Kosovo Agricultural Export Performance: Evidence from Gravity Model Analysis[1]

Kushtrim BRAHA – Artan QINETI** – Ján POKRIVČÁK** – Vesel USAJ*** – Leonora SOPAJ*** – Anera MUSLIU****

Abstract

The underperformance of the agricultural sector in Kosovo stems from small subsistence farming, land fragmentation, and low productivity, resulting in limited agricultural exports and a persistent trade deficit. This study examines the key determinants of agricultural exports and evaluates Kosovo's export potential using an augmented gravity model. The analysis employs a Poisson Pseudo Maximum Likelihood (PPML) estimator with high-dimensional fixed effects, covering bilateral export flows to 45 trading partners over the period 2005 – 2020. Results reveal that agricultural exports are strongly influenced by domestic production capacity, rather than the importing country's absorption potential. The presence of a Kosovar diaspora significantly facilitates exports flows by reducing information asymmetries and transaction barriers. Furthermore, the study highlights the positive effect of trade liberalization has supported export growth, particularly through the Stabilisation and Association Agreement (SAA) with the European Union. Despite these developments, Kosovo's agricultural exports remain underperforming, with considerable untapped export potential across key trading blocs. The findings underscore the need for policy interventions focused on enhancing productivity, aligning with international quality standards and strengthening institutional capacity to fully exploit agricultural export potential.

Keywords: *agricultural export, export potential, gravity model, panel data, Kosovo*

JEL Classification: C23, F11, F13, Q17, Q18

DOI: https://doi.org/10.31577/ekoncas.2025.07-08.04

Article History: *Received*: December 2023 *Accepted*: October 2025

[1] This work was supported by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic (ME SR) and the Slovak Academy of Sciences (SAS) under the contract No. APVV-21-017 and under the contract No. VEGA-1/0729/21.

Introduction

Kosovo, a small transition country, heavily reliant on European markets for agricultural trade, faces a significant agricultural trade deficit, reaching EUR 8.3 billion since the early 2005. With low agricultural exports relative to imports, understanding the factors hindering production and exports is crucial for the economic growth, employment, and rural welfare (Braha et al., 2019). The country's trade structure reflects its natural resource endowments, extensive diaspora linkages, and increasing integration into international markets (World Bank, 2021a). Kosovo has relatively low production capacities, while the consumption is significantly driven by remittances (Peci et al., 2010; Gashi, 2019; World Bank, 2021a). About 12 percent of Kosovo's GDP comes from remittances, mainly from EU countries. Remittances continue to play an important role in poverty mitigation and financing household food consumption (Möllers and Meyer, 2014; Braha et al., 2017). Kosovo's rural households predominantly rely on the own food production, with food expenditures comprising about 40 percent of total household expenditures (Latruffe and Desjeux, 2014). Agricultural production contributes 7.4 percent to Kosovar GDP, and the share of agricultural employment in total employment reached 23 percent in 2020 (MAFRD, 2021b; KAS, 2021). Despite its historical significance, the role of agriculture in the Kosovo economy has diminished, with its share in GDP halving since 2009 (World Bank, 2021b).

The agricultural sector in Kosovo is characterized by the prevalence of small subsistence farming. The average farm size in Kosovo is 2.73 hectares (OECD, 2021). According to World Bank (2021b) estimates, farmers in Kosovo have low input-to-output efficiency. The average farm technical efficiency score is 0.157, which means that a Kosovar farm loses 84.3% of potential output due to technical inefficiency (Alishani, 2019). Land fragmentation, along with an inefficient irrigation network and outdated production technologies, contributes to low agricultural productivity. Limited profit margins hinder farmers from investing in new

* Kushtrim BRAHA, University "Ukshin Hoti" Prizren, Faculty of Life and Environmental Sciences, Department of Agribusiness, Shkronjat street 1, 20000 Prizren, Republic of Kosovo; e-mail: kushtrim.braha@uni-prizren.com, ORCID: 0000-0001-7505-6664

** Artan QINETI – Jan POKRIVCAK, Slovak University of Agriculture in Nitra, Faculty of Economics and Management, Institute of Economic Policy and Finance, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic; Mendel University in Brno, Faculty of Business and Economics, Zemědělská 1665, 613 00 Brno, Czech Republic; email: artan.qineti@uniag.sk, ORCID: 0000-0003-4766-9601; jan.pokrivcak@uniag.sk, ORCID: 0000-0001-9166-7940

*** Vesel USAJ – Leonora SOPAJ – Anera MUSLIU, corresponding author, University "Ukshin Hoti" Prizren, Faculty of Economics, Department of Business Administration, Shkronjat street 1, 20000 Prizren, Republic of Kosovo; e-mail: vesel.usaj@uni-prizren.com, ORCID: 0000-0002-8555-4250; leonora.sopaj@uni-prizren.com, ORCID: 0000-0002-5329-6568; anera.alishani@uni-prizren.com, ORCID: 0000-0002-3549-2426

technologies and expanding their farms. Moreover, governmental support for Kosovo's agricultural sector, including public investment in rural infrastructure, falls significantly below EU standards, despite the EU being the primary trading partner. In such circumstances, it proves challenging for smallholder farmers in Kosovo to compete in the export-oriented sector (Bäuml et al., 2022).

Kosovo's transformation from a centrally planned to a market-based economy was significantly delayed and derailed by regional conflicts and war, with negative impacts on the country's economic development (Mustafa and Krasniqi, 2018). After the 1999 war, Kosovo's economy started from scratch with a non-existent manufacturing industry and a sharp trade deficit. Almost all consumer goods were imported (Tosuni and Vokrri, 2015). As the result, Kosovo's overall trade deficit in 2020 reached EUR 2.8 billion. While the value of imports was EUR 3.3 billion, exports amounted to EUR 474.8 million (KAS, 2020). The main trading partner of Kosovo is the EU, comprising 44.4 percent of the country's imports and exports. It is followed by neighbouring CEFTA countries (21.9 percent of imports and exports), BRIC countries (10.4 percent), and EFTA countries (1.7 percent). It is worth to note that Kosovo liberalized trade with CEFTA in 2007 and signed a Stabilization and Association Agreement (SAA) with the EU in 2016. Kosovo also signed a Joint Declaration on Cooperation with the economies of the European Free Trade Agreement (EFTA) in 2018. Currently, it is at an early stage in its application for observer status at the World Trade Organization (WTO) (Gashi et al., 2017; OECD, 2021).

The main objective of this study is to find out the key determinants of agricultural exports from Kosovo and estimate the untapped export potential in the agricultural sector. This is the first attempt in the empirical literature to use the gravity model to explain key factors of agricultural exports in the case of Kosovo, which has a unique position in world trade as a small open economy and a liberalized trade regime, low public involvement in agricultural policies, and significant food security problems. Hence, the objective of this study is to fulfil a research gap in the current literature concerning transition countries, such as Kosovo. In order to fulfil the study objective, we employ the Poisson Pseudo Maximum Likelihood (PPML) estimator to measure the effects of conventional gravity variables, augmented with a wide range of other factors, such as border effects, cultural and colonial linkages, the presence of diaspora, exchange rate and price instability, trade liberalization, quality of institutions, and Kosovo's potential for agricultural export.

The paper is organized as follows: after the introduction, the next section provides background information on the development of agricultural trade in Kosovo and destinations of agricultural exports. Further, this study follows a literature

review. The materials and methods section describes the methods used in the empirical estimation of determinants of Kosovo's agricultural exports. Results are provided and discussed in the next section, while the last section concludes and wraps up.

Analysis on Kosovo's Agricultural Trade and Destination of Agricultural Exports

Kosovo agricultural exports experienced significant growth since the early post-war period. Between 2005 and 2020, the volume of agricultural exports increased from EUR 7.9 million to EUR 78.1 million. Agricultural exports have increased almost ten-fold since 2005, while imports have grown at a significantly slower rate. Despite this impressive growth, 2020 data show that the agricultural exports-to-import coverage rate is only 10.2%, indicating that the import-to-export ratio is as high as 10:1.

T a b l e 1

Performance of Kosovo's Agricultural Trade (2005 – 2020)

Agricultural trade indicators	**2005**	**2010**	**2015**	**2020**	**2005 – 2020**
Agricultural exports					
Agricultural exports (million EUR)	7.9	24.7	41.7	78.1	590.3
Share of agricultural exports in total exports (%)	14.1	8.4	12.8	16.4	13.3
Agricultural exports to the EU (million EUR)	3.4	4.5	10.5	30.1	168.7
Share of the EU in agricultural exports (%)	43.5	18.1	25.3	39.5	28.6
Agricultural exports to the CEFTA (million EUR)	4.1	19.6	26.9	41.1	382.6
Share of the CEFTA in agricultural exports (%)	52.0	79.2	65.0	52..7	64.8
Agricultural imports					
Agricultural imports (million EUR)	285.6	482.8	633.7	765.4	8,941
Share of agricultural imports in total imports (%)	24.7	22.4	24.1	23.2	23.1
Agricultural imports from the EU (million EUR)	110.0	182.9	249.0	411.2	3,782
Share of the EU in agricultural imports (%)	38.5	37.9	39.3	53.7	42.3
Agricultural imports from the CEFTA (million EUR)	105.2	197.7	240.0	183.4	3,007
Share of the CEFTA in agricultural imports (%)	36.8	41.0	37.9	24.0	33.6
Agricultural trade					
Agricultural trade (million EUR)	293.5	507.6	675.4	843.4	9,531
Share of agricultural trade in total trade (%)	24.2	22.4	24.1	22.4	22.1
Agricultural trade balance (million EUR)	–277.6	–458.1	–592.0	–687.3	–8,350
Agricultural trade with EU (million EUR)	113.5	187.4	295.5	442.1	3,951
Share of the EU in agricultural trade (%)	38.7	36.9	38.4	52.4	41.5
Agricultural trade balance with EU (million EUR)	–106.6	–178.4	–238.5	–380.4	–3,613
Agricultural trade with CEFTA (million EUR)	109.3	217.4	266.9	224.5	3,389
Share of the CEFTA in agricultural trade (%)	37.2	42.8	39.5	26.6	35.6
Agricultural trade balance with CEFTA (million EUR)	–101.1	–178.1	–213.1	–142.2	–2,624

Source: Authors' own elaboration based on MAFRD (2021a,b).

