Effects of Trade Facilitation and Corruption on Trade: An Empirical Study of Transition Economies

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Abstract: Trade facilitation is implemented to enhance international trade. Well-organized trade facilitation is indispensable in developing countries, especially in transition economies. Trade facilitation performance is an important part of trade policy. This paper investigates the impact of trade facilitation on the exports and imports of 21 former socialist countries with a gravity model. The export and import data for the analysis consist of 10 major partner countries provided by UN Comtrade, and the sample period, which is confined by the availability of trade facilitation indicators from OECD, is three years (2017, 2019, and 2022).

The estimated results considering corruption with area-specific effects show that the coefficient of the average trade facilitation index (TFI) is positive and significant. In addition, the results reveal that when there is less corruption, trade is more enhanced. The study also discusses the relationship between current informal rules of institutions (e.g., anti-corruption) and new formal rules (proposed by trade facilitation). Transition economies with informal rules that support new formal rules initiated by trade facilitation tend to have more active trade.

Keywords: Trade facilitation, transition economies, institutional elements, gravity model

1. Introduction

Trade facilitation is implemented to enhance the smooth operation of international trade. The role of trade facilitation in trade activity is acknowledged by economists and policymakers. There are many empirical studies that stress the importance of trade facilitation efforts for increasing trade between countries (Djankov et al. 2010; Portugal-Perez and Wilson 2012; Shepherd and Wilson 2009; Wilson et al. 2003; 2005).

Recognizing this effect of trade facilitation, international experts and national policymakers relatively quickly find consensus in multilateral negotiations. Indeed, the Trade Facilitation Agreement (TFA) was the first multilateral trade agreement concluded by member countries in the World Trade Organization's nearly twenty-year history,[1] including twelve years of Doha Round

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1 The World Trade Organization was established in 1995, and the Trade Facilitation Agreement was concluded in 2013. After two-thirds of member countries ratified, the agreement came into force in 2017.

negotiations (Czapnik 2015). According to the World Trade Organization (2023), this agreement increased trade by USD 321 billion or by 1.17% during the first two years of its implementation, i.e., from 2017 to 2019. After five years of its coming into force, TFA had reduced trade costs by 1–4% on average (Duval and Utoktham 2022). Thus, trade facilitation is an important part of trade policy.

Well-organized trade facilitation is indispensable in developing countries, especially in transition economies. After the collapse of the Soviet Union in 1991, most of the former socialist countries started to open their borders by lowering import taxes and abolishing import restrictions, etc.

Kanybekov (2023) examines the progress of trade facilitation in 21 post-socialist countries using the OECD Trade Facilitation Indicators during 2017–2022 and finds that their achievements differ by country. When these countries are categorized into three areas, European and Baltic countries, Commonwealth of Independent States (CIS),[2] and Central Asia, the European and Baltic countries group records the highest score, followed by CIS and Central Asia.

Most empirical studies estimate the impacts of trade facilitation on trade by considering all the countries in the world, particular regions (e.g., Balkan countries of Europe, Central Asia), economic integration projects (e.g., APEC, ASEAN, EU), or specific economies. Usually, the model is a gravity model, and different variables are used as a proxy for trade facilitation. These variables are the trading across borders and logistics performance index provided by the World Bank and OECD's Trade Facilitation Indicators (TFIs), etc. The estimated results show that these indicators positively affect trade flows.

While many studies show how changes in trade facilitation indicators affect trade volume in different regions and countries, only a few focus on transition economies. Hence, it can be helpful to examine the impact of the trade facilitation of post-socialist countries on their trade.

Most previous studies on the determinants of trade activity consider geographical factors, cultural distance, and trade policies (Duval and Utoktham 2022). In addition, some authors discuss institutional issues in considering factors affecting trade (see Levchenko 2007). For instance, the problem of corruption in trade transactions is empirically studied by Anderson and Marcouiller (2002). Other studies discuss the relationship between trade facilitation and corruption (see Moïsé and Sorescu 2019). Based on this literature, corruption and trade agreements between trading partners can be considered as control variables in assessing the effect of trade facilitation on trade.

