

EVALUATING THE IMPACT OF BILATERAL TRADE AGREEMENTS ON SRI LANKA'S EXPORT PERFORMANCE: GRAVITY MODEL APPROACH

Hettiarachchi G.R.P.¹ and Kuruppu I.V.²

Abstract

Export is an important indicator used to assess the economic state of a nation. Sri Lanka has started a few trade policy reforms aimed at supporting the export industry. Sri Lanka's contribution to global exports is still a very small percentage, nonetheless. It was important to determine how bilateral trade agreements affected export flows between Sri Lanka and its trading partners given the importance of exports in the economy. Thus, using the gravity model of trade, this research investigates the determinants influencing Sri Lanka's exports. The panel dataset used ranged from 2012 to 2021. The results suggest that Sri Lanka's GDP and Sri Lanka's trading partner's GDP had a positive and statistically significant effect on Sri Lanka's export performance. The geographical distance between the two countries and Sri Lanka's GDP per capita had a negative and statistically significant effect on export performance in Sri Lanka. The study further showed that Sri Lanka's export performance significantly improved once trade agreements were formed. These findings have significance for the creation of trade policies to make sure Sri Lanka's export potential is utilized to boost economic growth.

Keywords: Export Performance, Gravity model, Panel Data, Trade Agreements

¹ Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila. *Corresponding author. Email: gayarhettiarachchi@gmail.com

² Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila.

1. Introduction

After Sri Lanka gained independence in 1948, the country's exports underwent significant changes. Most exports were cash crops such as tea, rubber, and coconut. However, over time, Sri Lanka has diversified its exports to include textiles and apparel, gems and jewelry, and spices. Nowadays, Sri Lanka's top exports are textiles and apparel, tea, rubber products, gems and jewelry, and seafood. Sri Lanka has also seen growth in the manufacturing industry, with an increase in exports. Export is an important component of the economy in Sri Lanka and it makes a major contribution to the country's GDP and generates foreign exchange. Sri Lanka has limited natural resources; therefore, it relies on exporting goods and services to other countries to sustain its economic growth. The major exports of Sri Lanka include tea, the apparel industry, rubber and coconut products, and other locally manufactured goods. These exports generate revenue for the country, which is used to import commodities that are required for the domestic market.

The revenue generated from exports helps to create job opportunities in the country and contributes towards poverty alleviation. According to Atkin *at. el.*, (2014), export is a powerful instrument for developing nations to boost their economies. The export-oriented industries in Sri Lanka are labor-intensive and have contributed immensely to the top exporters in the Asian Region. Sri Lanka has engaged in several Trade Agreements (TAs) over the years to promote economic growth and diversification. TAs help to minimize import and export trade restrictions among two or more nations. In addition to two bilateral TAs (with Pakistan and India), Sri Lanka is a member of four Regional Trade Agreements, such as the Preferential Trading Arrangement (SAPTA) of the South Asian Association for Regional Cooperation (SAARC), the Asia Pacific Trade Agreement (APTA), South Asian Free Trade Agreement (SAFTA) and the Global System of Tariff Preferences (GSTP). For the Asian Region, the study considers only the Indo-Sri Lanka Free Trade Agreement (ISFTA), Pakistan-Sri Lanka Free Trade Agreement (PSFTA), SAPTA, SAFTA, and APTA. Sri Lanka's current TAs only cover trade in goods. Following are the TAs in effect that Sri Lanka has been a member of based on the agreement:

1) Indo-Sri Lanka Free Trade Agreements (ISFTA)

This is a TA between Sri Lanka and India which has been signed as a bilateral free trade agreement. TAs between India and Sri Lanka were extremely important in the year 2000 because they provided duty-free access to the vast Indian market, which has 1.2 billion people and a GDP of US\$ 2,049 billion. India imports commodities of US\$ 391 billion annually, and during the past ten years, imports have increased at a rate of 13% annually. A further benefit is the quick and inexpensive shipping of commodities from Sri Lanka to India due to their close geographic proximity and superior air and maritime connectivity.

2) Pakistan – Sri Lanka Free Trade Agreements (PSFTA)

In force since 2006, this is a bilateral trade agreement between Pakistan and Sri Lanka. In 2021, Pakistan had about 231 million population and a GDP of US\$ 348.26 billion, making it the second-largest economy in South Asia (World Bank, 2021). Pakistan imports commodities worth US\$ 46 billion from throughout the world, and

during the past ten years, imports have increased 9% annually. Trade between Pakistan and Sri Lanka is small when compared to India. The export value increased from US\$ 55 million to US\$ 73 million between 2006 and 2015 in Pakistan and in 2015, Pakistan accounted for 0.7% of total exports. From 2006 to 2015, the export value reached from US\$ 55 million to US\$ 73 million. Pakistan contributed 0.7% of all exports in 2015, out of the total. In 2015, the FTA's concessions benefited 80% of the current exports to Pakistan. Between 2006 and 2015, the import value increased from 147 to 297 million USD. In 2015, 1.6% of Sri Lanka's total imports came from Pakistan. Only 14% of imports used FTA concessions in 2015, which is still a low percentage.

