DETERMINANTS OF AGRICULTURAL EXPORTS IN SRI LANKA: A GRAVITY MODEL ANALYSIS

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Abstract

Agricultural exports continue to be important to the Sri Lankan economy as a foreign exchange earner. However, its contribution shows a declining trend during the recent past and is reflected in individual sub-categories prompting the need to explore reasons and potential interventions. This study aims to identify the major factors affecting the performance of Sri Lanka's agricultural exports using the gravity model. A panel dataset of 50 major trading partners of Sri Lanka from 1988 – 2019 was used. This study finds that both the trading partner's GDP and Sri Lanka's GDP and the number of sanitary and phytosanitary measures (SPS) have a significant positive effect on export performance. According to the results, the GDP of both countries, geographical distance, number of SPS, and TBT are the most promising factors that affect Sri Lankan agricultural exports. Despite that, the presence of regional trade agreements (RTA), a common language, a common border, and other non-tariff measures (NTM) are found to be insignificant for trade. The analysis suggests that selecting high GDP and low-distance countries as importers, diversification of export destinations, and quality maintenance of export commodities using non-tariff measures will increase agricultural exports in Sri Lanka.

JEL: *F14, Q17, C23, F15, Q18*

Keywords*: Gravity model, Sri Lankan agricultural exports, Determinants of exports, Panel data, Bilateral trade flow*

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INTRODUCTION

The Agricultural sector, which consists of domestic and export sub-sectors, remains a vital sector in the Sri Lankan economy through the provision of food and raw materials, employment, income and foreign exchange. It also stimulates growth in the rest of the economy. Despite the declining share of agricultural GDP, its contribution to Sri Lanka's employment is considered to be quite significant.

The export crops in Sri Lanka can be categorised into two sub-groups, namely major and minor export crops. Major export crops such as tea, rubber and coconut, which contributed 92% to the total export earnings for the country in 1948, declined to 19.6% in 2022. Among the export crops, tea is the major export commodity, and Sri Lanka remains the third largest tea exporter in the world and the fourth position among the other coconut exporting countries in the world (as one of the leading natural rubber producers in the world, Sri Lanka was the cradle for the rubber industry, that revolutionised many industries across the globe).

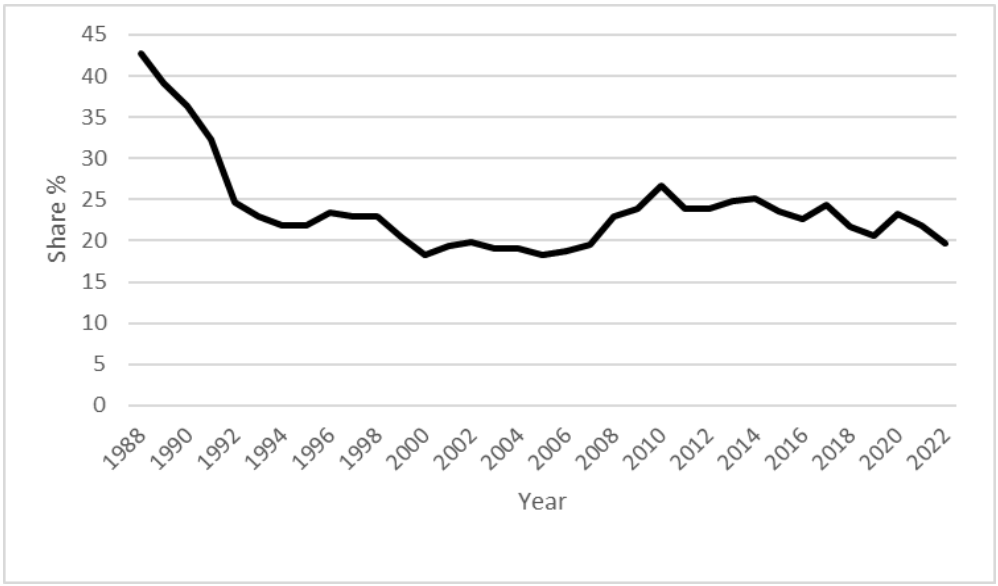
Minor export crops include cinnamon, cloves, pepper, sesame seed, cocoa, cashew nuts and cardamom, which also contributed 2.8% of the total exports (CBSL, 2022). Sri Lanka is the largest producer and exporter of Ceylon cinnamon in the world, whether in its primary or value-added form (cut pieces, powder, oil, tablets and crushed form) and on average, Sri Lanka exports a value of US$ 3.6 Mn cinnamons per year (CBSL, 2022). In addition, Sri Lanka is the fifth largest clove exporter in the world and the average annual export value is US$ 5,826. In addition, the country produces 6% of the world's demand for pepper, and the export value per year is around US$ 212.4 Mn (CBSL, 2021).

