ISSN: 2073-9524
eISSN: 2310-8746

India's Comparative Advantage and Trade Specialization in the Wheat Sector vis-à-vis the BIMSTEC Countries

Md. Monzur Hossain[1], Partha Acharjee[2], Mithun Bairagi[3*]

[1]Department of Finance and Banking, Comilla University, Cumilla, Bangladesh.
[2]Department of Management, Humanities and Social Sciences, National Institute of Technology Agartala, India.
[3]Department of Finance and Banking, Islamic University, Kushtia, Bangladesh.

[*]Corresponding author: mithunbairagi@fiba.iu.ac.bd

Article history:

Received: 19 September 2024
Accepted: 22 November 2024
Published: 30 December 2024

Keywords: *Wheat, Balassa Index, Lafay Index, BIMSTEC, India.*

Abstract

Currently, the global community is observing the increasing significance of Asian countries in international trade, and 48 Asian nations, India's wheat sector, has experienced a significant reorganization in generating revenue and employment prospects. The research aimed to analyze the comparative advantage and trade specialization in the wheat sector enjoyed by India compared to other member countries of BIMSTEC using the OEC database from 2013 to 2022. The Balassa and Lafay index highlights India's relative competitiveness and extent of trade specialization. To compare the pair-wise comparison between the member countries, Games-Howell Post-Hoc estimation was employed since the normality and homogeneity of data hardly provide any scope to apply one-way ANOVA. Finally, the study concluded that India enjoyed a high degree of competitiveness in the wheat market as compared to other BIMSTEC members during the study period. Consequently, the results indicate that India is enjoying a robust advantage in the global wheat trade market, in general, and in the BIMSTEC region, in particular. Based on the result, this study prescribed that since BIMSTEC will implement trade facilitation in 2030, the identification of specific products like wheat may be incorporated into the list for greater regional trade integration.

https://dx.doi.org/10.52951/dasj.24160212

Introduction

Asia has rapidly emerged as a major engine propelling global economic growth, with trade playing a pivotal role in this transformation. Oberoi (2019) attributes Asia's recent impressive progress to the growth of international trade and effective economic policies, which have fostered infrastructure development, technological advancement, foreign investment, job creation, and structural shifts within regional economies. Over the past few decades, Asia has increased its share of global GDP, surpassing other regions. Current projections suggest Asia's share of the world GDP will raise to 29.4 % by 2030, highlighting the continent's growing economic influence. Brooks and Menon (2008); Rasch (2016) emphasize that Asia's diversity and interconnectedness make it a crucial force in global commerce, positioning it as the most significant revenue and sales market worldwide. With a population of 4.3 billion, comprising 59% of the global population spread across 49 countries, Asia's demographic advantage is amplified by its burgeoning middle class, driving unprecedented demand for goods and services (Kharas, 2010; World Population Prospects, 2022).

One vibrant example of Asia's growth-oriented regional integration is the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), a dynamic regional organization that fosters collaboration across various sectors (Haldar, 2022). Established in Bangkok on June 6, 1997, BIMSTEC links five South Asian Association for Regional Cooperation (SAARC) nations with Thailand and Myanmar, promoting economic cooperation in fields such as IT, telecommunications, tourism, transportation, and energy (The Statesman, 1998). According to Bhattacharya and Bhattacharya (2007), BIMSTEC represents the first formal connection between India's "Look East Policy" and Thailand's "Look West Policy," with the potential to bridge South and Southeast Asia. BIMSTEC's member countries geographically close and culturally, economically, and historically connected, have significant potential to enhance intraregional trade. With 1.6 billion people and a collective economy worth USD 3 trillion, the BIMSTEC region accounts for 4% of global GDP and 3.7 % of world trade, showcasing the economic diversity and potential of its members.

Cereals, particularly wheat, play a critical role in addressing the food needs of a growing global population, especially in developing nations where cereals are primary sources of nutrition and calories (Rana *et al.*, 2015). Wheat, cultivated on about 217 million hectares worldwide with an annual production of approximately 808.44 million tons, ranks as the world's second-most-consumed cereal crop (FAOSTAT, 2022). Nearly 2.5 billion people depend on wheat as a dietary staple. India, with its diverse agro-ecological conditions, has maintained food security for a substantial portion of its population through robust wheat production, establishing itself as the second-largest wheat producer globally after China (Ramadas *et al.*, 2020).The wheat economy in India is the world's second-largest, with 107.74 million tons of wheat produced yearly (FAOSTAT, 2022). The proportion of marketed surplus has also increased, enhancing production and reaching the market (DES, 2022). Still, in 2022, India's contribution to world wheat exports was only 1.87% (OEC Database, 2022). India's rich wheat production has historically supported a stable food economy, yet recent policies aimed at enhancing agricultural exports signal new opportunities for India's wheat sector to expand in the global market.

