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EFFECTS OF NON-TARIFF MEASURES ON TEA EXPORTS FROM SRI LANKA

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Abstract

This study employed the gravity model of trade to examine the effects of non-tariff measures (NTMs) on Sri Lankan tea exports. The study used a panel data set including bilateral exports retrieved from Sri Lanka and its ten major tea export destinations from 2010 to 2019. The frequency of NTMs on Sri Lankan value of tea exports shows an increasing trend. The gravity model estimations show that except for tariff, the coefficients of all other gravity variables are statistically significant and aligned with theoretical justifications. The magnitude of the gross domestic product of Sri Lanka and importer countries and the presence of colonial links positively act on tea exports from Sri Lanka, while the distance between capital cities of trading partners and NTMs lower the exports. More specifically, imposing an additional NTM diminishes the value of tea exports by 48%. Furthermore, the NTMs have a 66% tariff equivalent effect. Hence, Sri Lanka's best prospects for profiting from tea exports depend on altering NTM policies, which are just as significant as other trade barriers.

JEL: *D, F, Q*

Keywords: *Coverage ratio, Frequency index, Gravity model, Ordinary least square technique, Tariff equivalent*

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INTRODUCTION

Tea is one of the most important crops in Sri Lanka. It has a vital role in the Sri Lankan economy by providing employment opportunities and as a source of foreign exchange earnings. Sri Lankan tea is popular in the world as Ceylon tea. The country ranks fourth in the world's production and export volume (FAOSTAT, 2021). By contributing more than one-tenth to the total export earnings in 2019, tea generated substantial foreign revenue for the Sri Lankan economy (Central Bank, 2019). Moreover, considering the composition of agricultural exports, tea accounts for the largest share, 55%, in 2019 (Central Bank, 2019). In 2019, the tea export volume was approximately 292,657 metric tons (Tea Exporters Association Sri Lanka, 2020*)*.

When engaging in international trade to earn foreign exchange, there are some restrictions or barriers to trade. Non-Tariff Measures (NTMs) are one type of such barrier. NTMs are policy measures that can affect international trade in addition to tariffs (UNCTAD, 2019). There are several types of NTMs, which are divided into three categories, namely, technical measures, non-technical measures, and export measures. For quite a long period, these NTMs consisted mainly of quantitative restrictions (QR) such as quotas and voluntary export restraints. NTMs caused a decline in import volumes while affecting trade values. Later, technical measures like Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary (SPS) regulations were rapidly implemented, involving compliance costs, increasing unit values, and restricting entry (Cadot and Gourdon, 2016).

In recent years, tariff levels on agricultural products have been reduced through various trade agreements. The Uruguay round negotiation concluded that there is a substantial reduction of tariff. Furthermore, this reduction is intensified by bilateral, regional, and preferential trade agreements (Kalaba and Kirsten, 2012). With trade liberalisation, attention has shifted to NTMs as an alternative or potential trade barriers (Hwang and Lim, 2017). Changes in the trading environment cause the nature of the NTMs imposed and their effects on the economy, such as the growth of global production networks, the recent financial crisis, the need to manage climate changes, and the need to maintain consumer concern about the food safety and environmental issues in rich countries (WTO, 2012). SPS and TBT measures are currently among the foremost often encountered NTMs. NTMs differ across sectors, but those are especially popular in agriculture.

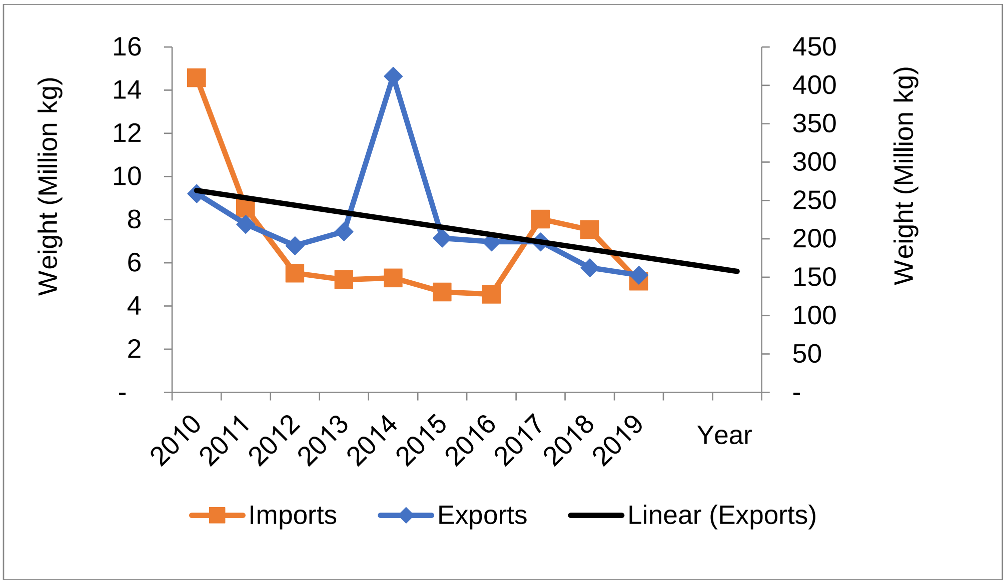
After the Uruguay round negotiation, the tariff level of agricultural products has been significantly reduced (Trienekens and Zuurbier, 2008; Kalaba and Kirsten, 2012). With trade liberalisation, more and more attention has been paid to NTMs as a substitute for potential trade barriers, which are used as a protectionist and regulatory means to control the free flow of international trade (Ferrantino, 2006). The NTMs are implemented by importing countries concerning their food safety, human, animal, and plant life or health

(Hilal, 2020). Compared with other products, the incidences of NTMs in agricultural products are considerably higher (Mohan et al., 2012).

Tea is one of the major agricultural commodities traded worldwide. It is subjected to international food safety standards (Hwang and Lim, 2017). Among several NTMs related to the tea industry, SPS and TBT are the main NTMs (UNCTAD, 2021). Other than that, there are pre-shipment inspection, price control, quality control, and export-related measures. Globally, there are 335 NTMs for the tea industry. Among them are 90 SPS and 19 TBT (UNCTAD, 2021).

The export volume of Sri Lankan tea has declined over the period (Figure 1), and the competitiveness of Ceylon tea in the world market is declining with production drop, high cost of production, low productivity, and price competition in the international market (Hilal, 2020). Therefore, it is essential to study the reasons for this decline.

Figure 1: Exports and import volume of tea in Sri Lanka over the past 10 years



Source: Compiled using exports and imports data from UN COMTRADE database.