This study aims to investigate the impact of the trade facilitation performance of post-socialist countries of Europe and Central Asia on their trade volume. Specifically, the study tests the relationship between scores in TFIs and trade volume (exports and imports) using the gravity model. This study examines how changes in trade facilitation performance affect trade flows. Such analysis can provide additional insights into the discussion on trade facilitation in the transition economies of Europe and Central Asia.

The organization of this study is as follows. Section 2 is a literature review. Section 3 explains the methodology and the data for the analysis, followed by discussions on the estimated results in Section 4. Section 5 is a conclusion.

2. Literature Review

This section reviews the existing literature on the impact of trade facilitation on the trade of transition economies and examines relevant empirical studies. Most studies use a gravity model

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2 Georgia and Ukraine are included in this category since they were former members of the CIS. Currently, Ukraine is a party to the CIS Free Trade Area agreement.

and examine different categories of countries. Also, some studies apply TFIs as a proxy variable for trade facilitation. The following are the empirical studies on the impacts of trade facilitation by area and country.

(1) Empirical Studies in Central Asia, Central and Eastern Europe

Felipe and Kumar (2012) examine the effect of trade facilitation measures on trade volume in Central Asia. They assess the impact of trade facilitation on bilateral trade flows and find that improving trade facilitation increases trade volume. Karymshakov and Sulaimanova (2023) investigate the effect of infrastructure and trade facilitation on the trade of five Central Asian nations from 2010–2020, participants of the Central Asia Regional Economic Cooperation (CAREC) program. They find that in addition to these countries' levels of infrastructure development, the costs incurred at their border crossing sites and the speed of travel along the CAREC corridors are crucial to the trade between the five studied countries and their six fellow CAREC members.

Ramasamy and Yeung (2019) evaluate the impact of the One Belt One Road project on the trade of countries that have signed on to this project and nations along the six economic corridors. They examine the impact of the quality of border administration and physical infrastructure of 141 countries in the years 2008, 2010, 2012, 2014, and 2016. They find that changes in border administration have the most significant impact on corridor countries' exports. They stress the importance of trade facilitation besides physical infrastructure to ensure trade channels run smoothly throughout the numerous corridors.

Bugarčić et al. (2020) examine the effect of logistics performance on trade value in Central and Eastern Europe and Western Balkans. Using the Logistics Performance Index (LPI) for 2007 and 2018 to test the impact on the trade volume of 16 countries in Central and Eastern Europe, they find a positively significant effect of LPI on trade.

(2) Empirical Studies Using TFIs as an Explanatory Variable

Several studies use trade facilitation indexes (TFIs) in their estimations based on a gravity model. Moïsé and Sorescu (2013) build a model to investigate the impact of TFIs on trade volume for 107 non-OECD countries for 2002–2010. They assume that trade facilitation indexes are relatively stable in this period. They use each component of trade facilitation as explanatory variables and find that information availability, simplification of documents, streamlining procedures, and automation significantly impact trade volume. The cumulative impact of these measures is a reduction of nearly 14.5% in total trade costs for low-income nations, 15.5% for lower middle-income nations, and 13.2% for upper middle-income nations.

Beverelli et al. (2015) studied the impact of trade facilitation on the trade margin of 133 countries by considering the 2009 TFI. The study revealed that trade facilitation positively affects export diversification in Sub-Saharan Africa, Latin America, and the Caribbean. Fontagné et al. (2020) analyze how trade facilitation in destination countries impacts French firms' exports. The authors use TFIs for 2008 and consider 152 countries where French companies export their products. Fontagné et al. (2020) find that while information availability helps exporters of all sizes, other policies, such as advanced rulings, appeals procedures, and automation, tend to benefit large exporters. Thu and Thanh (2021) estimate the impact of trade facilitation measures on the trade value between 10 ASEAN countries and their respective 88 trading partners. They use the trade facilitation indexes of 2017 and 2019 to construct scorecards for ASEAN countries and reveal that non-tariff barriers and institutional coordination impact the trade flows of ASEAN economies the most.

The existing literature examines the relationship between trade facilitation and trade activity in Central Asia and Eastern and Central Europe using proxies other than TFIs. While some other studies analyze the impact of trade facilitation using TFIs, they focus on countries outside the transition economies of Central Asia and Europe. Although previous research addresses transition economies in these regions, it relies on alternative indicators instead of TFIs. Moreover, studies utilizing TFIs typically exclude transition economies in Central Asia and Europe, leaving a gap in the literature.