However, the export performance of Sri Lanka has not been satisfactory in the recent past (CBSL, 2022). For example, the ratio of total exports to GDP has been falling since 2000. The total export share of Sri Lanka in the world is declining, while Sri Lanka's share of exports from all developing countries is also falling.

When it comes to the recent total export performance, Sri Lanka has been falling behind its peers, such as Bangladesh and Vietnam (Wickramarachchi, 2019). Considering the last two years, agricultural exports registered a decline in earnings resulting mainly from the lagged effect of inadequate fertiliser availability, with an overall contraction of 5.9 per cent in 2022, compared to 2021 (CBSL, 2022).

During the pre-trade liberalisation era, agricultural exports were around 60% of total trade while it declined to around 40-30% during the post-liberalization period (Weerahewa and Gunawardane, 2009). However, the current contribution is around 20% (CBSL, 2022). Figure 1 shows the trend of agricultural exports share in Sri Lanka to total exports over time.

Figure 1: Changes in agricultural export share to total exports in Sri Lanka



Source: Authors' calculations using CBSL annual data (1988 to 2022)

Figure 1 provides reliable evidence for declining of agricultural exports over the last four decades. Therefore, it is clear that Sri Lankan agricultural exports have not achieved a satisfactory position in the foreign trade sector over time. This situation has created a downfall in the export agriculture industry. Against this backdrop, competitiveness should be enhanced continuously to face challenges in today's highly competitive environment in the global agricultural export market. Also, the workforce who are employed in the agriculture sector will have to struggle more to fulfil their necessities as the agriculture sector collapses. This will lead to a drop in the export agriculture industry, too.

Concerning export sector performance analysis, several studies have used the gravity model for the estimations as it is the best method to analyse bilateral trade. For example, Dembatapitiya (2015) analysed the South Asian agricultural trade but not specifically Sri Lanka. At the same time, Dembatapitiya and Weerahewa (2015) have analysed Regional Trade Agreements in South Asia. Moreover, Dharmasena (2016) has focused only on the determinants of spice exports from Sri Lanka. Determinants of total exports in Sri Lanka have been considered by Wickramarachchi (2019) but did not specify the agricultural export potential. In addition, Sandaruwan et al (2020) discussed the determinants of seafood exports in Sri Lanka. An analysis related to international trade has been done by Pieris (2021) on South Asian free trade agreements. Further, this study identifies the most relevant factors that have shaped the composition of these exports for the period of 1988 - 2019 after the trade liberalisation. The study findings will be helpful for policy making to develop the sector by mitigating the above issues.

LITERATURE REVIEW

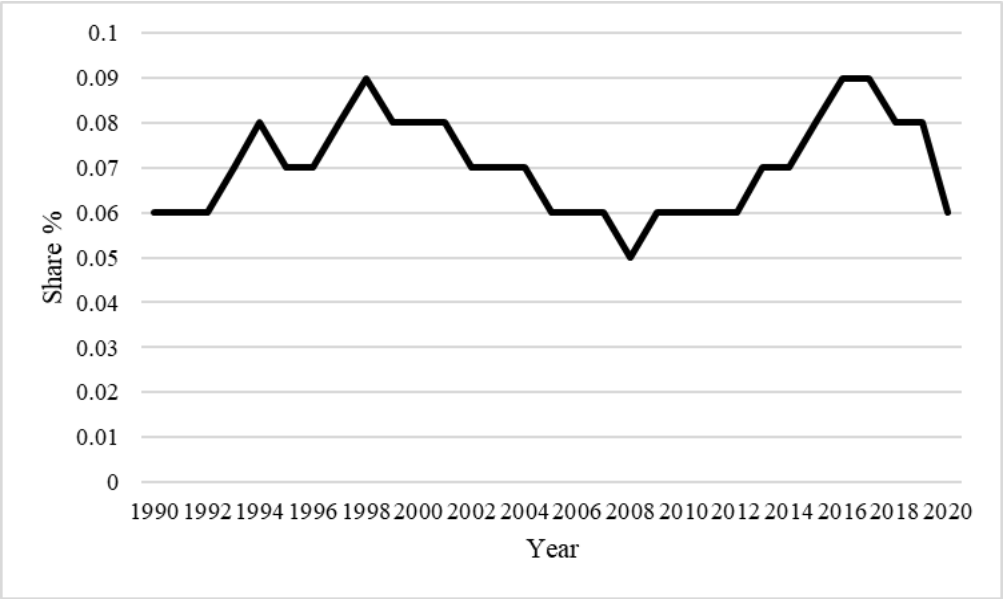
Sri Lanka is a lower-middle-income country with a GDP per capita of USD 3,362 in 2022 (CBSL, 2022). Following 30 years of civil war that ended in 2009, the economy grew at an average of 5.3 percent during the period 2010-2020 (CBSL, 2020) and Sri Lanka earns foreign exchange mainly from exports. Major export products of Sri Lanka are textiles and apparel, tea and spices, electronics, rubber manufactures, fish and precious stones. Out of them, the country earned 14.9 billion USD as the total export value in 2021 (World Integrated Trade Solution (WITS, 2021).

