
UAE	3.96	4.02	4.38	3.63	3.85	3.92
Cambodia	2.52	2.14	3.16	2.37	2.79	2.41
Thailand	3.47	3.14	3.81	3.14	3.46	3.41
Singapore	4.08	4.06	4.32	3.89	3.58	4.10

When Table 2 is examined, it is seen that Singapore received the highest score in all sub-criteria. Mongolia got the lowest score in Traceability, Infrastructure and Logistics Quality criteria. Pakistan scored the lowest in Timing, Uzbekistan in Customs Clearance, and Kyrgyzstan in International Shipping. These scores appear consistent for Singapore when compared with the import and export rates seen in Table 1. However, the same is not true for low-scoring countries.

4. Methodology

In the study, Tobit analysis is used to determine the relationship between dependent and independent variables. Sometimes the data of dependent variables are not fully available or only a portion of the data are available. In this case, it is not possible to estimate such models with least squares (LS) because the data may not be fully representative of the population. Tobit model is widely used to explain models with limited dependent variables and named after its first user, James Tobin, because it is very similar to the Probit model. When Tobin first analyzed household expenditures on durable goods in 1958, he encountered a type of regression with a negative dependent

variable because some households did not have expenditure items, such as durable goods. Based on the fact that expenditures can never be negative in his study, Tobin assigned a value of zero to this variable until the household income exceeds a certain level. The model he described in those years is a classic example of a regression model for review [19, 20].

Literature review related to previous studies on Tobit analysis is given in Table 3.

Table 3. Literature review on Tobit analysis

Name(s) of Author(s) and Year	Problem	Conclusion
Şengül et al. [21]	Turkey's economic activity in the NUTS 2 region	Improvements should be made for employment and international trade stability in economically inefficient places.
Külekçi [22]	To determine the profit activities of agricultural enterprises producing pistachios	According to the analysis results, under normal conditions, 20% reduction in inputs can provide the same gross profit.
Ersoy and Çetenak [23]	The effects of ownership concentration in industrial companies on dividend distribution decisions	Ownership concentration has a positive effect on dividend yield.
Üre et al. [24]	The impact of openness and growth on political freedoms	According to the analysis results, openness has positive effects on political freedoms, while growth has negative effects.
Demir et al. [17]	The effects of gross fixed capital formations on the logistic performance index	According to the analysis results, decrease in gross fixed capital formation, exports and unemployment positively affects logistics performance.
Guo et al. [25]	FDI, economic growth and the impact of innovation on the environmental efficiency of logistics	While innovation and FDI have positive effects on environmental efficiency of the logistics sector, industrial structure has negative effects.
Geng et al. [26]	To determine the relationship between green economy efficiency and environmental regulations	Although environmental regulations have positive effects on green economy efficiency in the eastern regions of China, they have negative effects in the central and western regions.

In our study, we use the Tobit analysis because the independent variables, i.e., LPI sub-criteria, take exceedingly small values and are published at different intervals. The LPI is published in a six-term series during 2007-2018. Therefore, in order to reduce the import and export rates, consisting of the dependent variables, to six series like LPI, the moving average of the LPI is taken in accordance with the years when it is published and included in the analysis in this way. In addition, logarithm of the import and export rates is used in the analysis.

5. Analysis

In order to better understand the analysis, explanations and abbreviations of the data used are given in Table 4.

Table 4. Abbreviations of variables

Abbreviations	Definition
EXPO	Share of exports in GDP
IMPO	Share of imports in GDP
CSCL	Customs Clearance
INFR	Infrastructure
LOGQ	Logistics Quality
INSH	International Shipping
TRAC	Tracking and Traceability
TMNG	Timing

EViews 10 software package is used in the analysis. Descriptive statistics included in the analysis are shown in Table 5.

Correlation between the variables used in the study is evaluated and the results are given in Table 6.

According to the results of correlation analysis, there is a high-level correlation between import and export. There is a high correlation between all of the LPI sub-criteria. In addition, there is a moderate correlation between export and all the LPI sub-criteria, and a low-level correlation among the sub-criteria except import and customs clearance. There is a moderate correlation between customs clearance and import.

In the last-stage study, two different models are created, in which these two variables are used as dependent variables, in order to determine the effects of LPI sub-criteria, which are independent variables, on import and export. These models are as follows:

$$EXPO = \alpha + \beta_1 CSCL + \beta_2 INFR + \beta_3 LOGQ + \beta_4 INSH + \beta_5 TRAC + \beta_6 TMNG + \mu_i \qquad (1)$$

$$IMPO = \alpha + \beta_1 CSCL + \beta_2 INFR + \beta_3 LOGQ + \beta_4 INSH + \beta_5 TRAC + \beta_6 TMNG + \mu_i \qquad (2)$$

Table 5. Descriptive statistics

	EXPO	IMPO	INFR	CSCL	LOGQ	INSH	TRAC	TMNG
Mean	3.7900	3.7878	2.9018	2.7579	2.9242	2.9755	3.0023	3.4181
Median	3.8918	3.8269	2.8873	2.7186	2.8700	2.9850	3.0050	3.4500
Maximum	5.4084	5.2767	4.2786	4.1789	4.2100	4.0400	4.2500	4.5300
Minimum	2.1669	2.8187	1.7800	1.8000	1.8000	2.0000	2.0000	2.2500
Std. Dev.	0.6242	0.5420	0.5857	0.5276	0.5206	0.4653	0.5192	0.4802
Skewness	-0.0134	0.2559	0.3118	0.3921	0.3013	0.0352	0.0876	-0.0524
Kurtosis	3.1104	2.6605	2.4999	2.7799	2.5464	2.4221	2.3687	2.3645
Jarque-Bera	0.0742	2.1691	3.6744	3.8154	3.2711	1.9485	2.4681	2.3850
Probability	0.9636	0.3381	0.1593	0.1484	0.1948	0.3775	0.2911	0.3035
Sum	523.02	522.71	400.45	380.59	403.54	410.62	414.32	471.70
Sum Sq. Dev.	53.372	40.249	47.002	38.133	37.132	29.655	36.929	31.586
Observations	138	138	138	138	138	138	138	138