NTMs are one of the reasons for the downward trend in the world agricultural trade. Compared to non-agricultural products, NTMs have a more significant effect on agricultural trade (WTO, 2012). A study by Henson and Loader (2001) revealed that SPS regulations are the most critical barrier to agricultural food exports to the European Union. SPS measures can prevent and restrict the trade of agricultural products. This especially affects developing countries because they cannot meet the requirements of restrictive regulation with less technology, awareness, and capital (Hwang and Lim, 2017). SPS policy is essential to ensure consumers' health and well-being and protect the environment. As a result of this use, it is known that 60% or more food-related products are affected by at least one of the SPS policy forms (Nicita and Gourdan, 2013). TBT policies apply to import restrictions based on specific product characteristics (UNCTAD, 2003).

Several studies have investigated the effects of NTMs on trade for agricultural and non-agricultural products. Trade literature found NTMs on agricultural products are more restrictive and widespread than in the manufacturing sector (WTO, 2012). Sandaruwan et al. (2020) explored the variation in the structure of NTMs imposed on Sri Lankan seafood exports by importing countries. The results revealed that SPS, TBT, and pre-shipment inspection (INSP) are the most critical NTMs on Sri Lankan seafood exports; there is a negative effect of NTMs, tariffs, and distance to the importing country on seafood exports, and there is a positive effect on the GDP (Gross Domestic Production) of importer and Sri Lanka. Total NTMs increase the price of seafood by 62%, and SPS, TBT, and INSP increase that by 48%, 15%, and 13%, respectively.

Permata and Handoyo (2019) analysed the effects of NTMs using SPS and TBT measures imposed on fisheries exports of Indonesia and its trading partners. Results show that the GDPs of exporting and importing countries affect Indonesian fisheries exports positively, distance and SPS affect negatively, and TBT has no effect. Kalaba and Kirsten (2012) examined the effect of NTMs on intra- Southern African Development Community (SADC) in meat and dairy products. This study found that NTMs' effect on trade flows ranges between 70% to 400% for meat and 10% to 20% for dairy products compared to the effect of tariffs. Nardella and Boccaletti (2004) evaluated the effects of EU and US agri-food NTMs on imports. It revealed that European technical requirements have a detrimental effect on agri-food imports from developing countries, and there is a negative effect on imports by EU and US labelling and marking requirements. Moreover, inspection, quarantine requirements, and non-technical NTMs negatively affect both borders.

Wood et al. (2017) analysed the effects of TBT and SPS measures on Korean exports to China. The results show that Chinese SPS measures have positive effects on Korean agricultural exports and Chinese TBT has a negative effect on Korean manufacturing exports and exports as a whole. Grubler et al. (2016) studied the effects of NTMs on imports at disaggregate levels (6-digit level of the Harmonised System (HS)). This study shows that SPS measures and TBT depress as well as promote the trade depending on the NTMs imposing country and product under consideration; quantitative restriction played an important role in restricting trade during the period under consideration; TBT and SPS measures play an important role for the manufacturing goods, and richer countries apply more NTMs than poor and richer countries have a smaller effect of NTM compared to poor countries. Ghodsi et al. (2017) examined how different NTMs affected global trade. It found that about 60% of trade has impeding effects of NTMs. At the product level, NTMs have a more restricting effect on luxury products, minerals arms, and ammunition, followed by agri-food products. Geographically, the most significant import-restricting effect was found in Sub-Saharan Africa. Standards and restrictions implemented in Europe and Central Asia affect imports more than that of North American NTMs. Disdier and Marette (2010) explore the link between gravity and welfare framework for measuring the effects of NTMs. This study revealed that econometric estimation using the gravity model reports a negative effect on imports by NTMs, and by the welfare analysis, it is revealed that in most cases, the stricter standards help to increase the welfare at both domestic and international levels.

Few pieces of literature focused on the effects of NTMs in the tea sector. Hwang and Lim (2017) examined the effects of differences in SPS measures as a measurement of NTMs on tea trade between importing and exporting countries. The study of Hwang and Lim found a slightly less negative effect of differences in Maximum Residual Levels (MRLs) than that of the tariff. Moreover, the results suggested that the NTMs act as a policy substitute for import tariffs in the global tea trade. Dong and Zhu (2015) examined the effects of the SPS differences both in quantity and quality between China and developed countries on China's tea export. The study shows that China's tea export would decrease by 0.6% when increasing one unit of difference in the regulated number of pesticide residue limits between China and developed countries. The MRL limit of Fenvalerate between China and developed countries increased by 1ppm, China's tea exports would decrease by 1.6%, and the MRL limit of Endosulfan increase by 1ppm then the tea exports would decrease by 0.7%. The quantity and quality differences in SPS measures are the main criteria of China's tea restricted by SPS measures of developed countries. Ranjan and Edirisinghe (2020) studied the effects of NTMs on the Sri Lankan tea trade using the Bayesian version of the gravity equation. A 1% increase in Endosulfan's controlling severity can affect a 0.67% decrease in Sri Lanka's tea exports. It means the MRL for Endosulfan imposed by importer countries can significantly affect tea export from Sri Lanka. The MRLs of some pesticides can severely limit Sri Lanka's tea exports rather than tariffs because the effects of MRLs are greater than the effects of tariffs, even if tariffs on tea remain a significant issue that influences Sri Lankan tea exports.

The above literature clearly shows that the tea sector has a negative effect on the tea trade by the imposed NTMs. Researchers assessed those effects by considering SPS measures applied to the tea trade, especially the MRLs limit of pesticides used for tea cultivation. However, further studies are needed to investigate how the other NTMs, such as INSP, price control measures, quality control measures, export-related measures, etc., affect the tea trade and compare the trade effect of NTMs with tariffs. Estimating the Ad-valorem tariff equivalent (AVE) is vital to compare the effect of NTMs with that of tariffs. Having identified the above-mentioned research gaps, this study attempted to quantify the effect of NTMs imposed on tea export flows and how large the effects of NTMs compared to tariffs on tea exports from Sri Lanka.

The broad objective of this study is to evaluate the effects of NTMs on tea export from Sri Lanka. Moreover, the specific objectives are (1) to investigate the prevalence of

NTMs imposed by major importing countries of Sri Lankan tea, (2) to quantify the effects of NTMs on tea exports from Sri Lanka, and (3) to quantify the NTMs associated with Sri Lankan tea in terms of tariff equivalent.

METHODOLOGY

To measure the effects of NTMs on trade flows, the gravity model of trade has been employed in many studies. This model is a partial equilibrium standard trade model, which is a very popular econometric technique in trade literature.