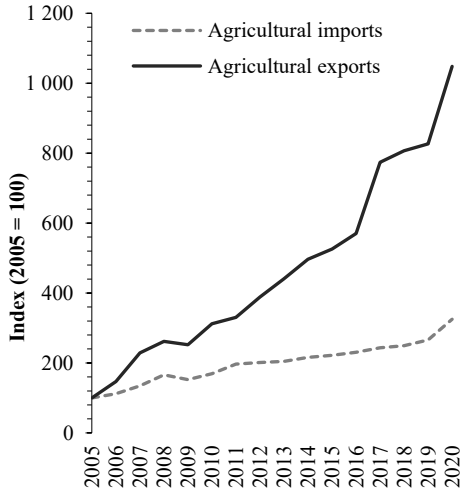
Table 1 presents key indicators of Kosovo's agricultural trade from 2005 to 2020, indicating the significant expansion of agricultural exports. The data reveal that the Kosovo's agricultural trade heavily relies on the CEFTA 2006 market,

with over 75% of total agricultural exports directed to neighbouring CEFTA countries (Figure 3) in the initial post-war period (2005 – 2010). It indicates that even prior to the implementation of the free trade agreement with CEFTA 2006, Kosovo trade ties were already robust with most of its member states. A significant portion of agricultural exports from Kosovo, comprising 60.3 percent, is directed towards neighbouring CEFTA countries. Among these, key agricultural export partners include Albania (35.4 percent), North Macedonia (14.8 percent), Serbia (9.3 percent), Montenegro (3.7 percent), and Bosnia and Herzegovina (2.5 percent).

During the period 2016 – 2020, the European Union (EU) accounted for 33.5 percent of Kosovo's agricultural exports (Figure 3). Notable agricultural export partners within the EU during this period included Germany (10.0 percent), Italy (2.5 percent), and Austria (2.0 percent). On the other hand, countries within the European Free Trade Association (EFTA) have a limited impact on Kosovo's agricultural exports, representing only 2.9 percent of the total. The geographical distance between Kosovo and EFTA economies diminishes the attractiveness of agricultural exports to these markets. The presence of the Kosovar diaspora, particularly in Switzerland, is a key factor influencing agricultural exports to EFTA countries. Conversely, trade with the BRIC countries (Brazil, Russia, India, and China) is minimal, accounting for less than 0.1 percent or EUR 0.4 million of total agricultural exports from 2016 to 2020. Lastly, the United States and Turkey emerge as growing markets for Kosovo's agricultural products, constituting nearly 1 percent of the total exports (approximately EUR 5.6 million).

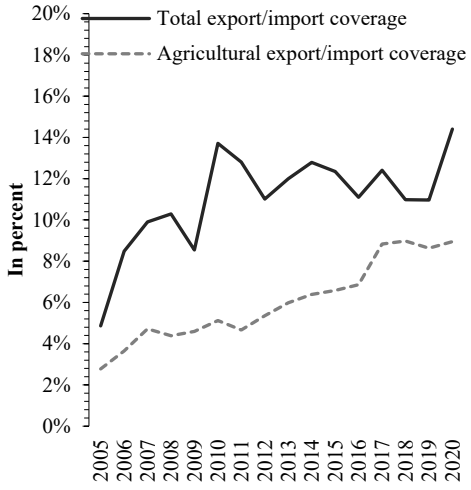
F i g u r e 1

Growth of Kosovo Agricultural Trade



F i g u r e 2

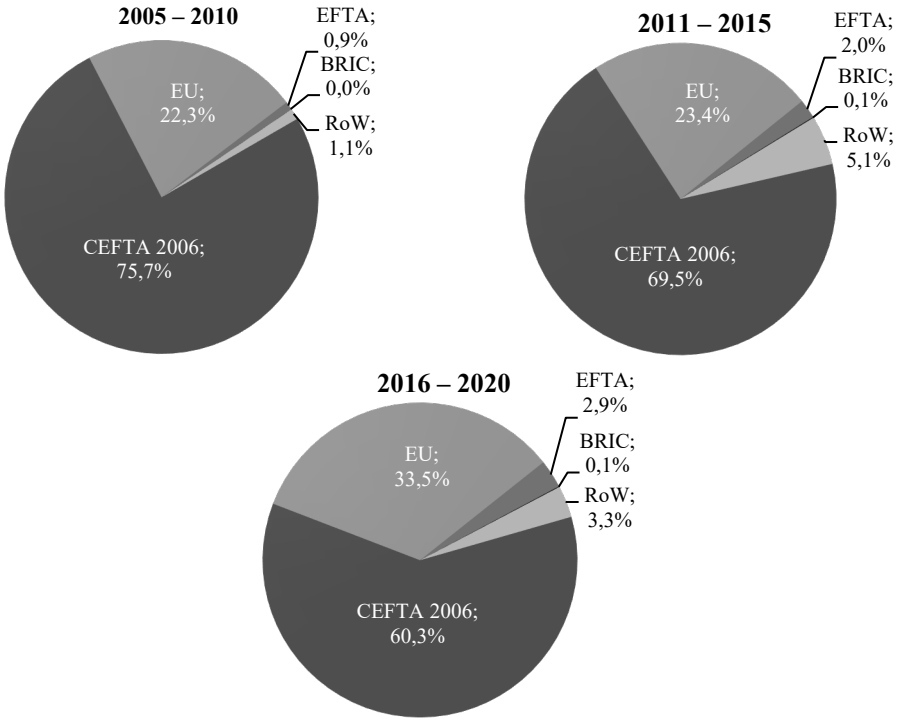
Agricultural Export/Import Coverage



Source: Authors' own elaboration based on MAFRD (2021a,b).

F i g u r e 3

Kosovo Agricultural Exports, by Trading Blocs (in percentage)



Source: Authors' own elaboration based on MAFRD (2021a,b).

1. Review of Existing Literature

Despite the importance of the topic, there is a limited number of studies on factors affecting agricultural and food exports in the existing literature (Ristanović and Stevanović, 2022; Sapa and Droždz, 2019; Braha et al., 2017; Erdem and Nazlioglu, 2008; Ševela, 2002). Ristanović and Stevanović (2022) analysed Serbian agricultural exports to EU market by employing gravity model approach using two-step OLS regression estimation for the period 2001 – 2017. Results of the study suggest that Serbia's economic size (GDP), importers' population, and distance between the trading partners were the key factors of Serbia's agricultural exports to the EU. Moreover, study finds that Serbia has significant untapped export potential to the common EU market. Sapa and Droždz (2019) examined Polish agricultural product exports to 138 non-EU countries between 2000 and 2016, using augmented gravity model with the effects of income inequality, agricultural gross value added (GVA), preferential trade agreements (PTAs), and

common post-socialist ties. The results show that with rising GDP trade among countries increases, while distance between trading partners reduces agricultural exports. Agricultural GVA and the impact of preferential trade agreements increase Polish agricultural and food exports. On the other hand, membership of Poland in the group of socialist nations prior to 1989 and subsequently in the group of transitional economies during the 1990s did not have a positive effect on Polish agri-food exports to those groups of countries.

Recently, Braha et al. (2017) conducted PPML estimations to analyse the determinants of Albanian agricultural export to its 46 trading partners for the period 1996 – 2013. The study results emphasise the importance of importer's absorption potential (importer's GDP) over domestic production potential (Albania's GDP). The results of this study indicate that geographical distance, income inequality, institutional distance and price instability have a significant negative impact, while the presence of the Albanian diaspora, currency devaluation and trade liberalisation (CEFTA) have a positive impact on Albanian agricultural exports. Erdem and Nazlioglu (2008) employed a gravity model to identify the key determinants of Turkey's agricultural export with the EU member states during the period 1996 – 2004. The results indicate that Turkish agricultural exports to the EU are positively associated with the size of the economy, population of the importer, Turkish diaspora living in the EU, and membership in the EU-Turkey Customs Union Agreement, while they are negatively correlated with the agricultural area of the EU member state and the distance between Turkey and the EU countries. Lastly, Ševela (2002) examined agricultural exports of the Czech Republic to its trading partners from 1999 to 2002 using a stepwise OLS-based gravity model analysis. The results indicate a positive relationship between agricultural exports and gross national income. In contrast, there is a negative relationship between agricultural exports and gross national income per capita and the distance between trading partners.

In addition to studies on agricultural exports in small and transition economies, recent literature has also examined export performance in larger agricultural economies. For instance, Abdullahi et al. (2022) analyzed China's agricultural exports and identified factors such as GDP, common borders, and linguistic similarities as significant drivers, while distance and exchange rates had a negative effect. Similarly, Ayuda et al. (2022) examined 15 Latin American countries and highlighted the role of cultural proximity and free trade agreements in promoting agri-food exports. Studies on Pakistan (Atif et al., 2016; Abbas and Waheed, 2015) have also underscored the positive impact of GDP and exchange rates on agricultural exports, while noting distance and tariff barriers as key constraints.