During the colonial era, Sri Lanka's export structure relied heavily on a limited range of primary commodities (Athukorala, 2017). During the first three decades of the post-independence period, the colonial export structure in Sri Lanka remained virtually unchanged. By 1977, the share of manufacturing in total exports was only 4%, while the rest came from traditional tea, rubber, coconut and other primary products. Following the 1977 economic policy reforms, the export composition shifted from primary products to manufactured goods. Exports of manufactured goods grew at an annual compound rate of over 30% during 1978–2000, lifting their share in total exports to over 70%. However, since then, the rate of expansion of manufacturing exports has lagged behind that of primary commodity exports, with the share in total exports varying in the range of 70% to 68%. And the overall pattern of export growth has slowed down during the last two decades (Athukorala, 2017). After 1977, Sri Lanka followed an advanced export diversification policy, which promoted more industrial products. However, due to a lack of backward industries and inherent weaknesses in the export sector, Sri Lanka continues to encounter issues in its international trade, which demonstrates macroeconomic instability (Sachithra et al., 2014).

Export agricultural crop sector in Sri Lanka comprises major export crops, minor export crops, fruits and vegetables and cut flowers as floriculture and ornamentals. Among the above categories, tea, rubber, coconut and cinnamon are the major export crops in Sri Lanka. Some of the major export-earning destinations of Sri Lanka are, the United States of America (26%), the United Kingdom (7.5%), India (6.8%), Germany (5.8%), and Italy (5%).

Despite the declining trends in export performances, Sri Lanka contributes a considerable proportion to the total world exports. The export trend and Sri Lanka's share of world exports have been illustrated in Figure 2. During the last few decades, export performance has continuously grown and again shows a declining trend over time. The present status also shows that the emerging trend has declined in the last two years. The reasons behind this present situation are the global pandemic of COVID–19 and the poor performance of most of the export categories.

Figure 2: Sri Lanka's total export share to the world total exports



Source: CBSL (2022)

The Share of agricultural exports to total exports in 1988 was 43%. This value has declined to 19% in 2022`. But the industrial export share has been increased to a satisfactory level. The agricultural exports in Sri Lanka have a declining trend in the world economy when compared to the other major sectors (Table 1). The reasons for the above declining trend are poor attention and low encouragement to the entrepreneurs in the export crop sector (CBSL, 2022).

