The Export Performance of the Sri Lankan Tea: An Econometric Analysis

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Abstract **- Sri Lanka is the fourth-largest tea producer and the world's third-biggest tea exporter. It is vital to investigate why Sri Lanka lost her second place as an exporter of tea and how she can regain this status. Current research fills the literature gap by exploring the tea export industry. The current research uses time-series data from 1989 to 2020, and the time-series properties were evaluated using the ADF unit root test. The Autoregressive Distributed Lag (ARDL) Model looked at the long-run and short-run relationship between variables. The ARDL bound test showed that tea export is cointegrated with the other three variables (tea production, real exchange rates, and foreign exchange earnings). When considered, the foreign income has a substantial long-run and short-run influence on tea exports, whereas real exchange rates suggest only significant short-run effects. Total tea production serves as a supply constraint and has a significant long-run effect, while one-period lag tea production has a significant short-run impact. This study recommends that policymakers ensure an export quality tea production to acquire a place before on the global export market.**

Keywords**: ARDL Approach, Foreign Income, Real Exchange Rates, Tea Export, Trade Models**

I. INTRODUCTION

Sri Lankan tea or "Ceylon tea" is renowned worldwide for its flavor and fragrance. Sri Lanka currently ranks as the fourth largest tea producer and the world's third-largest exporter of tea (T.E.A., Sri Lanka, 2021). Tea is one of Sri Lanka's primary export agricultural products, contributing 0.7 percent to the country's GDP (6.9 percent to the agricultural component of GDP) (C. B. S. L., 2019). India, Sri Lanka, China, and Kenya contribute more than 75 percent to global production and 71 percent to global exports. Vietnam and Indonesia also make a significant contribution to development and export. (Annual Report, Tea Board of Sri Lanka, 2018). Given the weakening trends in the role of Sri Lanka, one might wonder why the tea export industry has lost its second position and is now ranked third in the global tea export market.

Much research on the market for Sri Lankan black tea has been carried out so far. (Karunasena (1988), Weerahewa (1996), Ganewatta et al., (2005)) etc…). The tea production market in Sri Lanka was modeled as part of an economic model of the economy of Sri Lanka by Karunasena (1988). Weerahewa (1996) (as in Ganewatta et al., (2005)) developed an overall tea model considering Sri Lanka's supply and demand of tea individually and estimated tea demand for the United States, Canada, the United Kingdom, and other countries by modeling as derived demand. Bogahawatte (1989) created an econometric model to reflect the country's household and export demand for tea production and the projected elasticity of Sri Lankan tea export demand. The Ganewatta et al. (2005) research explores factors affecting the managing of value-added tea in Sri Lanka by modeling the export supply. To address global business barriers, Kamalakkannan et al. (2020) examined the social and environmental and of the Sri Lankan tea processing industry. But nobody has investigated the long-run effects and short-run dynamics on Sri Lanka's export market for black tea.

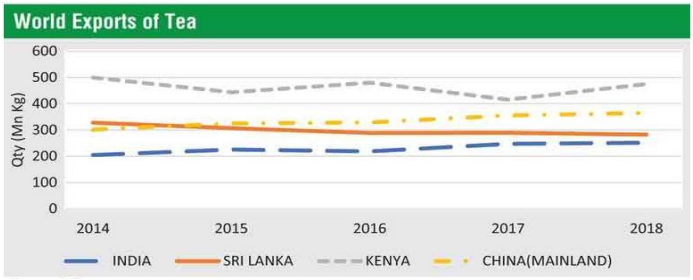
The current study aims to cover the above-mentioned literature gap by exploring the short-run and long-run effects of variables related to tea exports. This paper will be of concern to policymakers who are looking at the extent of the dynamic effect of the factors associated with tea exports. The paper is organized as follows: Section 2 prepares a literature review; Section 3 incorporates data and methods. On data interpretation and analytical observations, Section 4 elaborates. At the end, the conclusions and the policy implications are given.

II. LITERATURE REVIEW

Given the declining trends of the world market position of Sri Lankan tea, the tea export industry has lost its second place and become the third place in the global tea export market. (Figure 1). Cooray (1995) included the real price in domestic currencies, one-period lag of the inventory stocks as export drive variable, government policy variables, weighted tea demand from importing countries, and a time lag of the dependent variable to include the consequences of a partial change in its model of the world tea sector. Wei et al. (2012) studied the effect of standards of food safety on tea exports from China based on a gravity model. The production of primary commodities for selling more 'value-added' goods has become a commonly accepted growth policy in many developed countries to accelerate jobs and export revenues. The Ganewatta et al. (2005) research explores factors affecting the processing of value-added tea in Sri Lanka by

modeling the tea supply. Their model was "*ESVT=f(PVTRBT, ZVT, ER)*, where *ESVT* for the tea export supply, *PVTRBT* for the value-added tea export price relative to bulk tea exports (Rs/kg), *ZVT* for an index reflecting the tea export power, and *ER* for the exchange rate (Rs/US$)" of value-added tea and the ARDL approach applied.