3) South Asian Preferential Trade Agreements (SAPTA)

The SAARC Preferential Trading Arrangement (SAPTA) indicates the Member States' desire to enhance and preserve bilateral trade and economic cooperation within the SAARC area through the exchange of tariff reductions. Sri Lanka was the first to suggest expanding trade between SAARC states at the sixth SAARC summit, held in Colombo in December 1991.

4) South Asian Free Trade Agreements (SAFTA)

Sri Lanka joined SAFTA, a free trade agreement between nations in the South Asian region, in 2006. The goal of TA is to enhance regional commerce by removing tariff and non-tariff constraints on goods traded between countries.

5) Asia Pacific Trade Agreements (APTA)

APTA, sometimes known as the Bangkok Pact, is a preferential trade pact between Asia-Pacific countries. Sri Lanka signed the agreement in 2005, with the goal of promoting economic cooperation and commercial liberalization. Trade agreements can be a powerful tool for gaining export performance. There are some ways to increase export performance via trade agreements. These are reducing tariffs and barriers, increasing market access, harmonizing regulations, etc.

Reduce tariffs and barriers: TAs can help to reduce or eliminate tariffs on goods and services, making exports more competitive and improving market access. When tariffs are reduced, exports become more affordable for foreign buyers and can increase the demand for the products.

Increase market access: TAs can also help to increase access to new markets, as they often include provisions for opening markets that were previously restricted. This can create new opportunities for exporters who were previously shut out of certain markets.

Harmonize regulations: When regulations and standards are harmonized between countries, it can make it easier for exporters to sell their products in foreign markets. Harmonized standards can reduce costs, increase efficiency, and make it easier to navigate complex regulatory environments.

The primary goal of this study was to assess the impact of TAs on Sri Lanka's export prospects. The specific goals are to estimate Sri Lanka's trade effect with Asian partners in trade using panel-based estimates and to investigate the impact of gravity variables on TAs.

2. Literature Review

The gravity model has been widely used to investigate the structure and factors that encourage international trade flows. Gani (2008), for example, used panel data from 1985 to 2002 to apply the gravity model to explore the determinants influencing trade between Fiji and its Asian partners. The findings showed that development in Fiji and the distance to export markets have a substantial impact on the country's exports. India's globalized economy would fare at least as well in terms of exports as China (Kalirajan and Singh, 2007). It shows that performance metrics were based on the gravity model and endogenous growth theory, and the findings suggested that India's reform efforts needed to be effectively increased to catch up. Karimi (2008) estimated the Organization of the Islamic Conference (OIC) countries' trade potential using the generalized gravity model and the panel data approach. According to Kaushal (2021), consuming countries' regulations have a significant positive influence on the performance of exports. SAFTA's members identified an increase in global commerce as well as new trade (Rajakaruna *et al.*, 2019).

Roy and Rayhan (2011) investigated the determinants influencing trade flows in Bangladesh using a gravity model panel data methodology. This analysis included Bangladesh as well as the other 13 members of the South Asian Association for Regional Cooperation (SAARC), which has bilateral trade agreements with Bangladesh. Rahman (2009) examined Australia's potential for international commerce with its 57 trading partners from 1972 to 2006 using generalized gravity models. In this analysis, the standard gravity model was "augmented" to consider Australia's and its partners' GDP per capita, the per capita GDP differential between Australia and its partners, the partners' openness, and dummies for shared language and RTA involvement. Several studies have been conducted to examine the effects of trade agreements on Sri Lankan exports. According to Karunaratne and Kurukulasuriya (2017), Sri Lanka's participation in the South Asian Free Trade Agreement (SAFTA) is one example of a regional trade agreement. and bilateral accords have influenced its export growth, particularly in the textile and apparel sector. Similarly, De Silva and Athukorala (2016) examined the impact of bilateral trade agreements using the Gravity Model and discovered that preferential trade agreements significantly enhanced Sri Lanka's exports to partner countries. Furthermore, the research identifies significant hurdles and limits that Sri Lanka may encounter in fully achieving the benefits of trade agreements. Non-tariff barriers, infrastructure gaps, and the need for trade facilitation measures are among them (Wijayasiri and Edirisuriya, 2018).