The originality of this study is to examine the effect of trade facilitation in Central Asian and European post-socialist countries by utilizing TFIs as a proxy. Another special feature of this research is its incorporation of control variables in the regression models such as control of corruption and trade agreements as well as the interaction term between trade facilitation and control of corruption.

3. Trade Facilitation Reforms in the Kyrgyz Republic

In facilitating trade, the Kyrgyz Republic actively started several initiatives, including automated customs systems, electronic single windows, authorized economic operator schemes, and risk management systems. In March 2021, Kyrgyz Customs implemented an automated system that classifies traders into low, medium, and high-risk categories for streamlined customs clearance processes.

The Kyrgyz authorities have taken steps to enhance coordination and trade data exchange among border control agencies (UNECE 2021). For example, Kyrgyz Customs initiated the development of the "Smart Bazhy" digital platform, utilizing web technologies to optimize and modernize customs operations. This platform integrates various information subsystems and connects customs operation participants into a unified system. As part of the "Smart Bazhy" initiative, the pilot project "Sanarip Tamga" was launched in June 2021 at the "Dostuk" border crossing point to implement the "One-stop" principle. The project facilitates the exchange of preliminary information from the customs database with other agencies, enabling faster completion of border formalities. Additionally, an exchange of information, including export and import customs declarations, has been established between the customs authorities of the Kyrgyz Republic and Uzbekistan. This measure allowed us to reduce the difference in mirror statistics between countries. The "Single Window" information system was introduced, enabling all participants in foreign economic activities to provide the information required by border authorities for the processing of import, export, and transit operations. The "Single Window" information system is designed to simplify the procedures for issuing permits to businesses, as well as the transfer of issued permits to the information system of the Kyrgyz Customs for customs clearance.

Significant international support has been provided to the Kyrgyz Republic as part of the implementation of the WTO Trade Facilitation Agreement. The UNECE contributed to the development of the National Trade Facilitation Roadmap for 2021–2025, conducted business process analyses, and assisted in creating the National Trade Facilitation Committee's web portal. GIZ and the International Finance Corporation carried out a time-release study at key border crossings, identifying opportunities to improve border procedures. The World Customs Organization evaluated the readiness of Customs for the Mercator Program, which aims to advance trade facilitation. The Asian Development Bank upgraded border facilities through the CAREC program, reducing cargo handling times and costs. The OSCE assessed the needs of the National Trade Facilitation Committee, examined the implementation of Article 23.2 of TFA, and identified prospects for regional cooperation.

4. Methodology

(1) Model Specification

This study is based on Beverelli et al. (2015), Fontagné et al. (2020), Moïsé and Sorescu (2013), and Thu and Thanh (2021), which use TFIs as an explanatory variable in the gravity equation.

As mentioned before, previous empirical studies show the significant effect of trade facilitation on trade. The model envisages that the larger the two economies and the closer the distance between them, the more trading activity occurs. Hence, besides the primary interest variable, TFIs, three standard gravity variables, namely the GDP of a targeted country, the GDP of 10 major trading partners, and the distance between the capitals of targeted countries and their trading partners, are included in the equation.

In their previous study, Kanybekov and Inaba (2024) investigated the impacts of the average trade facilitation performance indicator and each component on exports and imports in the following equation:

$$ln\_Trade_{ijt} = \alpha_i + \beta_1 \ln\_DIST_{ij} + \beta_2 \ln\_GDPP_{jt} + \beta_3 \ln\_GDPT_{it} + \beta_4 ln\_TFI_{it} + \varepsilon_{ijt}$$

where i denotes twenty-one post-socialist countries of Europe, CIS, and Central Asia, and j is the ten main trading partners of each of these 21 countries; t is the year (2017, 2019, and 2022); $Trade_{ijt}$ presents exports and imports between partner countries i and j in the year t. $DIST_{ij}$ denotes the distances between the capital cities of partner countries i and j. The expected sign of ln_DIST_{ij} is negative $\beta_1<0$. $GDPP_{jt}$ and $GDPT_{it}$ denote the gross domestic product (GDP) of partner countries j and targeted countries i, respectively, in the year t. The expected signs of $GDPP_{jt}$ and $GDPT_{it}$ are both positive $\beta_2>0$, $\beta_3>0$. TFI_{it} is the trade facilitation indicators (average performance and specific component) of targeted 21 countries in the year t. The expected sign of ln_TFI_{it} is positive, $\beta_4>0$. An error term is presented by ε_{ijt}. All variables are measured in natural logarithms.

