

Assessment of Sri Lankan Cinnamon Export Competitiveness in the Global Market

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ABSTRACT

Cinnamon is the most valuable and important spice export crop in Sri Lanka which accounts over 85% of the world cinnamon exports. Competitiveness is one of the major challenges in cinnamon trade in an era of free trade. Intense competition faced by Sri Lanka with other countries results in adverse impacts on cinnamon trade thus decreasing its potential trading opportunities. This study aims to analyze the export competitiveness of Sri Lankan cinnamon in the world market. The study also considers the world's top 10 cinnamon exporters. The contribution of this paper is that it measures the comparative advantage using a range of indexes namely the Balassa Revealed Comparative Advantage Index (BRCA), Additive Revealed Comparative Advantage Index (ARCA), Normalized Revealed Comparative Advantage Index (NRCA), Revealed Symmetric Comparative Advantage Index (RSCA) and Trade Balance Index (TBI) for the period from 2001 to 2020. Data are extracted from the International Trade Center (ITC) trade map (COMTRADE) database. BRCA (566.49), ARCA (0.01207), NRCA (7.28×10^{-6}), and RSCA (0.996) result indicate that Sri Lanka has the highest comparative advantage in the global cinnamon export market. Madagascar (0.999) has the highest TBI value. The result of product mapping indicates that Sri Lanka, Madagascar, Vietnam, Indonesia and China have both comparative advantage and positive trade balances over other countries.

Keywords: Ceylon cinnamon, Comparative advantage, Export competitiveness, International trade

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Introduction

Cinnamon is a tropical evergreen plant which has two main varieties, *Cinnamomum zeylanicum* (CZ) and Cinnamon cassia (CC) also known as *Cinnamomum aromaticum* / Chinese cinnamon. Cinnamon cassia (Chinese cinnamon) originated in China, and it is mainly grown in South and Southeast Asia like as India, Indonesia, Malaysia, Thailand, and Vietnam. Cassia cinnamon taste is stronger and hotter while Ceylon cinnamon is full lighter, and brighter citreous tone. But Ceylon cinnamon is considered as the world's best cinnamon, which has been originated in Sri Lanka and used in the European Union (EU), Western Asia, and Oceania with very expensive prices. Cinnamon Cassia used in Canada and the USA with low prices which causes liver damage by constant use and Ceylon Cinnamon safe for the prolonged use and has an antioxidant and antimicrobial qualities (Sri Lanka Export Development Board, 2021). Such high quality and unique chemical composition of Ceylon cinnamon cause for the high price and high demand of this variety than Chinese cinnamon. It is a strength for the cinnamon export industry in Sri Lanka. Hence, Ceylon cinnamon is very indigenous to Sri Lanka, yet it has been now grown in Madagascar, Seychelles, and Northwestern India. Therefore, Sri Lankan cinnamon export industry faces with increasing competition in the world market, although, 80% of the global demand for Ceylon cinnamon is fulfilled by Sri Lankan exporters (Sri Lanka Export Development Board, 2021).

Cinnamon also is the most important and significant spice commodity among the spice sectors. In the past decades, cinnamon used for many purposes such as medicine, spice, soft drink and perfumery material. At present, cinnamon uses as a vital ingredient in bakery products, pharmaceuticals, and cosmetics around the world. Major cinnamon exports products consist of quills, quilings, retail packs, crushed or ground cinnamon, chips and cinnamon oil. Further, cinnamon tablets, energy drinks, cinnamon tea and toothpicks have been introduced recently. But these industries are still in the infancy because of competition in world branded cinnamon by products, produced in developed countries.

When considering the cinnamon trade statistics, cinnamon export earnings in Sri Lanka increased from 46.781 million US\$ in 1971 to 2.163 billion US\$ in 2020. It is growing at an average annual rate of 12.15% (World Data Atlas, 2020). The highest growth rate was recorded with respect to the exporting cinnamon retail packs. There are about fifty export destinations for Sri Lankan cinnamon and Mexico, USA and Peru are the top three imported countries of Sri Lankan cinnamon where the demand is more than half of the total cinnamon exported.

Table 1. Average shares in value in world's cinnamon export percentage (%) (2001 – 2020)

Country	Period				
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2020
China	21.9	17.6	19	18.3	21.2
Vietnam	5.5	7.7	10.9	14.7	20
Sri Lanka	38.2	39.6	36.0	30.3	26.2
Indonesia	15.1	16.2	16.7	20.4	18.5
Netherland	3.2	3.3	2.9	3.1	2.7
Germany	1.1	1.7	1.5	1.3	1.5
USA	2.2	1.7	1.7	1.7	1.6
India	0.5	0.6	0.6	0.7	0.8
France	0.3	0.5	1.4	1.2	0.9
Madagascar	0.2	0.4	0.5	0.6	0.7

Source: Author's calculations based on ITC Database

Table 1 shows the average shares in value in world's cinnamon export in percentages. Sri Lanka had a highest share during 2001 to 2020 time period. But it can clearly identify that Sri Lankan shares were gradually declining. At the present, Indonesia, Vietnam, and China have achieved their shares nearly to the Sri Lankan shares. This is a major problem for the Sri Lankan cinnamon export competitiveness. Vietnam has gradually increased their cinnamon export shares and it can give significant competition to the Sri Lankan cinnamon export industry.