The gravity model provides a link between trade barriers and trade flows. It has the stability and power to explain bilateral trade among trading partners. The most exciting feature of the gravity approach relies on the availability of trade data, which is ampler at the disaggregated product level than price data (Sandaruwan et al., 2020). In addition, the model can also be successfully employed for panel data analysis, which is vital for trade study data samples as they use a large number of countries and products where different NTMs and tariff levels evolve over a period.

The Nobel Laureate Jan Tinbergen proposed the model in 1962 to explain international bilateral trade. It was derived from Newton's gravitational force concept. He said that the gravitational force between two objects depends on their masses and is inversely proportional to the square of the distance between them. Applying Newton's gravitational concept to the trade theory, Tinbergen said that export or import, or trade from one country to another is directly proportional to the total economic masses (i.e., GDP) and inversely proportional to the trade costs between two countries (i.e., distance). This is the conceptual gravity model for trade. Among the other common gravity variables, the presence of common language, colonial links, common currency, island or landlocked nature, institutions, infrastructure, migration flows, the degree of regional integration, bilateral tariff barriers, and NTMs can be considered in the analysis as they have a great effect on trade flows between countries.

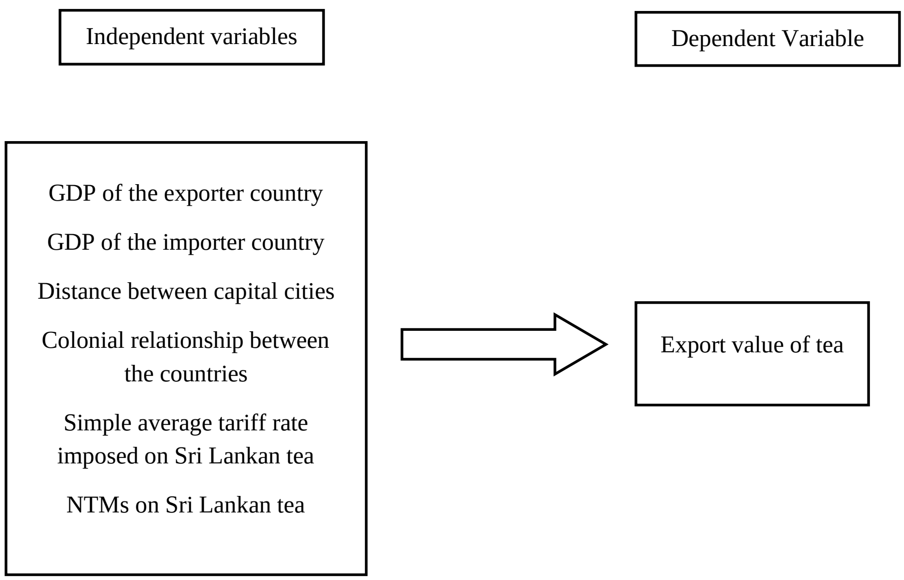
The simple ordinary least square (OLS) technique is the basis of estimating the gravity model (Hwang and Lim, 2017). The standard procedure for estimating the gravity model is to take the natural logarithms of all variables and obtain a log-linear equation. It can be estimated using OLS regression. The model can be used for hypothesis testing if it holds OLS assumptions. In this estimation, the null hypothesis is that all the model's coefficients are jointly or simultaneously equal to zero, and the alternative hypothesis is that not all the model's coefficients are equal to zero. The linear compound hypothesis can be tested using the F-statistic. Past empirical work employed this method to study the effect of NTMs on trade (Kalaba and Kirsten, 2012; Permata and Handoyo, 2019; Dembatapitia and Weerahewa, 2015; Bestbier, 2016). In such an analysis, zero trade flows have been excluded from the estimates. The problem of zero trade flows and heteroscedasticity can be corrected using the Heckman model (Disdier and Marette, 2010; Hwang and Lim,

2017) and Poisson pseudo maximum likelihood estimators (Hwang and Lim, 2017; Sandaruwan et al., 2020; Wood et al., 2017).

According to the theory of gravity model, it is expected that both the GDP of the importer and exporter countries have positive relationships. In contrast, the trade costs such as distance, tariff, and NTMs have a negative relationship with trade flows. Some previous studies have shown that the GDP of exporters and GDP of importers have a positive correlation with trade (Permata and Handoyo, 2019; Sandaruwan et al., 2020) while some studies found negative correlation between the proxies for transport costs and trade flows (Dong and Zhu, 2015; Hwang and Lim, 2017; Nardella and Broccaletti, 2004; Permata and Handoyo, 2019; Sandaruwan et al., 2020).

The gravity model approach was employed for this study based on the following conceptual framework (see Figure 2). In this framework, the export value of tea was used as the dependent variable. This variable depended on the exporter's GDP, the importer country's GDP, the distance between the capital cities, the colonial relationship between the countries, the simple average tariff rate imposed on Sri Lankan tea, and the NTMs on Sri Lankan tea.

Figure 2: Conceptual framework



For the study, the effects of NTMs on Sri Lankan tea exports, Sri Lanka and its major ten export destinations were selected as the sample. The selected export destinations are Belgium, Canada, Chile, China, Germany, Japan, the Russian Federation, Saudi Arabia, the United Arab Emirates (UAE), and the United States of America (USA). From 2010 to 2019, these ten export destinations accounted for around 50% of tea exports. The dataset of this study included export volumes and value of tea, the Gross Domestic Product (GDP) of Sri Lanka and importing countries, the distance between capital cities of the importer and Sri Lanka, the presence of colonial relationships, tariff data, and the prevalence of NTMs from ten export destinations for the period, 2010 to 2019 and for the tea products at the 4-digit level in the Harmonised System (HS). Tea export data were collected from United Nations Commodity Trade Statistics Database (UNCOMTRADE). The GDP of Sri Lanka and importer countries, the distance between capital cities, and common colonial ties were extracted from the Institute for Research on the International Economy database (Centre d' Etudes Prospectives et d' Information Internationales) (CEPII). The data on tariffs were taken from the World Integrated Trade Solutions (WITS), and data on NTMs were obtained from World Integrated Trade Intelligence Portal (I-TIP) (2019). Data were analysed using the STATA software package and Microsoft Excel.

Table 1: Statistics of tea exports from Sri Lanka (2010-2019)

Year	Total tea exports for selected destinations	Total tea exports	% of tea exports for selected destinations over total tea exports
2010	125,371,134	259,119,932	48.38
2011	127,245,728	219,035,251	58.09
2012	117,045,178	191,290,177	61.19
2013	114,493,034	209,621,354	54.62
2014	109,567,745	412,035,585	26.59
2015	106,754,830	201,063,732	53.10
2016	97,209,511	196,120,205	49.57
2017	96,739,469	196,216,297	49.30
2018	92,171,963	162,384,350	56.76
2019	94,604,898	152,782,837	61.92

Source: Author compiled using exported data from UNCOMTRADE database

Prevalence of NTMs Imposed by Major Importing Countries of Sri Lankan Tea

Coverage ratio and frequency index were used to investigate the prevalence of NTMs imposed by major importing countries of Sri Lankan tea. The coverage ratio gives the percentage of trade subject to NTMs, and the percentage of import products to which the NTMs are applied is calculated using the frequency index.