Furthermore, Abdullahi et al. (2021) found that Nigeria's agri-food exports to the EU are positively influenced by economic size but negatively affected by exchange rates and income differences. Consistent with these findings, Hatab et al. (2010) emphasized the importance of GDP and common language in Egypt's agricultural exports, while highlighting the negative role of distance and the mixed impact of regional trade agreements.

2. Materials and Methods

2.1. Gravity Model Specification

The gravity model has long been considered as a popular workhorse of applied international trade analysis (Eichengreen and Irwin, 1998; Shepherd et al., 2019). Originally developed as an intuitive framework to explain bilateral trade flows, the model has evolved into a theoretically grounded and empirically robust tool for analysing international trade patterns (Anderson, 1979; Bergstrand, 1985; Helpman, 1987; Krugman and Obstfeld, 2002). The gravity model represents a realistic general equilibrium model with flexible structure and predictive power (Yotov et al., 2016; Shahriar et al., 2019).

The foundations of the gravity model of trade can be tracked back to the early 1960s, with the pioneering studies of Tinbergen (1962), Pöyhönen (1963), Pulliainen (1963) and Linnemann (1964). Since its inception, the model has undergone significant theoretical and empirical refinements, becoming one of the most widely used approaches for explaining and predicting bilateral trade flows. The theoretical foundations of the gravity model were borrowed and adopted from the Newton's Gravitation Law. Gravity model of trade, based on Newton's law of physics, postulates that trade between two nations is inversely related to their distance and is proportional to their economic size (Frankel and Wei, 1997). Empirical studies have demonstrated that gravity model has a strong explanatory power, accounting for 70 to 80 percent of the variation in bilateral flows (Linders and De Groot, 2006; Van Bergeijk and Brakman, 2010).

The first rigorous theoretical foundation for the gravity equation was developed by Anderson (1979) based on the Armington (1969) assumption of the product differentiation by country of origin. In its simplest form, the baseline gravity equation is expressed at follows:

$$T_{ij} = \beta_0 \frac{GDP_i^{\beta_1} GDP_j^{\beta_2}}{DIST_{ij}^{\beta_3}} \tag{1}$$

where

T_{ij} – bilateral trade between exporter (i) and importer (j),
GDP_i – economic size of the exporter,
GDP_j – economic size of the importer,
$DIST_{ij}$ – bilateral distance between exporter (i) and importer (j),
β_0 – constant,
β_1, β_2 and β_3 – parameters, typically estimated in a log-linear specification.

Subsequent theoretical advancements enriched the microeconomic foundations of the gravity model. Bergstrand (1985) demonstrated the model's consistency within a framework of monopolistic competition and differentiated goods, while Helpman (1987) incorporated features of increasing returns to scale and imperfect competition. A significant breakthrough was achieved by Anderson and van Wincoop (2003), who introduced the concept of multilateral resistance terms (MRTs). MRTs highlight that bilateral trade flows depend not only on bilateral trade barriers but also on the relative trade resistance that each country faces with all of its trading partners. Incorporating MRTs refined both theoretical consistency and empirical accuracy of the gravity model. Following Anderson and van Wincoop (2003) the augmented gravity equation is commonly expressed as:

$$X_{ij} = \frac{GDP_i \times GDP_j}{Y} \left(\frac{t_{ij}}{P_i \times P_j} \right)^{1-\sigma} \tag{2}$$

where

P_i and P_j – represent the multilateral resistance terms,
t_{ij} – the trade costs between the exporter i to importer j,
σ – the elasticity of substitution.

Further empirical support for the structural gravity model was provided by Baier and Bergstrand (2007), who demonstrated that the inclusion of multilateral resistance terms and the correction for potential endogeneity are crucial for accurately estimating the trade effects of free trade agreements (FTAs). Their findings reveal that FTAs, when appropriately modelled, significantly increase trade flows among member countries, reinforcing the robustness and policy relevance of the gravity framework.

For the purpose of this study, a stepwise estimation procedure was employed. Initially, we estimate a baseline gravity model (Model 1) to derive the traditional gravity coefficients for Kosovo's agricultural exports. Subsequently, the baseline model is augmented to include additional explanatory variables across different specifications. Model 2 introduces the income differential between Kosovo and its importing partners to test the effects of income convergence/divergence. Model 3 incorporates the effect of Kosovar diaspora in importing countries, accounting for

migrant-driven trade linkages. Model 4 includes bilateral exchange rates and price stability indicators for both export and import countries, addressing price and monetary policy impact. Model 5 introduces dummy variables controlling for the effect of Kosovo's participation in regional trade agreement (CEFTA, 2026) and SAA with the EU. Model 6 controls for bilateral institutional quality differences to access the impact of institutional distance on agricultural export flows. Lastly, Model 7 (pooled model) consolidates all variables to capture the combined effects.

The final augmented gravity model estimated for the purpose of this study takes the following functional form:

$$X_{ij} = \exp(\beta_0 + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3\, GDPpc\_diff_{ij} + \beta_4 \ln DREM_i + \\ + \beta_5 \ln EXR_{ij} + \beta_6 \ln INF_i + \beta_7 \ln INF_j + \beta_8\, EUR_j + \beta_9\, CEFTA_j + \beta_{10}\, SAA_i + \\ + \beta_{11}\, INSTdist_{ij} + \delta_{ij} + \lambda_t + \varepsilon_{ijt}) \quad (3)$$

where

- X_{ij} – the value of agricultural exports from Kosovo to importing country,
- $\ln GDP_i$ – log of Kosovo's economic size (GDP),
- $\ln GDP_j$ – log of importing partner's economic size (GDP),
- $GDPpc_{ij}$ – log of bilateral income differential between Kosovo and importing partner,
- $\ln DREM_i$ – log of diaspora remittance inflows from importing country to Kosovo,
- $\ln EXR_{ij}$ – log of value of the exchange rate of Kosovo currency (EUR) vis-à-vis importing partner currency,
- $\ln INF_i$ – log of Kosovo's consumer price index (CPI),
- $\ln INF_j$ – log of importing partner's CPI,
- EUR_j – dummy variable equal to 1 if the importing partner is member of Eurozone,
- $CEFTA_j$ – dummy variable equal to 1 if the importing partner is member of CEFTA 2006,
- SAA_i – dummy variable equal to 1 if Kosovo signed the Stabilization and Association Agreement with EU,
- $INSTdist_{ij}$ – bilateral institutional distance between Kosovo and the importing partner,
- δ_{ij} – bilateral country-pair fixed effects to control for unobserved heterogeneity,
- λ_t – time fixed effects to control for MRT,
- ε_{ijt} – error term.

An important factor of export flows is the institutional quality distance. A higher institutional quality is associated with a positive impact on bilateral trade flows, primarily through the reduction of uncertainty and transaction costs (De Groot et al., 2004; Jansen and Nordås, 2004). To account for this effect, the present study constructs an index to measure the institutional quality distance between Kosovo and its trading partners. This index is build using six Worldwide Governance Indicators (WGI) developed by Kaufmann et al. (2010). Following the methodology proposed by De Groot et al. (2004), the bilateral institutional distance between Kosovo and each trading partner is calculated using the following formula:

$$INSTdist_{ij} = \frac{1}{6}\sum_{k=i}^{6}(I_{ki} - I_{kj})^2 \,/\, V_k \tag{4}$$

where

INSTdist – institutional distance,
I_{ki} – indicates country *i* score on WGI *k*th dimension,
I_{kj} – indicates country *j* score on WGI *k*th dimension,
V_k – variance of this WGI across the countries.

Lastly, the estimated parameters obtained from the augmented gravity model (Equation 3) are subsequently employed to assess Kosovo's agricultural export potential. The model first computes the predicted agricultural values (P_{ij}) for each bilateral follow over the observed period. These predicted flows represent Kosovo's agricultural export potential. Further, the export potential is calculated as the difference between the actual exports (A_{ij}) and predicted exports (P_{ij}), following the equation below:

$$EP_{ij} = P_{ij} - A_{ij} \tag{5}$$

where

EP_{ij} – estimated export potential for the agricultural products from Kosovo to importing country,
P_{ij} – predicted export flow derived from the gravity model,
A_{ij} – actual recorded export of the agricultural flows.

A positive agricultural export potential value ($EP_{ij} > 0$) indicates that actual exports are lower than the predictions of the gravity model. This suggests the existence of the untapped export potential. In contrary, a negative value ($EP_{ij} < 0$) implies that actual exports exceed the export opportunity in the particular market, suggesting the over-exploitation of the export opportunity.

In addition to the export potential analysis, this study provides the estimates of the export efficiency (EE_j), which measures the ratio of predicted exports to actual exports for each trading partner:

$$EE_j = \frac{P_{ij}}{A_{ij}} \tag{6}$$

The export efficiency ratio (EE_j) provides an additional measure of Kosovo's export performance with each trade partner. An export efficiency ratio greater than one indicates underperformance relative to potential, whereas a ratio less than one suggests overperformance or saturation in the bilateral export relationship, where actual trade levels exceed the model's projections.