Table 1: Composition of exports in Sri Lanka

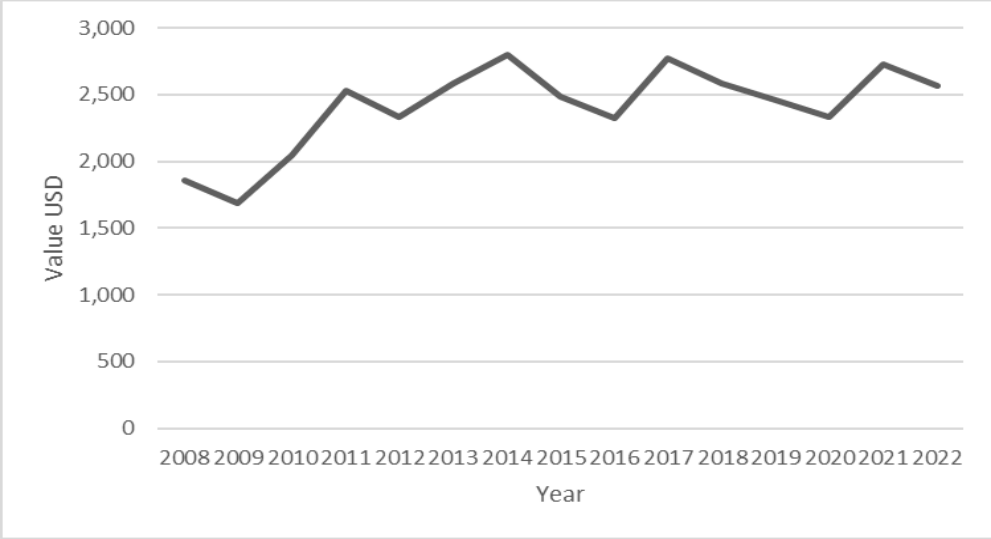
Description	1988	1998	2008	2018	2019	2020	2021	2022
Agricultural Exports (share %)	42.8	22.9	22.8	21.7	20.6	23.3	21.8	19.6
Industrial exports (share %)	48.3	74.9	76.0	77.9	78.9	76.4	77.6	79.8
Other (share %)	8.9	2.2	1	0.4	0.5	0.3	0.6	0.6
Total export value (US$ Mn)	1,097	4,735	8,137	11,890	11,940	10,047	12,499	13,106

Source: CBSL (1988-2021)

Sri Lanka's export share to the GDP consists of a considerable proportion of 20 % in 2022 (CBSL, 2022). Export crop sector also plays a vital role in this economy. However, this proportion was reduced to 18 % in 2021 due to Covid-19 global pandemic situation

CBSL (2021). The export crop sector has not shown a growth in its performance during the recent past (Figure 3). Munas et al. (2017) have stated in their study that overall exports and agricultural exports in Sri Lanka have performed poorly since the turn of the century and the study found that domestic trade barriers are a significant impediment to the growth and diversification of agricultural exports.

Figure 3: Value of agricultural exports in Sri Lanka during the recent past



Source: CBSL annual reports (2008 to 2022)

METHODOLOGY

Agricultural export values of Sri Lanka for 50 major importing markets were considered for 1988. The countries were selected according to the trade map of UN COMTRADE. Secondary data were collected from various published sources. Export value was extracted from the FAOSTAT database, and importer population, importer GDP, and Sri Lankan GDP were taken by UN statistical data (United Nations, Department of Economic and Social Affairs, Statistics Division, National Accounts). Geographical distance, regional trade agreements, common language, common border, and non-tariff measures were taken by the CEP II database. Both descriptive and inferential statistical analysis were used to analyse the trends in the export agricultural crop sector.

Test for Stationarity

Panel unit root tests were done for the model. This is the first step in determining a potentially co-integrated relationship between the variables. If all variables are stationary, then the traditional estimation is used to estimate the relationship between variables. If they contain a unit root or are nonstationary, a cointegration test should be performed (Hatab et al., 2010).

Test for Multicollinearity

Multicollinearity happens when independent variables in the regression model are highly correlated to each other. It makes it hard to interpret of model and also creates an overfitting problem. This test was performed focusing on Variable Inflation Factors (VIF) to test whether the independent variables are correlated with each other.

Gravity Model

The origins of the gravity model are credited to Tinbergen (1962) and Poyhonen (1963). The gravity model pertains to the class of empirical models that are concerned with the determinants of interaction. In general, the gravity model explains a flow of goods from area to area as a function of characteristics of origin, characteristics of the destination and some separation measures. It simply describes that the trade between two countries is determined positively by each country's GDP and negatively by the distance between them.

The formulation of that relationship is based upon the analogy of the law of gravity in physics such that attraction is larger between larger and more closely positioned bodies. When this idea is applied to trade, the gravity model states that trade increases with size and proximity to trading partners.