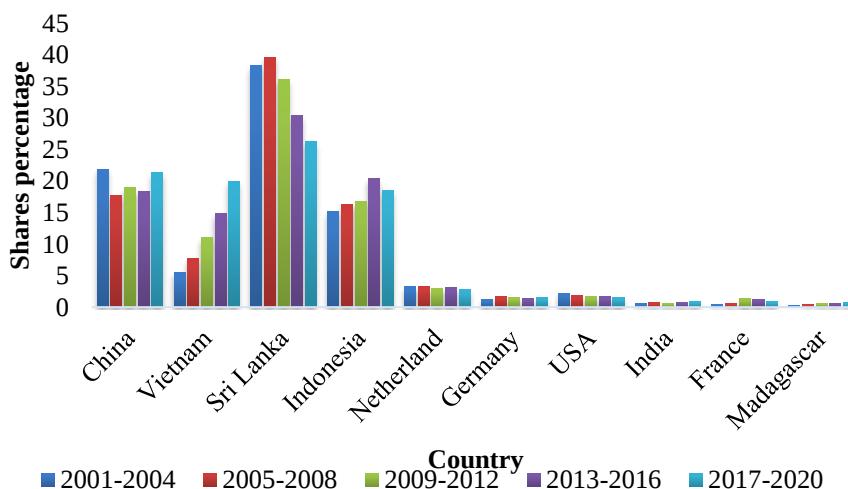


Figure 1. Comparison of average shares in value in world's cinnamon export percentages (%)

Source: Author's calculations based on ITC Database

Also, Figure 1 can be clearly defined, Sri Lankan export shares show a declining pattern while Vietnam, and Indonesia export shares show an increasing pattern, and it is an issue for Sri Lankan cinnamon trade. This evidence shows that Sri Lankan cinnamon industry is in a significant challenging situation compared with other exporters. Therefore, above export shares evidence suggest that Sri Lankan cinnamon export industry is facing more issues in exporting such as competition with Cassia cinnamon, inadequate supply of labor, land fragmentation, lack of government intervention, and inorganic fertilizer shortage for enhancing value-added industry, lack of peelers, poor quality products, and unnecessary competition of local cinnamon exporters. In addition, new Ceylon cinnamon exporters like Madagascar and Northwestern India are also entering the world market. In here, competitiveness is a major problem for the Sri Lankan cinnamon export industry. Therefore, the main objective of this study is to assess the export competitiveness of Sri Lankan cinnamon in the world market and compare the result with the world's top 10 cinnamon exporters to evaluate Sri Lanka's position in the global cinnamon trade. Following the introduction, the rest of the paper is as follows. Which is divided into five sections and in Section 2 includes the literature review of the study. It covers both theoretical and empirical review. In Section 3, we present the methodology of this study and Section 4 indicates the findings of this analysis and discussion part of the results. Finally, section 5 devotes for conclusions and future directions of this research study.

Literature Review

This section is divided into two parts. First one is theoretical review, and second part is empirical review of literature.

Theoretical Review

There are two prominent trade theories based on comparative advantage; those are the Ricardian theory and the Heckscher and Ohlin theory. Ricardian theory tells that comparative advantage arises from differences in productivity. Differences of labour productivity between nations underlie the notion of the comparative advantage. Ricardo firstly introduced the comparative advantage concept.

Also, H-O theory put forward a different explanation for the comparative advantage. Swedish economists Heckscher and Ohlin argued that comparative advantage arises from differences in national factor endowments in their theory. Leontief (1951) had examined and presented the H-O theory in his study. US data of 1947 was used for his study. US was most capital abundant nation in the world and Leontief had expected US exported capital intensive

commodities and imported labour intensive commodities. Also, he found the contrary of what he expected.

In fact, the comparative advantage of classical trade theories was determined by pre-trade relative prices. When consider the closed economy, one country has comparative advantage in a commodity if relative price of domestic goods is below its relative price in the global market. Pre-trade relative prices depend on relative cost of production and traditional measures of comparative advantage are based the comparison of pre-trade relative cost.

Empirical Review

There are many empirical studies of comparative advantage. Balassa (1965) introduced an alternative measure to calculate comparative advantage, which called Balassa Revealed Comparative Advantage Index (BRCA). It can fill the gap of absence of observable data on relative price and cost. BRCA indices have been used to measure the revealed comparative advantage of various studies.

Kuldilok *et al.*, (2013) analyzed the export competitiveness of the tuna industry in Thailand using BRCA and calculated BRCA indices for both major exporters in the world market and competitors in individual export markets. But they only used BRCA index for many export markets to measure the export competitiveness of the tuna industry in Thailand.

Suntharalingam *et al.*, (2011) undertaken a study to assess the competitive position of Malaysia's fruits against other exporters via the BRCA and Comparative Export Performance (CEP) analyses. BRCA showed that Malaysia had comparative advantage over Thailand, Indonesia, Philippines, Singapore, China and India in the global watermelon market. CEP index revealed that Malaysia was the most competitive nation in exporting watermelon and papaya to Singapore and Hong Kong. Suntharalingam and Othman (2017) assessed the competitive position of Malaysia's selected tropical fruits in comparison to five major tropical fruit exporters and three of these exporters are from ASEAN, namely Indonesia, Philippines and Thailand, and two are from Asia, China and India. This study demonstrates that Malaysia has a competitive advantage in selected fruit types. Also, its competitive position in the watermelon market, Malaysia should venture into downstream processing so as to add value, instead of focusing solely on marketing a whole fruit or minimally processed fruit. They got all of these results only using BRCA index. Also Gupta and Kumar (2015) undertook a detailed analysis of RCA of the exports of Rwanda and the BRCA index has been used for analysis. Rwanda's BRCA in its otherwise, primary exports product lines have been declining owing to increasing pressure from the supply side. Also, intense

competition from other exporting countries has made Rwandan exports uncompetitive and the country needs to invest in research and development, technological advancements and education in order to boost output and export.