Figure 1: Global Exports of Tea



Source: Ceylon Tea Brokers PLC

In traditional trade models, income and real exchange rates are primarily included. To calculate the export output of Kenya's tea exports, Were et al. (2002) used real exchange rate, real foreign income (revenues of major trading partners), and overall investment as a share of GDP as explanatory variables. Tiwari & Shahbaz (2013) and Perman (1991), Ganewatta et al. (2005), De Silva & Cooray (2020), Ginige & Cooray (2020) etc., and many researchers used the autoregressive distributed lag (ARDL) method to investigate cointegration nature and to evaluate the short-run and long-run relationships.

III. DATA AND METHODOLOGY

Sri Lankan black tea accounted for 97.53 percent of total tea exports and contributed 95.57 percent of total export revenues. (Annual Report, Tea Board of Sri Lanka, 2018). Data on time series from secondary sources is obtained from 1989 to 2020. Data are reliable since all the data are based on the Statistical Bulletin, the Tea Board, Sri Lanka, and Statistics from the Central Bank of Sri Lanka.

When it comes to the ability to analyze an economic situation, the ARDL model plays an important role. ARDL models deal with a single integration and were initially proposed by Pesaran and Shin (1999) and further expanded by Pesaran et al. (2001). This approach has some econometric advantages compared to other co-integration processes. The motivation for using ARDL is to prevent endogeneity problems and it is simultaneously calculated the long-run and short-run parameters of the model. This is one remedy to the failures in the Engle-Granger process, according to Halicioglu (2004).

According to the literature, tea export (TE_t) is estimated by the real exchange rate, (world price of tea/Colombo price of tea) *exchange rate index, (REt), the real income of trading partners is computed as GDP volume index of Sri Lanka's major trading partners; Iraq, Turkey, Russia, Iran, UAE, Libya weighted by export share (FI_t), and tea production as supply constraint (TQ_t). (Were et al. (2002), Vieira and MacDonald (2016)).

$$TE_t = f(RE_t, FI_t, TQ_t)$$

First, we used the ADF unit root test developed by Dickey and Fuller (1981) to examine the unit root properties. To investigate the existence of cointegration, we used an autoregressive distributed lag (ARDL) bound testing approach, which is developed by Pesaran et al. (2001). This approach provides the estimates of short-run and long-run parameters at the same time. And the error correction technique integrates short-run dynamics with long-run equilibrium without losing long-run information. Diagnostic tests examined the reliability of the ARDL models by the serial correlation test, normality tests, heteroscedasticity, and Cumulative Sum of recursive residuals (CUSUM) test as a stability test.

IV. DATA ANALYSIS AND EMPIRICAL FINDINGS

All variables are in logarithmic form, and the results of the stationary tests, ARDL modeling (cointegration), and the validity tests of the ARDL models are given below. The variables are tested for the presence of stationary by applying the Augmented Dickey-Fuller (ADF) unit root test before performing an econometric analysis. Table 1 reports the results of the unit root test.

Table 1: Estimation of unit root tests

ADF Test						
Variables	None		With Constant		With Constant and Linear Trend	
	T-Statistic	Prob-value	T-Statistic	Prob-value	T-Statistic	Prob-value
□LOG(TE)	-6.36	0.000**	-6.45	0.000**	-6.64	0.000**
□LOG(TQ)	-8.24	0.000**	-8.28	0.000**	-8.36	0.000**
□LOG(RE)	-7.04	0.000**	-5.86	0.000**	-5.99	0.000**
□LOG(FI)	-3.95	0.000**	-4.04	0.004**	-3.96	0.022*

Source: Author's Calculation

Note: The asterisks * and ** denote the significance at the 5 percent level and 1percent level, respectively

All variables are in logarithmic form, and the effects of the unit root test show that all variables are stationary at I (1), and this is to guarantee that none of the variables are in I (2). Therefore, this finding allows one to follow the ARDL method to explore the long-run relationship between the export of tea, the production of tea, the real exchange rate, and foreign income. The results of the ARDL bound testing approach to cointegration is shown in Table 2. F-statistics of the bound test measure has been reported to be higher than the upper critical bound 3.65 at a 1 percent significance level. These findings show that there are long-run relationships

between tea export and the other three variables (production, real exchange rates, and foreign income). Diagnostic tests have been performed to test if the findings are free from the problems of serial autocorrelation, heteroscedasticity, and residual analysis for normality. Figure 2 depicts the models' stability by plotting the cumulative sum of recursive residuals (CUSUM TEST).