The GDP of both countries has favorable effects on the import and export flows, according to Zhairkov *et al.*'s (2016) study of the factors influencing bilateral trade flows between China and Russia. Some empirical studies were also conducted using the gravity model framework to explore the factors that affect African countries' bilateral trade flows and the success of regional trade agreements in Africa. Eita (2008) utilized a detailed gravity model to evaluate the factors impacting Namibian exports using panel data from 39 countries from 1998 to 2006. Generalized Two Stages Least Squares were used to estimate the gravity model on panel data encompassing 30 trading partners of Ethiopia from 1995 to 2007. Growth in domestic national revenue, strong institutional quality, and internal communication systems

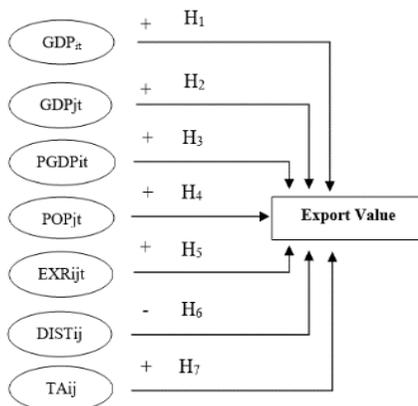
were found to have a significant impact on Ethiopia's export performance. The findings showed that the volume of Ethiopian exports is significantly influenced by distance and import restrictions imposed by Ethiopia's trading partners (Taye,2009). According to Kelegama (2014), Sri Lanka's economic ambitions were to expand trade links with the region's major economic force and to change the country's exports. Transportation costs, the origin and destination countries of markets, and the actual market infrastructure all have an impact on these factors (Redding and Venables, 2004).

Trade agreements, ranging from bilateral trade agreements to multilateral agreements, have become more common in the global economic environment. This is a must-have model for researchers who want to export their findings to other countries. According to Baier and Bergstrand (2007), the gravity model provides a solid foundation for assessing the trade-creating and trade-diverting consequences of such agreements. The model isolates the impact of the agreement itself on export values by adding variables such as tariff reductions and preferential trade practices. Theoretically, it gives a framework for examining the impact of gravity on the trade, as does the model provided by Anderson (2003). The model's core premise, that commerce is positively connected to the economic size of trading partners and adversely related to distance between them, is consistent with trade agreements' goals of promoting economic cooperation and lowering barriers. Rose (2004) notes that the model can isolate the changes in trade patterns attributable to the agreement itself, distinguishing between trade that is diverted from non-member countries and trade that is created between member countries. This distinction is vital for policymakers and researchers seeking a comprehensive understanding of the real impact of trade agreements.

Theoretical model and hypothesis format

Figure 1 shows how the conceptual framework is organized. To explain the relationship between the constructs, seven different hypotheses were developed based on the literature.

Figure 1: Conceptual framework



GDP_{it} (GDP_{jt}): Gross Domestic Product of country i (j), PGDP_i: Per capita GDP of Sri Lanka (Country i), DIST_{ij}: Geographical Distance between country i and country j, POP_{jt}: Total population of partner country(j), TA_{ij}: Availability of Trade Agreements

Hypothesis 1: The GDP value of Sri Lanka positively affects the export value.

Hypothesis 2: The GDP value of the trading partner positively affects the export value.

Hypothesis 3: GDP per capita in Sri Lanka positively affects the export value.

Hypothesis 4: The population of the trading partner positively affects the export value.

Hypothesis 5: The exchange rate in Sri Lanka positively affects the export value.

Hypothesis 6: Geographic distance between the countries negatively affects the export value.

Hypothesis 7: The availability of Trade Agreements between the partner countries positively affects the export value.

3. Methodology

Model specification

The gravity model is the most popular partial model to use in trade analysis, that can assess the impact of TAs on export performance. Tinbergen (1962) was the first to develop the model to evaluate trade flows, and it was subsequently modified by Anderson (1979), Deardorff (1980), Bergstrand and Peter (2009). The gravity model is the most effective empirical trade model that may be used to examine bilateral trade flows (Linnemann, 1966 Anderson, 1979). Newtonian physics serves as the theoretical foundation for the gravity model. According to the gravity model, "Two bodies in the universe are attracted to one another in inverse proportion to the square of their distance apart and proportion to the product of their masses." Additionally, the computed gravity models are highly predictive. To ensure that the parameter predictions were dependable, statistical tests appropriate to the econometric estimation of the given model and the employed data were performed (Rahman and Ibon, 2019). According to the gravity model of international trade flow, bilateral trade flow is a positive function of each country's GDP-measured economic size and a negative function of geographical distance between two countries. The classic gravity model of international trade is represented by the formula (Deardorff, 1998).