2.2. Gravity Model Estimator

Selecting an appropriate estimator for the gravity model is a critical aspect of empirical trade analysis. Numerous studies have debated the best estimation techniques for the gravity equation, particularly concerning issues of heteroscedasticity and frequent occurrence of zero trade bilateral flows. Traditional empirical estimators, including Ordinary Least Squares (OLS), have been widely criticized for producing biased and inconsistent estimates when applied for log-linearized gravity models in the presence of heteroskedasticity and zero trade observations (Santos Silva and Tenreyro, 2006; 2011). To address this issues, this study employs the Poisson Pseudo Maximum Likelihood (PPML) estimator, as proposed by Santos Silva and Tenreyro (2006; 2011). The PPML estimator is a generalized linear model where the variance is proportional to the mean, making it well-suited for gravity equations because it naturally handles zero trade flows and mitigates heteroskedasticity biases (Santos Silva and Tenreyro, 2002). In addition to the PPML estimator, this study implements High-Dimensional Fixed Effects (HDFE) using the ppmlhdfe command in Stata (Correia et al., 2020). The inclusion of HDFE enables the estimation of models that control for exporter-time, importer-time, and bilateral pair fixed effects – commonly referred to as multilateral resistance terms (MRTs) (Anderson and van Wincoop, 2003; Yotov et al., 2016). The model includes exporter-year fixed effects to capture time-varying factors specific to Kosovo, such as shifts in production capacity or policy environment. Importer-year fixed effects absorb annual variations in destination markets, including economic conditions and inward multilateral resistance. Bilateral fixed effects control for time-invariant characteristics between country pairs (e.g., geographic distance, language, historical ties). This fixed effects structure ensures that estimated coefficients reflect the influence of time-varying variables, mitigating omitted variable bias and satisfying the structural gravity framework.

Subsequently, the study performs the Ramsey Regression Equation Specification Error Test (RESET test) (Ramsey, 1969) to confirm the adequacy of the functional form and overall specification of the gravity model. Following the suggested approach by Santos Silva and Tenreyro (2006), the RESET test examines whether any non-linearities or omitted variables lead to model misspecification.

While earlier studies frequently relied on log-linearized gravity models estimated by OLS, these models have been shown to be problematic (Krisztin and Fischer, 2015). The log transformation excludes zero trade flows and results in bias in the presence of heteroscedasticity (Krisztin and Fischer, 2015). Alternative estimators, such as the Heckman two-step model (Gomez-Herrera, 2013), the Helpman sample selection model (Helpman et al., 2008), and the Tobit model (Martin and Pham, 2020) have been used to address zero trade observations and

sample selection issues. However, these methods often involve strong distributional assumptions and complex two-stage procedures, which may not fully resolve the challenges posed by zero flows and heteroscedasticity.

In contrast, the PPML estimator offers two key advantages over log-linear gravity regression estimators. Firstly, it avoids statistical constraints due to zero bilateral trade flows, and secondly, it solves efficiency and consistency problems in the presence of heteroskedastic residuals. A growing body of empirical literature supports this approach, including studies by Hoekman and Nicita (2011), Martínez-Zarzoso (2013) and Pfaffermayr (2019), who advocate the use of the PPML over traditional OLS estimators.

2.3. Data

The panel data employed in this study encompasses agricultural product exports from Kosovo to 45 trading partners, including the EU, CEFTA 2006, EFTA, BRIC countries, United States, Japan, and Turkey. The dataset covers the period from 2005 to 2020, accounting for 97.5 percent of Kosovo's total agricultural export flows. Data on agricultural exports were obtained from the Ministry of Agriculture, Forestry and Rural Development (MAFRD), while supplementary macroeconomic indicators, including real Gross Domestic Product (GDP), bilateral exchange rates, and inflation rates were sourced from the World Bank's World Development Indicators (WDI) database. Information regarding Kosovo's participation in CEFTA 2006 and the Stabilization and Association Agreement (SAA) with the European Union was collected from the Kosovo Customs (2022). Institutional quality data were retrieved from the World Governance Indicators (WGI) database (Kaufmann et al., 2010). Additionally, data on remittance inflows were provided by the Central Bank of Kosovo (CBK). Appendix Table A.1 offers a summary of detailed variable definitions, expected coefficient signs, and summary statistics, while Appendix Table A.2 presents a correlation matrix indicating the absence of multicollinearity issues in the panel dataset. Data processing and empirical estimations were performed using the Stata software.

It is worth noting that this study employs a single-exporter gravity model, focusing exclusively on Kosovo's exports to multiple export destinations. Unlike standard multi-country panels, this design captures exporter-side variation solely through time, addressed via exporter-year fixed effects. While this approach enables a targeted analysis of Kosovo's export dynamics, it precludes cross-country comparisons and limits exporter-side variation. Consequently, the findings should be interpreted within Kosovo's specific context and temporal evolution, rather than as generalizable results from a multi-exporter gravity framework.

3. Results and Discussion

3.1. Empirical Results

Building on the baseline model estimations presented in Table 2 (Model 1), the results generally align with the theoretical expectations of the gravity model framework. Across all estimated models (1 – 7), the coefficients of the exporter's economic size are consistently positive and statistically significant. Consequently, the findings indicate that Kosovo's agricultural exports are expected to increase proportionally with an increase of its economic size. Specifically, the baseline model suggests that a one percent increase in Kosovo's GDP corresponds to a 2.9 percent increase in agricultural export flow.

However, findings of this study indicate that the impact of the economic size of the importing countries has a statistically insignificant and inconsistent effect across the estimated models. This observation can be attributed to significant production and productivity constraints within the Kosovar agriculture sector, which seem to outweigh the market size constraints of the importing trading partners. This results are consistent with the findings for the other resource-constrained economies, such as Egypt and Ethiopia (Hatab et al., 2010; Eshetu and Mehare, 2020), and contrasts to findings from agriculturally endowed economies such as Albania, India, Algeria, and Serbia (Braha et al., 2017; Barma, 2017; Matallah et al., 2021; Ristanović and Stevanović, 2022).

Results of the Model 2 test the validity of the Heckscher-Ohlin (HO) vis-à-vis Linder hypotheses by augmenting the baseline gravity model with the variable of bilateral income differential. Results this model reveal consistent negative and statistically significant association (coefficient) between agricultural export flows and income disparities. This suggests that income inequalities between trading partners are likely to diminish agricultural export flows, emphasizing income convergence as a pivotal factor in promoting exports. Therefore, in the context of Kosovo, the study's findings align with the Linder hypothesis. Similar results were observed when testing the validity of the Linder hypothesis for Croatia (Jošić and Metelko, 2018), but in contrast with the evidence from Polish agri-food trade analysis (Sapa and Droždz, 2019).

Estimates from Model 3, focusing on the impact of diaspora remittances, indicate a positive and statistically significant correlation between the Kosovo diaspora residing in the importing country and agricultural export flows. The presence of a large Kosovo diaspora in importing countries is associated with lower transaction and information costs, leading to higher agricultural export flows. Furthermore, the estimates from the pooled model (Model 7) confirm the consistency of results regarding the effects of the Kosovo diaspora, considering it as a platform

for export promotion and growth. Indeed, the presence of the Kosovar diaspora in importing countries underscores the importance of transaction and information costs as significant determinants of export flows. Similar results have been observed in countries with large migrant communities, such as Turkey (Erdem and Nazlioglu, 2008) and Albania (Braha et al., 2017). Moreover, our findings provide evidence of the so-called "trade-creating effect of migration" (Rapoport, 2018). As suggested by Petraglia and Vecchione (2020), diaspora may boost exports by generating additional demand for products imported from their home country and influencing the preferences of natives. While the diaspora proxy (lnDREM) exhibits a strong positive association with exports, this result warrants caution due to potential endogeneity. Trade flows may both influence and be influenced by diaspora size and remittances, raising concerns of reverse causality and omitted variables. In the absence of a valid instrument, we interpret the diaspora effect as associative rather than causal – consistent with theoretical expectations of diaspora networks reducing trade costs, but not definitive evidence of causality.

Model 4 presents the estimates of the effects of bilateral exchange rates and price stability in both the exporting and importing countries. Based on the results, exchange rates exhibit a positive but statistically insignificant coefficient. This suggests that the depreciation of the Kosovo currency (Euro) against the currencies of its importing partners may have a limited direct effect on agricultural exports. This outcome is likely due to Kosovo's official adaption of the Euro, which minimizes exchange rate volatility, particularly in trade with Eurozone partners. These findings are consistent with the view that Kosovo's limited monetary policy mechanisms reduces the sensitivity of its trade to currency fluctuations. On the other hand, the impact of inflation is ambiguous and varies across the estimated models. Specifically, the price stability in the importing countries is statistically insignificant in all estimated models (Model 4 and 7), suggesting a limited impact on Kosovo's agricultural export flows. Conversely, inflation in the exporting country (Kosovo) shows a negative and statistically significant effect in the augmented model estimates (Model 4). This reveals a potential risk that higher inflation in Kosovo may undermine to export competitiveness by increasing production costs. Unexpectedly, the model estimates suggest that Kosovo's agricultural exports display a negative but statistically insignificant correlation when the importing partners are members of the Eurozone. These results are observed in both the augmented model (Model 4) and the pooled model (Model 7). The overall findings of the Model 4 suggest that exchange rates have no significant impact on Kosovo's agricultural exports. This result is consistent with Lee and Lim (2014) and Lee and Lim (2014), who emphasize the reduced impact of exchange rates in economies with stable currencies and limited monetary policy mechanisms.

External inflation pressures are found to have an insignificant impact on export flows, aligning with the findings of Eshetu and Mehare (2020), who reaffirm that price levels of the importing countries have limited effect on agricultural exports from developing countries. On the other hand, the negative impact of domestic price instability supports the findings of Atif et al. (2016) and Abdullahi et al. (2021), who highlight the competitiveness risks posed by rising production costs.