Since the previous studies (Beverelli et al. 2015; Fontagné et al. 2020; Moïsé and Sorescu 2013; Thu and Thanh 2021) do not consider the heterogeneity of country effect, Kanybekov and Inaba (2024) estimate ordinary least squares (OLS), OLS with area dummy, and country dummy (fixed effect). The area consists of three regions: European and Baltic countries, Central Asia, and CIS. The list of countries and area classification is in Appendix Table 1. Estimations with area and country dummies consider unobserved individual characteristics of each region and each country. The OLS and OLS area dummy estimations show the expected significant signs of all coefficients. On the other hand, regarding the estimation with a country dummy, the insignificant coefficient of TFI cannot conform to the significantly positive result of the previous studies.

This study extends their analysis by adding corruption control factors and trade agreements (separately) as independent variables to investigate whether these factors have impacts on trade, along with a trade facilitation variable. Accordingly, the following equations are the modified specifications.

$$ln\_Trade_{ijt} = \alpha_i + \beta_1 ln\_DIST_{ij} + \beta_2 ln\_GDPP_{jt} + \beta_3 ln\_GDPT_{it} + \beta_4 ln\_TFI_{it} + \beta_5 \text{Corruption} + \varepsilon_{ijt} \tag{1}$$

$$ln\_Trade_{ijt} = \alpha_i + \beta_1 ln\_DIST_{ij} + \beta_2\, ln\_GDPP_{jt} + \beta_3 ln\_GDPT_{it} + \beta_4 ln\_TFI_{it} + \beta_5 \text{Corruption} + \beta_6(\text{TFI} * \text{Corruption}) + \varepsilon_{ijt} \tag{2}$$

$$ln\_Trade_{ijt} = \alpha_i + \beta_1 ln\_DIST_{ij} + \beta_2 ln\_GDPP_{jt} + \beta_3 ln\_GDPT_{it} + \beta_4 ln\_TFI_{it} + \beta_5 \text{Trade agreement} + \varepsilon_{ijt} \tag{3}$$

$$ln\_Trade_{ijt} = \alpha_i + \beta_1 ln\_DIST_{ij} + \beta_2 ln\_GDPP_{jt} + \beta_3 ln\_GDPT_{it} + \beta_4 ln\_TFI_{it} + \beta_5 \text{Corruption} + \beta_6 \text{Trade agreement} + \varepsilon_{ijt} \tag{4}$$

$$ln\_Trade_{ijt} = \alpha_i + \beta_1 ln\_DIST_{ij} + \beta_2 ln\_GDPP_{jt} + \beta_3 ln\_GDPT_{it} + \beta_4 ln\_TFI_{it} + \beta_5 \text{Corruption} + \beta_6 \text{Trade agreement} + \beta_7 (\text{TFI} * \text{Corruption}) + \varepsilon_{ijt} \tag{5}$$

(2)   Measurement and Sources of Data

Trade volume between two countries (one of the post-communist countries and one of its ten main trading partners) is retrieved for 2017, 2019, and 2022[3] and converted into billions of USD. Trade volume is represented in export and import flows. Export and import volumes are adjusted for the export and import price indexes. The information on exports and imports is obtained from the UN Comtrade database. Data for the export and import price indexes, such as the Merchandise Trade Price Index for 2017, 2019, and 2022, are retrieved from the OECD database.

The OECD's trade facilitation indicators (TFI_{ijt}) reflect the main provisions of the WTO Trade Facilitation Agreement and seem to be a comprehensive proxy for the trade facilitation performance of countries. This indicator is a benchmarking instrument designed to provide factual data that is comparable geographically and consistently over time. The data sources for the indicator are publicly available information, direct submissions from countries, and information from the private sector. The indicator ranges from 0 to 2, with a value of 2 indicating the greatest possible performance. Data for 2017, 2019, and 2022 TFIs come from the OECD database. The average trade facilitation indicator is used in the estimations.

The distance between the capital cities of partner countries ($DIST_{ij}$) is measured in kilometers. The distance data is taken from the French Center for Research Expertise (CEPII), which maintains gravity data for related empirical studies.

