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TRADE SPECIALIZATION AND COMPETITIVENESS OF THE INDIAN ONION MARKET IN RELATION TO BIMSTEC MEMBER NATIONS

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Abstract

This study examined the extent of competitiveness in onion trade specialization and the comparative advantage between India and other BIMSTEC member nations from 2005 to 2021. It used secondary data from the OEC database and factored in the repeated pandemics and trade frictions. The findings indicate that India exhibited greater competitiveness in the onion market within the BIMSTEC region. The study concluded that India has a notable advantage over other BIMSTEC member nations in onion production and export. The study employed the Revealed Comparative Advantage Index (RCA), including the Balassa, Lafay, and the Grubel-Lloyd Indices, to determine the level of intra-industry trade and the trade balance index (TBI) to determine competitiveness level. India benefits from a significant edge in onion exports due to its high production capacity and strategic geographical location near major importing nations. The study recommended that India expand

its market globally since more than half of onion exports are transacted amongst BIMSTEC nations, especially Bangladesh and Bhutan, the world's largest producer of onions. India must rethink its strategies to become the top commodity exporter globally.

Keywords: BIMSTEC, Trade, Reveal Comparative Advantage, Onion, Trade Balance Index.

التخصص التجاري والقدرة التنافسية لسوق البصل الهندي حول الدول الأعضاء في BIMSTEC

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الخلاصة

تطرقت البحث الى دراسة مدى القدرة التنافسية في التخصص التجاري للبصل والميزة النسبية بين الهند ودول (BIMSTEC) مبادرة خليج البنغال للتعاون الفني والاقتصادي متعدد القطاعات الأخرى من عام 2005 إلى عام 2021. استخدمت بيانات ثانوية من قاعدة بيانات منظمة التعاون الاقتصادي وأخذت في الاعتبار الأوبئة المتكررة والصراعات التجارية. اظهرت النتائج إلى أن الهند لها قدرة تنافسية أكبر في سوق البصل داخل منطقة BIMSTEC، واشارت الدراسة إلى أن الهند تتمتع بميزة ملحوظة على دول BIMSTEC الأخرى في إنتاج وتصدير البصل. استخدمت الدراسة مؤشر الميزة النسبية المكشوفة (RCA)، بما في ذلك مؤشرات Balassa و Lafay و Grubel–Lloyd، لتحديد مستوى التجارة داخل الصناعة ومؤشر الميزان التجاري (TBI) لتحديد مستوى القدرة التنافسية. استفادت الهند من ميزة كبيرة في صادرات البصل بسبب قدرتها الإنتاجية العالية وموقعها الجغرافي الاستراتيجي بالقرب من الدول المستوردة الرئيسية. أوصت الدراسة بأن تعمل الهند على توسيع سوقها العالمية، حيث يتم تداول أكثر من نصف صادرات البصل بين دول BIMSTEC، وخاصة بنكلاديش وبوتان، أكبر منتج

للبصل في العالم. ويتعين على الهند إعادة النظر في استراتيجياتها لتصبح أكبر مصدر للسلع الأساسية على مستوى العالم.

كلمات مفتاحية: BIMSTEC، التجارة، الكشف عن الميزة النسبية، البصل، مؤشر الميزان التجاري.

Introduction

The onion trade significantly impacts the global trade and political spheres (34) and is a highly volatile international commodity. It is a commonly consumed item due to its ability to enhance the flavor of other food ingredients. In addition to being effective against respiratory infections, it also boosts immunity, lowers cholesterol, and has many other health benefits. Onions are frequently used as a spice in South Asian cooking. Onion [HS (Harmonized System) Code: 070310] production globally stands at more than 1600 million tons, and it was the 904th most traded product in the world in 2021 at USD 3.9 billion. A growth of 0.8% year-on-year in export volume is comparable to around 0.019% of world trade.

The Netherlands is the leading exporter of onions worldwide, earning the country approximately USD 728 million in revenues (22). It is estimated that India earns USD 463 million from exporting this spice. The US is the largest importer of onions, spending USD 528 million in 2015 alone. With an annual trade volume of USD 154 million, Bangladesh is the ninth-largest importer of onions globally, while Sri Lanka ranks eleventh at USD 108 million.

The Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), a cost-effective trade bloc in Asia, comprises seven South and Southeast Asian nations- Bangladesh, Bhutan, India, Myanmar, Nepal Sri Lanka, and Thailand, that share a border with the Bay of Bengal. Trade, investment, technology, energy, tourism, and cultural interaction are the sectors where the organization hopes to boost collaboration among its member countries. The group aims to promote regional economic growth and development through deeper ties of cooperation and integration. Only seven countries comprise BIMSTEC, yet their combined population of 1.5 billion represents over 24 percent of the global total. The onion is a common and popular vegetable of the BIMSTEC area, where it is consumed as a food, used to enhance the flavor of other ingredients, or eaten raw to improve the flavor of food. Onions are a highly in-demand spice not just in South Asia but across the globe.

Table 1 shows the top 10 onion-trading countries in 2021. The Netherlands was the world’s largest onion exporter, followed by India and Mexico, while the US was the largest importer. Despite having the second position in global exports, India is the largest exporter among BIMSTEC nations, with approximately 54% of the grouping’s market share, with Pakistan in second position. China, New Zealand, Egypt, Netherlands, Spain, and France also derive a share of onion exports from BIMSTEC. Though Mexico is the world's third onion exporter, its exports to BIMSTEC are negligible. China’s export share is one-fourth and third in the BIMSTEC area, but it is first outside BIMSTEC.

Table 1: Major onion trading nations at the global and BIMSTEC level, 2021.

Country	Onion exports to (%)		Country	Onion imports from (%)	
	World	BIMSTEC		World	BIMSTEC
The Netherlands	18.65	0.17	**United States**	13.53%	0.07%
India	11.87	53.97	**Germany**	6.05%	0.10%
Mexico	10.82	0.00	**United Kingdom**	5.98%	1.20%
China	9.96	5.13	**Malaysia**	4.75%	41.08%
United States	5.87	0.00	**Canada**	4.70%	0.39%
Spain	4.42	0.02	**Vietnam**	4.40%	4.83%
Egypt	4.15	0.28	**Bangladesh**	3.95%	95.50%
Pakistan	3.78	22.03	**Japan**	3.47%	0.90%
New Zealand	3.46	0.42	**The Netherlands**	3.07%	0.18%
France	2.61	0.00	**Sri Lanka**	2.77%	67.57%

Source: Compiled from (37).

In light of the preference for spicy dishes by South Asians, it is no surprise that India exports roughly 53% of its onions to its BIMSTEC neighbor, with imports from Bangladesh and Sri Lanka ranking eighth and tenth, respectively. North American and European countries are the leading import markets, with the US and Canada importing more than 18% of the total, while the UK, Germany, and the Netherlands hold approximately 15% of the import share. India is ranked third among the top 10 exporters of onions. It is, therefore, important to examine the onion trade network, particularly in the BIMSTEC countries. Besides India, the remaining six countries of the BIMSTEC have minimal onion production and depend on imports. As a result, India can benefit from being a net exporter and attain competitiveness amongst other trade countries.

Several studies have investigated the competitiveness of Indian agricultural commodities and the shifting of trade directions (12, 26, 29, 36 and 48). However, no studies have been conducted on the competitiveness of the onion trade since India's introduction of new agricultural export policies in 2018. Considering India is the fifth largest economy in the world, BIMSTEC is now getting more attention in terms of increasing trade value and enhancing the economic cooperation of the member nations. Above all, India notably plays a vital and leading role in BIMSTEC regional trade because of its geographical and financial position. However, there is a lack of information regarding the competitiveness of India's onion production sector. Also, there is a gap in the empirical literature on India's onion trade specialization compared to other BIMSTEC countries. As such, this study addresses the gap by being the first to focus on the level of competitiveness of the onion sector between India and other BIMSTEC members based on trade patterns and specialization.

Materials and Methods

Data: Data for the study was extracted from the OEC (Accessed from: https://oec.world/) at the country level. The research is based on secondary data using the onion commodity code [HS(Harmonized System): 070310] covers the 2005-2021 period when all the seven member nations (Bangladesh, Bhutan, India, Nepal, Myanmar, Sri Lanka, and Thailand) were already part of BIMSTEC.

Method: In analyzing global trade networks, (5) noted that intra-industry trade has risen significantly due to the liberalization process in recent trade history. (59) also agreed that intra-industry trade has generally experienced a notable increase compared to inter-regional trade. According to (27), prior to the Russia-Ukraine war, intra-industry trade was the highest between the two countries, while it was the lowest between Brazil and Egypt. They concluded that geographic distance is the key factor in determining the intensity of intra-industry trade. Hence, according to some researchers (18 and 50), average per capita, geographical distance, and economic integration are vital factors for determining intra-industry trade.

