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Estimating Trade Facilitation in a Regional Integration Initiative: Leveraging the Logistics Performance Index

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Abstract: *This study examines trade determinants, with a particular focus on logistics within the context of a regional integration initiative. A gap in the literature concerning the application of gravity models to the TRACECA initiative is identified through the literature review. Subsequently, an analysis of the legal framework underpinning TRACECA is undertaken. Utilizing the World Bank's Logistic Performance Index (LPI) within a gravity model framework, the study evaluates the impact of trade facilitation within the TRACECA region. Findings indicate positive associations between trade and GDP, common language, and shared borders, while distance exerts a negative influence. The research underscores the role of the LPI in facilitating trade within TRACECA, advocating for collaborative endeavors to enhance logistics, remove latent barriers, and streamline customs procedures. Furthermore, the study advocates for increased investment to strengthen TRACECA's trade facilitation initiatives, emphasizing the necessity of mutual political commitment to advance regional trade.*

1. INTRODUCTION

The enforcement of the WTO Trade Facilitation Agreement (TFA) back in 2017, switched the focus of deeper trade liberalization from classical to the many hidden non-tariff and administrative barriers to trade (NTBs). Since, numerous research articles have pointed out advantages, savings, and increments of profits if TFA is fully implemented. Despite these findings, in the period from 2017-2019, new NTBs appeared at a several times quicker pace than the pace of their elimination.

The failure of the multilateral trading system, as well as the high level of restrictiveness to trade of the old/new NTBs, pressed many national economies to undertake initiatives on deeper trade liberalization at the regional instead of multilateral level. This tendency has become even more intense since the outburst of the COVID-19 pandemic.

The initiative on the Transport Corridor Europe Caucasus Asia (TRACECA) was launched in Brussels in 1993. It is an EU initiative founded upon a program on technical assistance for the development of a transport corridor on the west-east axis from Europe, across the Black Sea, through the Caucasus and the Caspian Sea to Central Asia. In 1998, five Central Asian republics, three Caucasian republics, and four European countries, among which two EU member-states, signed the "Basic Multilateral Agreement on International Transport for Development of the Europe-the Caucasus-Asia Corridor" in Baku. Ten years later, the Islamic Republic of Iran joined the

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agreement. Thus, an initiative that covers 47 routes with a total of 45,198 km of international roads and highways, 93,474 km of railway lines, 6,960 nautical miles of ferry routes, and 16 seaports connected by Ro-Ro communication, was created. Before the COVID-pandemics the volume of total TRASECA trade exchange of goods amounted to 65 million tons of cargo, of which 40.4% were oil and oil products; 12.4% were ores; 11% were foodstuffs; 8.8% chemicals; 6.5% were construction materials; 5.4% cereals; 4.7% metals and metal ware; and 11% other goods (Permanent Secretariat of the Intergovernmental Commission TRACECA, 2020).

To enable deeper insight into the efficiency of the TRACECA initiative and to measure its achievements and failures of trade facilitation up to date, this study incorporates an LPI-variable calculated for TRACECA members in a gravity model. The structure of the paper is as follows: summary; introduction, literature review; overview of enacted legal acts within TRACECA; the gravity model and results; and conclusion.

2. LITERATURE REVIEW

Since the 1970s, gravity models, based on the Newtonian gravity theory, have been broadly used in research on trade flows. Translated in economic terms, the basic assumption in the gravity model for economic purposes is that bilateral trade flows between neighboring economies that share common borders and that have bigger GNP per capita are more intense than with trade partners geographically more distant and/or with a limited economic potential. The model may also include several different variables that measure trade facilitation and logistic performance effects. Hence, it became the theoretical framework for measuring the strengths and weaknesses of trade liberalization within different regional initiatives. Abundant literature on gravity models used for different regions in the world is available, however, published papers using this model for the TRACECA initiative cannot be found. At the same time, a paper by Bugarčić et al. (2020) includes LPI in a gravity model in assessing trade facilitation effects in Western and Eastern Europe and Western Balkan. That was the motivation to create a gravity model for TRACECA member-states that would include the LPI variable, which would enable to analysis of trade facilitation effects within the region.