$$T_{ij} = A \frac{Y_i Y_j}{D_{ij}} \text{ ---(1)}$$

Where,

T_{ij}: Flows of bilateral trade between countries i and j,

Y_i: Gross Domestic Product (GDP) of country i(Sri Lanka)

Y_j: GDP of country j(Partner Country),

D_{ij}: Geographical distance between country i and j

A: Constant

Although the basic model is as stated above, several additional variables influence commerce between nations and are essentially classed as follows. The

gravity model also predicts that as trading partners' distances increase, costs will rise because of the need for more logistical and transport services. In different studies, the exchange rate is used as an explanatory variable as a substitute for prices. It is calculated as local currency per unit of foreign currency, considering both domestic and international inflation. Commonly used is the exchange rate that has been adjusted for purchasing power parity. If the dummy variable is used frequently, the positive effects of TAs on export growth may be overestimated (Mahmood and Jongwanich, 2018). According to the gravity model's status as one of the most reliable empirical results in macroeconomics, it is used to measure global trade (Gul and Yasin, 2011).

Econometric model

$$\ln EX_{ijt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \alpha_3 \ln PGDP_{it} + \alpha_4 \ln POP_{jt} + \alpha_5 \ln EXR_{ijt} + \alpha_6 \ln DIST_{ij} + \alpha_7 Trade\ Agreements_{ijt} + U_{ijt}$$

Where EX_{ijt} : Total export value between Sri Lanka (country i) and partner (country j) for the year t, GDP_{it} : Gross Domestic Product of country i and (j) for the year t, GDP_{jt} : Gross Domestic Product of country i and (j) for the year t, $PGDP_{it}$: Per capita GDP of Sri Lanka (Country i) for the year t, POP_{jt} : Total population of partner country (j) for the year EXR_{ijt} : The exchange rate between countries i and j. $DIST_{ij}$: The geographical distance between countries i and j. $Trade\ Agreements_{ijt}$: A value of one is assigned if Sri Lanka has an active TA with country j during the period t (dummy variable). U_{ijt} stands for error term; t stands for time period and s stands for parameters.

Taguchi and Rubasinghe (2019) proved that cross-sectional techniques using instrumental variables and control functions lacked the reliability required to make appropriate assessments of the TAs effects. Instead, it was shown that "random effects" in the gravity model utilizing panel data were the most effective way to control the unobserved time-invariant trade variables. The intensity of trade integration brought on by an agreement can therefore be measured by including the coefficients of dummy variables to the model equation for Free Trade Agreement (FTA) partners during the Agreement-in-force time frame.

Data

In the Asian region, there are 48 countries but for this study, only 42 countries were used as data availability was considered. It includes; seven countries of SAARC: India, Bangladesh, Afghanistan, Nepal, Maldives, Pakistan, and Bhutan; six Central ASEAN countries: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan; five East Asian countries: China, Japan, Korea (South), Mongolia and Taiwan; 16 Western Asia countries: Armenia, Azerbaijan, Bahrain, Georgia, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Turkey, Yemen and United Arab Emirates (UAE); ten Southeast Asian countries: Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Vietnam and Russia from North Asia. The data was gathered from 2012 and 2021 (10 years). All observations for this study are annual.

Total export value data were collected from the Direction of Trade Statistics of the International Monetary Fund (IMF) and it is the dependent variable of this model. Due to data availability and as Trade Agreements only covered goods, the study considered merchandise exports from Sri Lanka to their partner countries.

GDP data (in US\$ Million) were collected from World Development Indicators (World Bank Data) as greater trade flows between nations will result from larger economies the predicted indication is positive. GDP per capita (in US\$ Million) was obtained from World Development Indicators (World Bank Data). The relationship between GDP per capita and export performance is complex and can depend on a range of factors. Exchange Rate (% GDP) in Sri Lanka (country i) and its partner country (country j) for the corresponding year were obtained from the World Development Indicators (WDI) database of the World Bank. For the uses of the study, the following formula is used to compute the exchange rate, which was adopted by Binh, (2013):

$$EXR_{ijt} = \frac{\text{Annual average of the national currency unit of Sri Lanka per USD}}{\text{Annual average of the national currency unit of partner country per USD}}$$

Sri Lanka's annual average exchange rate per unit of the importing country's currency rate is established by the ratio. The depreciation of Sri Lanka's currency would be implied by an increase in this ratio, which theoretically would aid in boosting exports. Thus, it is anticipated that the variable will have a favorable impact on the overall value of exports (Kaushal,2021).