Conversely, (28) claimed that intra-industry trade significantly depends on the quality of the products. They also found that the level of such trade is gradually increasing globally. Meanwhile, (16) noted that the value of agricultural export turnover has increased significantly. Moreover, (58) explored the international tourism flows of various countries and suggested that with many countries and suggested that intra-industry trade is likely to be significant in international tourism. Shifting the focus towards the trade patterns, (9) presented evidence that globalization has altered trade specializations, particularly in the significant trade flows from Lithuania to the EU within specific groupings.

In addition to the dataset, national and international literature and reports were used as inputs for this study. Multiple methodologies exist for identifying robust and vulnerable sectors within nations. One of the most widely used indices is the revealed comparative advantage (RCA) metric as refined by Bela Balassa (1 and 51), while numerous studies have investigated intra-industry trade (6). To explain comparative advantage, this study applied the (7 and 31). The Grubel-Lloyd index (54) was used to investigate the trade patterns in onions among BIMSTEC countries. The trade balance index (TBI) assesses whether a country is a net importer or exporter of a specific product (60).

Revealed Comparative Advantage (RCA) Indices: Two methods of RCA (the original Balassa and the Lafay indices), intra-industry trade (Grubel-Lloyd), and trade balance Indices, were employed to assess the comparative advantages of onions among the BIMSTEC countries. The RCA index was initially developed by Liesner in 1958 and then refined and enhanced by (7). Subsequently, it became known as the Balassa index. The RCA is widely recognized in academic literature and is utilized to gauge specialization in international trade (2, 3, 19, 24, 30, 41, 53 and 55). It is utilized to ascertain export industries' relative strengths or weaknesses in different countries. (7) defined the RCA index as:

$$RCA_{ij} = \left[\left(\frac{X_{ij}}{X_i} \right) / \left(\frac{X_{wj}}{X_w} \right) \right]$$

Where RCA_{ij} refers to the revealed comparative advantage index of sector 'j' in country 'i', X_{ij} represents the export value, X_i the overall export value, X_{wj} the total world export value of sector 'j,' and X_w world export value. The RCA index is a numerical value ranging from 0 to infinity. If the index score is one or higher, the

country has a competitive advantage in that industry. However, the proportion of that sector's exports is more than that of global trade. If the index score is below 1, the industry does not possess a comparative advantage (35, 40 and 44). The RCA index assesses the competitiveness of different sectors and sub-sectors in domestic and foreign literature. The Lafay index (LFI) considers both exports and imports, enabling the control of intra-industry trade and re-export flows (61):

$$LFI_j = 100\left\{\frac{x_j - m_j}{x_j + m_j} - \frac{\sum_{j=1}^{N}(x_j - m_j)}{\sum_{j=1}^{N}(x_j + m_j)}\right\}\frac{x_j + m_j}{\sum_{j=1}^{N}(x_j + m_j)}$$

Where,

exports of a specific product $= x_j$

imports of a specific product $= m_j$

According to this definition, the LFI maintains symmetry across all products within a country, and the sum of indices for all sectors of a given country must be zero. This specialization index of a product in a country is thus related to the deviation of the product's normalized trade balance and the country's overall trade balance, along with its share of trade. Positive values in the LFI indicate specialization, with higher values suggesting greater degrees of specialization and a larger contribution to the trade balance for the sector. Conversely, negative levels indicate dependence on imports (4, 17, 38, 42, 43 and 62). The index takes into consideration the trade flows of each sector as well as the overall sectors. Subsequently, it can determine whether a country exhibits a relatively high level of specialization in a specific sector compared to all other economic sectors. This holds even if the country is typically a net importer as long as the percentage disparity between imports and exports is smaller than the overall national disparity (14).

The Intra-Industry Trade index: The Grubel-Lloyd index measures intra-industry trade in an industry or the economy. It calculates an industry's trade volume by combining exports and imports. The absolute difference between exports and imports for a particular industry is used to compute net exports. The Grubel-Lloyd index (GL) for a product *i* is defined formally (11, 13, 15, 20, 33, 39, 46, 47 and 49) as:

$$GL_i = \frac{(X_i + M_i) - |X_i - M_i|}{(X_i + M_i)} = 1 - \frac{|X_i - M_i|}{X_i + M_i} = 1 - B_j;\ for\ all\ i = 1, 2, ..., n;$$

Where X_i is an export product of i, and M_i is an import product of i. The index values range from 0 to 1, with a value of 0 indicating only intra-industry trade and a value of 1 indicating exclusively intra-industry trade. The GL index quantifies the proportion of intra-industry trade within a specific sector or the entire economy and is often computed at the most granular level feasible. Nevertheless, this study relies on the aggregated values of the index. Aggregation can be assembled at many levels; it can be restricted to trade inside a specific sector or encompass broader categories, such as industry sectors in the economy.

The Trade Balance Index: The trade balance index (TBI) determines whether a country specializes in exporting or importing a specific category of products. It is a key variable in analyzing catching-up economies' comparative advantage and shows the

qualitative structure of product export, import, and trade flows. It is formulated as follows:

$$TBI_{ij} = \frac{x_{ij} - m_{ij}}{x_{ij} + m_{ij}}$$

TBI indicates the trade balance of *j* goods of country *i*; the export and import of *j* products of *i* countries are represented by x_{ij} and m_{ij} respectively. This index value lies between -1 and +1; when the TBI of product *j* of the country *i* is greater than 0, the country is a net exporter, and if it is less than 0, then it is a net importer (53 and 56).

Results and Discussion

This study analyzed the nature of the specialization of the onion trade at the BIMSTEC level. Apart from BIMSTEC countries, all the other countries are grouped with the rest of the world. The trade data for onions for the 2005-2021 study period is compiled from the OEC database. For analytical convenience, Bhutan is excluded from this study since it only exported once and had zero imports during 2013-2019.

Global Onion Production Trends: Table 2 depicts the top ten onion-producing nations for 2008-2021, compiled from the Tridge database. As shown, seven countries are from the Asian continent, where onions are a major component of their cuisine.

Table 2: Major Onion Producers 2008-2021 (Billion Kg).

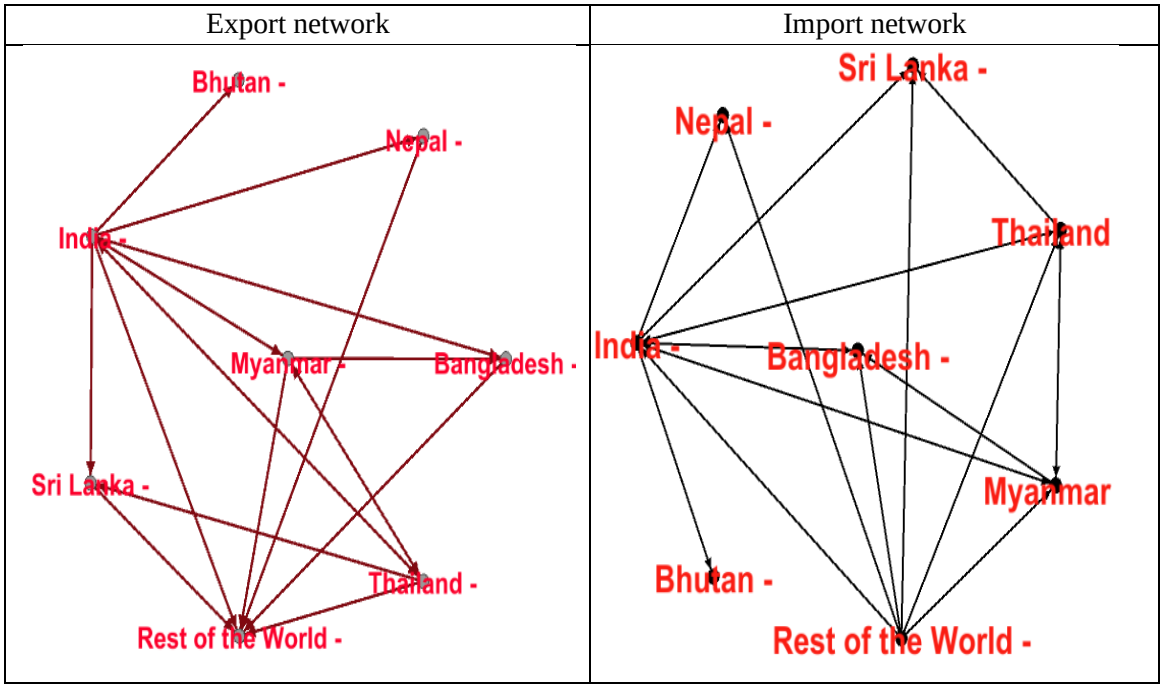
Year	India	China	Egypt	United States	Bangladesh	Turkiye	Pakistan	Indonesia	Iran	Algeria
2008	13.57	20.75	1.95	3.41	0.89	2.01	2.02	0.85	1.85	0.76
2009	12.16	21.00	2.13	3.43	0.74	1.85	1.70	0.97	1.53	0.98
2010	15.12	21.69	2.21	3.34	0.87	1.90	1.70	1.05	1.93	1.00
2011	17.51	22.00	2.30	3.36	1.05	2.14	1.94	0.89	2.17	1.14
2012	16.81	22.20	2.02	3.24	1.16	1.74	1.69	0.96	1.94	1.18
2013	19.30	22.30	1.09	3.16	1.17	1.90	1.66	1.01	2.05	1.36
2014	19.40	22.53	2.51	3.17	1.39	1.79	1.74	1.23	2.07	1.34
2015	18.93	23.38	3.05	3.41	1.70	1.88	1.67	1.23	2.43	1.44
2016	20.93	23.73	2.46	3.80	1.74	2.12	1.74	1.45	2.40	1.53
2017	22.43	23.97	2.97	3.74	1.87	2.18	1.83	1.47	1.70	1.42
2018	23.26	24.10	3.07	3.28	1.74	1.93	2.12	1.50	1.52	1.40
2019	22.82	24.44	3.08	3.17	1.80	2.20	2.08	1.58	1.98	1.61
2020	26.09	24.75	3.20	3.35	1.95	2.28	2.12	1.82	2.37	1.67
2021	26.64	24.43	3.58	3.08	2.27	2.50	2.31	2.00	1.93	1.71