Research work on trade facilitation started after the Ministerial Conference of the WTO in Singapore in 1996, as the necessity of elimination of administrative barriers to trade as a form of non-tariff barriers was never tackled under the GATT from 1947. In 2003 a research paper by Wilson et al. (2003) pointed out the strong negative impact of these kinds of barriers on the economic development in the Asia-Pacific region. Two years later, these authors researched air and maritime infrastructure, customs environment, regulatory environment, and e-business infrastructure for 75 countries using panel data in a gravity model, which pointed out that the effects of undertaking trade facilitation measures might differ among different economies. However, if such measures were implemented to the level of half of the world average in the four analyzed areas, the trade might increase by 377 billion American dollars (Wilson et al., 2005).

In the meanwhile, the World Bank, the World Bank Group, the OECD, and the WTO developed methodologies to follow trade facilitation impact and economic effects. A study by the World Trade Organization (2015) even stated that the increase in exports from the trade facilitation process might reach at least 9.1% and would be especially beneficial in the case of developing and less developed countries. These highly optimistic results could be realized by shortening the time needed for imports by 47%, and the time needed for exports by 91% on average.

Decreux and Fontagné (2009) in modeling trade facilitation assumed that administrative barriers behave as iceberg costs.

Zaki (2010) first used a gravity model to measure the bilateral trade effects from administrative barriers by estimating the time to export and to import, finding out that time to import has a higher negative impact on trade than time to export. In another paper, Zaki (2014) also stated that trade facilitation had an especially positive effect on sectors that show higher sensitivity to time, such as food; textiles, and electronics. He also found that the long-run welfare effects of trade facilitation are much higher than the short-run ones and that positive effects from this process led to export diversification, as well.

In their works many authors, like Beverelli et al. (2015), Moïsé and Sorescu (2013), and Fontagne et al. (2016), made estimations on various intensities of favorable effects of implementing the WTOs TFA, emphasizing its positive effect on exports.

A literature set concerning logistic performance and the LPI has a starting point that states that logistic performance is tightly correlated with international competitiveness (OECD, 2005). Hausman et al. (2005), De Souza et al. (2007), and Mustra (2011) support OECD findings, claiming that being part of the value chain, logistics is the fundament of efficiently solved transportation, storage, and packaging issues. Their research also confirms that inefficient logistics prolongs the time needed to import/export, thus significantly increasing costs and reducing turnover.

Using the World Bank's LPI for the creation of a regulatory restrictions index in the case of ASEAN, Hollweg and Wong (2009) detected a negative correlation between them, pointing out that countries that have fewer legal barriers obtain better logistic scores due to decreasing trade costs and increasing competitiveness. Shortening the time of queuing at borders, leads also to lower emission and pollution costs, which was proved in the study of Min and Kim (2010) based on the combination of LPI with Data Development Analysis.

By using LPI as an explanatory variable analysis, Korinek and Sourdin (2011) confirmed that the improvement of transport infrastructure has greater significance for exporters from middle-income countries, while at the same time improvements of administrative barriers have greater importance for importers. Using the same index, Martí et al. (2014) found that logistics is more strongly correlated to terms of transport in the bilateral trade exchange of complex goods.

An abundant literature review pointing out the usefulness and the many analytical possibilities of LPI in recent research throughout the world was published in a research paper by Aboul-Dahab and Ibrahim (2020).

3. THE LEGAL FRAMEWORK OF THE TRANSPORT CORRIDOR EUROPE–CAUCASUS–ASIA (TRACECA)

The foundational document of the TRACECA - the Basic Multilateral Agreement on International Transport for Development of the Europe–Caucasus-Asia Corridor (MLA, 1998) was initially signed for 10 years. Its validity has been continually extended for an additional period of 5 years according to Article 16.