Results from the augmented Model 5 indicate that the effects of the signature of the SAA with the EU has a positive and statistically significant effect on Kosovo's agricultural export flows. This suggests that regional trade liberalization, along with the EU accession process, is a key driver of increased agricultural exports to EU markets. Given that the SAA has been in force since 2017, further trade creation and export expansion effects are expected to emerge over time. This highlights the substantial potential of the EU common market to absorb Kosovo's agricultural exports, despite the asymmetric nature of the agreement. Similar results have been found in the case of Turkey (Erdem and Nazlioglu, 2008), Latvia (Melece and Hazners, 2014), and Serbia (Matkovski et al., 2017), suggesting that EU membership of the importing country plays an export-enhancing role in agricultural export flows. However, taking in to account this potential will depend on the ability of Kosovo farmers to exploit their competitive advantages and compete with heavily subsidized EU farmers. In contrast, the coefficient of CEFTA membership is positive but statistically insignificant, indicating that participation in CEFTA 2006 has not had a significant impact on Kosovo's agricultural exports. This suggests that the expected benefits of regional trade liberalization may have been constrained by structural barriers, non-tariff measures or competitiveness issues within the region.

Model 6 focuses explicitly on the impact of institutional quality on Kosovo's agricultural export flows. Results of the baseline model augmented with bilateral institutional distance reveal a negative and statistically significant coefficient across the estimated models. As expected, this finding suggests that institutional disparities between the Kosovo and its trading partners impose additional transaction costs, thereby limiting export flows. These results are consistent with the theoretical framework proposed by North (1990), which emphasis the role of institutional quality in reducing transaction costs and facilitating trade. Further, empirical studies (Bojnec, 2015; Engemann et al., 2023) suggest that institutional convergence among trading partners positively influences agricultural trade flows by lowering uncertainty and compliance costs. In Kosovo's context, narrowing institutional distance with its key trading partners, particularly those within the EU, is likely to foster greater export opportunities. Specifically, Kosovo's ambitions to comply with EU institutional standards under the SAA process is anticipated to narrow the institutional gap with trading partners.

T a b l e 2
PPML Estimation Results of the Gravity Model: Kosovo Agricultural Exports

AgriExp	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
lnGDPexp	2.910*** (.225)	2.439*** (.296)	2.873*** (.219)	2.768*** (.216)	2.055*** (.307)	2.897*** (.223)	1.792*** (.334)
lnGDPimp	–.169 (.116)	.118 (.146)	–.169 (.118)	–.127 (.109)	–.140 (.099)	–.108 (.111)	.076 (.129)
GDPpc_diff		–.939** (.404)					–.590* (.312)
lnDREM			.430*** (.119)				.325*** (.108)
lnEXR				.055 (.799)			.299 (.815)
lnINFimp				–.002 (.036)			.046 (.037)
lnINFexp				–.081*** (.023)			–.020 (.017)
EURO				–.444 (.469)			–.436 (.470)
CEFTA					.047 (.085)		.049 (.122)
SAA					.445*** (.124)		.411*** (.106)
INSTdist						–.263*** (.088)	–.134** (.061)
Constant	–3.494*** (.614)	–3.448*** (.606)	–3.448*** (.606)	–3.458 (2.653)	–2.515*** (.597)	–3.330*** (.566)	–2.722 (2.739)
Observations	720	720	720	720	720	720	720
Pseudo R^2	.720	.722	.722	.722	.727	.727	.730
RESET test	.798	.993	.638	.956	.574	.679	.610

Note: Standard errors are in parentheses; *** p < .01, ** p < .05, * p < .1. All models include exporter-year, importer-year, and country-pair fixed effects.

Source: Authors' own elaboration.

The robustness of the functional form and overall specification of the estimated gravity models was evaluated using the Ramsey RESET test. This test was applied to PPML estimations presented in Table 2. The RESET test p-values, ranging from 0.574 to 0.993, indicate no evidence of functional form misspecification at conventional significance thresholds, supporting the validity of the model specification. In addition, the relatively high Pseudo R-squared values (ranging from 0.720 to 0.730) suggest a strong explanatory power of the gravity model in capturing the determinants of Kosovo's agricultural export.

3.2. Results of the Estimates of the Agricultural Export Potential

This section provides estimates of Kosovo's export potential based on the gravity model estimations, focusing specifically on the export efficiency estimates derived from the predicted-to-actual export ratios. The findings offer insight into the extent to which Kosovo has exploited its agricultural export potential during the period 2005 – 2020, both at individual country level and across major trading blocs.

Table 3 reveals that Kosovo's export efficiency ratios are significantly above one for several neighbouring and geographically proximate transition economies, including Serbia (2.76), Bosnia and Herzegovina (2.62), North Macedonia (1.49) and Turkey (1.54). In particular, high potential efficiency is observed in the post-transition EU economies, notably Czechia (5.38), Hungary (4.66), Romania (4.91), Poland (4.38), Slovakia (4.20) and Bulgaria (3.12). These elevated export efficiency estimates point to untapped export potential for agricultural export expansion. First, the liberalized bilateral trade regimes with CEFTA 2006 and EU (through SAA) facilitated easier market access. Second, relatively low transportation cost coupled with similarities in institutional quality and shared or pegged currency system (such as Euro), create favourable conditions for export growth.

The results also highlight significant untapped export potential in a group of developed EU economies, where Kosovo's export efficiency consistently above one. Notable examples include distant EU member states such as Spain (2.91), Belgium (2.29) and Ireland (2.05). Despite these results, Kosovo faces substantial barriers in exploiting these market expansion opportunities. Key impediments include higher transportation and transaction costs, institutional differences and constraints of the quality and safety standards imposed by the developed EU markets.

Moreover, Table 3 also indicates that Kosovo outperforms in several neighbouring and culturally proximate countries (Albania and Montenegro) and Kosovar diaspora resident economies (Germany, Switzerland, Austria, Italy and Netherlands), possibly due to the strong historical, cultural and diaspora ties, which enhance trade relationships beyond what conventional gravity model factors predict. In particular, Kosovar diaspora plays a crucial role in this markets, acting as a platform for export expansion by reducing transaction and information costs and creating demand for Kosovo's traditional agricultural and food products.

In addition, export efficiency ratios in BRIC countries and other geographically distant markets reveal relatively untapped export potential for India (1.95) and China (1.34), reflecting limited access into these large and dynamic markets. Moreover, Brazil (0.54) and Russia (0.23) show particularly low ratios, which are primarily attributed to political trade restrictions, including non-recognition of Kosovo's statehood by all BRIC countries. The political and diplomatic barriers effectively limit Kosovo's ability to export to these large economies, despite their predicted trade potential.

Finally, it should be noted that the agricultural export potential of Kosovo in the main trade blocks is quite interesting. Figure 4 presents Kosovo's actual and predicted agricultural exports, across major trading blocs over the period 2005 – 2020. Kosovo's predicted exports to the EU remained significantly higher than actual exports during the observed period, indicating persistent untapped export

potential. Similar findings apply to the export potential analysis with the CEFTA 2006 trade bloc. Despite the agricultural production potential, Kosovo remains a marginal player in regional CEFTA agricultural trade. Hence, Kosovo remains a net importer in the regional agricultural trade, with actual exports failing to fully exploit predicted potential. Similarly, the common EFTA market exhibit Kosovo's agricultural export underperformance, despite the strong driven diaspora demand, particularly, in Switzerland, where Kosovo enjoys strong community ties. The pattern of export potential with the BRIC trade bloc is driven by the market size therefore predicted agricultural export is significantly higher than actual exports. Economies with huge markets, such as those of the BRIC members (China and India) provide the opportunity for export expansion flow.

T a b l e 3

Kosovo Agricultural Export Potential 2005 – 2020

Country	Trade block	Export potential (mil. EUR)	Export efficiency (P/A ratio)	Country	Trade block	Export potential (mil. EUR)	Export efficiency (P/A ratio)
Austria	EU	–0.51	0.30	Romania	EU	2.34	4.91
Belgium	EU	0.25	2.29	Slovakia	EU	0.66	4.20
Bulgaria	EU	1.75	3.12	Slovenia	EU	0.21	1.42
Croatia	EU	1.15	1.90	Spain	EU	0.57	2.91
Cyprus	EU	0.40	2.87	Sweden	EU	0.19	1.21
Czechia	EU	2.07	5.38	Albania	CEFTA	–1.93	0.85
Denmark	EU	0.47	1.96	Bosnia H.	CEFTA	1.95	2.62
Estonia	EU	0.49	1.34	N. Macedonia	CEFTA	2.76	1.49
Finland	EU	0.18	0.78	Moldova	CEFTA	2.12	2.74
France	EU	0.22	1.65	Montenegro	CEFTA	0.28	1.15
Germany	EU	–3.38	0.08	Serbia	CEFTA	6.22	2.76
Greece	EU	0.61	4.94	Iceland	EFTA	0.70	1.11
Hungary	EU	6.87	4.66	Liechtenstein	EFTA	0.12	1.95
Ireland	EU	0.20	2.05	Norway	EFTA	0.45	2.88
Italy	EU	–0.32	0.61	Switzerland	EFTA	–0.59	0.27
Latvia	EU	0.76	1.58	Brazil	BRIC	0.46	0.54
Lithuania	EU	0.74	1.67	China	BRIC	0.98	1.34
Luxembourg	EU	0.10	1.47	India	BRIC	0.48	1.95
Malta	EU	0.44	1.69	Russian Fed.	BRIC	0.52	0.23
Netherlands	EU	–0.38	0.32	Japan	ROW	2.53	1.33
Poland	EU	1.91	4.38	Turkey	ROW	3.34	1.54
Portugal	EU	0.53	1.56	United States	ROW	1.75	3.26

Note: Export potential (mil. EUR) = Actual export – Predicted export; Efficiency = Predicted export / Actual export.