When it considers the Indian studies, Nutjaree *et al.*, (2018) did an empirical study of export competitiveness in ASEAN 3, namely Indonesia, Philippines and Thailand and only used the BRCA Index. The calculation showed that the export competitiveness on agricultural products namely cocoa, cereal and maize with three ASEAN countries. This calculation was done through only one index. But Jagadambe (2016) analyzed the export competitiveness of Indian agricultural products with ASEAN countries. Trade Intensity (TI) index, BRCA index and product mapping were used in this study and found that India's export intensity in total agricultural trade was increasing with respect to ASEAN rather than with the rest of the world. Also, Vanitha *et al.*, (2014) determined India's export competitiveness and comparative advantage in exporting vegetables, Nominal Protection Coefficient (NPC), Rate of Protection, BRCA and RSCA indices were computed. They identified India has a comparative advantage in exporting onion (*Allium cepa* L.) and peas (*Pisum sativum* L.) compared to other vegetables. Those Jagadambe (2016) and Vanitha *et al.*, (2014) studies could be able to identify best results through the comparison of each indices' results because they used various indexes in their studies and found best results through the comparison. Those studies can reduce the weakness of study by Nutjaree *et al.*, (2018).

Further, Seleka and Kebakile (2017) investigated Botswana's beef export competitiveness for the period 1961-2011 using the Normalized Revealed Comparative Advantage Index (NRCA) index. This study indicated that Botswana had a comparative advantage throughout the review period and country ranked fifth out of nine leading beef export countries. Also, Seleka and Dalmini (2019) employed the NRCA index to examine the competitiveness of the African, Caribbean and Pacific (ACP) countries in the global sugar market. Results indicated that most countries had a comparative advantage in the global sugar market during the period of 1961 to 2013. Both studies used only NRCA index. NRCA can be got accurate results than BRCA index. Because it is one of the alternative indices of BRCA index. That can be assessed comparative advantage dynamically rather than statistically and NRCA can get results as symmetrically. So, sensitivity is higher than BRCA index and above both studies calculated only NRCA (Yu *et al.*, 2009).

Ahmad *et al.*, (2021) used BRCA index and its extensions to analyze the export competitiveness of major fruits and vegetables of Pakistan for the period from 2001 to 2018. They indicated that mangoes, citrus and dates had revealed comparative advantage and estimated results of various RCA indices for onions and potatoes showed both comparative advantage as well as disadvantage. The

existence of comparative advantage highlights a considerable export potential of fruits and vegetables of Pakistan. They used only one index for all calculations, and they got only one result for each commodity groups. Also, Rizwanulhassan (2013) analyzed the global competitiveness of Pakistan's agricultural exports, rice, fish and fish preparations, vegetables and fruits, meat and meat preparations, vis-à-vis major Asian competitors using the approach of BRCA index during the period from 2001 to 2010. The study indicates that rice exhibits very strong comparative advantage while an increasing trend has been observed in all other commodities reflecting heavy potentials for export growth in world market. But another study by Rizwanulhassan and Shafiqurrehman (2015) analyzed the global competitiveness of Pakistan's mango export against leading exporters/competitors of the world. In this study, BRCA, RSCA and Relative Export Advantage (RXA) were applied on mango exports of Pakistan with those of global competitors for a period from 2004 to 2012 and they revealed that the comparative advantages of Pakistan in global market for mango exports is declining during the period of study as well as India and Brazil were also on losing side but the other players like Mexico, Peru, Thailand and Philippines are gaining comparative advantage posing competition for Pakistani exports in World market. Studies by Ahamed *et al.*, (2021) and Rizwanulhassan (2013) clearly showed that, if analysis used only one index, then obtained results cannot compare with other findings. Because they used only BRCA index, and they got only one result for each commodity. Rizwanulhassan and Shafiqurrehman (2015) analyzed the global competitiveness of Pakistan's mango export against leading exporters/competitors of the world and tried to fill above identified risk using their study. They used various indices for each commodity group and got various results through the calculations of various indices for mango. Then they compared each finding and finally they obtained robust result for mango export competitiveness in Pakistan with global leading exporters.

In fact, Allo *et al.*, (2017) analyzed the dynamic changes in comparative advantage of Indonesian agricultural products. Which mainly focused for the product mapping through the RSCA combined with the TBI and used 1984 – 2014 period export and import data of Indonesian Agricultural products. In their study, they gave their conclusions using product mapping with TBI and RSCA calculations. But Subaruddin (2015) investigated export competitiveness for agricultural output in Indonesia and China using product mapping. They have applied various model for describing product mapping and those are NRCA and product mapping, Social Accounting Matrix 2008 (SAM 2008) etc. When observed various calculation with product mapping, they got most accurate results than Allo *et al.*, (2017) results.

Hettiarachchi (2018) examined the competitiveness of Sri Lanka's leading exports in the international market by using BRCA and RSCA indexes from

2008 to 2015. Their empirical results show that the export sector has changed during the last eight years and Sri Lanka enjoys the comparative advantage in 35 product categories. But cinnamon included into the spice product category and not separately focused on the cinnamon export competitiveness. Sachitra and Chong (2016) studied the enhancing competitive advantage of Sri Lankan minor export crops. This study described the competitive structure and dynamics of minor export crops sector in Sri Lanka, and they compared the performance of export growth with similar countries using the BRCA index. They analyzed comparative advantage for minor export crops. Minor export crops mainly included cinnamon, clove, and pepper. Our study is different from Sachitra and Chong (2016) as we consider a range of RCA index in our analysis namely BRCA, NRCA, ARCA, RSCA and TBI indices. Then most robust results are obtained than above study. Also, Sachithra *et. al.*, (2012) did another study based on leading exports in Sri Lanka and analyze the comparative advantage in international trade. They used BRCA, RSCA and TBI indices, however, analyzed agricultural products in one category and others are major export crops and non-agricultural products. They did not focus on the cinnamon exports. But our study focuses on cinnamon and finds more robust results than those studies.

In this paper, we tried to fill above gaps and analysis doing through the developing an approach to the most accurate identification of export competitiveness of Sri Lankan cinnamon export with the global market. So, we attempt to bridge above identified gaps using various indices to analyze the cinnamon export competitiveness.