The original agreement is ratified by all 13 member-states: Armenia, Azerbaijan, Bulgaria, Georgia, Iran, Kazakhstan, Kyrgyzstan, Moldova, Romania, Tajikistan, Turkey, Ukraine, and Uzbekistan. The MLA remains open to accession to any State or Regional Economic Integration Organizations (Article 14). In addition, there have been 4 additional Protocols for its amendment, but so far, they have not received the same recognition from the member states. Out of the 4 protocols, only 2 have entered into force.

The MLA is comprised of the Basic Agreement and the Technical Annexes on international road transport, international railway transport, international commercial maritime navigation, and customs and documentation procedures (Article 10). The Technical Annexes are an integral part of the MLA and are binding to member-states.

The MLA serves as the legal framework for promoting economic relationships, facilitating trade, and improving transport links in the regions of Europe, the Black Sea, the Caucasus, the Caspian Sea, and Asia. The main objectives are:

- Developing economic relations, trade, and transport communication in the regions of Europe, the Black Sea, the Caucasus, the Caspian Sea, and Asia;
- Facilitating access to the international market of road, air, and railway transport and commercial maritime navigation;
- Facilitating international transport of goods and passengers and international transport of hydrocarbons;
- Ensuring traffic safety, security of goods, and environmental protection;
- Harmonizing transport policy and the legal framework in the field of transport; and
- Creating equal conditions of competition between different types of transport.

The MLA stipulates that no taxes, duties, or other payments will be imposed for transport in transit, except payments for transport and customs services, services related to transport, and payments for the use of transport infrastructure (Article 5). Additionally, tariffs for transport transit services have to be established based on preferential terms - if preferential terms and tariffs are established between two Parties, then no less preferential terms and tariffs will apply to other Parties (Article 6). An exception to this is the advantages granted by Bulgaria and Romania in virtue of their membership in the EU.

Another significant instrument for TRACECA is the Agreement on the Development of Multimodal Transport. The Agreement was adopted in 2009 in Cholpon-Ata, Kyrgyzstan. It entered into force in 2011, and so far, it has been signed and ratified by six states: Armenia, Azerbaijan, Georgia, Kyrgyzstan, Tajikistan, and Ukraine.

The main objective of the Agreement is to harmonize the legislation of signatories and to compel them to implement a unified legal framework of multimodal transport (Article 2). Considering this objective, the Agreement aims to regulate broadly the rights and obligations of all participants in multimodal transport operations, including transport organizations, multimodal transport operators, consignors, consignees, and other physical and legal persons, acting on behalf of the consignor carrying goods in multimodal services.

The Agreement is only applicable to the multimodal transport of goods, when it occurs between the states-participants and transit through the territories of these countries, effected by the forwarders registered on the territory of one of the Parties with the points of departure or destination on the territories of the states of the parties, with the use of all modes of transport.

4. STYLIZED FACTS AND THE EMPIRICAL MODEL AND RESULTS

The World Bank Logistic Performance Index (LPI) is an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI provides a general picture of customs procedures, logistic costs, and quality of overland and maritime transportation infrastructure. As a weighted average, it scores the efficiency of the clearance process (i.e., speed, simplicity, and predictability of formalities) by border control agencies, including Customs; quality of trade and transport-related infrastructure (e.g., ports, railroads, roads, information technology); ease of arranging competitively priced shipments; competence and quality of logistics services (e.g., transport operators, customs brokers); ability to track and trace consignments; and timeliness of shipments in reaching destination within the scheduled or expected delivery time (World Bank, 2023). They are a valuable instrument for monitoring and comparing the logistics performance of economies.

Figure 1 shows an overview of the logistic performance measures across the TRACECA countries. These results point to an improvement in the state of logistics (average score of 2.7 in 2023, compared to 2.4 in 2007).