The GDP of targeted countries (*GDPT*) and the main ten trading partner countries (*GDPP*) is in billions of international dollars in 2017 purchasing power parity rates. Information on GDP is retrieved for 2017, 2019, and 2022 from the World Development Indicators database.

The proxy for the corruption factor is the Control of Corruption indicator from the Worldwide Governance Indicators. The country's score on the aggregate indicator ranges from approximately −2.5 to 2.5.

The trade agreement factor is represented by a dummy, i.e., whether trading partners have trade agreements. Information regarding trade agreements between partners is collected from the WTO's Regional Trade Agreements Database.

5. Empirical Results and Discussion

This section presents the empirical results of the TFIs' impact on export and import volume in

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3 Trade data for Russia and Belarus is retrieved for 2021, since data for 2022 is not available.

Subsection 5.1 and discusses the implications of these results in Subsection 5.2. In the estimations, the robust standard errors are used to consider heteroscedasticity. Also, descriptive statistics are presented in Appendix Table 2.

(1) Impact of Trade Facilitation, Corruption Control, and Trade Agreements

While Appendix Table 3 demonstrates the separately estimated results of the effects of trade facilitation, control of corruption, their interaction term, and trade agreements on exports, Appendix Table 4 presents the impact of the same variables on imports. In addition, Appendix Table 5 shows the effect of trade facilitation, control of corruption, trade agreements, and the interaction term between trade facilitation and control of corruption on trade.

The first four columns in Table 3 demonstrate the impact of trade facilitation and corruption control on export trade. Columns 1 and 3 show estimates by the OLS method, and columns 2 and 4 present estimates with area dummies. In addition, columns 3 and 4 reflect the interaction effect of trade facilitation and control of corruption. All four estimated results show that trade facilitation positively and significantly impacts export trade. Similarly, control of corruption impacts trade volume significantly and positively. The interaction between trade facilitation and control of corruption is also significant for export trade. This means that the combination of trade facilitation efforts with a low level of corruption (high value of corruption control) also enhances export trade.

Columns 5 and 6 illustrate the effect of trade facilitation and trade agreements (between trading partners) on export trade. Column 5 shows estimated results by the OLS method, and Column 6 illustrates results by adding an area dummy. According to the results, the effect of trade facilitation on trade is positively significant. Also, trade agreements between trading partners positively impact export trade. Similarly, the results of Table 3 show that in addition to TFI, the low level of corruption and trade agreements have a significantly positive impact on import trade in the OLS estimation as well as OLS with area dummies.

Before the tests shown in Table 5, we estimated the direct effects of trade facilitation, control of corruption, and trade agreements on exports and imports. According to the results, trade facilitation and control of corruption have a positive and significant impact on exports and imports. At the same time, while the trade agreement's variable has a significant and positive effect on imports, this variable does not affect exports.

Table 5 presents tests for the effects of trade facilitation, control of corruption, and trade agreements on exports and imports by including the interaction term between trade facilitation and control of corruption. Columns 1 and 4 show the estimated results using OLS, columns 2 and 5 show the results with an area dummy, and columns 3 and 6 show the results with a country dummy. Trade facilitation and control of corruption continue to demonstrate significant and positive effects on exports and imports. The coefficient of trade agreements is significantly positive only in imports. The interaction term between trade facilitation and control of corruption is also positively significant. This result means that trade facilitation is enhanced when the control of corruption is high. When we consider country heterogeneity by adding a country dummy, we find that the control of corruption becomes insignificant for exports, as does the interaction between trade facilitation and control of corruption for imports.

(2) Discussion of Estimated Results

The estimated results suggest that an increase in trade facilitation indicators is correlated with an increase in the values of exports and imports. In addition, the results suggest that trade

facilitation and a low level of corruption enhance both export and import trade. The outcomes conform with previous studies that found a negative effect of corruption on trade (see Anderson and Marcouiller, 2002; Thede and Gustafson, 2012). Thus, not only having a low level of corruption (high value of corruption control) but also securing trade facilitation is essential for trade. In addition, the combined effect of trade facilitation and control of corruption also contributes to active trade.