Data on the population in Partner countries was obtained from the World Development Indicators (WDI) database of the World Bank. Data on the geographical distance (in kilometers) between Sri Lanka and its partner nation as an average distance between major cities, (Trade by sea) are obtained from the United Nations Conference on Trade and Development (UNCTADstat) database. The economic cost between countries rises as the distance between them increases, which results in reduced trade between the nations and as a result, a negative sign was anticipated. Control variables such as exchange rates and other pertinent economic data to improve the model's explanatory power are included and these variables assist in accounting for macroeconomic situations that may have an impact on export performance.

The Central Bank of Sri Lanka (2021) provided the information on availability of trade agreements in Sri Lanka. (ISFTA, PSLFTA, APTA, SAFTA, and SAPTA). The Gravity Model allowed the researchers to examine the impact of trade agreements on Sri Lanka's export performance while adjusting for other factors, as represented by the variables SAFTA, SAPTA, and Bilateral. The researchers ensured robust statistical analysis and accurate results by using STATA version 16.0.

4. Results and Discussion

Estimation procedure

Before estimating results, it is most appropriate to check the missing values. Missing values were forecast and then panel data were analyzed. The results were generated using the Ordinary Least Square (OLS) method and the random effect model. The extended gravity model in Equation 2 was first estimated using fixed effect regression and random effect regression. The Hausman test was applied to check whether the random effect model was more efficient than the fixed effects model (Table 1). According to the findings of the Hausman test in Table 1, the null hypothesis is accepted, and the random effect model outperforms the fixed effect model. According to the Hausman test comparison, the random effect is the best model to explain the impact of independent factors on dependent variables.

Table 1: Hausman specification test

| | Coef. |
|-----------------------|--------------|
| Chi-square test value | 1.017 |
| P-value | 0.961 |

With a fixed effects model, time-invariant variables in the gravity model (such as distance, a shared language, and a common border, for example) cannot be accurately estimated because the inherent transformation eliminates these characteristics (Martinez-Zarzoso and Nowak-Lehmann, 2003).

Estimation results and discussion

The panel regression for the basic gravity factors is shown in Table 2. As the data show, the GDP of a partner country and the distance between the two nations have significant effects on Sri Lanka's export value. The coefficient value for GDP in trading partners shows that they significantly affect the export value of Sri Lanka. Distance between the two countries has a significant relationship between export value in Sri Lanka. However, according to general theory when the geographical distance between trading partners is decreasing or when the GDP value of the importer is increasing, the export value should increase as the export performance will gain.

With higher estimated values of F and R-square statistics, the econometric model's goodness of fit metrics were significant. The value of R-square suggests that variation in the dependent variable explained by explanatory variables was 69.8 %; (Table 3), whereas F statistic estimates the joint significance of the estimated parameters. The empirical results obtained from estimating equation 2 using random effects (inside) regression are summarized in Table 3. In the calculated model, the effect of Sri Lanka's GDP was shown to be positive and statistically significant ($=3.745$, $t=2.750$, $p=0.006$) at the 1 percent level, which is consistent with the theory's prediction. When the GDP in Sri Lanka gained 1 percent, the export value increased by 3.745 percent. Therefore, H_1 is accepted. This finding indicates that Sri Lanka's ability to export is significantly affected by its GDP. A larger GDP means more manufacturing capacity, which enhances the economy's supply-side export capacity.

This is similar to the findings of Carrillo and Lee (2002), who examined the impact of regional integration on intra-regional and intra-industrial trade in Latin America from 1980 to 1997. These authors showed that the exporter's GDP was statistically significant and positive using the gravity model.

Table 2: Panel Regression for the basic gravity model

| Variables | Coefficient (α) | St. Err. | t-value | p-value |
|-----------|--------------------------|----------|----------|---------|
| GDPit | 0.836 | 0.794 | 1.050 | 0.293 |
| GDPjt | 1.007*** | 0.034 | 29.200 | 0.000 |
| DISTij | -0.979*** | 0.142 | -6.900 | 0.000 |
| Constant | -10.165 | 9.092 | -1.120 | 0.264 |
| F-test | 287.290 | | Prob > F | 0.000 |