Source: Adapted from (52).

Among the BIMSTEC nations, India and Bangladesh are among the top ten onion-producing nations, while India and China are leading globally. India's share has consistently increased yearly from 13.57 billion kgs in 2008 to 26.64 billion kgs in 2021, while China's increased from 20.75 billion kgs to 24.43 billion kgs for the same period. The percentage growth of India has been significantly higher than that of China and all the other nations. Despite being the top onion-producing country, India is not the largest exporter, perhaps because it satisfies the local market demand. Bangladesh's share also gradually increased from 0.89 billion kgs in 2008 to 2.27 billion kgs in 2021. It is not among the top ten onion exporters due to local demands. Despite the high local

demand, India is also the second largest exporter of onions, which explains the volume of production and the trade competitiveness of India at the world level (22).

Trends in the Onion Trade at the BIMSTEC level: Figure 1 shows the trade network in onions among BIMSTEC nations.

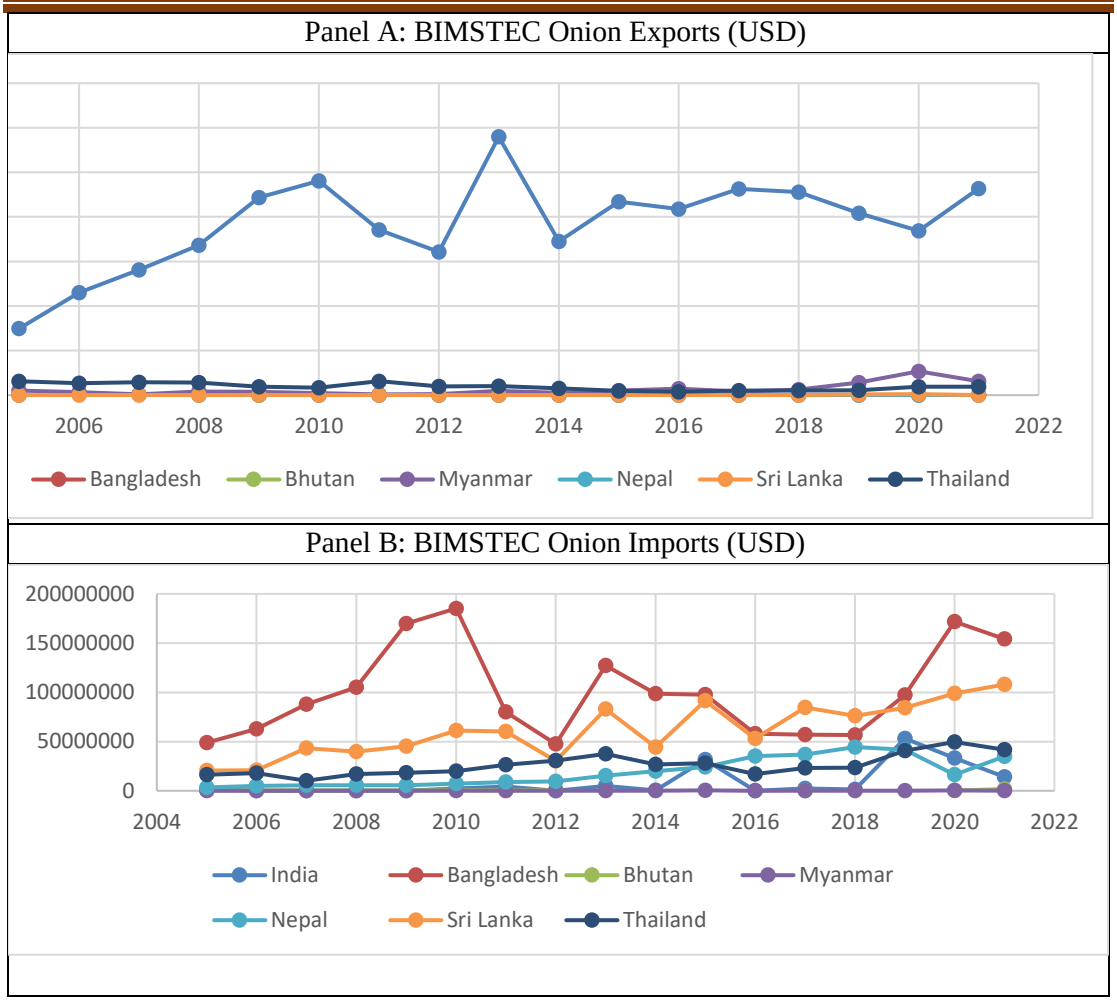


Source: Based on (37).

Fig 1: BIMSTEC trade network for onions.

The trade statistics show India as the leading exporter of onions each year from 2005-2021 amongst the BIMSTEC countries. 2005-2010, India witnessed a significant increase in onion exports each year, but exports declined in 2011 and 2012. The highest export volume was in 2013. Exports decreased in 2014 and 2020. Exports for the other years maintained their trends with some fluctuations. Exports from Thailand formed a straight-line pattern with the highest volume in 2011. Myanmar witnessed its highest exports in 2020. Both Myanmar and Thailand are strong competitors in onion exports in BIMSTEC countries.

Bangladesh was the largest importer of onions among the BIMSTEC countries, with the highest level in 2012. It experienced a gradual import increase in 2005-2010 and a sudden decline in the following 2 years, with the lowest level in 2012. Imports fluctuated slightly from 2013 to 2019 but increased in the final two years. Sri Lanka ranked second as an importer of onions among BIMSTEC countries, with the highest occurring in 2021. Thailand and Sri Lanka intersected at the same level of imports in 2012. India's highest level of imports was in 2019 (Figure 2).

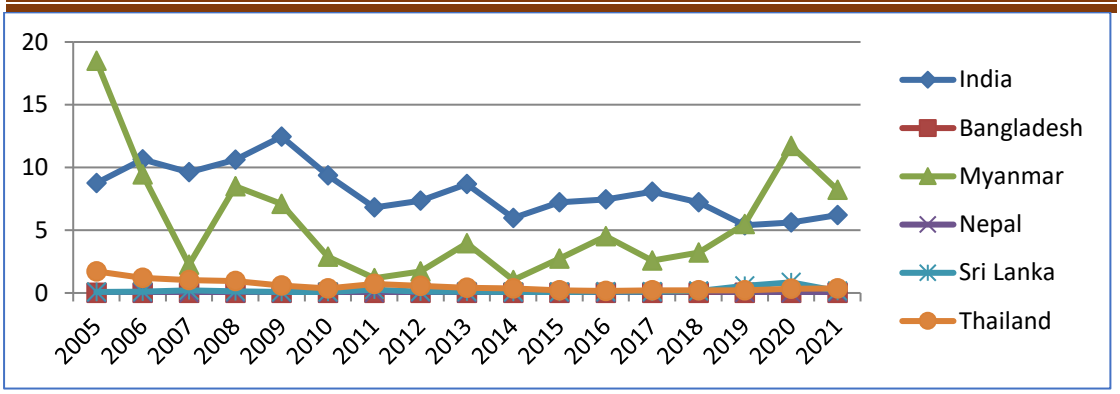


Source: (37).
Based on Tables A1 and A2 in the Appendix.