The income variable impacts the economic capacity of trade while the population variable impacts market size. The income (GDPs of home and partner countries) therefore positively impacts trade flow. Population determines market size, and a larger population means a larger domestic market (economies of scale) and therefore leads to less trade flow. The distance between two partners determines the transportation cost and negatively affects the trade flow. Neighbour countries are expected to have more trade because of similarities in tastes and preferences (Atici and Guloglu, 2006).

The standard gravity model was tested first. The model was estimated by multiple regression analysis. The formulation for the gravity model can be generalised as follows:

$$\boldsymbol{X_{ij} = \beta_0 \, Y_i^{\beta 1} \, Y_j^{\beta 2} \, D_{ij}^{\beta 3}} \quad \text{.......} \quad (1)$$

Where,

X_{ij} = Value of exports into country j from country i, (from Sri Lanka)

$Y_i \& Y_j$ = GDPs of country i and country j

D_{ij} = Geographical distance between the countries' capitals

β s = Parameters of the model

The linear form of the model,

$$\boldsymbol{log\,(X_{ij}) = \alpha + \beta_1 log(Y_i) + \beta_2 log(Y_j) + \beta_3 log(D_{ij})} \quad \text{.......} \quad (2)$$

Where,

α = log β_0

When expand the formula 1, then it can be written as the value of exports between pairs of countries, X_{ij} is a function of their incomes (GDPs), their populations (importer's population), their distance (proxy of transportation costs) and a set of dummy variables either facilitating or restricting trade between pairs of countries. That is,

$$\boldsymbol{X_{ij} = \beta_0 Y_i^{\beta 1} Y_j^{\beta 2} L_i^{\beta 3} L_j^{\beta 4} D_{ij}^{\beta 5} A_{ij}^{\beta 6} eu_{ij}} \quad \text{……..……..……..... (3)}$$

(Hatab *et al.*, 2010)

Where,

Y_i&Y_j = GDPs of country i and country j

L_i&L_j = Population of the country i and country (j)

D_{ij} = Distance between the two countries' capitals (or economic centers),

A_{ij} = Dummy variables

eu_{ij} = Error term

B = Parameters of the model

β_0 = Model constant

In addition to the above explanatory variables, the model can be specified by adding some more independent variables to investigate the factors affecting Sri Lanka's agricultural exports. According to Sandaruwan *et al.* (2020), Non-Tariff Measures (NTM) have been added to the model. Sanitary and Phytosanitary Measures (SPS) and Technical Barriers to Trade (TBT) were selected as NTMs as they are the most affected NTM types in Sri Lankan agricultural products (Ranjan and Edirisinghe, 2020). All the other NTM types were considered as one factor (ONTM). Then the modified model is as follows:

$$\boldsymbol{X_{ij} = \beta_0 Y_i^{\beta 1} Y_j^{\beta 2} L_i^{\beta 3} L_j^{\beta 4} D_{ij}^{\beta 5} RTA_{ij}^{\beta 6} CommonB_{ij}^{\beta 7} CommonL_{ij}^{\beta 8} SPS_{ij}^{\beta 9} TBT_{ij}^{\beta 10} ONTM_{ij}^{\beta 11} eu_{ij}} \quad \text{…… (3)}$$

(Hatab *et al.*, 2010)

Where,

Y_i&Y_j = GDPs of country i and country j

L_i&L_j = Population of the country i and country (j)

D_{ij} = Geographical distance between the two country's capitals (or economic centres)

RTA_{ij} = Dummy variable for the presence of regional trade agreements

$CommonB_{ij}$ = Dummy variable for the presence of a common border

$CommonL_{ij}$ = Dummy variable for the presence of a common language

$SPS_{ij}^{\beta 9}$ = Presence of Sanitary and Phytosanitary measures imposed by country j to Sri Lanka (if present, "1" otherwise "0")

$TBT_{ij}^{\beta 10}$ = Presence of Technical Barriers to Trade imposed by country j to Sri Lanka (if present, "1" otherwise "0")

$ONTM_{ij}^{\beta 11}$ = Presence of Other Non-Tariff Measures imposed by country j to Sri Lanka (if present, "1" otherwise "0")

eu_{ij} = Error term

βs = Parameters of the model (β1= parameter of Sri Lankan GDP, β2= parameter of importer's GDP, β3= parameter of Sri Lankan population, β4= parameter of importer's population, β5= parameter of geographical distance, β6= parameter of RTA dummy variable, β7= parameter of common border dummy variable, β8= parameter of common language dummy variable, β9= parameter of sanitary and phytosanitary measures dummy variable, β10= parameter of technical barriers to trade dummy variable, β11= parameter of other non-tariff measures dummy variable)

β_0 = Model constant

According to the above modification, new independent variables can be added to the model as needed (Hatab *et al.,* 2010; Elsehawy *et al.,* 2014; Sevela, 2002; Prasai, 2014; Kubo, 2014).