After controlling for trade agreements (low tariffs between trading partners), trade facilitation and control of corruption continue to enhance trade. Such findings are in line with the trade facilitation advocates, who argue that trade liberalization in developing countries did not bring the expected results because of border-related (non-tariff) trade obstacles. In addition, trade agreements along with trade facilitation and control of corruption also promote trade by offering preferential conditions. The positive impact of trade agreements on trade may also be affected by proper control of corruption.

OECD defines trade facilitation as implementing measures to optimize and simplify the technical and legal procedures related to goods crossing the border. It encompasses policies such as information availability, involvement of the trade community, advanced rulings, appeal procedures, fees and charges, documents, automation, procedures, internal border agency co-operation, external border agency co-operation, governance and impartiality. The trade facilitation policy by components is described by Kanybekov (2023, 6) in detail. When assessing the effect of each trade facilitation policy on trade, we did not find consistent results. Although some trade facilitation policies clearly promote trade, others do not affect trade activity.

Trade facilitation indicators reflect the institutional aspects of the countries studied. According to North (1990), institutions can be divided into formal rules and informal rules. Kanybekov and Inaba (2023), who follow the North's (1990) concept of institutions, find that each trade facilitation component reflects some aspect of institutions. Their finding leads to the following question: How can formal and informal rules interact to determine the pace of trade facilitation? In order to answer this question, it can be helpful to consider one of the trade facilitation components to describe how institutional interaction influences trade facilitation reforms. One can discuss the internal border agency co-operation indicator, which significantly impacts exports and imports in transition economies (Kanybekov and Inaba 2024).

The internal border agency co-operation indicator prominently reflects how institutions function in cross-border trade activity. This indicator shows how informal rules of institutions underpin or hinder newly suggested formal rules by trade facilitation reforms. Kanybekov and Inaba (2023) discuss how the interaction of formal and informal rules can result in trade facilitation performance, including in internal border agency co-operation. They describe the case of the Kyrgyz Republic, where weak coordination of control activities among border authorities is observed. Poor coordination leads to duplication of clearance requirements and excessive paperwork for traders. The reason for such coordination is the weak interest of border authorities in delegating their functions to other authorities. Keeping their initial functions allows some border officers to get unofficial remuneration. Complex bureaucratic procedures generate demand for informal services of officials for expedited clearance of goods. Thus, current informal rules provide opportunities for border officers to receive unofficial revenues. Hence, these officials are interested in maintaining the existing informal rules (according to which they receive remuneration for accelerated clearance of goods). This discussion leads us to corruption as one of the determinants of trade.

Corruption is one of the informal rules through which some people build their relationships in trade activity (including border clearance). As mentioned, such informal rules can be preserved by people with vested interests. Changes in formal rules as part of trade facilitation initiatives may not be supported by the informal rules of corrupt practices. Accordingly, corruption may impede trade

facilitation reforms. Thus, the human factor expressed in informal rules plays an important role in the implementation of reforms.

In discussing trade facilitation and corruption, one can notice a vicious cycle. While corrupt officials may impede trade facilitation reforms, successful trade facilitation reforms eliminate grounds for corruption. It is worth mentioning that our data for corruption reflects the situation in a whole country. This indicator illustrates the institutional quality of nations in general (a combined picture of corruption in all state bodies), not in a border-related environment. At the same time, TFI is related to the border clearance field. If one considers each authority in a country, the level of corruption most likely differs even among border agencies.

Thus, our regression results suggest that low corruption levels and trade facilitation promote trade. Business operators may trade actively with fewer bureaucratic border requirements and low levels of corruption (implying that there is no need to pay bribes to border officials).

Thus, the human factor of border-regulating agencies is important in explaining trade activity. For instance, the internal border agency co-operation indicator significantly impacts trade (Kanybekov and Inaba 2024). In turn, this indicator is explained by institutional aspects. Current informal rules are most likely to be maintained by the vested interests of border officials. Accordingly, these informal rules hinder newly proposed formal rules by trade facilitation initiatives. Thus, the human factor plays an essential role in determining the internal border agency co-operation indicator, which in turn significantly affects trade.

6. Conclusion

This study assessed the effect of the trade facilitation performance of post-socialist countries of Europe and Central Asia on their exports and imports. Using a gravity model, the study estimated the relationship between the trade facilitation indicator and trade volume (exports and imports). Our estimations are based on the OLS and OLS with area-specific effects and added corruption control and trade agreements between trading partners as control variables.