Fig 2: Onion Trade for BIMSTEC countries, 2005-2021.

Onion Trade Specialization of India at BIMSTEC Level: This subsection focuses on India's onion trade specialization compared to other countries. According to economic integration theories, free trade agreements (FTAs) can offer additional advantages to participating countries. They include enhancement of economies of scale (21), greater market competition (25), improved consumer surplus (8 and 57), and specialization of goods that help promote comparative advantages (23), amongst other.

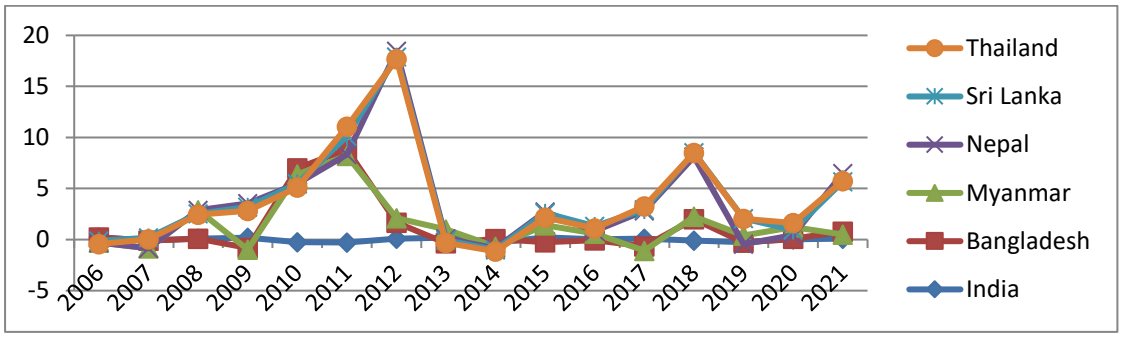
Analysis of Revealed Comparative Advantage at BIMSTEC Level: RCA index scores are determined by the share of onion exports in the overall exports of the BIMSTEC countries (Table A3). The mean scores for India (8.08535) and Myanmar (5.58960) for 2005-21 illustrate their significant competitive advantage in the onion trade, while Bangladesh (0.00323), Thailand (0.56329), Sri Lanka (0.19297), and Nepal (0.01568) lack competitiveness. The Balassa index for the study period shown in Figure 3 is based on Table A3 in the Appendix.



Source: (37).

Fig 3: Balassa Index for Onion at BIMSTEC level.

Based on the Balassa index, India has a competitive advantage in onion exports over the other BIMSTEC countries. India and Myanmar continuously enjoyed a privileged position during the study period. However, instead of examining the issue using absolute figures, this study explains this from a different viewpoint. The annual growth trend of the index for 2006-2021 is calculated, and the result is shown in Figure 4:



Source: Authors' estimates using the (37).

Fig 4: Balassa index growth rates for onions at the BIMSTEC level.

Next, a one-way ANOVA model was used to test for significant differences in the Balassa index's growth during the study period. Due to the lack of data normality and homogeneity, a one-way test was applied under Welch correction and the Games-Howell post hoc analysis. The result is presented in Table 4:

Table 4: One-way ANOVA with Welch's correction for growth in the Balassa index.

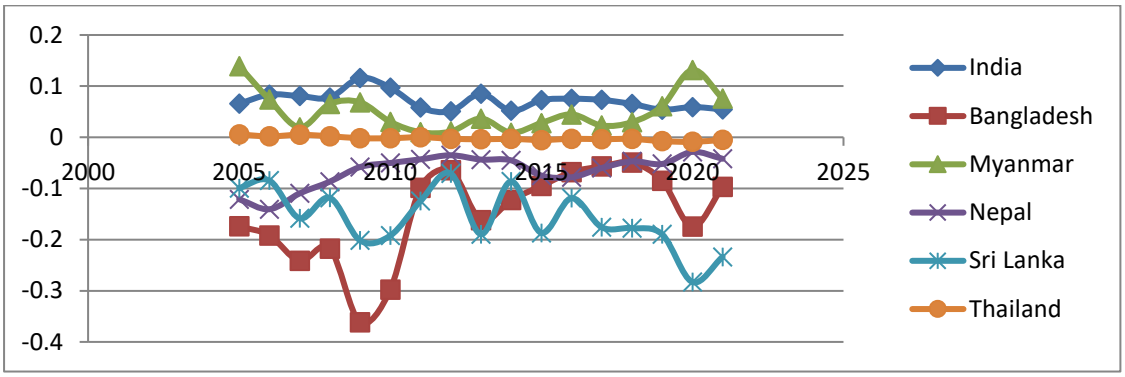
Sources of Variation	SS	Df	MS	F	p-value
Between countries (error + effect)	1424.53	5	284.91	0.94	0.46
Within countries (error only)	25479.6	84	303.33		

Source: Authors' estimations.

As seen, the null hypothesis is accepted, and no statistically significant differences exist in terms of the growth of the Balassa index during the study period at the BIMSTEC level. The Games-Howell post hoc test confirms these findings, and it was observed that there was no statistically significant pair-wise difference in the growth of the Balassa index during the study period. The relative pattern of trade specialization in terms of the Balassa index is about the same for the entire study period.

The Balassa index is based only on export figures, so the Lafay index (LFI) is applied to explore the combined export and import patterns. During the study period,

the LFI of onions revealed mixed results, with India showing a comparative advantage. The findings indicate that the higher the value of this index, the more specialized India is in the onion trade. India experienced a high degree of onion trade specialization according to the LFI values. Except for India and Myanmar, other BIMSTEC nations experienced a decline in specialization and diversification, as shown in the study. The LFI index shown in Figure 5 is based on Table A4 in the Appendix.



Source: Authors' estimates based on the (37).

Fig 5: Lafay index for onions at the BIMSTEC level.

Figure 5 shows that India and Myanmar continuously hold dominant positions in the Lafay index, implying some specialization in the inter-industry onion trade at the BIMSTEC level. Alternatively, Bangladesh, Nepal, and Sri Lanka consistently lie below the zero-threshold limit, which indicates their net importer positions. The case of Thailand is interesting as it continuously maintains its around zero level, implying practical self-sufficiency in its domestic demand through inter-industry trade within the grouping. Further, without loss of generality, significant differences exist among the LFI of onion at the BIMSTEC level. Since normality and homogeneity assumptions are lacking in the index, the one-way test under Welch growth correction was applied with the Games-Howell post hoc analysis under the null hypothesis of no statistically significant differences between the groups. The results are presented in Table 5.

Table 5: One-way ANOVA with Welch correction of growth in the Lafay Index.

Sources of variation	SS	Df	MS	F	p-value
Between groups (error + effect)	16.73	5	3.35	1.32	0.265
Within groups (error only)	228.9	90	2.54		

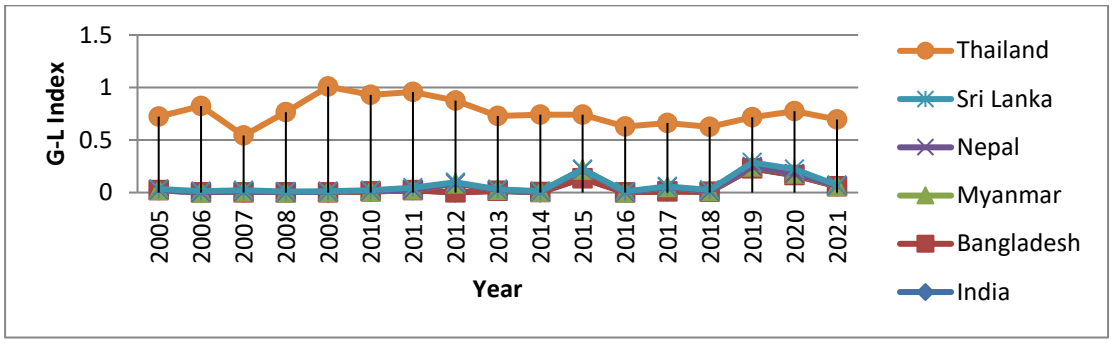
Source: Estimated by authors.