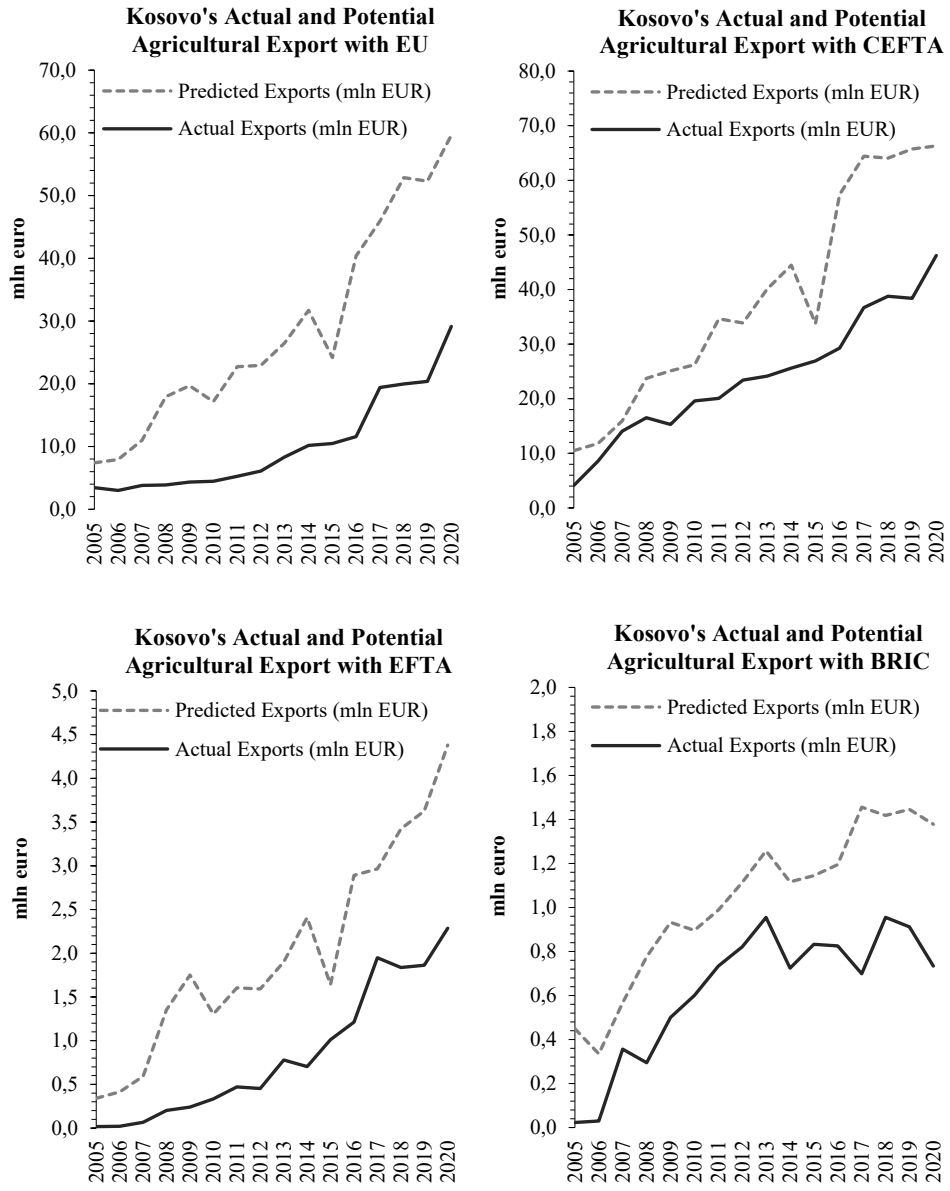
Source: Authors' own elaboration.

The export efficiency metric (P/A ratio) helps identify markets where Kosovo's exports under- or overperform relative to gravity model predictions. However, as a transformed residual, its validity depends on correct model specification. Omitted variables or misspecification can bias predicted values, affecting the P/A ratio. Extremely high ratios – especially when actual exports are near zero – may reflect

unobserved barriers rather than realistic export potential. Thus, P/A should be interpreted as a diagnostic tool indicating potential gaps, not as a guarantee of attainable export levels without addressing underlying constraints.

F i g u r e 4

Kosovo Potential Agricultural Export with the Main Trading Blocs (2005 – 2020)



Source: Authors' own elaboration.

Conclusion

This paper employs an augmented gravity framework to study the main determinants of agricultural exports and to estimate Kosovo's agricultural export potential. The empirical results show that country's agricultural exports flows are positively associated with the size of domestic economy (GDP). The expected growth of Kosovo's production potential will be reflected in higher exports. Low agricultural production capacity and inefficient structure of Kosovar's agricultural sector hinder agricultural exports.

Consistent with trade gravity model theory, the study supports the Linder hypothesis, indicating that a larger income gap between trading partners is associated with reduced trade. In addition, diaspora networks emerge as significant and robust facilitator of Kosovo's agricultural exports, reducing transaction and information costs, as well as confirming the trade-creating effects of migration in observed in other countries. On the other hand, exchange rates fluctuations were found to have no significant impact on Kosovo's agricultural flows, a result attributed to Kosovo's official adoption of the euro and its limited monetary policy mechanisms. However, domestic inflation poses a notable risk to export competitiveness by increasing production costs, while inflation in importing countries has an insignificant effect.

The study highlights the positive and significant impact of the Stabilization and Association Agreement (SAA with the EU in promoting Kosovo's agricultural exports. This finding reinforces the potential of the EU common market as a key export destination, conditional on Kosovo's ability to meet competitive and quality standards. In contrast, participation in the regional CEFTA 2006 shows no significant impact on Kosovo's agricultural exports, reflecting persistent structural and competitiveness challenges within the region.

Estimates of the export potential show that Kosovo achieved full agricultural export potential with neighbouring and culturally proximate trade partners and developed EU economies with large presence of the Kosovar diaspora. Moreover, analysis reveals untapped export potential, particularly with post transition EU economies and several developed EU member states. However, barriers such as higher transportation costs, institutional disparities and string to quality standards limit Kosovo's ability to fully exploit these markets.

In conclusion, the results of this study have significant implications for trade and agricultural policies. From a trade policy perspective, targeting new international markets through agricultural export promotion programs would enable Kosovo farmers to fully exploit their comparative advantages. Agricultural policy interventions should focus on improving local farmers' competitiveness by investing in agricultural infrastructure and irrigation systems. Given limited production and low competitive potential in traditional agricultural sectors, investment support

should be directed toward high-value crops to reduce the sector's trade deficit and increase farm incomes. A dual focus on improving the competitiveness of the agricultural sector and enhancing export performance has the potential to alleviate food insecurity among Kosovar households in rural areas. Lastly, results of this study suggest that Kosovo should strengthen efforts on aligning its institutional frameworks with EU governing standards and address intensive diaspora engagement strategies as a platform for market entry and expansion.

References

ABDULLAHI, N. M. – ALUKO, O. A. – HUO, X. (2021): Determinants, Efficiency and Potential of Agri-food Exports from Nigeria to the EU: Evidence from the Stochastic Frontier Gravity Model. Agricultural Economics, *67*, No. 8, pp. 337 – 349. DOI: 10.17221/15/2021-AGRICECON.

ABDULLAHI, N. M. – ZHANG, Q. – SHAHRIAR, S. – IRSHAD, M. S. – ADO, A. B. – HUO, X. (2022): Examining the Determinants and Efficiency of China's Agricultural Exports Using a Stochastic Frontier Gravity Model. PLoS One, *17*, No. 9, e0274187. DOI: 10.1371/journal.pone.0274187.

ALISHANI, A. (2019): The Impact of Support Policies on Technical Efficiency of Farms in Kosovo. Review of Agricultural and Applied Economics, *22*, No. 2, pp. 46 – 54. DOI: 10.15414/raae.2019.22.02.46-54.

ANDERSON, J. E. – VAN WINCOOP, E. (2003): Gravity with Gravitas: A Solution to the Border Puzzle. American Economic Review, *93*, No. 1, pp. 17 – 192. DOI: 10.1257/000282803321455214.

ANDERSON, J. E. (1979): A Theoretical Foundation for the Gravity Equation. The American Economic Review, *69*, No. 1, pp. 106 – 116.

ARMINGTON, P. S. (1969): A Theory of Demand for Products Distinguished by Place of Production. Staff Papers, *16*, No. 1, pp. 159 – 178.

AYUDA, M. I. – BELLOC, I. – PINILLA, V. (2022): Latin American Agri-Food Exports, 1994 – 2019: A Gravity Model Approach. Mathematics, *10*, No. 3, pp. 1 – 22. DOI: 10.3390/math10030333.

ABBAS, S. – WAHEED, A. (2015): Pakistan's Potential Export Flow: The Gravity Model Approach. The Journal of Developing Areas, *49*, No. 4, pp. 367 – 388. DOI: 10.1353/jda.2015.0135.

ATIF, R. M. – HAIYUN, L. – MAHMOOD, H. (2016): Pakistan's Agricultural Exports, Determinants and its Potential: An Application of Stochastic Frontier Gravity Model. The Journal of International Trade and Economic Development, *26*, No. 3, pp. 257 – 276. DOI: 10.1080/09638199.2016.1243724.