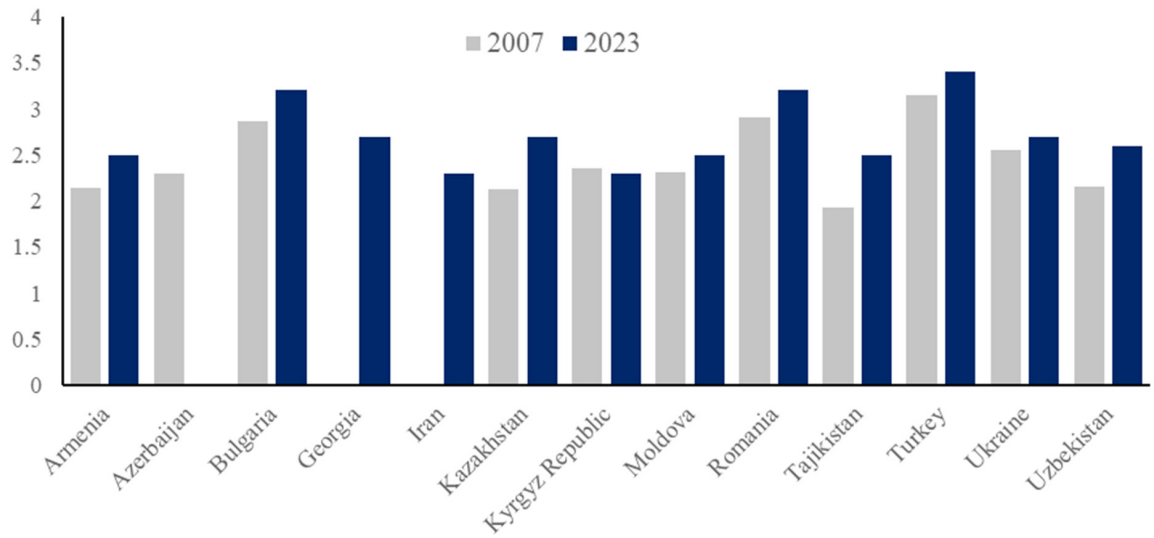

Figure 1. Overall Logistic Performance Index score in TRACECA countries, 2007 and 2023
Source: World Bank, 2023

To investigate the factors influencing the international trade patterns of member-states within the TRACECA initiative and to gauge the impact of their logistics performance, this study employed the gravity model as the conceptual framework. This model operates on the premise that bilateral trade flows are positively correlated with the economic size of two countries, as measured by their GDP. Conversely, an increase in the geographical distance between trading partners exerts a negative influence on their reciprocal trade. Distance serves as a proxy for transportation costs and is quantified by the geographical separation between the respective capital cities. Countries included in the analysis are Armenia, Azerbaijan, Bulgaria, Georgia, Iran, Kazakhstan, Kyrgyzstan, Moldova, Romania, Tajikistan, Turkey, Ukraine and Uzbekistan.

Additional variables augment the model, such as dummy variables designed to control for the effects of shared borders between countries and a common language, factors anticipated to

bolster trade volumes. Furthermore, the baseline equation incorporates a summary LPI. The estimations are conducted utilizing the STATA statistical software, employing the Ordinary Least Squares (OLS) model, without incorporating any specific effects. The dataset encompasses annual trade flow data between TRACECA member-states for the period spanning from 2000 to 2023, totaling more than 3,000 observations.

The used data sources comprise information from various databases, including the International Monetary Fund's Direction of Trade Statistics (for export data), the International Monetary Fund's World Economic Outlook Database (for GDP data), the CEPII GeoDist database (providing data on geographical distances between specific economic centers within member-states) (Mayer & Zignago, 2011), and the World Bank (for LPI data). It is worth noting that LPI scores have been available since 2007, and the database that is used encompasses overall country LPI scores for the years 2007, 2010, 2012, 2014, 2016, 2018, and 2023.

The following specification of the gravity model on panel data is used:

$$\log(EXP_{ijt}) = \beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3 DIST_{ij} + \beta_4 LPI_t^* + \beta_5 BORDER + \beta_6 LANG + u_{ij} \quad (1)$$

where EXP_{ijt} – quantity of exports from country *i* to country *j* in year *t* expressed in millions of US dollars; GDP_{it} – GDP of country *i* in year *t*; GDP_{jt} – GDP of country *j* in year *t*; $DIST_{ij}$ – average distance between countries *i* and *j* in kilometers; *BORDER* – binary variable equal to 1 for countries that share a common border and 0 otherwise; *LANG* – binary variable equal to 1 for countries that share a common language; u_{ij} – standard error. A logarithmic transformation of the variables enables interpreting the coefficients as elasticities. It is expected that most variables included in the gravity model have a significant positive impact on total bilateral exports, except the distance variable, which should have a negative effect on exports. The larger and closer the two countries are, the higher the volume of their exports can be expected.