As seen, the results fail to reject the null hypothesis that there are any statistically significant differences in terms of the growth of the LFI during the study period at the BIMSTEC level. The Games-Howell post hoc test confirmed these findings that there was no statistically significant pair-wise difference in the growth of the LFI. The relative pattern of trade specialization in the LFI is also about the same during the whole study period.

Analysis of Intra-Industry Trade at the BIMSTEC Level: The findings derived from the Grubel-Lloyd (GL) index measure will be given precedence at the outset. These findings are static since they provide the annualized rate of intra-industry (IIT) derived from trade flows. Their immutability makes this so. They do not utilize shifts in trade flows to gauge IIT's progress when contrasting two eras. This kind of dynamic

information can not be gleaned from gaps in GL values across time intervals; at most, these gaps reveal data that is similar to static information. Ignoring this, learning more about IIT's development from 2005 to 2021 is possible by plotting a time series of the weighted average GL values for all sectors. With this figure, choices for future sub-periods can be narrowed for examination, expanding upon the three studied until now.

According to the findings, the onion trade that India engages in with the other BIMSTEC is characterized by a significant diversification of GL by volume - index of the intra-industry trade (in USD) for 2005-2021. India and Thailand have the highest metric value related to the discussed product, the onion. Bangladesh and Nepal have the least onion commerce within their respective industries. Their trade is characterized by a significant proportion of imports and a tiny export volume, leading to this predicament.



Source: Authors' estimates based on the (37).

Fig 6: Grubel-Lloyd Index for onions at the BIMSTEC level.

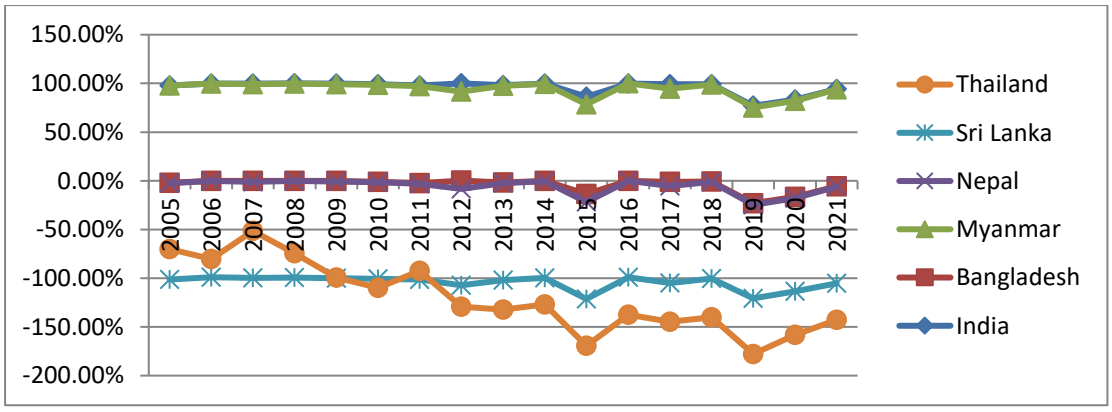
Lying between zero and one, the G-L index is analytically more convenient than other indices reported in this study. From Figure 6, Thailand's G-L index is found to be different from the other BIMSTEC nations for the study period. For confirmation, a one-way ANOVA was used to test for significant differences in index. Due to the lack of data normality and homogeneity, the one-way test under Welch correction was applied together with the Games-Howell post hoc analysis. The resulting p-value of the one-way test (p-value<0.05) confirmed this for further exploration of data the Games-Howell post-hoc test was conducted. The resulting p-value of pair-wise differences in the G-L index with the Games-Howell post hoc test revealed the statistically significant differences between the Sri Lanka-Bangladesh, Thailand-Bangladesh, Thailand-India, Thailand-Myanmar, Sri Lanka-Nepal, Thailand-Nepal, and Thailand-Sri Lanka pairings. In terms of other indices, however, Thailand's performance in the G-L index outpaced the others for the study period.

Table 6: Pair-wise test of the G-L index with and the Games-Howell post hoc test at BIMSTEC level.

	diff	ci.lo	ci.hi	t-statistic	df	p-value
India-Bangladesh	0.04	-0.01	0.09	2.37	16	0.224
Myanmar-Bangladesh	0.02	0	0.04	2.58	16.01	0.158
Nepal-Bangladesh	0	0	0	1.49	31.92	0.675
Sri Lanka-Bangladesh	0.01	0	0.02	4.43	16.03	0.005
Thailand-Bangladesh	0.69	0.57	0.81	18.26	16	<.001
Myanmar-India	-0.02	-0.08	0.03	1.27	20.74	0.797
Nepal-India	-0.04	-0.09	0.01	2.38	16	0.22
Sri Lanka-India	-0.03	-0.08	0.03	1.62	16.86	0.596
Thailand-India	0.65	0.52	0.78	15.73	22.06	<.001
Nepal-Myanmar	-0.02	-0.04	0	2.61	16.01	0.151
Sri Lanka-Myanmar	0	-0.03	0.02	0.67	21.48	0.984
Thailand-Myanmar	0.67	0.55	0.8	17.55	16.95	<.001
Sri Lanka-Nepal	0.01	0	0.02	4.5	16.03	0.004
Thailand-Nepal	0.69	0.57	0.81	18.26	16	<.001
Thailand-Sri Lanka	0.68	0.56	0.8	17.89	16.17	<.001

Source: Authors' estimates.

Analysis of the Trade Balance Index at the BIMSTEC Level: The Trade Balance Index (TBI) is another measure BIMSTEC nations use to assess the intensity of their onion trade competition. India's TBI remained constant at 0.959846 throughout the study period (2005–2021). It is fair to say that India was a net exporter for the period under consideration. The TBI for Myanmar, a net commodity exporter, was also positive during the period, while Nepal, Sri Lanka, Bangladesh, and Thailand all registered negative TBI scores. Based on Table A5 in the (Appendix), the TBI trend for the study period is presented in Figure 7.

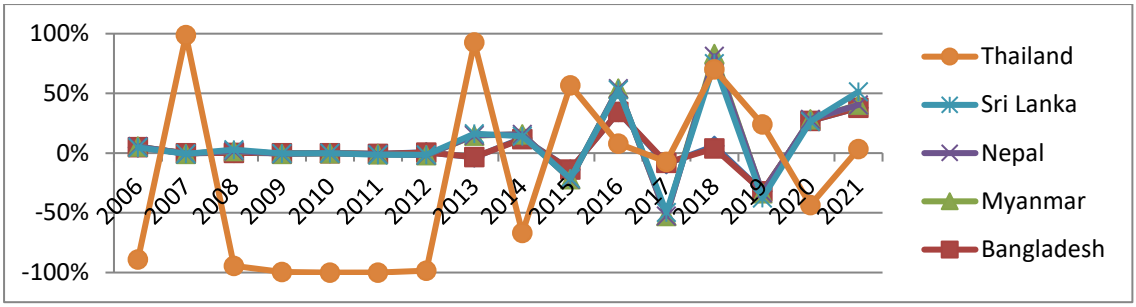


Source: Authors' estimates based on the (37).

Fig 7: Trade balance index for onions at the BIMSTEC level.

The figure shows Nepal's TBI trend lies between India and Myanmar (positive TBIs) and Sri Lanka, Bangladesh, and Thailand (with monthly onion trade deficits). All BIMSTEC member countries except Thailand registered straightforward TBI during the study period. For Thailand, the TBI trends over the years show domestic demand for onions outpacing production levels, with TBI reaching its minimum in at least two years, i.e., 2015 and 2019.

Figure 8 describes the growth of the TBI in onions at the BIMSTEC level for 2005-2021.



Source: Authors' estimates based on the (37).

Fig 8: Trade balance index growth rate for onions at the BIMSTEC level.

From 2006-12, all the member nations except Thailand registered higher TBI growth rates. After 2012, the fluctuations in the rates for Thailand continued but with less intensity. Interestingly, the spike in the growth rate of TBI in member countries in BIMSTEC member countries during the study period also fluctuated. To confirm this, the one-way ANOVA model was used to test for significant differences in the TBI growth rates. Due to the lack of data normality and homogeneity, a one-way test under Welch correction was applied together with a Games-Howell post hoc analysis. The results are as in Table 7.

Table 7: One-way ANOVA with Welch correction in the trade balance index.

Sources of variation	SS	Df	MS	F	p-value
Between groups (error + effect)	30.26	5	6.05	1.54	0.186
Within groups (error only)	353.76	90	3.93		

Source: Estimated by the authors.

Based on Table 7, the null hypothesis that there are any statistically significant differences in the growth of TBI at the BIMSTEC level is rejected. The Games-Howell post hoc test confirmed these findings, and it was observed that there was no statistically significant pair-wise difference in TBI growth during the study period. TBI's relative growth pattern is the same for the study period.