The estimated results demonstrate that the coefficients for distance, partner countries' GDP, and targeted countries' GDP are significant and align with expectations. Enhanced trade facilitation and control of corruption are correlated with an increase in the values of exports and imports. In addition, we find that the joint effect of trade facilitation and low corruption promotes trade. Also, our results suggest that trade facilitation is still important after tariff reductions. In other words, trade facilitation remains a significant factor in trade activity even when trade agreements are concluded between countries.

Trade facilitation performance can reflect how institutions work in cross-border trade activity. The pace of trade facilitation changes is determined by how informal rules of institutions interact with formal rules. Countries where informal rules support newly introduced formal rules may implement trade facilitation reforms faster. Transition economies with informal rules that support new formal rules initiated by trade facilitation tend to have more active trade.

Corruption can be considered an informal rule some individuals follow to establish relationships in border clearance activities. Accordingly, such informal rules can be maintained by individuals with personal interests. Thus, the human factor expressed through institutions is essential in considering trade facilitation performance.

Several limitations of this study should be considered. The sample size includes only 21 countries, while most previous analyses include all countries. The reverse causal effect or endogeneity issue is another limitation that deserves attention. Trade volume can also influence GDP, resulting in a two-way causal relationship. For example, increased trade volume may result in

higher GDP due to improved market efficiencies and larger markets, whereas increasing GDP may increase a country's trade.

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Appendix

Table 1. Countries' division by area

Central Asia				Commonwealth of Independent States (CIS)							European and Baltic former socialist countries									
Kazakhstan	Kyrgyz Republic	Tajikistan	Uzbekistan	Armenia	Azerbaijan	Belarus	Georgia	Moldova	Russia	Ukraine	Albania	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovak Republic

Note: Georgia and Ukraine are in this category since they are former members of the CIS. Currently, Ukraine is a party to the CIS Free Trade Area agreement.

Table 2. Descriptive statistics

Variable	Number of observations	Mean	Standard Deviation	Minimum	Maximum	Variation of coefficients
Log Exports	630	3.129	.804	1.052	4.974	0.27
Log Imports	630	3.201	.674	1.571	4.884	0.21
Log TFI	630	.107	.133	-.249	.259	1.24
Log Distance	630	3.103	.441	1.908	4.201	0.14
Log GDP targeted	630	5.2	.563	4.461	6.605	0.10
Log GDP partner	630	6.061	.694	4.088	7.41	0.11

Note: All variables are in log form. Dummy variables are not included in the descriptive statistics.

Table 3. The effect of trade facilitation, corruption, and trade agreements on exports

Independent Variables	Exports					
	(1)	(2)	(3)	(4)	(5)	(6)
Average TFI	**0.325***	**0.336**	**0.509***	**0.458***	**0.672***	**0.336**
	(0.125)	**(0.139)**	**(0.138)**	**(0.146)**	**(0.139)**	**(0.151)**
Control of Corruption	**0.275***	**0.256***	**0.224***	**0.209***		
	(0.0223)	**(0.0265)**	**(0.0277)**	**(0.0321)**		
Interaction of TFI and Control of Corruption			**0.536***	**0.535***		
			(0.174)	**(0.206)**		
Trade Agreements					**0.0970***	**0.105***
					(0.0360)	**(0.0352)**
Log Distance between trading partners	-0.533***	-0.542***	-0.534***	-0.528***	-0.636***	-0.583***
	(0.0479)	(0.0491)	(0.0475)	(0.0492)	(0.0526)	(0.0523)
Log GDP targeted	1.121***	1.134***	1.133***	1.138***	1.112***	1.168***
	(0.0274)	(0.0282)	(0.0275)	(0.0281)	(0.0311)	(0.0310)
Log GDP of trade partner	0.338***	0.344***	0.343***	0.340***	0.363***	0.351***
	(0.0319)	(0.0323)	(0.0317)	(0.0322)	(0.0355)	(0.0345)
Area Dummies		Yes		Yes		Yes
Constant	-3.130***	-3.218***	-3.245***	-3.272***	-3.046***	-3.405***
	(0.187)	(0.192)	(0.189)	(0.192)	(0.214)	(0.214)
R-squared	0.798	0.799	0.801	0.801	0.751	0.772
Number of observations	630	630	630	630	630	630