Coverage ratio:

The coverage ratio presents the percentage of the trade of a product that NTMs imposed on the importing country and provides a measure of the importance of imported NTMs (UNCTAD, 2013). The coverage ratio has been widely applied to some previous studies (Permata and Handoyo, 2019; Wood et al., 2017).

$$CR_i = \frac{\sum_{k=1}^{hs} NTM_{ik} X_{ik}}{\sum_{k=1}^{hs} X_{ik}} 100 \quad \text{...} (1)$$

where,

CR = Coverage ratio

NTM = Dummy variable denoting the presence of NTM

X = Value of imports

Frequency index:

$$FI_i = \frac{\sum_{k=1}^{hs} NTM_{ik} D_{ik}}{\sum_{k=1}^{hs} D_{ik}} 100 \quad \text{...} (2)$$

where,

FI = Frequency index

NTM = Dummy variable denoting the presence of an NTM

D = Dichotomous variable (taking the value 1 when country i imports any quantity of product k, and zero otherwise)

Quantify the Effects of NTMs on Tea Exports of Sri Lanka

Following is the empirical gravity model used in this study.

$$lnX_{ijt}^{k} = \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 lnDIS_{ij} + \beta_4 DCOMCOL_{ij} + \beta_5 \, ln \, ln \left(1 + T_{ijt}^{k}\right) + \beta_6 DNTM_{ijt}^{k} + \varepsilon_{ij}^{k} \quad \text{...} (3)$$

where,

X_{ijt}^{k} = Export value of tea to i^{th} importing country at time *t* (US$) (HS code-0902)

GDP_{it} = Gross domestic product of i^{th} importing country at time *t* (Thousand US$)

GDP_{jt} = Gross domestic product of Sri Lanka at time *t* (Thousand US$)

DIS_{ij} = Distance between the capital of the i^{th} importing country and capital of Sri Lanka (kilometres)

$DCOMCL_{ij}$ = Presence of common colonies (dummy variable takes value 1 if present and 0 otherwise)

T_{ijt}^{k} = The simple average tariff rate imposed by the country *i* for the exported tea from Sri Lanka (percentage)

$DNTM_{ijt}^{k}$ = NTMs imposed by i^{th} importing country to Sri Lankan tea (dummy variable takes the value 1 if present and 0 otherwise)

ε_{ij}^{k} = Error term

As the WTO and the United Nations (2012) suggested, two reasons exist for using a dummy variable to capture the effect of NTMs. First, there is a high correlation between the dummy of NTMs and the frequency of NTMs. Second, the dummy of NTMs is unlikely to be correlated with the export values (Sandaruwan et al., 2020).

One of the main assumptions for the ordinary least square regression is the homogeneity of variance of the residuals. The violation of that assumption is referred to as heteroscedasticity. In this study, heteroscedasticity among variables was detected using the Breusch-Pagan test. When there is a perfect linear relationship among the predictors, the estimates for a regression model cannot be uniquely computed. The term collinearity implies that two variables are near-perfect linear combinations of one another. Consequently, the detection of multicollinearity is essential as the presence of such a problem increases the likelihood of regression model estimates becoming unstable and standard errors getting widely inflated. A Variance Inflation Factor (VIF) estimator was used to detect multicollinearity among the variables of the regression model of this analysis.

Quantify the NTMs Associated with Sri Lankan Tea

Here, by comparing the effects of NTMs with tariff equivalents, the effects of NTMs on Sri Lankan tea exports were estimated. The gravity model is preferred because the coefficients can be used easily to derive the tariff equivalent of the NTMs. After running the model, the estimated values could be used to retrieve the tariff equivalent of the NTMs. A tariff equivalent of NTMS is the level of tariff that has the same effect on trade flows (Kalaba and Kirsten, 2012).

The more advanced gravity research extends the estimation process to calculating equivalent tariff rates or AVE. In this way, the effects of NTMs can be compared with the effects of equivalent tariffs. The basic idea is that once the effects of price and quantity are known, it is possible to determine an exchange rate with the same effects. The analysis was then carried out, and the tariff equivalent of the NTM coefficient was estimated according to the method proposed by Kalaba and Kirsten (2012). This method aimed to quantitatively study the effects of NTMs on Sri Lankan tea exports by directly comparing NTMs with tariffs. The elasticity of NTMs is estimated through the empirical gravity model and then used to calculate the tariff equivalent of NTMs as follows.

$$Tariff\ equivalent = exp\ exp\left(\frac{\widehat{\beta}_6}{\widehat{\beta}_5}\right) - 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

The coefficient values of tariff (β5) and the NTMs (β6) obtained by solving the gravity model equation 3 were used for this estimation.

By calculating the AVE of NTMs, the effects of NTMs on trade with the effects of tariffs can be compared. (Kee et al., 2009; Kalaba and Kirsten, 2012). One way to calculate AVE is to analyse the price gap generated by implementing NTMs. Following Kee et al. (2009), first, the study used the gravity model to assess the effects of NTMs on the value of imports and then the results of the model were converted to AVEs using import demand elasticities.

RESULTS AND DISCUSSION

This study includes both cross-sectional and time-series data. Therefore, data were arranged as a panel data set. When comparing the time series and cross-sectional data, the advantage of using panel data is that it can minimise the biases caused by heterogeneity in different countries or regions.

To summarise the data used for this study, the mean value, standard deviation, the minimum and maximum values of the data are presented (Table 1). In this study, the export values of tea at HS 4-digit level to its major export destinations, the GDP of Sri Lanka and ten importing countries, and the distance between the capital cities of Sri Lanka and importer countries were considered for all ten countries. All ten export destinations except UAE do not have colonial relationships. Also, tariff and NTM data are not available for some importer countries.