Conclusions

This study compared India's trade specialization and performance in the onion trade with those of other BIMSTEC member nations. It employed the revealed comparative advantage (RCA) approach, including the Balassa and Lafay indices, the Grubel-Lloyd index to examine the level of intra-industry trade, and the trade balance index (TBI) to determine the competitiveness levels of the member nations. The findings showed that India outperformed the other nations in onion production and exports for all the analytical approaches used, while her trade performance remained consistent over the years. The study also highlighted Thailand's noteworthy trade performance.

India has a significant edge in onion exports due to its high production capacity and strategic geographical proximity to major importing nations. Based on the RCA index, India possesses a comparative advantage over other BIMSTEC countries in the onion trade. In contrast, the Balassa index shows that India and Myanmar continuously enjoy a dominant position and that onion exports are consistently direct at the BIMSTEC

level. The Lafay index implies the same sort of trade specialization for India and Myanmar in the inter-industry onion trade of BIMSTEC. According to the Grubel-Lloyd index, India engages with other countries through a significant diversification in which Bangladesh and Nepal have the least amount of onion commerce. India's TBI remains constant, meaning it has been a net exporter for a considerable time. Besides, all BIMSTEC members except Thailand showed more or less a straightforward trade balance over the years, and its domestic demand for onion outpaced production.

The study recommended that India expand its market globally since more than half of its onion exports are transacted amongst BIMSTEC nations, especially Bangladesh and Bhutan. Moreover, India must review its global export strategies to become the top exporter of onions in line with its dominant position in producing the commodity.

This study has broader implications for the BIMSTEC region in general and other regional trade blocs. As per the trade statistics, almost 53% of the onion trade in the member countries is concentrated in a particular country. This type of monopsony in the onion trade market affects geo-political relations among member countries. Accordingly, India should concentrate on diversifying its onion trade beyond the BIMSTEC market, while onion-importing countries should explore alternative avenues for reducing market dependency when sourcing the commodity.

Like others, this study also has some limitations. The 2005-2021 study period was determined by considering various crises, such as pandemics and trade frictions in recent years. For instance, it focused exclusively on India's onion trade specialization and performance with other BIMSTEC nations, whereas it could have examined the global onion trade and other spice products. However, it cannot reflect the whole picture of BIMSTEC's onion trade changes.

Furthermore, in terms of methodology, it employed RCA and TBI, whereas OLS, trade network method, Markov matrix, and product sophistication index (PSI) could be used for deeper analysis. Future research requires a more extensive time series analysis with additional data. Apart from that, the study overlooked technological aspects, geographical area, country size production capacity, etc., where, in all respects, India is in an advantageous position to impact the trade performance of other BIMSTEC nations, often leading to political issues and debates among the onion importing nations.

Supplementary Materials:

No Supplementary Materials.

Author Contributions:

Conceptualization: Md. Monzur Hossain and Subir Kumar Sen; Data curation: Md. Monzur Hossain; Formal analysis: Md. Monzur Hossain and Subir Kumar Sen; Funding acquisition: Manav Kumar Chakma; Methodology and Software: Subir Kumar Sen; Writing – original draft: Md. Monzur Hossain and Manav Kumar Chakma; Writing – review and editing: Md. Sohanul Islam and Md Shafiul Hossain.

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References

1. Ahmad, N., and Kalim, R. (2013). Changing revealed comparative advantage of textile and clothing sector of Pakistan: Pre-and post-quota analysis. Pakistan Journal of Commerce and Social Sciences (PJCSS), 7(3): 520-544.
2. Akgüngör, S., Barbaros, R. F., and Kumral, N. (2002). Competitiveness of the Turkish fruit and vegetable processing industry in the European Union market. Russian and East European Finance and Trade, 34-53.
3. Aksoy, A., Kaymak, H.Ç. and Avcıoğlu, Ü. (2020). Walnut (Juglansregia L.) Trade: Competition power of Turkey with Balkan countries. Scientific Papers Series Management, Econ Engineering in Agriculture and Rural Development, 20(4): 11-18.
4. Allegra, V., Zarbà, C., La Via, G., and Zarbà, A. S. (2019). Why the new orange juice consumption model favors global trade and growth in orange production. British Food Journal, 121(9): 1954-1968. https://doi.org/10.1108/BFJ-05-2019-0316.
5. Algieri, B. (2004). Trade Specialisation Patterns: The case of Russia. SSRN Electronic Journal. https://dx.doi.org/10.2139/ssrn.1015446.
6. Anggrasari, H., and Mulyo, J. H. (2019). The trade of Indonesian spice comodities in international market. Agro Ekonomi, 30(1): 13-27. https://doi.org/10.22146/ae.41665.
7. Balassa, B. (1965). Tariff protection in industrial countries: an evaluation. Journal of Political Economy, 73(6): 573-594.
8. Behrens, K., Gaigné, C., Ottaviano, G. I. P., and Thisse, J.-F. (2007). Countries, regions and trade: On the welfare impacts of economic integration. European Economic Review, 51(5): 1277-1301. https://doi.org/10.1016/j.euroecorev.2006.08.005.

9. Bernatonyte, D., Burksaitiene, D., and Rimiene, K. (2013). Trade specialization pattern of Lithuania. Economics and Management, 18(4): 661-665. https://doi.org/10.5755/j01.em.18.4.5474.
10. Bernatonytė, D., and Juškienė, G. (2008). Development of intra-industry trade among the Baltic States. Social Research, (3): 32-41.
11. Bernhofen, D. M., and Hafeez, Z. (2001). Oligopolistic Competition and Intra-industry Trade: Evidence From the OECD. Australian Economic Papers, 40(1): 77-90. https://doi.org/10.1111/1467-8454.00114.
12. Bhattacharya, P. (2019). Determinants of export competitiveness of fresh fruits in India. International Journal of Sustainable Economy, 11(1): 61-80. https://doi.org/10.1504/IJSE.2019.096567.
13. Biernacka, J. (2021). Analysis of intra-industry mutual trade in the furniture manufacturing industry between the V4 and the EU-27 countries using the Grubel-lloyd index. Acta Facultatis Xylologiae Zvolen res Publica Slovaca, 63(2): 175-188. DOI: 10.17423/afx.2021.63.2.15.
14. Boffa, F., Bolatto, S., and Zanetti, G. (2010). Specializzazione produttiva e crescita: un'analisi mediante indicatori. In Economia Aziendale e Management. Scritti in onore di Vittorio Coda, 2: 1739-1758.
15. Brulhart, M., and Thorpe, M. (1999). East Asian export growth, intra-industry trade and adjustment. Asia Pacific Journal of Economics and Business, 3(2): 34-47.
16. Burianova, J., and Belova, A. (2012). The competitiveness of agricultural foreign trade commodities of the CR assessed by way of the Lafay Index. Agris on-line Papers in Economics and Informatics, 4(4): 27-36. http://dx.doi.org/10.22004/ag.econ.146274.
17. Caselli, P., and Zaghini, A. (2005). International specialization models in Latin America: the case of Argentina. Bank of Italy, Economic Research and International Relations Area.
18. Çepni, E., and Köse, N. (2003). Intra-Industry Trade Patterns Of Turkey: Apanel Study. Gazi Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 5(3): 13-28.
19. Çicek, R., and Bashimov, G. (2016). Determination of central Asia's comparative advantage in cotton trade. International Journal of Management Economics and Business, 12(28): 1-14.
20. Cimpoieş, L. (2013). Agri-food trade-a path to agricultural development of Moldova. Scientific papers. Series "Management, Economic Engineering in Agriculture and Rural Development", 49-56.
21. Corden, W. M. (1972). Economies of scale and customs union theory. Journal of Political Economy, 80(3, Part 1): 465-475.
22. Food and Agriculture Organization (FAO). (2021). FAOSTAT Statistics Database of the Food and Agricultural Organization of the United Nations (FAO); Food and Agriculture Organization (FAO).
23. Forslid, R., and Wooton, I. (2003). Comparative advantage and the location of production. Review of International Economics, 11(4): 588-603. https://doi.org/10.1111/1467-9396.00405.