Equation 3 has been transformed into a linear form by logarithmic transformation.

$$\boldsymbol{lnX_{ij} = \beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnL_i + \beta_4 lnL_j + \beta_5 lnD_{ij} + \beta_6 RTA_{ij} + \beta_7 CommonB_{ij} + \beta_8 CommonL_{ij} + \beta_9 SPS_{ij} + \beta_{10} TBT_{ij} + \beta_{11} ONTM_{ij} + eu_{ij}} \quad \ldots\ldots (4)$$

Estimation of Models

Panel data involves different models that can be estimated. These are pooled, fixed effects and random effects. The pooled model does not allow for heterogeneity of countries. It does not estimate country-specific effects and assumes that all countries are homogenous (Egger, 2000). It is a restricted model.

A random effects model can be more appropriate when estimating the flows of trade between a random sample drawn of trading partners from a large population. In the Random Effects model, the unit-specific effects for all units are distributed around a common mean value according to some unknown probability distribution. Furthermore, this common mean is constant across all periods in the data panel. A fixed effects model would be a better model when estimating the flows of trade between *a* predetermined selection of countries (Hatab *et al.,* 2010).

However, this study used the random effects model as the fixed effects model had a low adjusted R^2 value and it omitted most of the important variables from the model.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 2 presents the descriptive statistics of the estimated variables. These variables were calculated using data from 50 exporting countries to summarise the data.

Table 2: Descriptive Statistics of Estimated Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Export value (US$ Mn)	28	41	0.001	457
Importers' GDP (US$ Mn)	556,840	1,071,431	184	12,143,572
Importers' population (no. of persons in Mn)	94	233	0.20	1,421
Sri Lanka GDP (US$ Mn)	33,168	25,940	7,283	88,020
Geographical distance (km)	7,313	4,017	772	17,437

Source: Survey data

Univariate Characteristics of the Variables

Panel unit root test was applied to test the stationarity of variables. This test determines the cointegrated relationship of the variables. If all variables are stationary, the traditional estimation model can be used to estimate the relationship between variables (Hatab *et al.,* 2010). The study applied the Levin Lin Chu unit root test for the main variables (Hatab *et al.,* 2010). It uses the null hypothesis that all panels contain unit roots and the alternative hypothesis that panels are stationary. The results of the panel unit root test imply all the variables are stationary and can be estimated using the Ordinary Least Square (OLS) method (Table 3).

Table 3: Panel unit root test results

VARIABLE	LLC TEST RESULTS
EXPORTED VALUE	-8.6765 (0.000)***
IMPORTER'S GDP	-4.1914 (0.000)***
IMPORTER POPULATION	-1.3378 (0.091)*
SL GDP	-0.9890 (0.061)*
GEOGRAPHICAL DISTANCE	-7.0711 (0.000)***
SPS	-4.3215 (0.000)***
TBT	-7.3258 (0.000)***
OTHER NTM	-3.0211 (0.0000)***

Source: Survey data

Note: *** and * denote the Significance level at 1% and 10%. Probabilities are in parenthesis.

Multicollinearity Test Results

Table 4: Results of the Multicollinearity test

Variable	VIF	1/VIF
TBT	17.22	0.058
SPS	16.1	0.062
ONTM	1.95	0.512
Population	1.75	0.172
Geographical distance	1.43	0.701
Importer GDP	1.35	0.740
RTA	1.23	0.814
Common language	1.10	0.906
SL GDP	1.08	0.926
Mean VIF	4.8	

Source: Estimation by Authors

According to Table 4, the mean VIF is 4.8. As this value is less than 5, there is no multicollinearity effect in variables.