Note: Levels of statistical significance, ***P<0.01

Economists have traditionally used GDP to assess economic growth. In all estimated models, the impact of the importing nation's GDP proved to be positive and statistically significant ($\alpha=0.924$, $t=7.040$, $p=0.000$). So, H_2 is accepted. The results showed when the trading partner's natural log of GDP increases by one unit, the natural log of export value of Sri Lanka also increases by 0.924 units (Table 3). This study shows that the GDP of a trading partner country is related to its consumption capacity, implying that the trading partner country may import more (demand side). According to Orindi (2011), when applied to a sample of 25 trading countries, the gravity model had a positive influence on the volume of bilateral trade between Kenya and its trading partners. Orindi (2011) studied the determinants of Kenyan exports. According to the estimation results, the gravity model's economic size role is essentially the same as the size role in current trade models and is therefore rather simple. The theory of trade can be used to explain the connection between partner GDP and exports from Sri Lanka. This hypothesis holds that nations typically trade with one another based on their comparative advantages. If GDP is developing, the economic performance is doing well, and the country is developing. On the other hand, if the GDP is decreasing, there may be a problem with the economy and the country may fall behind (Anyanwu, 2014).

Table 3: Panel Data Regression Results, Random Effect Model

| Variables | Coefficient (α) | St.Err. | t-value | p-value |
|--------------------|--------------------------|---------|-------------------|---------|
| GDPit | 3.745*** | 1.360 | 2.750 | 0.006 |
| GDPjt | 0.924*** | 0.131 | 7.040 | 0.000 |
| PGDPit | -3.982** | 1.780 | -2.240 | 0.025 |
| EXRijt | 0.031 | 0.072 | 0.440 | 0.663 |
| POPjt | 0.126 | 0.187 | 0.670 | 0.502 |
| DISTij | -1.220*** | 0.443 | -2.760 | 0.006 |
| TAij | 1.284* | 0.663 | 2.940 | 0.053 |
| Constant | -64.115** | 25.104 | -2.550 | 0.011 |
| Mean dependent var | | 2.718 | SD dependent var | 2.503 |
| Overall r-squared | | 0.698 | Number of obs | 420 |
| Chi-square | | 149.935 | Prob > chi2 | 0.000 |
| R-squared within | | 0.115 | R-squared between | 0.735 |

Source: Compiled by author

*Note 1: *** p<.01, ** p<.05, * p<.1*

Note 2: if p<0.01; Hypothesis is supported, α : Standardized path coefficients, GDP_{it} (GDP_{jt}): Gross Domestic Product of country i (j), $PGDP_i$: Per capita GDP of Sri Lanka (Country i), $DIST_{ij}$: Geographical Distance between country i and country j, POP_{jt} : Total population of partner country(j), TA_{ij} : Availability of Trade Agreements between two countries

As the results, the impact of GDP per capita in Sri Lanka is negative and statistically significant ($\alpha = -3.982$, $t = 2.240$, $p = 0.025$) at a 5 percent level in the estimated model (Table 3). Therefore, H_3 can be rejected. But this shows that Sri Lanka's population grows faster than its GDP. When the Per capita GDP value in Sri Lanka increases by 1 percent the export value may decrease by 3.982 percent. Its positive outcome suggests that disparities in technical progress rates between nations have a favorable link with bilateral trade flows between Sri Lanka and its trading partners. The effect of GDP per capita income inequality was negative for homogeneous groups of goods but positive and they were statistically significant for diversified categories of goods, according to Carrillo and Li's (2002) study on trade blocs in Latin America. This result is consistent with their findings. Higher GDP per capita can also lead to greater investment in infrastructure, which can improve a country's overall competitiveness. It's ability to export goods and services. High GDP per capita can, however, also result in greater manufacturing costs, which can reduce the competitiveness of exports. For instance, if labor prices are higher in a wealthy nation, producing goods and services for export may be more expensive as a result, resulting in reduced export volumes.

According to the theoretical prediction, the effect of geographic distance was shown to be negative and statistically significant ($\alpha = -1.220$, $t = -2.760$, $p = 0.006$) at the 1 percent level in the random effects. Hence H_6 is accepted. These findings offer substantial evidence in support of the theory that trade flows between Sri Lanka and its trading partners are significantly influenced by transportation costs. The coefficient value ($\alpha_6 = -1.220$) showed when the natural log of distance increased by one percent the natural log of export value decreased by 1.22 percent. This suggests that rather than trading less frequently with countries farther distant, Sri Lanka tends to trade more frequently with its neighbors, where transportation costs are cheaper (Orindi, 2011). Orindi, (2011) examined how geographical relationships affected the exporter and showed that, among other things, distance had a negative impact on the volume of trade between the exporter and its trading partner nations.