The focus of the paper is on examining the effects of LPI so that other variables have a controlling character. The variable LPI_t^* refers to the product of the values of logistics performance indices of both trading partners. This variable makes it possible to see jointly how changes in specific LPI affect exporters and importers. The variable LPI_t^* is constructed as the product of a specific LPI for importer and exporter.

$$LPI_t^* = LPI_{tj} * LPI_{ti} \quad (2)$$

The results from the analysis are presented in Table 1.

Table 1. Results from the gravity model

Dependent variable: Log of exports		
	(1)	(2)
Log of exporting country's GDP	0.446***	0.442***
	(0.042)	(0.043)
Log of importing country's GDP	0.652***	0.645***
	(0.042)	(0.043)
Log of distance	-1.012***	-1.012***
	(0.270)	(0.268)
Joint LPI		0.006*
		(0.006)

Common language	1.431**	1.429**
	(0.694)	(0.688)
Common border	0.379	0.381
	(0.502)	(0.498)
Constant	6.583***	6.611***
	(2.081)	(2.065)
Observations	3,462	3,462
Number of id	155	155
Standard errors in parentheses		
***** p<0.01, ** p<0.05, * p<0.1**		

Source: Own calculations

5. CONCLUSION

Results from the gravity model on the TRACECA initiative mostly convey findings of similar research in the case of other regional initiatives. However, the outcomes have yielded several noteworthy discoveries as elucidated within the confines of this scholarly exposition. The foundational specification of the model adheres entirely to the anticipated repercussions of the essential gravity model variables. Specifically, the GDP of trading partners manifests a positive and statistically significant impact on trade, whereas geographical distance exhibits a detrimental and statistically significant influence on trade. Furthermore, the inclusion of dummy variables designed to control for the presence of common borders and a shared language both yield positive and statistically significant results.

However, it is imperative to underscore that the most pivotal variable of all, denoted as the LPI, is intimately associated with the ramifications of heightened trade facilitation among member-states of the TRACECA initiative. The results point to many existing hidden and non-hidden barriers to trade that are not compliant with the trade facilitation process and create additional costs to trade. TRACECA authorities have already undertaken additional initiatives to support and enhance trade facilitation at the regional level by eliminating some of the most frequently experienced challenges by traders from member-states, among which the most visible are the need for harmonization and simplification of customs procedures; improvement of customs efficiency through digitalization and simplification of customs formalities; introducing mechanisms for systematic information exchange among customs authorities and potential use of electronic queueing systems at border crossings; elimination of existing (non)physical barriers and bottlenecks at border crossings; considering the conclusion of an Agreement on Mutual Recognition of Authorized Economic Operators, thus minimizing requirements for equipment on different checkpoints; digitalization of International Customs Transit System; and others.

Being aware of the changing geopolitics and of the potential for container transport through TRACECA corridors special emphasis is put on harmonization and simplification of transit procedures and a strong support of multimodal transport operations. The success of multimodal transportation, however, depends on the usage of internationally recognized and accepted transport transit documents. However, only five of the TRACECA countries provide usage of TIR carnet, while the Central Asian countries additionally request a permit for carriage of goods.

The underscored assertion from the empirical model confirms that by intensifying cooperative efforts aimed at enhancing logistic performance, TRACECA member-states may discern a favorable and statistically significant impact on their aggregate exports. Besides enhancing

logistical performance, TRACECA members should also increase investment and provide all necessary resources to support and continue the process of digitalization and simplification of customs procedures, to implement internationally recognized good practices and accepted forms and documents on transit, as well as to find strength to express mutual political will to support and enhance trade facilitation by all means.

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