Methodology

Theoretical Model

Balassa (1965) derived the popularly used index to measure the international trade competitiveness among the countries for the same commodity. Most RCA indices are derived from the BRCA index. The BRCA index can be expressed as follow.

$$BRCA_{ij} = \frac{\frac{X_{ij}}{X_w}}{\frac{X_i}{X_w}} \dots \dots \dots (1)$$

Where, $BRCA_{ij}$ refers to the Balassa's revealed comparative advantage index of commodity j in country i: X_{ij} is the export of commodity j by country i, X_w indicates the world export of commodity j, X_i is the total export of country i and X_w denotes the total export of world. BRCA measures the relative export

performance, when $BRCA = 1$ implies neutral comparative advantage, $BRCA > 1$ implies RCA and $BRCA < 1$ implies the revealed comparative disadvantage. There are some criticisms of the BRCA index that is, it cannot be used to make comparisons of comparative advantage across space and time, because it is neither a cardinal nor ordinal measure of comparative advantage. Another criticism is that the BRCA index is distributed asymmetrically around its mean; because it has a mean greater than 1 (the comparative-advantage-neutral point), a lower bound of 0 and no upper limit (Hoen and Oosterhaven 2006; Seleka and Kebakile 2017; Yu, Cai and Leung 2009). Alternative RCA indices developed to address some of these shortcomings have yielded improved symmetry properties of the index (Bowen 1983; Hoen and Oosterhaven 2006; Seleka and Kebakile 2017; Vollrath 1991) but have failed to address issues relating to comparison of comparative advantage across space and time (Hoen and Oosterhaven 2006; Seleka and Kebakile 2017; Yu, Cai and Leung 2009).

So, alternative measures of RCA index have been proposed in the international economics literature to address some of these shortcomings (Bowen 1983; Hoen and Oosterhaven 2006; Seleka and Kebakile 2017; Utkulu and Seymen 2004; Vollrath 1991). Such proposed indices focused to improve symmetry properties of BRCA. Those indices have yielded an improvement in the BRCA index, they have not addressed all of the shortcomings outlined earlier particularly the ability to compare comparative advantage across space and time (Seleka and Kebakile 2017; Yu, Cai and Leung 2009). Hoen and Oosterhaven (2006) proposed the Additive Revealed Comparative Advantage index (ARCA). The ARCA index is expressed as:

$$ARCA_{ij} = \left(\frac{X_{ij}}{X_i} \right) - \left(\frac{X_{wj}}{X_w} \right) \dots \dots \dots (2)$$

When $ARCA_{ij} = 0$ means the export share of commodity j by country i is equal to the export share of commodity j in the world market. It is known as the comparative advantage neutral point. If $ARCA_{ij} > 0$, which implies that country 'i' has comparative advantage for commodity j and $ARCA_{ij} < 0$ implies comparative disadvantage. When considering the advantage of this index, it produces a mean of zero, implying that an average sector lies on the comparative advantage neutral point. However, when country 'i' exports are included in the computation of world exports X_w , the index become biased (Hoen and Oosterhaven 2006; Seleka and Kebakile 2017). If country 'i' exports are excluded and the index become unbiased, but it cannot be used to make cross country comparisons.

To address these shortcomings, Yu *et. al.*, (2009) proposed another alternative version of BRCA that is normalized RCA index enabling researchers to assess

comparative advantage dynamically rather than statically. The NRCA index is expressed as follows.

$$NRCA_{ij} = \left(\frac{X_{ij}}{X_w} \right) - \left(\frac{X_{ij}X_{wj}}{X_wX_w} \right) \dots \dots \dots (3)$$

If, $NRCA > 0$, it indicates that country ‘i’ has a comparative advantage; if $NRCA = 0$, then country ‘i’ indicates the comparative advantage neutral point; if $NRCA < 0$, it indicates the comparative disadvantage. Also, one of the properties of NRCA index is that it is symmetrical index and ranging from -0.25 to +0.25 with 0 being the comparative advantage neutral point. Another property of NRCA index, is that NRCA scores for a commodity sum to zero over the countries included in the analysis. Then in order to restore the balance and if some certain countries experience a loss in comparative advantage, other countries must gain comparative advantage. Third property is that NRCA index can be used to compare the levels of comparative advantage across the countries and time.

When treating the asymmetric value problem of the Balassa’s index, Dalum *et. al.*, (1998) and Widodo (2009) have proposed the Revealed Symmetric Comparative Advantage (RSCA) index. RSCA expressed as follows.

$$RSCA_{ij} = \frac{(BRCA_{ij} - 1)}{(BRCA_{ij} + 1)} \dots \dots \dots (4)$$

RSCA ranges between -1 and +1, which is now symmetric around 0 with positive values indicating comparative advantage and negative values indicating comparative disadvantage. Since the RSCA distribution is symmetric around zero, the potential bias is avoided.

Trade Balance Index (TBI)

To analyze whether a country is a net exporter or net importer of a particular product, Lafay (1992) proposed an analytical formula namely the Trade Balance Index (TBI). TBI expressed as follows.

$$TBI_{ij} = \frac{(X_{ij} - M_{ij})}{(X_{ij} + M_{ij})} \dots \dots \dots (5)$$

Where X_{ij} and M_{ij} represent the exports and imports of commodity j by country i. TBI index value ranges from -1 to +1. If TBI equals to the -1, country only imports. If TBI equals to the +1, country only exports. If any value within the range of -1 to +1, the country exports and imports a commodity simultaneously.

When combining the RSCA and TBI indexes, the product mapping can be obtained. Which classify a product and a country in to four categories. The A category is a country have comparative advantage and country is a net exporter for considered product. The B category is a country produces product that have comparative advantage, but the country is a net importer. The C category describes the country has no comparative advantage for a particular product, but the country is a net exporter for the particular product. When consider the D category, A country that has no comparative advantage for a particular product and it is a net importer for the considered product. Figure 2 presents the above classification.