Table 6. Correlation analysis

	EXPO	IMPO	INFR	CSCL	LOGQ	INSH	TRAC	TMNG
EXPO	*1*	*-*	*-*	*-*	*-*	*-*	*-*	*-*
IMPO	*0.7796*	*1*	*-*	*-*	*-*	*-*	*-*	*-*
INFR	*0.4801*	*0.2271*	*1*	*-*	*-*	*-*	*-*	*-*
CSCL	*0.5359*	*0.3515*	*0.9303*	*1*	*-*	*-*	*-*	*-*
LOGQ	*0.4047*	*0.1924*	*0.9307*	*0.8909*	*1*	*-*	*-*	*-*
INSH	*0.4095*	*0.2271*	*0.8602*	*0.8305*	*0.8649*	*1*	*-*	*-*
TRAC	*0.4411*	*0.1962*	*0.9039*	*0.8410*	*0.9291*	*0.8440*	*1*	*-*
TMNG	*0.4464*	*0.1637*	*0.8589*	*0.8030*	*0.8508*	*0.7644*	*0.8275*	*1*

The results of Tobit analysis with Model 1, in which the dependent variable is export, are given in Table 7.

Table 7. Model 1 Tobit analysis

Dependent Variable: EXPO				
Independent Variable	Coefficient	Std. Error	z-statistics	Probability
CSCL	0.954530	0.209361	4.559257	0.0000*
INFR	-0.032854	0.250809	-0.130993	0.8958
LOGQ	-0.918183	0.240765	-3.813616	0.0001*
INSH	-0.039971	0.163596	-0.244327	0.8070
TRAC	0.434537	0.222956	1.948982	0.0513***
TMNG	0.260313	0.168330	1.546438	0.1220

*: 1% significance level, **: 5% significance level, ***: 10% significance level

According to the results of Tobit analysis with Model 1, although customs clearance and traceability have positive effects on export, logistics quality has negative effects on it. It is understood that infrastructure, international shipping and timing criteria do not have significant effects on export.

The results of Tobit analysis with Model 2, in which the dependent variable is import, are given in Table 8.

Table 8. Model 2 Tobit analysis

Dependent Variable: IMPO				
Independent Variable	Coefficient	Std. Error	z-statistics	Probability
CSCL	1.145523	0.202032	5.670018	0.0000*
INFR	-0.481840	0.238289	-2.022081	0.0432**
LOGQ	-0.483231	0.237663	-2.033264	0.0420**
INSH	0.084265	0.169791	0.496286	0.6197
TRAC	0.177723	0.222947	0.797153	0.4254
TMNG	-0.096746	0.165593	-0.584236	0.5591

*: 1% significance level, **: 5% significance level, ***: 10% significance level

According to the analysis results with Model 2, customs clearance affects import positively, but infrastructure and logistics quality affect imports negatively. Other sub-criteria of LPI do not have a significant impact on import.

6. Conclusion

In the study, Tobit analysis is applied in order to examine the effects of LPI sub-criteria on import and export in countries of Shanghai Pact and the BRI. The data used in the study are obtained from the World Bank, ranging from 2007 to 2018.

According to the analysis results, the LPI sub-criteria of customs clearance, infrastructure and logistics quality have effects on import; customs clearance, logistics quality and traceability criteria have significant effects on export. Customs clearance has positive effects on both import and export, while logistics quality has negative effects on them. In addition, although the infrastructure criterion has negative effects on import, the traceability sub-criterion has positive effects on export. It is thought that customs clearance has positive effects on both import and export because of increase in transparency and control at customs and decrease in illegal transactions, such as bribery and smuggling. In order to increase logistics quality and competence, investments should be made to increase the competence of agencies and logistics companies, as well as activities, such as transportation, storage and handling. The costs of these investments will inevitably increase the costs of logistics services. This situation explains the negative effects of logistics quality on import and export in the analysis. It is thought that the negative impact on import and export will disappear after the logistics quality investment reaches the optimum point.

Logistics infrastructure has been increasing in all countries since the year when LPI data began to be published. It is thought that countries, which develop logistics infrastructure, will directly develop technology and developing technology has positive effects on production. In line with the analysis made in the study, the results explain this. Finally, it is thought that the tracking and traceability criteria has positive effects on export because of the simultaneous observability of all movements of the products in the supply chain.

It is thought that the logistics quality and infrastructures of relevant countries will improve during the BRI process. In this context, it can be said that the negative effects of the above-said criteria on import and export will change positively. In the following years, the study can be expanded by increasing the data and using different analyses with different country groups. The fact that logistics plays a key role in international trade has also revealed how important it is for countries. The increase in international trade, especially export, has a positive effect on the growth of a country. Among all the investments, logistics infrastructure investment is the one, which can be intervened most easily by a country. Therefore, the country group in question can accelerate its logistics infrastructure investment and support its growth in order to increase production. It has been observed that the analysis results overlap with the studies on post-1960 growth by Kaldor et al. [27-31].

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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