Results of the Gravity Model Estimation

Gravity model estimation results are presented in Table 5. Three types of gravity models, namely pooled, fixed effects, and random effects models, have been estimated. Simple pooled regression results are given in column 1. The model is significant, but this model is not appropriate for this data set because of the low adjusted R^2 value. As well as there is a risk of having endogeneity problems and heteroscedasticity problems. Because of that, it is better to go for a fixed effect model, and the results are presented in column 2. The fixed model was estimated, and the model is significant. But it is practically useless as it omitted most of the important variables. A random effects model will be more appropriate when estimating trade flows between selected partners from a large population (Hatab *et al.*, 2010). Therefore, this study used a random effects model for the gravity estimation. The model is more appropriate as its adjusted R^2 value is 0.76, which means 76% of the total variation is explained by the model.

According to the results of the random effects model (column 3), both the importer's GDP and Sri Lanka's GDP have positive signs of coefficients, and both are significant .This implies that an increase in both variables causes to increase in agricultural exports .One per cent increase in the importer's GDP will result in a 0.52 per cent increase in Sri Lankan agricultural export flows when the other factors are constant. Also, Sri Lanka's GDP is a significant variable and a one per cent increase in Sri Lanka's GDP will also cause to increase of 0.53 per cent in agricultural exports ceteris paribus. The higher the income, the greater the volume of agricultural exports which took place. The results also

suggested that agricultural exports were positively influenced by an increase in GDP in the importing countries which means that the higher the income in the importing country, the greater the volume of agricultural exports. This is the expected result for both Sri Lankan GDP and importing countries 'GDP. In addition, Sri Lankan exports analysed by Wickramarachchi (2019) found that the importing country's GDP has a positive impact on Sri Lanka's exports. An analysis of seafood exports in Sri Lanka also revealed a positive impact of Sri Lanka's GDP on Seafood exports (Sandaruwan *et al.,* 2020).

Table 5: Results of the gravity model estimation

Explanatory Variable	Pooled Regression	Fixed Effects Model	Random Effects Model
Constant	-4.118 (3.02)	-11.961 (8.85)	-3.256 (4.50)
Ln Importer's GDP	0.581 (0.04)	0.509 (0.04)	0.522 (0.04)**
Ln Importer population	0.152 (0.08)	0.016 (0.60)	0.125 (0.18)
Ln SL GDP	0.505 (0.11)	0.538 (0.12)	0.531 (0.10) **
Ln Geographical distance	-1.124 (0.21)	-	-1.113 (0.48) **
RTA	-0.447 (0.25)	1.193 (0.79)	0.179 (0.4)
Common language	-0.012 (0.58)	-	-1.281 (0.85)
Common border	-	-	-
SPS	-0.626 (0.14)	-	0.649 (0.34) **
TBT	-0.699 (0.15)	-	-0.736 (0.3) **
Other NTM	-0.204 (0.15)	-	-0.159 (0.35)
No. Of observations	1,400	1,400	1,600
Adjusted R^2	0.17	0.12	0.76
F- test		7.39	

Notes: ** Significant at 5% level. All other variables are statistically insignificant.
Figures in parentheses are the standard errors of the coefficients.

In addition, the importing country's population is also a considerable factor .When the other factors are constant, a one per cent increase in the importer's population will increase the Sri Lankan agricultural export value by 0.13 per cent. But this factor is not a significant factor for Sri Lanka according to the study results. Though the population is not a significant factor, some other studies found that it is an explaining factor of Si Lankan exports (Dharmasena, 2016; Atici & Guloglu, 2006). Population represents the market size of the economy, that is, the higher the population, the bigger will be the market for exports and there will be more opportunities for trade with diverse demand . This is similar to the agricultural exports as well. But, at the same time, countries with smaller populations tend to trade more as smaller domestic markets do not provide sufficient opportunities for trade. Another explanation for the population variable to be negative is that economies with larger populations have an absorption effect. Therefore,

the expected sign for the population would be either negative or positive (Wickramarachchi, 2019).

Moreover, the geographical distance between the two countries is a significant factor and the coefficient is negative .This implies that a one per cent increase in geographical distance causes to decrease in the export value of Sri Lanka by 1.11 per cent, ceteris paribus .This is the expected result for this factor and most of the studies revealed the same result (Sevela 2002; Gopinath and Echeverria 2004; Hatab *et al.,* 2010; Elshehawy *et al.,* 2014; Wickramarachchi 2019).