BAIER, S. L. – BERGSTRAND, J. H. (2007): Do Free Trade Agreements Actually Increase Members' International Trade? Journal of International Economics, *71*, No. 1, pp. 72 – 95. DOI: 10.1016/j.jinteco.2006.02.005.

BARMA, T. (2017): Efficiency of India's Agricultural Exports: A Stochastic Panel Analysis. South Asia Economic Journal, *18*, No. 2, pp. 276 – 295. DOI: 10.1177/1391561417713130.

BÄUML, T. – MÖLLERS, J. – DUFHUES, T. – WOLZ, A. – TRAIKOVA, D. (2022): Producer Organisations in an Export-Oriented Value Chain: What Motivates Small-scale Farmers in Kosovo to Collaborate? European Countryside, *14*, No. 2, pp. 379 – 396. DOI: 10.2478/euco-2022-0019.

BERGSTRAND, J. H. (1985): The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence. The Review of Economics and Statistics, *67*, No. 3, pp. 474 – 481. DOI: 10.2307/1925976.

BOJNEC, Š. – FERTŐ, I. (2015): Export Competitiveness of the European Union's Food Industry. Agricultural Economics, *61*, No. 1, pp. 46 – 56.

BRAHA, K. – QINETI, A. – CUPÁK, A. – LAZORČÁKOVÁ, E. (2017): Determinants of Albanian Agricultural Export: The Gravity Model Approach. AGRIS On-line Papers in Economics and Informatics, *9*, No. 2, pp. 3 – 21. DOI: 10.22004/ag.econ.262457.

BRAHA, K. – RAJČÁNIOVÁ, M. – QINETI, A. – POKRIVČÁK, J. – LAZORČÁKOVÁ, E. (2019): Evidence of Spatial Price Transmission in the Case of Kosovo. AGRIS on-line Papers in Economics and Informatics, *11*, No. 1, pp. 3 – 15. DOI: 10.7160/aol.2019.110101.

CEPII (Centre d'Etudes Prospectives et d'Informations Internationales) (2022): GeoDist Database. Paris: Center for Research and Expertise on the World Economy.

CORREIA, S. – GUIMARÃES, P. – ZYLKIN, T. (2020): Fast Poisson Estimation with High-Dimensional Fixed Effects. The Stata Journal, *20*, No. 1, pp. 95 – 115. DOI: 10.1177/1536867X20909691.

DE GROOT, H. L. – LINDERS, G. J. – RIETVELD, P. – SUBRAMANIAN, U. (2004): The Institutional Determinants of Bilateral Trade Patterns. Kyklos, *57*, No. 1, pp. 103 – 123. DOI: 10.2139/ssrn.417323.

EICHENGREEN, B. – IRWIN, D. A. (1998): The Role of History in Bilateral Trade Flows. In: FRANKEL, J. A. (ed.): The Regionalization of the World Economy. Chicago: University of Chicago Press.

ENGEMANN, H. – JAFARI, Y. – HECKELEI, T. (2023): Institutional Quality and the Duration of Agri-Food Trade Flows. Journal of Agricultural Economics, *74*, No. 1, pp. 135 – 154. DOI: 10.1111/1477-9552.12491.

ERDEM, E. – NAZLIOGLU, S. (2008): Gravity Model of Turkish Agricultural Exports to the European Union [Working Paper, No. 21.] Berkeley: Berkeley Electronic Press.

ESHETU, F. – MEHARE, A. (2020): Determinants of Ethiopian Agricultural Exports: A Dynamic Panel Data Analysis. Review of Market Integration, *12*, No. 1 – 2, pp. 70 – 94. DOI: 10.1177/0974929220969272.

FRANKEL, J. A. – WEI, S. J. (1998): Regionalization of World Trade and Currencies: Economics and Politics. In: FRANKEL, J. A. (ed.): The Regionalization of the World Economy. Chicago: University of Chicago Press.

GASHI, P. – HISARCIKLILAR, M. – PUGH, G. (2017): Kosovo – EU Trade Relations: A Dynamic Panel Poisson Approach. Applied Economics, *49*, No. 27, pp. 2642 – 2654. DOI: 10.1080/00036846.2016.1245836.

GASHI, P. (2019): Trade and Industrial Development in Kosovo. In: OSBILD, R. and BARTLETT, W. (ed.): Western Balkan Economies in Transition. Cham: Springer. DOI: 10.1007/978-3-319-93665-9_8.

GÓMEZ-HERRERA, E. (2013): Comparing Alternative Methods to Estimate Gravity Models of Bilateral Trade. Empirical Economics, *44*, No. 3, pp. 1087 – 1111. DOI: 10.1007/s00181-012-0576-2.

HATAB, A. A. – ROMSTAD, E. – HUO, X. (2010): Determinants of Egyptian Agricultural Exports: A Gravity Model Approach. Modern Economy, *1*, No. 03, pp. 134 – 144. DOI: 10.4236/me.2010.13015.

HELPMAN, E. – MELITZ, M. – RUBINSTEIN, Y. (2008): Estimating Trade Flows: Trading Partners and Trading Volumes. The Quarterly Journal of Economics, *123*, No. 2, pp. 441 – 487. DOI: 10.1162/qjec.2008.123.2.441.

HELPMAN, E. (1987): Imperfect Competition and International Trade: Evidence from Fourteen Industrial Countries. Journal of the Japanese and International Economies, *1*, No. 1, pp. 62 – 81. DOI: 10.1016/0889-1583(87)90027-X.

HOEKMAN, B. – NICITA, A. (2011): Trade Policy, Trade Costs, and Developing Country Trade. World Development, *39*, No. 12, pp. 2069 – 2079. DOI: 10.1016/j.worlddev.2011.05.013.

JANSEN, M. – NORDÅS, H. K. (2004): Institutions, Trade Policy and Trade Flows. [Working Paper, No. ERSD-2004-02.] Geneva: World Trade Organization. DOI: 10.30875/78538056-en.

JOŠIĆ, H. – METELKO, M. (2018): Testing the Validity of the Linder Hypothesis for Croatia. Croatian Review of Economic, Business and Social Statistics, *4*, No. 1, pp. 62 – 73. DOI: 10.2478/crebss-2018-0006.

KAS (Kosovo Agency of Statistics) (2020): Kosovo International Trade Statistics 2020. Pristina: KAS.
KAS (Kosovo Agency of Statistics) (2021): Labor Force Survey in Kosovo, 2020. Pristina: KAS.
KAUFMANN, D. – KRAAY, A. – MASTRUZZI, M. (2010): Response to 'What do the Worldwide Governance Indicators Measure?' The European Journal of Development Research, *22*, No. 1, pp. 55 – 58. DOI: 10.1057/ejdr.2009.49.
KOSOVO CUSTOMS (2022): Free Trade Agreements. Pristina: Kosovo Customs.
KRISZTIN, T. – FISCHER, M. M. (2015): The Gravity Model for International Trade: Specification and Estimation Issues. Spatial Economic Analysis, *10*, No. 4, pp. 451 – 470. DOI: 10.1080/17421772.2015.1076575.
KRUGMAN, P. R. – OBSTFELD, M. (2009): International Economics: Theory and Policy. Arlington: Pearson Education.
LATRUFFE, L. – DESJEUX, Y. (2014): Perpetuation of Subsistence Farming in Kosovo: The Role of Farm Integration in Input Markets. Post-Communist Economies, *26*, No. 1, 137 – 148. DOI: 10.1080/14631377.2014.874671.
LEE, S. Y. – LIM, S. S. (2014): Determinants of the Korean Agricultural Trade with the LDCs and the OECD Countries. Agricultural Economics, *60*, No. 3, pp. 110 – 122. DOI: 10.17221/118/2013-AGRICECON.
LINDERS, G. J. – DE GROOT, H. L. (2006): Estimation of the Gravity Equation in the Presence of Zero Flows [Discussion Paper, No. 06-072/3.] Amsterdam: Tinbergen Institute.
LINNEMANN, H. (1966): An Econometric Study of International Trade Flows. Amsterdam: North-Holland.
MAFRD (Ministry of Agriculture, Forestry and Rural Development) (2021a): Strategy for Agriculture and Rural Development 2022 – 2028. Pristina: MAFRD.
MAFRD (Ministry of Agriculture, Forestry and Rural Development) (2021b): Kosovo Agriculture in Numbers. Pristina: MAFRD.
MAFRD (Ministry of Agriculture, Forestry and Rural Development) (2021c): Green Report 2021. Pristina: MAFRD.
MARTIN, W. – PHAM, C. S. (2020): Estimating the Gravity Model When Zero Trade FLOWS are Frequent and Economically Determined. Applied Economics, *52*, No. 26, pp. 2766 – 2779. DOI: 10.1080/00036846.2019.1687838.
MARTÍNEZ-ZARZOSO, I. (2013): The Log of Gravity Revisited. Applied Economics, *45*, No. 3, pp. 311 – 327. DOI: 10.1080/00036846.2011.599786.
MATALLAH, M. A. A. – BENMEHAIA, M. A. – BENMEBAREK, A. (2021): Agricultural Exports and Potentials of Algeria: An Econometric Investigation Through Gravity Model. International Journal of Economic Policy in Emerging Economies, *14*, No. 3, pp. 319 – 335. DOI: 10.1504/IJEPEE.2021.114949.
MATKOVSKI, B. – LOVRE, K. – ZEKIĆ, S. (2017): The Foreign Trade Liberalization and Export of Agri-food Products of Serbia. Agricultural Economics – Czech, *63*, No. 7, pp. 331 – 345. DOI: 10.17221/345/2015-AGRICECON.
MELECE, L. – JURIS H. (2014): Evaluation of Latvia's Agri-Food Trade Using the Gravity Model. Actual Problems of Economics, *9*, No. 159, pp. 518 – 526.
MÖLLERS, J. – MEYER, W. (2014): The Effects of Migration on Poverty and Inequality in Rural Kosovo. IZA Journal of Labor and Development, *3*, No. 16, pp. 1 – 18. DOI: 10.1186/2193-9020-3-16.
MUSTAFA, M. – KRASNIQI, B. (2018): Entrepreneurship in Kosovo. In: PALALIĆ, R., DANA, L. P. and RAMADANI, V. (ed.): Entrepreneurship in Former Yugoslavia. Cham: Springer.
NORTH, D. C. (1990): Institutions, Institutional Change and Economic Performance. Cambridge: Cambridge University Press.
OECD (Organisation for Economic Co-operation and Development) (2021): Competitiveness in South East Europe 2021: A Policy Outlook, Kosovo Profile. Paris: OECD Publishing.