Table 2: Descriptive statistics of the variables used in the study

Variable	Unit	Obs.	Mean	Std. Dev.	Min	Max
Export value	US$	100	5.08e+07	5.84e+07	5,805,397	2.82e+08
Exporter GDP	Thousand US$	100	7.36e+07	1.31e+07	4.96e+07	8.84e+07
Importer GDP	Thousand US$	100	4.24e+09	5.57e+09	2.18e+08	2.14e+10
Distance	Kilometers	100	8614.373	4260.107	3342.212	15796.09
Common colony	Dummy	100	.1	.3015113	0	1
Tariff	Percentage	100	4.0751	5.142252	.01	15
NTMs	Dummy	100	.67	.4725816	0	1

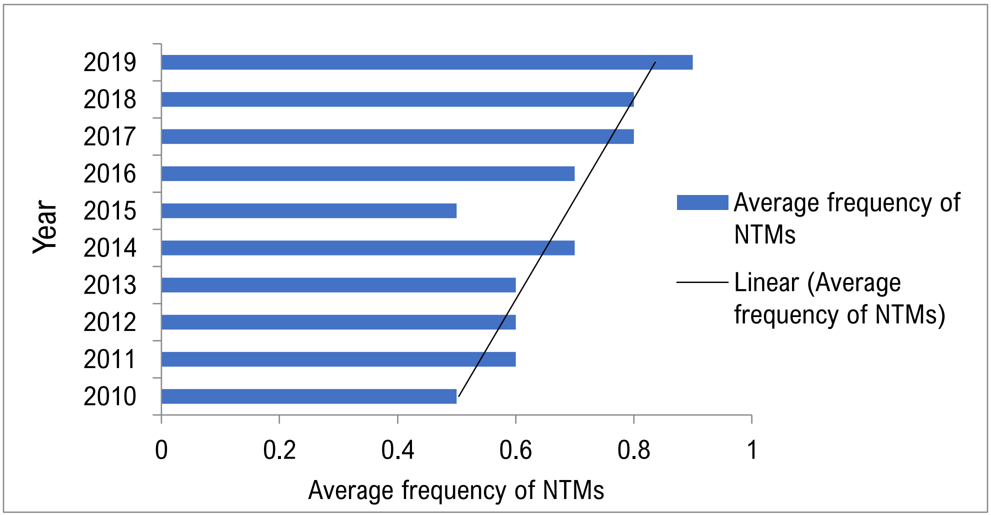
Source: Authors' calculations using gravity dataset

Prevalence of NTMs Imposed by Major Importing Countries of Sri Lankan Tea

NTMs for tea exports from Sri Lanka have increased from 2010 to 2019 (Figure 3). The highest frequency of NTMs was reported in 2019, and the lowest in 2015. The values in 2012, 2013, 2015, and 2018 represent the lowest points along the trend line. When considering each export destination, the average frequencies of NTMs vary from 0.1 to 1 (Figure 4).

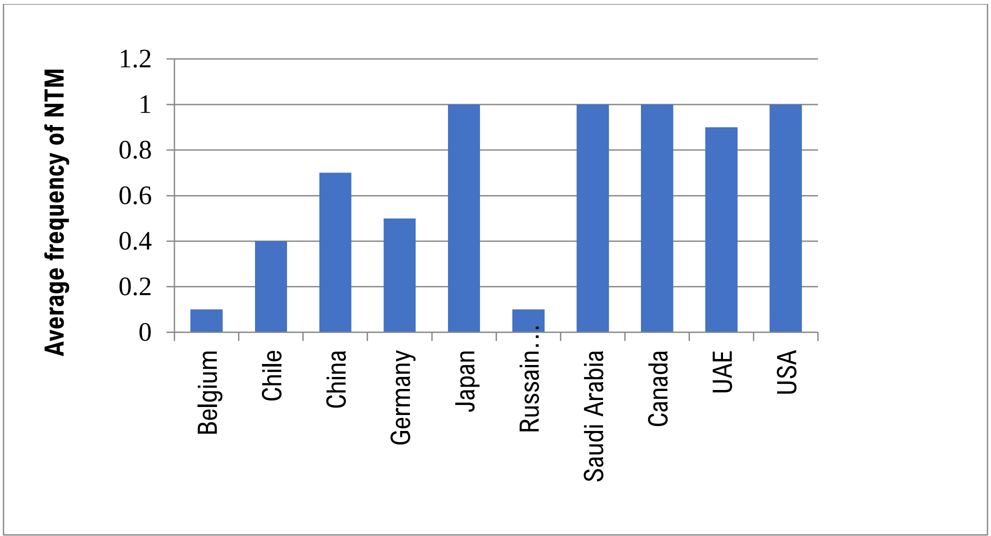
The USA, Canada, Saudi Arabia, and Japan recorded the highest frequency of NTMs from 2010 to 2019. These countries imposed NTMs on tea exports from Sri Lanka every year over the period under review, while other countries reported NTMs only for some years.

Figure 3: Average frequencies of NTMs



Source: Authors' calculation based on NTM data from I-TIP Database

Figure 4: Average frequencies of NTMs of different export destinations



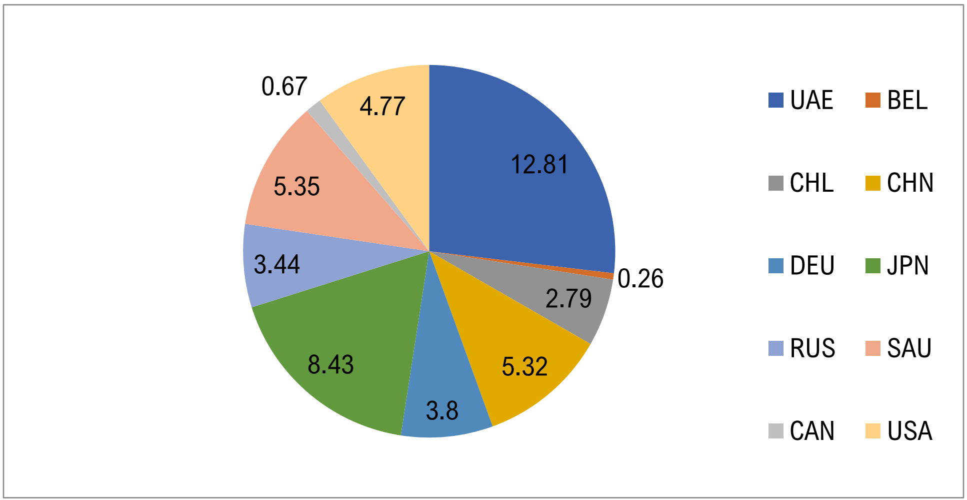
Source: Authors' calculation based on NTM data from I-TIP Database

The percentage of tea exports from Sri Lanka subjected to NTMs was calculated using the coverage ratio1. The results are presented in two ways as year-wise and country-wise analysis. The percentage of tea exports subjected to NTMs to different export destinations is presented in Figure 5, while the same year-wise are shown in Figure 6. Tea exports

[1]The coverage ratio was calculated as a percentage of the total value of tea exports from Sri Lanka to the selected ten destinations.

subjected to NTMs to the UAE show a higher percentage because the country imports a large volume of Sri Lankan tea and has almost 90% of the average frequency of NTMs.