RSCA > 0	Group B Have Comparative Advantage, No Export Specialization (net importer) (RSCA>0 and TBI<0)	Group A Have Comparative Advantage, Have Export Specialization (net exporter) (RSCA>0 and TBI>0)
	Group D Have Comparative Disadvantage, No Export Specialization (net importer) (RSCA<0 and TBI<0)	Group C Have Comparative Disadvantage, Have Export Specialization (net exporter) (RSCA<0 and TBI>0)
	TBI < 0	TBI > 0

Figure 2. Product Mapping

Source: Widodo (2008)

Data Used

Secondary data such as cinnamon exports, and imports values of world's top 10 cinnamon exporters were collected for the period from 2001 to 2020. Data were extracted from International Trade Center (ITC) trade map. These countries were selected based on the export values of cinnamon in 2020.

Results and Discussion

Cinnamon export competitiveness was calculated, for world top 10 cinnamon exporting countries using various RCA indexes, namely, BRCA, ARCA, NRCA, RSCA and TBI.

When consider the BRCA index results, Table 2 explains mean BRCA scores for leading exporting countries in the global market. When it considers the 2001 - 2004 sub time period, Netherland (0.93), USA (0.22), Germany (0.12), India (0.65) and France (0.09) remained comparatively disadvantageous countries throughout the 2001 - 2004 study period as the BRCA values of those countries were less than one. In here, France indicates the lowest BRCA value for this period. Also, Sri Lanka (560.05), Vietnam (20.62), Madagascar (18.95), Indonesia (17.94) and China (4.14) indicate the BRCA values, which are higher than one. Those countries were comparatively advantageous countries from 2001 to 2004 sub-time period. Those results are same for the 2005 - 2008, 2009 - 2012 and 2017 - 2020 sub periods. But in 2013 - 2016 sub time period, it had some changes compared with other time periods. From 2013 to 2016 sub-time period, Netherland became the comparatively advantageous country because Netherland indicates 1.04 BRCA scores for this time period. Then Netherland had a comparative advantage throughout this period. When it considers the overall results, Netherland, India, USA, Germany and France are the comparatively disadvantageous countries throughout the study period while Germany (0.17) being the country with the highest comparative disadvantage. Sri Lanka, Vietnam, Madagascar, Indonesia and China were the comparatively advantageous countries throughout the study period. Considering China, mainly export the Cassia cinnamon and China had a very low comparative advantage than the others. Ceylon cinnamon exporting countries had very high comparative advantage (eg: Sri Lanka and Madagascar). However, BRCA indices can illustrate declining patterns for Sri Lanka and Vietnam. From 2001 to 2005 sub - time period, Sri Lanka indicates the 560.05 mean BRCA scores and after that scores are gradually decreasing. Finally, consider the sub- time period from 2017 to 2020, Sri Lankan mean BRCA score is 391.63. Sri Lanka BRCA scores decreasing rate is very higher than others. Madagascar becomes competitor for Sri Lanka and Madagascar is increasing its BRCA scores still 2012 at very high increasing rate due to exporting of Ceylon cinnamon variety in Madagascar. It is a risk for the Sri Lankan Cinnamon export industry. However, Sri Lanka remained as the first with the highest comparative advantage and Madagascar indicates the 2nd highest BRCA values and Madagascar gives some competition for Sri Lanka than the other countries because Madagascar reflects substantial improvement in their indices indicating rising competitiveness. Therefore, Sri Lanka needs to make much attention for this cinnamon export industry to increase the future comparative advantage than the others.

Table 2. Mean BRCA scores for world's top 10 cinnamon exporting countries (2001 to 2020)

Country	Period				
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2020
China	4.14	2.15	1.83	1.43	1.56
Vietnam	20.62	22.14	21.29	16.96	14.47
Sri Lanka	560.05	713.39	661.87	505.55	391.63
Indonesia	17.94	19.307	16.174	21.961	19918
Netherland	0.93	0.98	0.91	1.04	0.9.0
Germany	0.12	0.19	0.18	0.17	0.19
USA	0.22	0.21	0.21	0.20	0.19
India	0.65	0.64	0.44	0.46	0.54
France	0.09	0.14	0.42	0.42	0.33
Madagascar	18.95	42.2	76.67	57.02	51.30

Source: Author's calculations based on ITC Database

Table 3 elaborates the mean ARCA scores of the world's top 10 cinnamon export countries for the 2001 – 2020 sub-time period. As the evident from ARCA index calculation indicates, Sri Lanka, Madagascar, Indonesia, Vietnam and China indicate the positive scores for ARCA index. Therefore, those countries had comparative advantage throughout the study period. Also, Sri Lanka had highest ARCA scores than the other players and which had highest comparative advantage among these top 10 cinnamon exporting countries. Hence, the Sri Lanka, Vietnam, Indonesia and Madagascar can gradually increase their ARCA scores with time period. But BRCA scores has many fluctuating throughout the study period. Also, Sri Lankan BRCA scores are gradually decreasing. Because ARCA equation's 2nd variable set is constant for all countries and only 1st variable set different with each country. Sri Lankan cinnamon export has considerable percentage compare with total exports and Sri Lankan cinnamon export values gradually increasing with time. Therefore, Sri Lankan ARCA scores gradually increase with time at an increasing rate and no fluctuating. In here, Sri Lanka has obtained 1676.491×10^{-5} mean ARCA scores and Madagascar has obtained 211.94×10^{-5} mean ARCA scores during 2017 - 2020 period. Consider the overall ARCA calculations, Madagascar obtained the second highest ARCA values except 2001-2004-time period and indicates the comparative advantage. In the same way, Netherland, Germany, USA, India and France indicate the negative ARCA scores and they act as comparatively disadvantageous countries during the time period. Germany and USA represent the highest comparative disadvantage because they had highest negative ARCA scores than the other countries.