The study also suggested that the presence of a regional trade agreement between two countries has a coefficient with a positive sign (0.1788), but this is not significant .This reveals the fact that a country is a member of RTA with Sri Lanka does not seem to determine the export volume of agriculture. This implies that trade gains from the regional trade agreements have been increased but are not a key determinant .Also, Dembatapitiya (2015) revealed in his study even though WTO membership and regional trade agreements are key determinants of both world and South Asian total trade, they do not significantly influence the agriculture trade .Sri Lanka is a member of two bilateral trade agreements (with India and Pakistan) and three regional trade agreements :The South Asian Free Trade Agreement (SAFTA), the Asia Pacific Trade Agreement (APTA), and the Global System of Tariff Preferences (GSTP). Sri Lanka's current trade agreements only cover trade in goods) Ministry of Foreign Affairs (2016). Having membership in regional trade agreements is beneficial for international trade, and it leads to the enhanced exports of both agricultural commodities and other products in the country. Many of the researchers emphasise regional trade agreements as key determinants of a country's exports (Dembatapitiya 2015; Elshehawy *et al.,* 2014; Atif *et al.,* 2016; Pieris 2021).

This study also reveals that the presence of a common language between two countries has a significant negative effect. However, this is not in line with the theory. Using a common language in exporting and importing countries leads to easy trade between two countries. However, this factor does not determine Sri Lankan agricultural exports and is proven by Wickramarachchi (2019), stating that a common language is not applicable as Sri Lanka is an island and speaks a unique language. Further, a common border between the two countries was applied as a dummy variable in this study. However, this factor was omitted from the model. Non-tariff measures (NTM) have a negative coefficient of 0.1598 but are not significant. This means that a one per cent increase in the number of other NTMs in Sri Lanka causes to decrease in agricultural exports by 0.16 per cent, ceteris paribus. However, it is not a determining factor for Sri Lankan agricultural exports. In addition, the number of SPS has a positive significant coefficient implying that a one percent increase in SPS will result in a 0.65 percent increase in agricultural exports, ceteris paribus. This result contradicts the conventional trade theory. Santeramo and Lamonaca, (2018) revealed the same result on the effect of NTMs in agri-

food trade implying that, it is not always true that SPSs and TBTs limit trade. Further, Crivelli and Groschi (2012) found the same result on the effect of SPS on market entry and trade flows. This study shows that the number of TBT is a significant variable in model 1 and it has a negative coefficient which means when the other factors are constant, a one per cent increase in TBT will result 0.74 per cent decrease in agricultural exports from Sri Lanka. This is in line with the results of Sandaruwan *et al.,* (2020) which revealed the most critical NTM types of Sri Lankan seafood exports are SPS, TBT and Pre-Shipment Inspections (PSI).

CONCLUSIONS & RECOMMENDATIONS

This study attempted to analyse the agricultural export performance over 30 years in Sri Lanka and to identify the most promising factors that are shaping agricultural exports. According to the results of the study, the random effects model was fitted for the gravity estimation. Study results imply that bilateral trade flows in Sri Lanka will increase in proportion to the trading partner's GDP. In addition, the GDP of Sri Lanka increases the agricultural exports too. The variable of geographical distance indicates that reducing the distance between two countries causes a positive value on Sri Lankan agricultural exports. At the same time, the number of SPS has a positive significant coefficient and TBT has a negative significant coefficient. Therefore, it is concluded that the GDP of both countries, geographical distance, and number of SPS, and the number of TBT are the most promising factors of Sri Lankan agricultural exports. However, the presence of RTA between trading partners and, the presence of a common language between them does not determine the Sri Lankan agricultural export flow. The number of NTM also shows the same result. The variable of the presence of a common border was omitted from the model as it is not a determining factor of Sri Lankan agricultural exports.

Lastly, the results of this study can be useful for policy-making as well as for improving the international marketing channels of agriculture in Sri Lanka. This study can be further improved by using the data on commodity-wise agricultural products.

The findings of this study highlight an urgent need to encourage modernising plantations to make the sector competitive in the global market. Encouraging high-value export-oriented items such as processed food and spices are more likely to contribute to GDP. Diversification of export destinations by choosing low-distanced countries will enhance the agricultural export sector performance. Countries with high GDP values should be selected to export as the GDP of the importer is a promising factor for exports.

Based on NTMs, the relevant institutes of the exporting country should support the producers and exporters to quickly adopt changing NTM requirements by providing easy access for quality and health certification and completing the supporting facilities for pre-processing and post-processing with additional incentives.

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