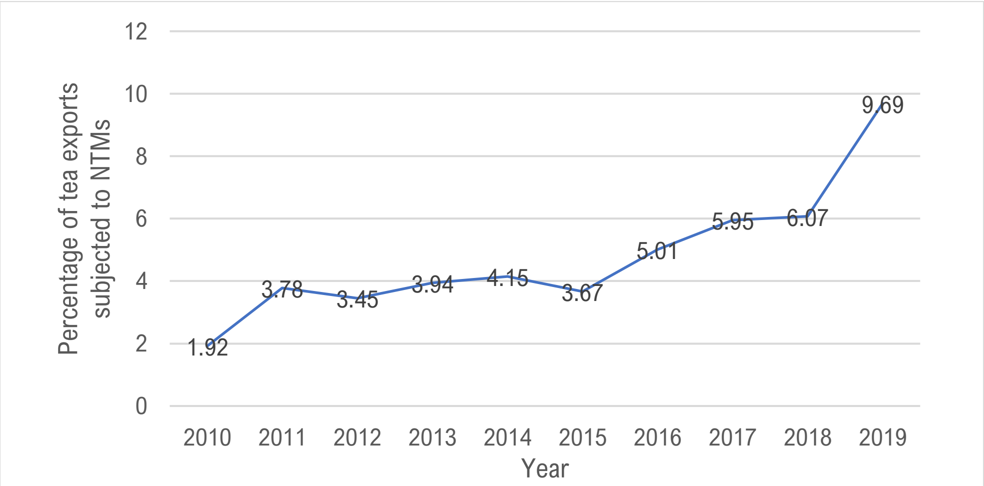
Figure 5: Percentage of tea exports subjected to NTMs from 2010-2019 by importing countries



Source: Authors' calculation based on NTM data from I-TIP Database.

These percentage values depend on both export volumes and the frequency of NTMs. When considering the time, the percentage of tea exports subjected to NTM variation depends on the frequency of NTMs rather than the export volume because, over the period percentage of tea exports subjected to NTMs has been increasing along with the average frequencies of NTMs. However, the export volume over this period has decreased.

Figure 6: Percentage of tea exports subjected to NTMs from selected export destinations (Year)

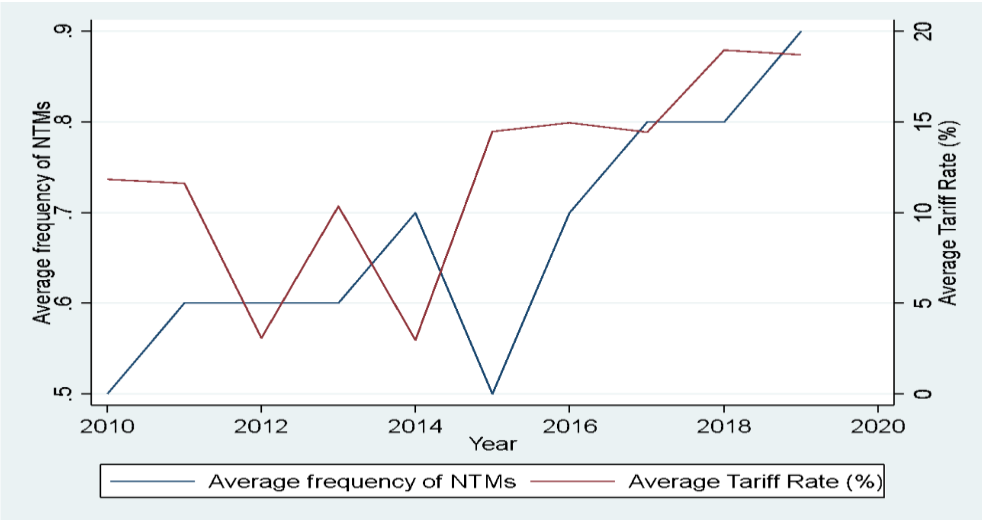


Source: Authors' calculation based on NTM data from I-TIP Database

The gravity model approach was used to analyse the effects of NTMs on tea exports of Sri Lanka, using OLS estimation. For the regression, natural logarithm values were taken for the variables, namely, export values, GDPs of the exporter and importer countries, the distance, and tariff. The dummy variables were used for the presence of colonial ties and NTMs. The regression results were checked for heteroscedasticity and multicollinearity problems. The Breusch-Pagan test result shows that the probability value is less than 0.05. Hence the test's null hypothesis, i.e., constant variance, is rejected. It implies that the regression results are subjected to the heteroskedasticity problem. STATA corrected this problem using the "*vce(robust)*" option. According to the VIF results, this dataset has no multicollinearity problem. Table 2 presents the regression results of OLS estimation and OLS robust estimation.

Figure 7 shows that the average frequency of NTMs and the average tariff rate fluctuate over the period reviewed. However, in general, both increase over time. It reflects that there were more and more restrictions imposed on tea exports from Sri Lanka.

Figure 7: Changes in average tariff rate and average frequency of NTMs



The Effects of NTMs on Tea Exports of Sri Lanka

According to the results, all the variables except tariff bear the expected signs, and the other variables are statistically significant except the GDP of Sri Lanka. The GDP of Sri Lanka, the GDP of importing countries, common colonies, and tariffs bear positive signs implying some positive effects on tea exports of Sri Lanka. The other two variables, the distance and NTMs, bear negative signs. As expected, NTMs have a negative effect on tea export from Sri Lanka. That is, one additional NTM from importing country leads to a 48% decrease in tea export value. The GDP of importing country found to increase the value of tea exports. It shows that a 1% increase in importing country's GDP increases the tea export value of Sri Lanka by 0.13%. According to the results, the GDP of Sri

Lanka positively affects the value of tea exports. However, the evidence is insufficient to say it is a significant effect. The colonial relationships show a positive effect on tea exports. If the export destination Sri Lanka chooses has a colonial relationship, the tea exports will likely be boosted by 103.4%. Distance reduces the flow of tea exports in magnitudes; a 1% increase in the distance to the Sri Lankan export destination reduces the value of exports by 0.57%.