PECI, F. – HOLZNER, M. – KUTLLOVCI, E. (2010): Determinants of Kosovo Trade: A Gravity Model Approach. South East European Journal of Economics and Business, *5*, No. 2, pp. 33 – 41. DOI: 10.2478/v10033-010-0013-4.

PETRAGLIA, C. – VECCHIONE, G. (2021): Long-run Pro-Trade Effects of Diasporas: Evidence on Italian Regions. Spatial Economic Analysis, *16*, No. 1, pp. 47 – 72. DOI: 10.1080/17421772.2020.1779334.

PFAFFERMAYR, M. (2019): Gravity Models, PPML Estimation and the Bias of the Robust Standard Errors. Applied Economics Letters, *26*, No. 18, pp. 1467 – 1471. DOI: 10.1080/13504851.2019.1581902.

PÖYHÖNEN, P. (1963): A Tentative Model for the Volume of Trade between Countries. Weltwirtschaftliches Archiv, *90*, pp. 93 – 100.

PULLIAINEN, K. (1963): A World Trade Study: An Econometric Model of the Pattern of the Commodity Flows in International Trade in 1948 – 1960. Ekonomiska Samfundets Tidskrift, *16*, No. 2, pp. 78 – 91.

RAMSEY, J. B. (1969): Tests for Specification Errors in Classical Linear Least-Squares Regression Analysis. Journal of the Royal Statistical Society Series B: Statistical Methodology, *31*, No. 2, pp. 350 – 371.

RAPOPORT, H. (2018): Migration and Trade. In: TRIANDAFYLLIDOU, A. (ed.): Handbook of Migration and Globalisation. Cheltenham: Edward Elgar Publishing.

RISTANOVIĆ, V. – STEVANOVIĆ, A. T. (2022): Export of Agricultural Products from Serbia to the EU Panel Gravity Model. Ekonomika Poljoprivrede, *69*, No. 1, pp. 257 – 268. DOI: 10.5937/ekoPolj2201257R.

SANTOS SILVA, J. – TENREYRO, S. (2006): The Log of Gravity. The Review of Economics and Statistics, *88*, No. 4, pp. 641 – 658. DOI: 10.1162/rest.88.4.641.

SANTOS SILVA, J. S. – TENREYRO, S. (2011): Further Simulation Evidence on the Performance of the Poisson Pseudo-Maximum Likelihood Estimator. Economics Letters, *112*, No. 2, pp. 220 – 222. DOI: 10.1016/j.econlet.2011.05.008.

SANTOS SILVA, J. S. – TENREYRO, S. (2022): The Log of Gravity at 15. Portuguese Economic Journal, *21*, No. 3, pp. 423 – 437. DOI: 10.1007/s10258-021-00203-w.

SAPA, A. – DROŽDZ, J. (2019): Polish Agri-Food Trade with Non-EU Countries – A Gravity Model Analysis. Annals of the Polish Association of Agricultural and Agribusiness Economists, *11*, No. 4, pp. 403 – 412. DOI: 10.5604/01.3001.0013.6006.

SHAHRIAR, S. – QIAN, L. – KEA, S. – ABDULLAHI, N. M. (2019): The Gravity Model of Trade: A Theoretical Perspective. Review of Innovation and Competitiveness: A Journal of Economic and Social Research, *5*, No. 1, pp. 21 – 42. DOI: 10.32728/ric.2019.51/2.

SHEPHERD, B. – DOYTCHINOVA, H. – KRAVCHENKO, A. (2019): The Gravity Model of International Trade: A User Guide [R vision.] Bangkok: United Nations ESCAP.

ŠEVELA, M. (2002): Gravity-type Model of Czech Agricultural Export. Agricultural Economics – Czech, *48*, No. 10, pp. 463 – 466. DOI: 10.17221/5353-AGRICECON.

TINBERGEN, J. (1962): Shaping the World Economy. Suggestions for an International Economic Policy. New York: Twentieth Century Fund.

TOSUNI, G. – VOKRRI, V. (2015): Potential Export Markets for Food Processing, Agriculture, Wood Processing, Construction Materials, Tourism and Artisanal Crafts Sectors. Pristina: Ministry of Foreign Affairs Finland and UNDP.

VAN BERGEIJK, P. – BRAKMAN, S. (2010): The Gravity Model in International Trade: Advances and Applications. New York: Cambridge University Press.

WDI (World Development Indicators) (2021): Trade (% of GDP): Kosovo. Washington, DC: World Bank.

WORLD BANK (2021b): Kosovo Country Economic Memorandum: Gearing up for a More Productive Future. Washington, DC: World Bank Group.

WORLD BANK (2021a): Boosting Export Performance. Washington, DC: World Bank Group.

YOTOV, Y. V. – PIERMARTINI, R. – MONTEIRO, J.-A. – LARCH, M. (2016): An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model. Geneva: The World Trade Organization.

Appendix

Table A.1

Definition, Expected Sign and Basic Statistics of the Model Variables

Variable	Code	Definition	Source	Period	Expected sign	Summary statistics				
						Obs	Mean	SD	Min	Max
Agri-food export	AgriExp	Value of exports (in million USD)	MAFRD	2005 – 2020		720	0.80	2.47	0.00	25.29
GDP (exporter)	lnGDPexp	Log of real GDP of Kosovo (in million USD)	World Bank	2005 – 2020	+	720	1.82	0.23	1.30	2.07
GDP (importer)	lnGDPimp	Log of real GDP of importing country (in million USD)	World Bank	2005 – 2020	+	720	5.28	2.11	0.81	9.97
GDP p.c. differential	GDPpc_diff	Log of absolute difference in GDP per capita	World Bank	2005 – 2020	+/–	720	1.83	0.95	0.00	3.93
Diaspora remittances	lnDREM	Log of diaspora remittance inflow from importer	World Bank	2005 – 2020	+	720	0.11	0.59	0.00	4.18
Exchange rate	lnEXR	Log of exchange rate between exporter/importer currency	UNCTAD	2005 – 2020	+/–	720	1.35	1.79	–0.38	5.86
Inflation (importer)	lnINFimp	Log of inflation rate of the importer (CPI annual rate)	World Bank	2005 – 2020	–	720	0.80	1.15	–4.79	13.90
Inflation (exporter)	lnINFexp	Log of inflation rate of the importer (CPI annual rate)	World Bank	2005 – 2020	–	720	0.32	1.12	–1.62	2.24
Eurozone member	EUR	= 1 if importer is Eurozone member	EC	2005 – 2020	+	720	0.37	0.48	0.00	1.00
CEFTA member	CEFTA	= 1 if importer is CEFTA 2006 member	WTO	Since in force	+	720	0.13	0.34	0.00	1.00
SAA with EU	SAA	= 1 if Stabilization and Association Agreement is signed	WTO	Since in force	+	720	0.31	0.46	0.00	1.00
Institutional distance	INSTdist	Institutional distance between exporter and importer	WGI	2005 – 2020	+/–	720	3.16	2.68	0.00	9.31

Note: MAFRD (Ministry of Agriculture, Forestry and Rural Development), SAA (Stabilization and Association Agreement), CPI (Consumer Price Index), CEFTA (Central European Free Trade Agreement).

Source: Authors' own elaboration.

T a b l e A.2

Matrix of Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) AgriExp	1.000											
(2) GDPexp	0.156	1.000										
(3) GDPimp	–0.069	0.064	1.000									
(4) GDPpc_diff	–0.331	–0.114	0.110	1.000								
(5) DREM	0.192	0.134	0.168	0.214	1.000							
(6) EXR	0.272	0.030	–0.040	–0.217	–0.116	1.000						
(7) INFimp	–0.066	–0.241	–0.047	–0.333	–0.155	0.137	1.000					
(8) INFexp	–0.028	0.030	0.000	0.029	–0.003	–0.009	0.315	1.000				
(9) EURO	–0.125	0.106	–0.123	0.358	0.148	–0.328	–0.302	–0.013	1.000			
(10) CEFTA	0.480	0.045	–0.159	–0.552	–0.108	0.177	0.095	0.050	–0.297	1.000		
(11) SAA	0.157	0.620	0.046	–0.080	0.093	0.020	–0.192	–0.185	0.072	–0.003	1.000	
(12) INSTdist	–0.210	–0.052	0.014	0.872	0.243	–0.171	–0.354	0.014	0.285	–0.423	–0.064	1.000

Source: Authors' own elaboration.