In the random effect, the effect of this dummy variable (Trade Agreements) was shown to be positive and statistically significant ($\alpha = 1.284$, $t = 2.940$, $p = 0.053$). Hence H_7 is accepted. According to the random effect model, exports from Sri Lanka to other TA members have increased by approximately 1.28 percent since the founding of TAs. TAs assist Asian exporters and manufacturers in growing. As a result, developing trade agreements is critical for gaining access to the global market. TAs help to reduce trade restrictions like tariffs and other barriers and advance the nation's economic growth. According to Kaushal, (2021), India's export efficiency is significantly boosted by the trade agreements it has with its partner countries.

The overall model, as indicated by the chi-square statistic and the high R^2 value (0.698), demonstrates strong explanatory power in capturing the variation in

Sri Lanka's exports. The within-group and between-group R^2 values (0.115 and 0.735, respectively) suggest that a substantial portion of the variation in exports is explained by differences between countries over time.

5. Conclusion and Policy Recommendations

Finally, this study attempted to comprehend the impact of TAs on export performance in Sri Lanka. The empirical data was evaluated using a pooled OLS model and a random effect model within a group estimator. The dataset from 2012 to 2021. The results from the instrumental variables gravity model show that Sri Lanka's GDP and trading partners' GDP had a positive and statistically significant effect on Sri Lanka's export value. The study further showed that the availability of Trade Agreements had a significant positive effect on Sri Lanka's export value. The GDP per capita of Sri Lanka and the geographical distance between Sri Lanka and its major trading partners both have a negative and statistically significant impact on export performance. Trade agreements (TA_{ij}) between Sri Lanka and its trading partners have a beneficial influence on exports, however it falls short of statistical significance ($p=0.053$) which suggests that trade agreements may play a role in boosting export performance, supporting the argument that preferential trade agreements can facilitate trade (De Silva & Athukorala, 2016). This study presents empirical evidence that economic size, geographical distance, and the presence of trade agreements are important factors influencing Sri Lanka's export performance. While some control factors, such as per capita GDP, provide unexpected results, the findings highlight the importance of trade agreements in aiding Sri Lanka's exports. However, a bigger sample size research may be required to reach more definitive conclusions about the influence of trade agreements.

Policy recommendations

The results of the study demonstrate the variables affecting Sri Lanka's export performance and it is important to promote the positive factors identified to boost Sri Lanka's exports. TAs also should be promoted with high GDP countries that have a low distance between Sri Lanka as they are deemed more effective. The findings show that the economic integration process needs to be deepened to increase Sri Lanka's export value. This suggests that investments in transportation lower operating costs based on the cost of transportation and proximity variables, which would significantly affect Sri Lanka's exports. These findings are crucial for the creation of a trade strategy to ensure that Sri Lanka's export performance is utilized to boost economic growth. For the next study, the authors hope to take into consideration all international trade agreements that Sri Lanka has already signed.

Acknowledgment³

³ *I acknowledge the staff of the Department of Agribusiness Management of Wayamba University of Sri Lanka, Ms. S.M.D. Madhumali, Assistant Director (National Organic Control Unit), and Ms. Apsara Chandanie, Assistant Director (Marketing Development Division) in Export Development Board, Colombo, Sri Lanka for their valuable support.*

References

- Athukorala, P., and Balasubramanyam, A. (Eds.). *Trade, Development, and Political Economy: Essays in Honour of Anne O. Krueger* (pp. 243-268). Palgrave Macmillan.
- Anderson, J. E. (1979). A Theoretical Foundation for the Gravity Equation. *American Economic Review*, 69(1), 106-116.
- Anderson, J. E., and Van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, 93(1), 170–192.
- Anyanwu, J. C. (2014). Factors Affecting Economic Growth in Africa: Are There any Lessons from China? *African Development Review*, 26(3), 468–493.
- Atkin, D., Khandelwal, A. K., and Osman, A. (2014). Exporting and Firm Performance: Evidence from a Randomized Trial. National Bureau of Economic Research. Massachusetts Avenue Cambridge, Massachusetts.
- Baier, S. L., and Bergstrand, J. H. (2007). Do Free Trade Agreements Actually Increase Members' International Trade? *Journal of International Economics*, 71(1), 72–95.
- Bergstrand, J. H., and Peter, E. (2009). Gravity Equations and Economic Frictions in the World Economy.
- Bernhofen, D. Falvey R., Greenaway D., and Kriekemeier U. (Eds.), *Palgrave Handbook of International Trade*. Palgrave Macmillan.
- Binh, P. T. (2013). Unit root tests, cointegration, ECM, VECM, and causality models: Topics in Time Series Econometrics.
- Carrillo, C. and Li, C. A. (2002). Trade Blocs and the Gravity Model: Evidence from Latin American Countries. Working Paper, Department of Economics, University of Essex, UK.
- Deardorff, A. (1980). The General Validity of the Law of Comparative Advantage. *Journal of Political Economy*.
- De Silva, H., and Athukorala, P. (2016). South-South Preferential Trade Agreements: The Sri Lankan Experience. *Journal of Asian Economics*, 45, 47-61.
- Eita, J. H. (2008). Determinants of Namibian Exports: A Gravity Model Approach, University of Namibia, Namibia.
- Gani, A. (2008). Factors influencing trade between Fiji and its Asian partners. *Pacific Economic Bulletin*, 23(2), The Australian National University.
- Gul, N. and M. Yasin, H. (2011). The Trade Potential of Pakistan: An Application of the Gravity Model. *The Lahore Journal of Economics*, 16(1), 23–62.
- Jonathan, E., and Kortum, S. (Eds.). (2002). *Technology, Geography, and Trade. Econometrica*, 70, 1741-1779.
- Kalirajan, K., and Singh, K. (2007). A competitive analysis of recent export performances of China and India. Paper presented at the Asian Economic Panel Meeting at the Brookings Institution, Washington, DC.
- Karimi, H. H. (2008). Trade integration of agricultural products for Iran and Islamic countries. *American-Eurasian Journal of Agriculture and Environment*, 2,124-130.