Table 3: Regression results of the gravity model analysis

Variable	Description	OLS	Robust
ln_gdp_exp	Natural logarithm of exporter's GDP	0.385 (1.12)	0.385 (1.02)
ln_gdp_imp	Natural logarithm of importer's GDP	0.133* (2.34)	0.133** (2.97)
ln_discap	Natural logarithm of distance between capital	-0.568*** (-3.76)	-0.568*** (-4.66)
d-comcol	Dummy of common Colony	1.034*** (3.60)	1.034*** (5.81)
ln_tariff	Natural logarithm of (1+tariff)	0.451*** (6.46)	0.451*** (6.49)
d_NTM	Dummy of NTMs	-0.484*** (-3.15)	-0.484*** (-2.74)
Constant		12.31 (1.89)	12.31 (1.68)
R-squared		0.533	0.533
F		17.66	19.88
Observations		100	100

Notes: t statistics in parentheses.

*, **, *** Denotes significance at 0.05, 0.01, and 0.001 levels respectively.

Source: Authors' estimates of gravity model using STATA version 16.0.

Based on the theory of gravity model, the GDP of the exporter and importer countries positively correlates with trade flows and hence the export flows. The estimation results of the GDP importer country are consistent with the previous studies, which found that the GDP of the importer country has a positive effect on exports (Hwang and Lim, 2017; Sandaruwan et al., 2020; Permata and Handoyo, 2019; Kalaba and Kirsten, 2012; Nardella and Boccaletti, 2004). Hwang and Lim (2017) find that the importer country's GDP increase the tea trade value by 46%. Kalaba and Kirsten (2012) obtained a positive correlation between export value and the GDP of the importer countries for five products out of eight. The result of the importer's GDP has a positive and insignificant effect. This is incompatible with the gravity model theories and past empirical studies. According to the economic and social statistics of Sri Lanka (2019), there were not many changes in the GDP growth rate throughout the period under review. This may lead to a statistically insignificant correlation between the GDP of Sri Lanka and tea export value.

Other variables used in the empirical gravity model of this study, except GDPs, are proxies for trade costs. According to the theory of gravity model, trade costs are inversely proportional to the trade flows. According to that, the trade costs used in this study (distance, tariff, and NTM) should negatively correlate with trade or flows. The regression result of the distance variable aligns with the theory and is consistent with the previous research (Kalaba and Kirsten, 2012; Dong and Zhu, 2015; Hwang and Lim, 2017; Permata and Handoyo, 2019; Sandaruwan et al., 2020). Regression results of a study by Kalaba and Kirsten (2012) showed negative signs for all products. Dong and Zhu (2015) obtained a negative sign for the coefficient of distance variable. Hwang and Lim (2017) said that the distance between partner countries decreases both the probability and trade value between partner countries.

The tariff comes under trade costs in the gravity model. Based on the theory of gravity model, tariff negatively affects trade flow and exports. In most previous studies, this has been proved. However, the estimation of tariff obtained in this analysis is positive and consistent with some previous studies. Kalaba and Kirsten (2012) found a positive value for the tariff variable for one product in their analysis. Dong and Zhu (2015) obtained a positive value using the OLS estimation. Peterson et al. (2013) have obtained this except for two model specifications out of seven. Peterson et al. (2013) stated that this exception resulted from low tariff rates on the United States' fresh fruits and vegetable imports, and this rate remains throughout the period under review. This study also has a low tariff rate on tea over the sample period, with a minimum value of 0.01% to a maximum of 15%. Out of 100 observations in this study, 63% of observations have a tariff rate of less than 5%, which might be a reason for the obtained positive sign for this coefficient.

NTMs also come under trade costs. It means NTMs also have a negative effect on trade flows. The results of NTMs are consistent with previous studies on the same (Sandaruwan et al., 2020; Kalaba and Kirsten, 2012; Permata and Handoyo, 2019, Hwang and Lim, 2017). NTMs reduce seafood export value by 37.6% (Sandaruwan et al., 2020). Hwang and Lim (2017) studied the effects of NTMs on the tea industry using the MRL difference index. The study's results revealed that MRL difference index leads to a 14.5% reduction in tea trade value. Dong and Zhu (2015) also study the effects of NTMs on China tea exports using the MRL index. The study showed that the MRLs of chemicals decreased China’s tea exports by 0.6%.

The variable related to the culture should have positive effects on trade. Common colonial relationships as a variable related to the culture show a positive and significant effect of tea export from Sri Lanka. In their study, Kalaba and Kirsten (2012) obtained a similar finding.

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The coefficient values obtained from the gravity estimation for tariff and NTMs were introduced to the equation 3 used for tariff equivalent calculation (Table 3). Tariff equivalent value implies that NTMs have a 65.32% effect on tea exports from Sri Lanka as equivalent as tariff. This is the first study that calculated tariff equivalent values for tea exports from Sri Lanka. According to Sandaruwan et al., (2020), seafood exports from Sri Lanka has a 62.38% of tariff equivalent on NTMs. The results of the study of Kalaba and Kirsten (2012) show that, for meat products, it varies from 10% to 200% in the South African Development Community. Kee et al., (2009) estimated the trade-restrictive indicators for apparel and found that it ranges from 0% to 249%.

Table 4: Tariff equivalent values

	Coefficient of NTMs	Coefficient of tariff	Tariff equivalent (%)
Total NTMs	-0.484	0.451	65.82

Source: Authors' calculations from gravity model estimations.

CONCLUSION AND POLICY RECOMMENDATIONS

This study investigated the effects of NTMs on tea exports from Sri Lanka during 2010 to 2019 to its major ten export destinations. The partner countries used for this study are Belgium, Canada, Chile, China, Germany, Japan, Russian Federation, Saudi Arabia, UAE, and the USA. The study found that there is a positive and significant relationship between these countries' GDPs and export values of Sri Lankan tea. Hence, Sri Lanka can consider its tea export destinations as having ties with larger economies in terms of its exports will boost the economic growth through increased net exports. The distance between the capital city of Sri Lanka and the capital cities of importing countries shows a negative and significant correlation with export value, that is, the longer the distance, it will negatively affect the export flows. The study finds that NTMs have a negative and significant relationship to the tea exports from Sri Lanka implying that the necessity of removing or lowering such barriers through negotiations to foster economic growth of the country through this important major agricultural commodity.

The study also finds the tariff equivalent value of the NTMs imposed on Sri Lankan tea is high as 65.82% reflecting the importance of trade negotiations as the NTMs effect is also equal to tariff although it is not visible as a tariff. Furthermore, it implies that how big the price raising effects and hence the trade restriction effect.

Past empirical work related to the effects of NTMs on tea exports mainly focused on one type of NTMs, for example, SPS measures. However, this study evaluated the effects of total NTMs (SPS, TBT, INSP, price control measures, quality control measures, etc.) on tea exports which is the novelty of the current analysis. The estimated results of NTMs finally concluded that, NTMs cause a reduction in tea exports from Sri Lanka. However, some of these trade restrictions are to maintain the quality of the production and fulfilling such standards will value Sri Lankan tea production.