24. Grigorovici, C. (2009). Analysing the degree of specialization in Romania's services trade. Romanian Journal of Economic Forecasting, 10(1): 95-115.
25. Harrison, G. W., Rutherford, T. F., and Tarr, D. G. (1996). Increased competition and completion of the market in the European Union: static and steady state effects. Journal of Economic Integration, 332-365.
26. HC, Y., and Srivastava, S. K. (2020). An application of Markov chain Model to study on trade direction of export of FCV tobacco from India. Scientific Agriculture, 4: 73-77.
27. Ischukova, N., and Smutka, L. (2014). Russia's intra-industry trade in agricultural products: the extent and major trends. Journal of central European green innovation, 2(1): 75-89. http://dx.doi.org/10.22004/ag.econ.171038.
28. Isemonger, A. G. (2000). The estimation of intra-industry trade in South Africa. Development Southern Africa, 17(1): 53-63. https://doi.org/10.1080/03768350050003406.
29. Jha, G. K., Suresh, A., Punera, B., and Supriya, P. (2019). Growth of horticulture sector in India: Trends and prospects. The Indian Journal of Agricultural Sciences, 89(2): 314-321.
30. Kanaka, S., and Chinadurai, M. (2012). A study of comparative advantage of Indian agricultural exports. Journal of Management and Science, 2(3): 175-183.
31. Lafay, G. (1992). The measurement of revealed comparative advantages. International Trade Modelling, 209-234.
32. Liesner, H. H. (1958). The European common market and British industry. The Economic Journal, 68(270): 302-316. https://doi.org/10.2307/2227597.
33. Lovely, M. E., and Nelson, D. R. (2000). Marginal intraindustry trade and labor adjustment. Review of International Economics, 8(3): 436-447. https://doi.org/10.1111/1467-9396.00233.
34. Minoia, G., Mumatz, W., and Pain, A. (2014). The social life of the onion: the informal regulation of the onion market in Nangarhar, Afghanistan. Secure Livelihoods Research Consortium.
35. Mushanyuri, B. E., and Mzumara, M. (2013). An assessment of comparative advantage of Mauritius. European Journal of Sustainable Development, 2(3): 35-35. https://doi.org/10.14207/ejsd.2013.v2n3p35.
36. Narayan, S., and Bhattacharya, P. (2019). Relative export competitiveness of agricultural commodities and its determinants: Some evidence from India. World Development, 117: 29-47. https://doi.org/10.1016/j.worlddev.2018.12.013.
37. OEC. (2023). https://oec.world/en.
38. Oger, G., Doring, M., Alessandrini, B., and Ferrant, P. (2007). An improved SPH method: Towards higher order convergence. Journal of Computational Physics, 225(2): 1472-1492. https://doi.org/10.1016/j.jcp.2007.01.039.
39. Pawlak, K., and Łukasiewicz, J. (2022). Does intra-industry specialization enhance or limit comparative advantage? Evidence from the world citrus fruit trade. Agricultural Economics, 68(9): 338-347. https://doi.org/10.17221/163/2022-AGRICECON.

40. Peker, A. E. (2015). Turkey cereals and Baklagil Sector of the substance competitive power against the European Union market. Faculty of Economics and Administrative Sciences Journal, 5(2): 1-20.
41. Pilinkiene, V. (2014). Evaluation of International Competitiveness Using the Revealed Compar-ative Advantage Indices: The Case of Baltic States. Mediterranean Journal of Social Sciences, 5(13): 353-359. DOI:10.5901/ichss-2014-vol-01.
42. Platania, M. (2014). Trade advantage of Italian industrial districts: Persistence and change. Regional and Sectoral Economic Studies, 14(2): 39-52.
43. Platania, M., Rapisarda, P., and Rizzo, M. (2015). Italian trade specialization: persistence and change in regional agri-food production. AGRIS on-line Papers in Economics and Informatics, 7(4): 101-109. http://dx.doi.org/10.22004/ag.econ.231897.
44. Rundassa, M. W., Azene, D. K., and Berhan, E. (2019). Comparative advantage of Ethiopian textile and apparel industry. Research Journal of Textile and Apparel, 23(3): 244-256. https://doi.org/10.1108/RJTA-08-2018-0049.
45. Scott, M. F. G. (1975). Intra-industry trade: the theory and measurement of international trade in differentiated products. The Economic Journal, 85(339): 646-648. https://doi.org/10.2307/2230917.
46. Shelburne, R. C. (1993). Changing trade patterns and the intra-industry trade index: A note. Review of World Economics, 129(4): 829-833.
47. Škuflić, L., and Botrić, V. (2008). Analysis of the Cohesive Trade Elements between the European Union and the SEEC-7. Eastern European Economics, 46(1): 6-23. https://doi.org/10.2753/EEE0012-8775460101.
48. Sitanini, A. (2022). Competitiveness of Indonesian coffee exports to Japan. Perwira Journal of Economics and Business, 2(1): 72-79. https://doi.org/10.54199/pjeb.v2i1.83.
49. Soo, K. T. (2016). Intra-industry trade: A Krugman–Ricardo Model and Data. Economica, 83(330): 338-355. https://doi.org/10.1111/ecca.12173.
50. Stone, J. A., and Lee, H. H. (1995). Determinants of intra-industry trade: A longitudinal, cross-country analysis. Weltwirtschaftliches Archiv, 131(1): 67-85. https://doi.org/10.1007/BF02709072.
51. Suntharalingam, C., Ahmad, T. M. A. T., Ali, A. K., Rusli, R., and 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.
52. Tridge Global Food Sourcing and Data Hub (2023). Available online: https https://www.tridge.com.
53. Terin, M. and Yavuz, F. (2018). An analysis of international competitiveness of Turkey's cheese sector in comparison with European Union countries. Turkish Journal of Agriculture - Food Science and Technology, 6(9): 1243-1250. https://doi.org/10.24925/turjaf.v6i9.1243-1250.2023.

54. Terin, M., Yildirim, I., Aksoy, A. D. E. M., and Sari, M. M. (2018). Competition power of Turkey's honey export and comparison with Balkan Countries. Bulgarian Journal of Agricultural Science, 24(1): 17-22.
55. Torok, A., and Jambor, A. (2016). Determinants of the revealed comparative advantages: The case of the European ham trade. Agricultural Economics/Zemědělská Ekonomika, 62(10): 471-481. DOI: 10.17221/177/2015-AGRICECON.
56. ShariatUllah, M., and Kazuo, I. (2012). Dynamics of comparative advantage and export potentials in Bangladesh. The Ritsumeikan Economic Review, 61(4): 1-14.
57. Viner, J. (1950). The customs union issue. Carnegie Endowment for International Peace. New York. London: Stevens and Sons Ltd, pp. viii, 221. American Political Science Review, 44(4): 1055-1055.
58. Webster, A., Fletcher, J., Hardwick, P., and Morakabati, Y. (2007). Tourism and empirical applications of international trade theory: a multi-country analysis. Tourism Economics, 13(4): 657-674. https://doi.org/10.5367/000000007782696041.
59. Widodo, T. (2009). Modified Grubel-Lloyd index: Intra-industry trade and intra-regional trade in East Asia. In MPRA Paper 77992; University Library of Munich: Munich, Germany, 1-27.
60. Widodo, T. (2008). Dynamic changes in comparative advantage: Japan "flying geese" model and its implications for China. Journal of Chinese Economic and Foreign Trade Studies, 1(3): 200-213. https://doi.org/10.1108/17544400810912365.
61. Zaghini, A. (2003). Trade advantages and specialisation dynamics in acceding countries (No. 249). ECB Working paper.
62. Zaghini, A. (2005). Evolution of trade patterns in the new EU member states. Economics of transition, 13(4): 629-658. https://doi.org/10.1111/j.0967-0750.2005.00235.x.

Appendix: List of Tables

Table A1: Onion Exports of BIMSTEC Countries (USD).

Years	India	Bangladesh	Bhutan	Myanmar	Nepal	Sri Lanka	Thailand
2005	1.49E+08	15004	0	9910509	0	91909	31040865
2006	2.3E+08	0	0	6471241	0	121516	26479664
2007	2.81E+08	0	0	1807921	0	301265	29104826
2008	3.36E+08	19480	0	8020916	401	187478	27884027
2009	4.43E+08	161	57	7735219	2808	138099	18554299
2010	4.81E+08	1610	0	4223701	209	181060	16593062
2011	3.71E+08	17074	0	1931263	201	511190	31344957
2012	3.21E+08	35755	0	2390848	2700	165679	19421691
2013	5.8E+08	26813	0	9417742	352	205888	20012418
2014	3.45E+08	33595	0	5144047	264	163479	15222084
2015	4.34E+08	24523	2	10472821	643	168040	9860014
2016	4.18E+08	21258	0	14907327	825	234353	7622773
2017	4.63E+08	5476	0	8372618	3535	264546	9994060
2018	4.56E+08	19268	0	12736009	25223	362505	10134607
2019	4.08E+08	23348	0	28064946	4743	1664058	11180183
2020	3.69E+08	21960	0	53461628	931	2212163	18948880
2021	4.63E+08	37382	0	31082502	9431	409176	19002719

Source: Authors' estimates based on OEC database.