- Karunaratne, N. D., and Kurukulasuriya, P. (2017). Preferential Trade Agreements and Exports from Sri Lanka: A Gravity Model Analysis. *Asian-Pacific Economic Literature*, 31(2), 84-99.
- Kaushal, L. A. (2021). Impact of regional trade agreements on export efficiency – A case study of India. *Cogent Economics and Finance*, 10(1).
- Kelegama, S. (2014). China–Sri Lanka Economic Relations. *China Report*, 50(2), 131–149.
- Linnemann, H. (1966). *An Econometric Study of International Trade Flows*, North Holland, Amsterdam.
- Mahmood, F. and Jongwanich, J. (2018). Export-enhancing Effects of Free Trade Agreements in South Asia. *Journal of South Asian Development*, 13(1), 24-53.
- Martinez-Zarzoso, I. and Nowak-Lehmann, F. (2003). Augmented Gravity Model: An Empirical Application to Mercosur-European Union Trade Flows. *Journal of Applied Economics*, 6(2), 291-316.
- Orindi M.N. (2011). Determinants of Kenyan Exports: A Gravity Model Approach. *International Journal of Economic and Political Integration*. 1(1).
- Rahman, S. H. and Ibon, W. F. (2019). Bangladesh's Trade with Asia: What Do Gravity Models Tell Us? *The Bangladesh Development Studies*, 42(1), 1–22.
- Rahman, M. M. 2009. Australia's Global Trade Potential: Evidence from the Gravity Model Analysis. In: Oxford Business and Economics Conference, 24-26 June, 2009, Oxford University, Oxford, UK.
- Rajakaruna S.M., Chandrarathne S.G.U.S. and Jayasundara, J.M.D.P. (2019). Effectiveness of South Asia Free Trade Agreement (SAFTA): a study of trade flows between Sri Lanka and India *Sri Lankan Journal of Business Economics*, 8(2).
- Rose, A. K. (2004). Do We Really Know That the WTO Increases Trade? *American Economic Review*, 94(1), 98–114.
- Roy, M. and Rayhan, I. (2011). Trade Flows of Bangladesh: A Gravity Model Approach, *Economics Bulletin*, 31(1), 950 -959.
- Taguchi, H. and Rubasinghe, D. C. I. (2019). Trade Impacts of South Asian Free Trade Agreements in Sri Lanka. *South Asia Economic Journal*, 20(1), 1–18.
- Taye, Y. T. (2009). Determinants of Ethiopia's Export Performance: A Gravity Model Analysis BKP Development Research and Consulting, Trade and Development Discussion Paper No. 01/2009.
- Tinbergen, J. 1962. *Shaping the World Economy; Suggestions for an International Economic Policy*.
- Wijayasiri, J., and Edirisuriya, P. (2018). Challenges and Opportunities in Sri Lanka's Participation in Global Value Chains.
- World Bank (2021). *WDI - Home*. [online] Worldbank.org. Available at: <http://datatopics.worldbank.org/world-development-indicators>.
- Zhairkov, E.P., Kravchenko, A.A., Sergeeva, O.O., and Stetsyuk, V.V. (2016), Econometric estimation of bilateral transboundary trade between Russia and China. *International Journal of Economics and Financial Issues*, 6(3), 1068-1071.