Table 2: The Results of the Cointegration Test

Panel I: ARDL Long Run Form and F Bounds Tests		
Estimated model	LOGTQ, LOGRE, LOGFI, on LOGTE	
Optimal lag length	(4,4,4,4)	
F-statistics	11.390	
Outcome	Presence of cointegration at 1% level	
Critical values		
Lower Bounds I (0)		Upper Bounds I (1)
10 percent level	2.37	3.2
5 percent level	2.79	3.67
1 percent level	3.65	4.66
Panel II: diagnostic tests	Statistics	
R^2	0.998	
Adjusted-R^2	0.982	
Breusch-Godfrey Serial Correlation LM Test	0.448(0.675)	
Normality Test Jarque Bera Test	0.513(0.774)	
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.931(0.638)	
CUSUM (See Appendix)	Stable	

Source: Author's Calculation

Note: The asterisks * and ** denote the significance at the 5 percent level and 1percent level, respectively. The parenthesis () for the probability values of diagnostic tests.

Figure 2: Stability Test for Tea Export Model

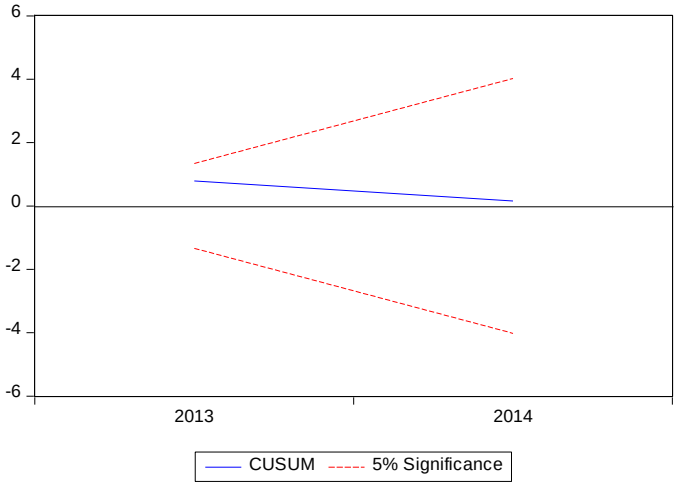


Table 3 depicts the long-run results. Tea production and foreign income show a significant positive impact on tea export in the long run while real exchange rates show an insignificant negative effect on tea export.

Table 3: Long-Run Results

Variable	Coefficient	P-Value
LOG(TQ)	0.739	0.007**
LOG(RE)	-0.010	0.741
LOG(FI)	0.029	0.086*

Source: Author's Calculation

Note: The asterisks * and ** denote the significance at the 5 percent level and 1percent level, respectively

Table 4 depicts the short-run results and their significance. The one-period lag in total tea production, foreign income, and real exchange rates show a significant positive impact on tea export in the short run. Table 5 provided a negative and considerable error correction term indicating that any disequilibrium in the tea export model will get corrected with the rate of adjustment of 234 percent on an annual basis.

Table 4: Short-Run Results from ARDL Error Correction Regression

Variable	Coefficient	Prob.
D(LOGTQ)(-1)	0.17	0.02**
D(LOGRE)	0.16	0.08*
D(LOGFI)	0.55	0.06*
CointEq(-1)*	-2.34	0.01***

Source: Author's Calculation

Note: The asterisks *, **, *** denote the significance at the 10 percent level, 5 percent level, and 1 percent level respectively.

V. CONCLUSIONS AND POLICY IMPLICATIONS

This analysis focused mainly on examining the impact of tea production, real exchange rates, and foreign income on tea exports in the short and long run. We found that all three variables used in this study were stationary in their first difference, I (1). ARDL bound testing results reveal that tea export has a long-run relationship with the other three variables, i.e., tea production, real exchange rates, and foreign income. The foreign income variable has a substantial long-run and short-run influence on tea exportation, while real exchange rates only expose considerable short-run effects. In this analysis, relative exchange rates indicate an insignificant negative coefficient of long-run effect.

Ganewatta et al. (2005) observed that the exchange rate had no significant impact on the value-added export supply of tea over the long run. In general, the exchange rates have had a profound effect on tea exports, according to Were et al. (2002), and his study had also not obtained the predicted results and further explained that there might be some anomalies, such as unexpected signs and insignificant price coefficients, particularly in the export models of developing countries. The results of the Vieira and MacDonald (2016) panel data study indicate that for a collection of developing economies, there is evidence that an increase (decrease) in real

effective exchange rate volatility decreases (increases) the number of exports. Oiro (2015) also recorded the same findings while exporting tea, coffee, and horticulture from Kenya. Vieira et al. (2016) indicate that strategies to reduce currency fluctuations should be taken in various ways if export amounts are raised.

In this study, total tea production acts as a supply constraint and it shows a significant long-run impact while one-period lag tea production shows a significant short-run impact. To retain its position as a significant sector, the government needs to pay more attention to tea production to raise its export revenue.

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