Table 3. Mean ARCA scores (in 10^{-5} units) of world's top 10 cinnamon export countries (2001 to 2020)

Country	Period				
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2020
China	5.2817	1.5875	1.4449	1.1437	2.6510
Vietnam	32.2389	29.2161	35.3152	41.5344	58.8175
Sri Lanka	904.1911	978.7869	1158.2906	1315.7805	1676.491
Indonesia	27.2382	25.2417	26.4606	56.1341	80.2878
Netherland	-0.1221	-0.0360	-0.1475	0.1347	-0.5715
Germany	-1.4511	-1.1239	-1.4381	-2.2141	-3.5355
USA	-1.2853	-1.0868	-1.3858	-2.1396	-3.5522
India	-0.5655	-0.5030	-0.9816	-1.4423	-1.9962
France	-1.5008	-1.1878	-1.0208	-1.5609	-2.9577
Madagascar	29.5136	56.763	131.2162	149.1146	211.9409

Source: Author's calculations based on ITC Database

Table 4 illustrates the NRCA scores for world's top 10 cinnamon exporters. The scores reported therein are mean values for four-year periods from 2001 to 2020. As evident from calculations, Sri Lanka, China, Indonesia, Vietnam and Madagascar had comparative advantage during all sub-periods. Those countries indicate positive NRCA scores throughout the study period. In here, Sri Lanka had highest NRCA scores throughout the study period, but Madagascar become the 5th comparative advantageous country from NRCA scores. Earlier calculated BRCA and ARCA indices revealed that Madagascar had 2nd place of comparative advantage. When consider the NRCA for Madagascar cinnamon export, Madagascar has very low cinnamon export values compare with other countries except France. Madagascar total export values also are very low. Then Madagascar has high cinnamon export contribution compare with total export values of Madagascar. In NRCA calculation, 2nd variable set shows the high values for low total export values having countries (Can't understand). Hence, Madagascar 2nd variable set indicates the high values and Madagascar 1st variable set indicates the low values due to the low cinnamon exports values. Then NRCA calculation shows the low scores for Madagascar and high total export values having countries show high NRCA values than Madagascar. Then Madagascar become 5th place in NRCA calculations. However, Netherland, Germany, USA, France and India had comparative disadvantage during the period from 2001 to 2020 because their NRCA values remained as the negative values. Period based scores revealed that Netherland had negative NRCA scores and comparative disadvantage during three sub-periods and comparative advantage (Positive NRCA scores) is seen during periods from 2013 to 2020.

Table 4. Mean NRCA scores (in 10⁻⁶ units) of world's 10 top cinnamon export countries (2001 to 2020)

Country	Period				
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2020
China	2.73	1.29	1.50	1.49	3.71
Vietnam	0.85	1.02	1.83	3.72	8.29
Sri Lanka	6.25	5.45	6.30	8.01	10.42
Indonesia	2.32	2.12	2.75	5.20	7.48
Netherland	-0.04	-0.01	-0.05	1.49	3.70
Germany	-1.41	-1.06	-1.20	-1.78	-2.83
USA	-1.35	-0.92	-1.16	-1.90	-3.03
India	-0.05	-0.05	-0.15	-0.24	-0.33
France	-0.71	-0.47	-0.34	-0.47	-0.85
Madagascar	0.04	0.05	0.10	0.18	0.30

Source: Author's calculations based on ITC Database

TBI is also used to determine the competition level of cinnamon trade among the world top 10 cinnamon exporting countries. Table 5 represents mean TBI scores for world's top 10 cinnamon exporters. TBI index of China, Vietnam, Sri Lanka, Indonesia, Netherland, USA and Madagascar have been positive for all four sub-periods. Hence, all seven countries were net exporters, while Germany and India had negative values for TBI scores, hence remained as net importers in the world trade and India gives highest negative TBI scores. France had negative TBI scores from 2001 to 2004, from 2005 to 2008, and from 2017 to 2020 but positive TBI scores from 2009 to 2012, and from 2013 to 2016 sub - period. Madagascar had highest TBI scores than the other countries and it shows the best cinnamon export performance with TBI calculation. According to the TBI calculations, Sri Lanka which gives second highest scores for TBI index. Madagascar become the highest net exporter with TBI index because both imports and exports of cinnamon data affect to the TBI results. Sri Lanka had highest cinnamon export values, but Sri Lanka had done cinnamon imports at the considerable value than Madagascar. TBI calculations results indicate the Madagascar cinnamon imports are very lowest than the others. Then Madagascar can pass the Sri Lanka and Madagascar can become the first place of net cinnamon exporter than Sri Lanka and other traders.

Table 5. Mean TBI scores for world's top 10 cinnamon exporting countries

Country	Period				
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2020
China	0.996	0.984	0.986	0.974	0.977
Vietnam	0.998	0.956	0.922	0.918	0.790
Sri Lanka	0.996	0.993	0.995	0.992	0.997
Indonesia	0.939	0.942	0.907	0.938	0.892
Netherland	0.091	0.131	0.175	0.055	-0.015
Germany	-0.490	-0.342	-0.243	-0.282	-0.263
USA	0.994	0.939	0.801	0.994	0.999
India	-0.856	-0.806	-0.837	-0.846	-0.838
France	-0.471	-0.355	0.019	0.033	-0.075
Madagascar	1	0.998	0.999	0.999	0.999

Source: Author's calculations based on ITC Database

Table 6 elaborates RSCA indices for world top 10 cinnamon exporting countries for the period from 2001 to 2020 on four-year average basis. There was a significant decline in RSCA indices of China and Vietnam. Those countries mainly export the Cassia cinnamon. Cassia Cinnamon demand is lower than the Ceylon cinnamon. Due to this reason, it may be affected to the RSCA indices scores decline in China and Vietnam. Madagascar improved its competitiveness with good competitiveness among the other leaders. RSCA indices for Sri Lanka and Indonesia were remained unchanged during the period. Netherland, Germany, USA, India and France indicate the negative RSCA scores. Those countries had comparative disadvantage during the study period. According to RSCA results, Germany had highest comparative disadvantage from 2001 to 2020. Results of NRCA, TBI and RSCA index scores are nearly matching with each other.