Table A2: Onion Imports of BIMSTEC Countries (USD).

Years	India	Bangladesh	Bhutan	Myanmar	Nepal	Sri Lanka	Thailand
2005	1586998	48958513	318272	16891	3476091	20549005	16273907
2006	76862	62987713	265091	2908	4944472	20734359	18086501
2007	88690	88038896	496531	7902	5749130	43301257	10191205
2008	81037	105187166	389906	3447	5710200	39742937	16854519
2009	128650	169718858	517402	24795	5581986	45171835	18356082
2010	2488250	185274700	680879	9257	7116207	61100985	19906850
2011	4246393	79966299	512609	6290	8938426	60114312	26312518
2012	67395	47507473	751468	105919	9390953	30434142	30517009
2013	4984302	127311974	0	38503	15306272	82924265	37368784
2014	312234	98543469	0	8658	19928972	44355810	26594063
2015	31571253	97647592	0	449672	24225160	91560458	28142660
2016	121608	58113705	0	2962	35340286	52932797	17076569
2017	2264216	56944984	131	187338	36707957	84721980	23249830
2018	1492870	56693991	0	37910	44438619	76044216	23521362
2019	53098684	97365833	0	240400	41854524	84360238	40866986
2020	33397055	171696249	156256	345206	16253837	98842271	49595005
2021	13918225	154304443	1805508	67209	34983173	1.08E+08	41736797

Source: Authors' estimates based on OEC database.

Table A3: Balassa Index on Onion Trade Statistics of BIMSTEC Countries.

Years	India	Bangladesh	Myanmar	Nepal	Sri Lanka	Thailand
2005	8.75977	0.00873	18.50358	….	0.08955	1.72188
2006	10.63786	…..	9.43354	….	0.10277	1.19130
2007	9.61742	…..	2.25313	….	0.20924	1.02284
2008	10.60962	0.00696	8.49576	0.00275	0.13686	0.94924
2009	12.45980	0.00004	7.09735	0.01516	0.09122	0.58096
2010	9.36089	0.00033	2.87821	0.00096	0.09221	0.36980
2011	6.81830	0.00333	1.16765	0.00107	0.25579	0.71699
2012	7.35182	0.00857	1.70406	0.01857	0.11226	0.55959
2013	8.68370	0.00415	3.95540	0.00173	0.09446	0.42219
2014	5.97073	0.00564	1.03299	0.00147	0.07837	0.36356
2015	7.23565	0.00307	2.72623	0.00342	0.06931	0.20162
2016	7.45934	0.00274	4.53160	0.00426	0.10183	0.16288
2017	8.05741	0.00073	2.57879	0.02090	0.11386	0.21281
2018	7.22048	0.00228	3.22466	0.14292	0.16155	0.20475
2019	5.39669	0.00219	5.49165	0.01989	0.56808	0.19801
2020	5.61545	0.00231	11.72060	0.00419	0.84648	0.33800
2021	6.19596	0.00389	8.22793	0.02926	0.15662	0.35949
Mean	**8.08535**	**0.00323**	**5.58960**	**0.01568**	**0.19297**	**0.56329**

Source: Authors' estimates based on OEC database.

Table A4: Lafay Index on Onion Trade Statistics of BIMSTEC Countries

Year	India	Bangladesh	Myanmar	Nepal	Sri Lanka	Thailand
2005	0.065656	-0.17398	0.139263	-0.12104	-0.09909	0.005566
2006	0.08349	-0.19173	0.073894	-0.14062	-0.08459	0.001837
2007	0.080608	-0.24171	0.01941	-0.10971	-0.15836	0.004933
2008	0.077706	-0.2175	0.065221	-0.08673	-0.11837	0.002119
2009	0.116039	-0.36188	0.0685	-0.05814	-0.20162	-0.00179
2010	0.096965	-0.2979	0.030271	-0.05022	-0.19223	-0.00182
2011	0.058307	-0.09899	0.010036	-0.04307	-0.12469	0.000208
2012	0.050988	-0.06445	0.011238	-0.03507	-0.07068	-0.00272
2013	0.085221	-0.16196	0.036609	-0.04352	-0.18938	-0.00389
2014	0.051762	-0.12278	0.009111	-0.04506	-0.08638	-0.0031
2015	0.072639	-0.09506	0.027949	-0.07471	-0.18686	-0.00522
2016	0.075421	-0.06813	0.044814	-0.07816	-0.11902	-0.00298
2017	0.073119	-0.05692	0.022998	-0.06004	-0.17596	-0.00363
2018	0.065152	-0.04952	0.029618	-0.04694	-0.17754	-0.00321
2019	0.053967	-0.08516	0.061037	-0.05208	-0.18974	-0.00751
2020	0.059077	-0.17475	0.131615	-0.02852	-0.28294	-0.00887
2021	0.054683	-0.09697	0.075851	-0.04199	-0.2337	-0.00494
Mean	**0.071812**	**-0.15055**	**0.050437**	**-0.06563**	**-0.1583**	**-0.00206**

Source: Authors' estimates based on OEC database.

Table 5A: Trade Balance Index on Onion Trade Statistics of BIMSTEC Countries.

Years	India	Bangladesh	Myanmar	Nepal	Sri Lanka	Thailand
2005	0.979	-0.999	0.997	-1.000	-0.991	0.312
2006	0.999	-1.000	0.999	-1.000	-0.988	0.188
2007	0.999	-1.000	0.991	-1.000	-0.986	0.481
2008	1.000	-1.000	0.999	-1.000	-0.991	0.247
2009	0.999	-1.000	0.994	-0.999	-0.994	0.005
2010	0.990	-1.000	0.996	-1.000	-0.994	-0.091
2011	0.977	-1.000	0.994	-1.000	-0.983	0.087
2012	1.000	-0.998	0.915	-0.999	-0.989	-0.222
2013	0.983	-1.000	0.992	-1.000	-0.995	-0.302
2014	0.998	-0.999	0.997	-1.000	-0.993	-0.272
2015	0.864	-0.999	0.918	-1.000	-0.996	-0.481
2016	0.999	-0.999	1.000	-1.000	-0.991	-0.383
2017	0.990	-1.000	0.956	-1.000	-0.994	-0.399
2018	0.993	-0.999	0.994	-0.999	-0.991	-0.398
2019	0.770	-1.000	0.983	-1.000	-0.961	-0.570
2020	0.834	-1.000	0.987	-1.000	-0.956	-0.447
2021	0.942	-1.000	0.996	-0.999	-0.992	-0.374
Mean	**0.959846**	**-0.999567**	**0.982703**	**-0.99975**	**-0.98741**	**-0.154034**

Source: Authors' estimates based on OEC database.

Table 6A: Grubel-Lloyd Index on Onion Trade Statistics of BIMSTEC Countries.

Years	India	Bangladesh	Myanmar	Nepal	Sri Lanka	Thailand
2005	0.02104	0.00061	0.00340	0.00000	0.00891	0.68790
2006	0.00067	0.00000	0.00090	0.00000	0.01165	0.81167
2007	0.00063	0.00000	0.00870	0.00000	0.01382	0.51869
2008	0.00048	0.00037	0.00086	0.00014	0.00939	0.75347
2009	0.00058	0.00000	0.00639	0.00101	0.00610	0.99463
2010	0.01030	0.00002	0.00437	0.00006	0.00591	0.90921
2011	0.02262	0.00043	0.00649	0.00004	0.01686	0.91272
2012	0.00042	0.00150	0.08484	0.00057	0.01083	0.77782
2013	0.01705	0.00042	0.00814	0.00005	0.00495	0.69753
2014	0.00181	0.00068	0.00336	0.00003	0.00734	0.72805
2015	0.13560	0.00050	0.08234	0.00005	0.00366	0.51891
2016	0.00058	0.00073	0.00040	0.00005	0.00882	0.61725
2017	0.00974	0.00019	0.04377	0.00019	0.00623	0.60126
2018	0.00653	0.00068	0.00594	0.00113	0.00949	0.60225
2019	0.23015	0.00048	0.01699	0.00023	0.03869	0.42962
2020	0.16607	0.00026	0.01283	0.00011	0.04378	0.55290
2021	0.05834	0.00048	0.00432	0.00054	0.00755	0.62571
Mean	**0.04015**	**0.00043**	**0.01730**	**0.00025**	**0.01259**	**0.69056**

Source: Authors' estimates based on OEC database.