Producers, institutions, and governing bodies which are having the authority to check the quality of product and issuing certificates and policy makers are the responsible parties to address the issue of NTMs on tea export from Sri Lanka. At the basic level the country can take precautionary actions to selectively reduce some of the NTMs. Meantime, it requires improvements in institution structures, infrastructure, human resources, and capacities of institutes to increase the standards of Ceylon tea. As future research directions, it can be proposed that comparing the effects of NTMs on the tea export of Sri Lanka and its major export competitors would be beneficial.

REFERENCES

Bestbier, R. H. (2016). Factors influencing trade patterns of South Africa's fresh apple exports, with a focus on non-tariff barriers (Doctoral Dissertation, Stellenbosh: Stellenbosch University).

Cadot, O. and Gourdon, J. (2016). Non-tariff measures, preferential trade agreements, and prices: new evidence. Review of World Economics, 152(2), 227-249.

Central Bank of Sri Lanka (2019). Economic and social statistics of Sri Lanka. Colombo.

Central Bank of Sri Lanka (2019). Economic and social statistics Sri Lanka. https://www.cbsl.gov.lk/sites/default/files/cbslweb_documents/statistics/otherpub/ess_2019_e.pdf.

CEPII (2019). Gravity variables data of 2010-2019. [Online]. Retrieved on March 4, 2021, from www.cepii.fr

Dembatapitiya, P. and Weerahewa, J. (2015). Effects of regional trading agreements on South Asian trade: a gravity model analysis. Tropical Agricultural Research, 26(3), 468–485. DOI: http://doi.org/10.4038/tar.v26i3.8110

Disdier, A. C. and Marette, S. T. (2010). The combination of gravity and welfare approaches for evaluating non-tariff measures. American Journal of Agricultural Economics, 92(3), 713-726.

Dong, Y. and Zhu, Y. (2015). Effects of SPS measures imposed by developed countries on China's tea export: a perspective of differences in standards. Applied Economics and Finance, 2(4), 160–169. https://doi.org/10.11114/aef.v2i4.1175.

Ferrantino, M. (2006). Quantifying the trade and economic effects of non-tariff measures. OECD Trade Policy Papers, No.28, OECD Publishing, Paris.

Food and Agricultural Organisation (2021). Statistics. [Online]. Retrieved on January 1, 2021, from www.fao.org.

Ghodsi, M., Grübler, J., Reiter, O., and Stehrer, R. (2017). The Evolution of NTMs and Their Diverse Effects on Trade. Wiiw Research Report (No.419).

Grübler, J., Ghodsi, M., and Stehrer, R. (2016). Assessing the effects of non-tariff measures on imports. The Vienna Institute for International Economic Studies.

Henson, S., and Loader, R. (2001). Barriers to agricultural exports from developing countries: the role of sanitary and phytosanitary requirements. World Development, 29(1), 85-102.

Hilal, M., and Ismail, M. (2020). Sri Lanka's tea economy: issues and strategies. Journal of Politics and Law. 13(1), 1–11. https://doi.org/10.5539/jpl.v13n1p1.

Hwang, C. W. andLim, S. S. (2017). Effect of non-tariff measures on international tea trades. 21(4), 309–323. https://doi.org/10.1108/JKT-05-2017-0054.

Kalaba, M. and Kirsten, J. (2012). Estimating the quantity effects of non-tariff measures on SADC meat and milk trade. Department of Agricultural Economics, Extension and Rural Development, 1–28.

Kee., H. L., Nicita, A.,and Olarreaga, M. (2009). Estimating the trade restrictiveness indices. The Economic Journal, 119(4), 172-199.

Mohan,S., Khorana, S., and Choudhury, H. (2012). Barriers to prosperity: developing countries and the need for trade liberalilation,44, 1–34.

Nardella, M. and Boccaletti, S. (2004). The effects of EU and US agro-food non-tariff measures on exports from developing countries (No.377-2016-20859).

Nicita, A., and Gourdon, J. (2013). A preliminary analysis on newly collected data on non-tariff measures. United Naion. https://unctad.org/en/PublicationsLibrary/itcdtab54_en.pdf

Permata, S. P. and Handoyo, R. D. (2019). NTMs effects on Indonesian fishery export. Journal of Developing Economies, 4(1). https://doi.org/10.20473/jde.v4i1.12686.

Peterson, E., Grant, J., Roberts, D., and Karov, V. (2013). Evaluating the trade restrictiveness of vegetable imports. American Journal of Agricultural Economics, 1–17. https://doi.org/10.1093/ajae/aat015

Ranjan, K.R.H.M. and Edirisinghe, J.C. (2020). The effects of non-tariff measures on Sri Lankan tea trade: a Bayesian inference of the gravity model. Sri Lankan Journal of Agricultural Economics, 21(1), 17-39. http://doi.org/10.4038/sjae.v21i1.4637

Sandaruwan, K. P. G. L., Weerasooriya, S. A., and Weerahewa, J. (2020). Effects of non-tariff measures on seafood exports from Sri Lanka: a Gravity Approach. Tropical Agricultural Research, 31(3), 11–24. https://doi.org/10.4038/tar.v31i3.8393.

Tea Export Association Sri Lanka (2020). Statistics. [Online]. Retrieved on January 1, 2021, from http://teasrilanka.org.

Trienekens, G. and Zuurbier, P. (2008). Quality and safety standards in the food industry development and challenges. International Journal of Production Economics, 113(1), 107-122.

UNCTAD (2003). Dispute settlement. 3.10 Technical barriers to trade. http://unctad.org/en/docs/edmmisc232add22_en.pdf

UNCTAD (2019). International classification of non-tariff measures. United Nations Conference on Trade and Development. Geneva, Switzerland.

UNCTAD (2021). Non-tariff measures data. [Online]. Retrieved on January 1, 2021, from https://unctad.org.

United Nations. UN Comtrade Database. [Online]. Retrieved at https://comtrade.un.org/.

Wood, J., Wu. J., Li, Y., and Kim, J. (2017). TBT and SPS effects on Korean exports to China: an empirical analysis using the PPML method. https://doi.org/10.1111/apel.12186.

World Integrated Trade solution (2021). Tea tariff data of 2010-2019. [Online]. Retrieved on January 4, 2021, from https://wits.worldbank.org.

World Trade Organisation and the United Nations (2012). A practical guide to trade policy analysis. World Trade Organisation. Geneva, Switzerland.

World Trade Organisation Integrated Trade Intelligence Portal (2019). Data non-tariff measures of 2010-2019. [Online]. Retrieved on January 1, 2021, from https://i-tip.wto.org.