Table 6. Mean RSCA scores for world's top 10 cinnamon exporting countries.

Country	Period				
	2001-2004	2005-2008	2009-2012	2013-2016	2017-2020
China	0.600	0.356	0.290	0.176	0.214
Vietnam	0.907	0.913	0.908	0.885	0.870
Sri Lanka	0.996	0.997	0.997	0.996	0.995
Indonesia	0.892	0.901	0.883	0.912	0.903
Netherland	-0.039	-0.013	-0.045	0.016	-0.061
Germany	-0.794	-0.688	-0.698	-0.707	-0.681
USA	-0.643	-0.651	-0.655	-0.667	-0.681
India	-0.262	-0.242	-0.400	-0.381	-0.304
France	-0.846	-0.762	-0.413	-0.410	-0.509
Madagascar	0.898	0.942	0.973	0.965	0.960

Source: Author's calculations based on ITC Database

Figure 4 describes the product mapping for cinnamon export competitiveness among the world top 10 cinnamon exporting countries. Sri Lanka, Madagascar, Vietnam, Indonesia and China are in right side top corner because they had high RSCA and TBI scores than the others. Those countries have the reported the highest comparative advantage than other countries while being the net exporters. On the other hand, Germany, France and India have higher comparative disadvantage with net importer position than other countries. USA and Netherland had negative RSCA value and positive TBI values. But Netherland indicates the lower negative RSCA value than USA. So, Netherland comparative disadvantage is lower than the USA comparative disadvantage. When it considers the Vietnam and Indonesia, they had same level comparative advantage. But China's comparative advantage is lower than the Sri Lanka, Madagascar, Vietnam and Indonesia. China had low RSCA and TBI positive values than the earlier mentioned four countries. When consider each cell of Figure 4, USA and Netherland observe in bottom right-side cell. Those two countries remained as the net exporters but have comparative disadvantage for cinnamon export. When consider the top right-side cell, Sri Lanka, Madagascar, Vietnam, Indonesia and China observe and those countries act as a net exporter and have comparative advantage. India, France and Germany are observed in the bottom left-side cell and those three countries are remaining the net importers with comparative disadvantage.

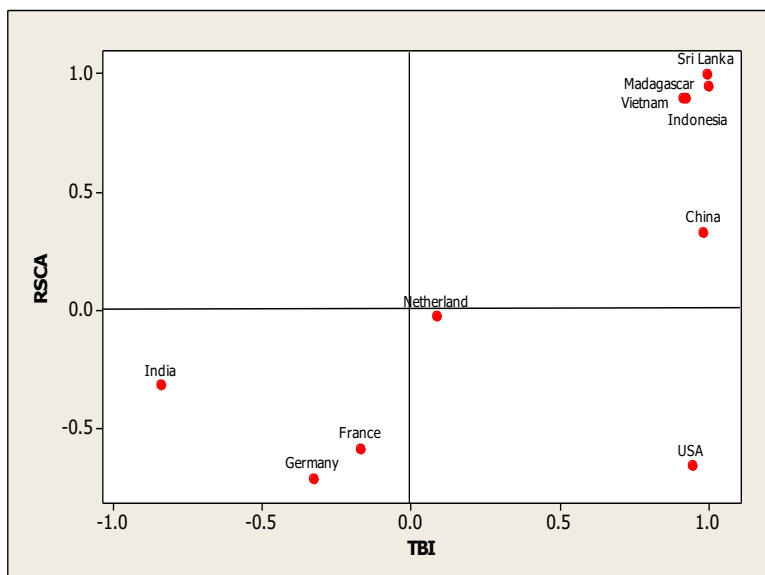


Figure 4. Product mapping for cinnamon export competitiveness

Conclusions

Based on overall study, results revealed that Sri Lanka has been the most competitive cinnamon exporter in the world market. However, Sri Lanka, Vietnam, China, Indonesia and Madagascar has comparative advantage during the reviewed period (i.e., 2001-2020). When considering the TBI scores of world top 10 cinnamon export countries, they act as net exporters in cinnamon trade since all five countries indicated positive scores. When consider the BRCA, ARCA, NRCA, RSCA and TBI scores, Netherland, USA, India, Germany and France have comparative disadvantage. These countries act as net importers in cinnamon trade. Product mapping indicated that Sri Lanka, Madagascar, Vietnam, Indonesia, and China had comparative advantage in global cinnamon market while holding the net exporter position. Netherland and USA are net exporters but had comparative disadvantage. Also, India, France and Germany have comparative disadvantage in world cinnamon market while being net importers. The results of the present study also unveiled that cinnamon export markets were getting intense competitiveness with the entry of new Ceylon Cinnamon trade players like Madagascar with improved comparative advantage. Recently competitiveness of Sri Lankan cinnamon export industry has declined due to the major reasons such as introduction of value-added cinnamon and entrants of new competitive players like Madagascar. Also, economic issues, global pandemic situation, low food safety and quality standards and lack of government intervention for the Sri Lankan cinnamon industry can be pointed out as other factors which negatively influence cinnamon trade in Sri Lanka. The study suggests analyzing determinants which affect the Sri Lankan cinnamon export competitiveness as a future research direction.