*** Significant at 1%, ** 5%, and * 10% level.

Table 4. The effect of trade facilitation, corruption, and trade agreements on imports

Independent Variables	Imports					
	(1)	(2)	(3)	(4)	(5)	(6)
Average TFI	**0.554***	**0.730***	**0.752***	**0.892***	**0.695***	**0.661***
	(0.114)	**(0.126)**	**(0.125)**	**(0.131)**	**(0.119)**	**(0.134)**
Control of Corruption	**0.200***	**0.242***	**0.145***	**0.179***		
	(0.0203)	**(0.0240)**	**(0.0252)**	**(0.0288)**		
Interaction of TFI and Control of Corruption			**0.574***	**0.716***		
			(0.158)	**(0.185)**		
Trade Agreements					**0.169***	**0.181***
					(0.0310)	**(0.0314)**
Log Distance between trading partners	-0.581***	-0.606***	-0.582***	-0.587***	-0.630***	-0.629***
	(0.0435)	(0.0444)	(0.0431)	(0.0441)	(0.0454)	(0.0467)

	(1)	(2)	(3)	(4)	(5)	(6)
Log GDP targeted	0.854***	0.842***	0.866***	0.847***	0.867***	0.892***
	(0.0250)	(0.0255)	(0.0249)	(0.0252)	(0.0268)	(0.0276)
Log GDP of trade partner	0.381***	0.391***	0.386***	0.386***	0.387***	0.391***
	(0.0290)	(0.0292)	(0.0287)	(0.0289)	(0.0305)	(0.0307)
Area Dummies		Yes		Yes		Yes
Constant	-1.822***	-1.771***	-1.946***	-1.843***	-1.917***	-2.092***
	(0.170)	(0.173)	(0.172)	(0.173)	(0.184)	(0.190)
R-squared	0.762	0.767	0.767	0.773	0.738	0.743
Number of observations	630	630	630	630	630	630

*** Significant at 1%, ** 5%, and * 10% level.

Table 5. The effect of trade facilitation, corruption, and trade agreements on trade

Independent Variables	Exports					
	(1)	(2)	(3)	(4)	(5)	(6)
Average TFI	**0.480***	**0.424***	**0.774***	**0.642***	**0.786***	**0.830***
	(0.141)	**(0.149)**	**(0.469)**	**(0.126)**	**(0.132)**	**(0.463)**
Control of Corruption	**0.219***	**0.205***	**-0.136**	**0.128***	**0.166***	**0.201***
	(0.0281)	**(0.0323)**	**(0.104)**	**(0.0251)**	**(0.0286)**	**(0.103)**
Trade Agreements	**0.0336**	**0.0374**	**0.120***	**0.127***	**0.118***	**0.113***
	(0.0328)	**(0.0336)**	**(0.0292)**	**(0.0293)**	**(0.0298)**	**(0.0288)**
Interaction of TFI and Control of Corruption	**0.542***	**0.515***	**0.827***	**0.599***	**0.653***	**0.531**
	(0.174)	**(0.207)**	**(0.345)**	**(0.156)**	**(0.184)**	**(0.341)**
Log Distance between trading partners	-0.527***	-0.522***	-0.523***	-0.556***	-0.570***	-0.509***
	(0.0480)	(0.0494)	(0.0432)	(0.0429)	(0.0438)	(0.0426)
Log GDP own	1.139***	1.146***	1.280**	0.891***	0.873***	1.853***
	(0.0282)	(0.0291)	(0.514)	(0.0252)	(0.0258)	(0.507)
Log GDP of trade partner	0.339***	0.337***	0.342***	0.372***	0.377***	0.360***
	(0.0319)	(0.0323)	(0.0275)	(0.0285)	(0.0286)	(0.0271)
Area Dummies		Yes			Yes	
Country Dummies			Yes			Yes
Constant	-2.140***	-2.045***	-6.531***	-2.140***	-2.045***	-6.531***
	(0.175)	(0.178)	(2.258)	(0.175)	(0.178)	(2.258)
R-squared	0.801	0.802	0.870	0.774	0.778	0.819
Number of observations	630	630	630	630	630	630

*** Significant at 1%, ** 5%, and * 10% level