Despite extensive agricultural trade and competitiveness research, studies on India's wheat trade performance within BIMSTEC remain scarce. This study addresses that gap by analyzing India's comparative advantage and trade specialization in wheat relative to other BIMSTEC nations, drawing upon the Balassa and Lafay indices from 2013 to 2022. As Jayawickrama and Thangavelu (2010) note, India's export competitiveness in various agricultural goods has been driven by factors such as input self-sufficiency, low labor costs, and favorable agro-climatic conditions. The economic liberalization in the 1990s further strengthened India's competitiveness in numerous industrial sectors, though challenges persist, particularly in agriculture. For instance, Kumar *et al.* (2005) observed declining competitiveness in India's potato exports post-WTO, underscoring the need for policies to boost profitability and lower production costs.

Several studies, such as Bhattacharyya and Bhattacharyya (2007), Kaur and Sarin (2017); Chaudhary (2016) have utilized indices like the Revealed Comparative Advantage (RCA) to examine India's export competitiveness across agricultural sectors.Their findings highlight India's strengths in agricultural exports like fruits and vegetables but suggest a mixed picture for other categories, such as flowers and garments, which have struggled with global competitiveness. For wheat, however, regional integration within BIMSTEC offers India a unique platform to expand its export reach. As agricultural competitiveness is

often rooted in comparative advantage, methodologies including the Balassa and Lafay indices have proven effective for assessing trade potential across similar sectors (Yilmaz and Ergun, 2003; Erlat and Erlat, 2008; Fertő, 2008; Alessandrini *et al.*, 2011; Ainur and Diana, 2015; Erokhin *et al.*, 2020). Recent academic studies have employed the comparative advantage approach to analyze the trade performance and competitiveness of food commodities (Fertö and Hubbard, 2003; Havrila and Gunawardana, 2003; Jambor and Babu, 2016; Benesova *et al.*, 2017; Esquivias, 2017; Falkowski, 2017; Demir and Aksoy, 2021).This study adopts these indices to understand India's competitive position in wheat trade within the BIMSTEC region. Expanding India's wheat exports could significantly enhance trade within BIMSTEC, as other member nations produce little wheat and rely heavily on imports. India can fulfill these demands as a net exporter while reinforcing its economic ties with neighboring countries. This competitive positioning is echoed in prior studies of agricultural trade, such as Gopal *et al.* (2009) on fish exports and Serin and Civan (2008) on Turkish olive oil, which illustrates how targeted policy interventions can bolster export strength. Numerous studies have examined India's food grain economy, including works by (Sims, 1988; Sarma and Gandhi, 1990; Sidhu and Byerlee, 1991; Gandhi, 1997; Bhalla *et al.*, 1999; Gandhi *et al.*, 2004).For instance, studies on India's agricultural competitiveness, including those by Kaur and Nanda (2011); Yogesh and Srivastava (2020), suggest that aligning trade policies with regional goals, such as those of BIMSTEC, could yield mutually beneficial results.

Given India's leadership in wheat production among BIMSTEC nations and the region's import reliance, this research examines India's wheat trade competitiveness and specialization. Utilizing the OEC database from 2013 to 2022, this study applies the Balassa and Lafay indices to assess India's trade specialization within BIMSTEC. Past research has demonstrated that, while India's agricultural exports are generally competitive, the wheat sector within BIMSTEC remains underexplored. By analyzing India's wheat trade dynamics in BIMSTEC, this study seeks to fill that literature gap and provide insights into India's comparative advantage, fostering opportunities for trade expansion and economic cooperation.

Materials and Methods

The wheat crop was chosen for this study due to its commercial significance as a staple food and major agricultural product in the BIMSTEC region. Secondary data from the OEC database (https://oec.world/) covering the period from 2013 to 2022 was utilized, focusing on wheat under HS Code 1001 (Harmonized System 1992, 4-digit level). The study also incorporated insights from national and international literature to contextualize the findings. To assess the relative advantage of wheat production in India and other BIMSTEC countries, the study applied the Balassa Index (Revealed Comparative Advantage, RCA) and the Lafay Index. These indices are commonly used to evaluate trade specialization and competitiveness, allowing for a comparative analysis of each country's performance within the region (Yilmaz, 2005; Kanaka andChinadurai, 2012; Ishchukova and Smutka, 2013; Pilinkienė, 2014; Torok and Jambor, 2016; Çicek and Bashimov, 2016; Terin *et al.*, 2018; Aksoy and Kaymak, 2021). The RCA, proposed by Bela Balassa (1965), measures a country's comparative advantage in a specific good by comparing the share of its exports in that good to the global share. The Lafay Index, in contrast, assesses the contribution of specific goods to the trade balance, offering an alternative measure of comparative advantage.