References

- Ahmad, B., Anwar, M., Hammad, B., Mehdi, M., & Farooq, T. (2021). Analyzing export competitiveness of major fruits and vegetables of Pakistan an application of revealed comparative advantage indices: *Pakistan Journal of Agricultural Sciences*. 58(2): 719-730.
- Allo, A. G., Sukartini, N. M., & Widodo, T. (2017). Dynamic Changes in Comparative Advantage of Indonesian Agricultural Products: Munich Personal RePEc Archive, 80028.
- Balassa, B. (1965). Trade liberalization and revealed comparative advantage: *The Manchester School of Economic and Social Studies*. 33: 99-123.

- Bowen, H. P. (1983). On the theoretical interpretation of indices of trade intensity and revealed comparative advantage: *Weltwirtschaftliches Archiv*. 119(3): 464-472.
- Dalum, B., Laursen, K., & Villumsen, G. (1998). Structural change in OECD export specialisation patterns: De-specialisation and 'stickiness'. *International Review of Applied Economics*. 12(3): 423-443.
- EDB (Sri Lanka Export Development Board). (2021). The difference between Cassia and true Ceylon Cinnamon. <https://www.srilankabusiness.com/blog/difference-between-cassia-and-ceylon-cinnamon.html>. Accessed June 5, 2022.
- Gupta, M., & Kumar, H. (2017). Revealed comparative advantage An analysis of exports of Rwanda: *IOSR Journal of Economics and Finance* (IOSR-JEF). 8(3): 69-76.
- Hettiarachchi, H. B. W. (2018). Revealed Comparative Advantage An Analysis Based on Leading Exports of Sri Lanka: *Journal of Humanities and Social Science*. 30-42.
- Hoen, A. R., & Oosterhaven, J. (2006). On the measurement of comparative advantage. *The Annals of Regional Science*, 40(3), 677-691.
- Jagdambe, S. (2016). Analysis of export competitiveness of Indian agricultural products with ASEAN countries: Institute for Social and Economic Change.
- Kuldilok K.S., Dawson P.J., & Lingard J. (2013). The export competitiveness of the tuna industry in Thailand: *British Food Journal*. 115(3), 328-341
- Lafay, G. (1992). The Measurement of Revealed Comparative Advantages: In *International Trade Modelling*. pp.209-234. Springer US.
- Leontief, W.W. (1951). Input-Output Economics: Scientific American, a division of Nature America, Inc, 185(4): 15-21
- Nutjaree, C., Barbaso, A., Wulansari, N., & Priambudi, M. F. (2018). Empirical Study of Export Competitiveness of Agricultural Products in ASEAN 3: Revealed Comparative Advantage (RCA) Approach: UNEJ e-Proceeding. 95-100.

- Rizwanulhassan, M. (2013). An analysis of competitiveness of Pakistan's agricultural export commodities: *IOSR Journal of Business and Management*. 11(5), 29-34.
- Rizwanulhassan, M., & Shafiqurrehman. (2015). Analysis of Competitiveness of Pakistan's Mango Exports in the World Market: *IOSR Journal of Business and Management*. 17. 69-75.
- Sabaruddin, S. S. (2015). Analisis product mapping daya saing ekspor produk primer Indonesia dan China. *Jurnal Organisasi dan Manajemen*, 11(2), 99-117.
- Sachitra, K. M. V., & Chong, S. C. (2016). Enhancing competitive advantage of Sri Lankan minor export crops: *Journal of Global Economics, Management and Business Research*. 4(4), 185-194.
- Sachithra, K. M. V., Sajeevi, G. A. C., Withanawasam, M. P. K., & Jayathilake, W. M. S. A. (2012). Comparative advantage in international trade: a study based on leading exports in Sri Lanka. 51-85
- Seleka, T. B., & Dalmini, T. S. (2019). Competitiveness of ACP Sugar Exporters in the Global Market: *The International Trade Journal*. 34(2), 247-277.
- Seleka, T. B., & Kebakile, P. G. (2017). Export competitiveness of Botswana's beef industry: *The International Trade Journal*. 31(1), 76-101.
- Suntharalingam, C., Ahmad, T. M. A. T., Ali, A. K., Rusli, R., & Halim, N. A. (2011). Competitiveness of Malaysia's fruits in the global agricultural and selected export markets: Analyses of Revealed Comparative Advantage (RCA) and Comparative Export Performance (CEP): *Economic and Technology Management Review*. 6, 1-17.
- Suntharalingam, C., & Othman, M. F. (2017). Competitiveness of Malaysia's fruits in the global market Revealed comparative advantage analysis: *Malaysian Journal of Mathematical Sciences*. 11, 143-157.
- Utkulu, U., & Seymen, D. (2004). Revealed comparative advantage and competitiveness: Evidence for turkey vis-à-vis the EU/15. European Trade Study Group 6th Annual Conference. 1-26
- Vanitha, S. M., Kumari, G., & Singh, R. (2014). Export Competitiveness of Fresh Vegetables in India: *International Journal of Vegetable Science*. 20(3): 227-234.

- Vollrath, T. L. (1991). A theoretical evaluation of alternative trade intensity measures of revealed comparative advantage: *Weltwirtschaftliches Archiv*. 127(2): 265-280.
- Widodo, T. (2008). Dynamic Changes in Comparative Advantage, Japan “flying geese” model and its implications for China: *Journal of Chinese Economics and Foreign Trade Studies*. 1(3): 200-213.
- Widodo, T. (2009). Comparative advantage: Theory, empirical measures and case studies: *Review of Economic and Business Studies*. 4: 57-82.
- World Data Atlas. (2020). Cinnamon Exports from Sri Lanka. <https://knoema.com/data/sri-lanka+foreign-trade-exports+cinnamon>. Accessed Jan 01, 2022.
- Yu, R., Cai, J., & Leung. (2009). The normalized revealed comparative advantage index: *Annals of Regional Science*. 43: 267-28.

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