Balassa emphasized how difficult it is to gauge competitiveness because there is a dearth of thorough information on factor costs. As a result, the RCA indexwhich

determines a country's comparative advantage based on its past trade datais the most generally recognized indirect method (Balassa, 1986). When comprehensive factor cost data is unavailable, export results can be used to reveal a nation's comparative advantage. The relative costs and changes in non-price elements that influence the structure of exports are reflected in the pattern of commodity exports (Saboniene, 2009).

$$B = \frac{x_{ij} / x_{it}}{x_{mj} / x_{mt}}$$

Where:

x_{ij} = Export of specific country in specific product (wheat) in a specific year.

x_{it} =Total Export of a specific country in a specific year.

x_{mj} = Export of specific product by the world in a specific year.

x_{mt} = Total Export of the world in a specific year.

X indicates exports, i mean a specific country, j means a given product (wheat), t is a Group of products, and m stands for a group of nations or countries.

A country's comparative advantage in a particular commodity or industry is indicated by RCA > 1, according to Balassa. Contrarily, a comparative disadvantage is indicated by an RCA value less than 1.

In order to overcome the practical constraints of the Balassa index, Lafay (1992) devised an index that incorporates both trade and production characteristics. The Lafay Index quantifies a nation's degree of trade specialization about a particular product. Positive values of the index suggest a higher level of comparative advantage, whereas negative values indicate a decrease in specialization. The absolute values' magnitude indicates the specialization or despecialization level (Vollrath, 1991).This figure is the result of evaluating country i's standardized trade balance for a particular good, j. The trade balance for a given product is divided by the total value of trade to get the normalized trade balance, i.e.:

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

Where:

x_j = exports of a specific product.

m_j = imports of a specific product.

A country with a favorable product j index has a comparative advantage and strong specialization. Conversely, a negative number indicates a comparative disadvantage and low product specialization. This definition states that the Lafay Index is symmetrical across all products in a country, ensuring that the sum of all sector indices equals zero. The specialization index of product j in nation i shows how its normalized trade balance differs from the country's overall trade balance and percentage of trade. RCA indicators should be evaluated cautiously and with an understanding of their limits, but the industrial sector RCA helps study structural changes in export specialization.

To analyze trade specialization differences among BIMSTEC countries, Welch's ANOVA was used due to its robustness in handling unequal variances across groups. After ANOVA, the Games-Howell test was employed as a post-hoc analysis to identify significant pair wise differences in wheat trade specialization. This test is particularly effective when groups have unequal variances and different sample sizes, which violates the assumptions of traditional ANOVA. As highlighted by Ghosh *et al.* (2024), the Games-Howell test is a reliable choice when unequal variances are observed, making it more robust than other post-hoc methods like Tukey's HSD. This approach provides a comprehensive understanding of each country's relative advantage in wheat trade,

capturing the nuances of comparative advantage within the BIMSTEC region.

Results and Discussion

This study examines the nature of specialization in wheat trade at the BIMSTEC level. To facilitate this analysis, all countries outside of BIMSTEC are aggregated into a category termed "the rest of the world." Utilizing the OEC database, wheat trade data (HS Code: 070310) from 2013 to 2022 has been compiled. In accordance with the OEC Database (https://oec.world/), Table 1 shows the top ten exporter and importer countries regarding wheat trade volume in 2022. In 2022, Australia was the world's largest wheat exporter, closely followed by the United States, Canada, and France. Conversely, Egypt stood out as the world's foremost wheat importer. Despite Australia's global dominance in wheat exports, it only accounted for 0.76% of exports to BIMSTEC countries. In contrast, India, a significant wheat exporter, contributed 1.88% of global wheat exports, with 1.29% directed towards BIMSTEC nations, making it the largest wheat exporter to these countries. This trend can be attributed to the geographical interconnection and trade relations within the BIMSTEC bloc. The United States of America (USA) and Canada ranked as the second and third largest wheat exporters globally, only exported 0.35% and 0.68%, respectively, to BIMSTEC nations. Ukraine and Romania also played notable roles in wheat exports to the BIMSTEC region. Although France, Russia, Argentina, and Germany are major wheat exporters to the rest of the world, their export levels to the BIMSTEC area were less significant (OEC, 2022).

Table 1. Top Exporter and Importer of Wheat at the World and BIMSTEC level

Country	Wheat Export to		Country	Wheat Import from	
	World (%)	BIMSTEC (%)		World (%)	BIMSTEC (%)
Australia	12.38	0.76	**Egypt**	6.52	0.06
USA	11.86	0.35	**China**	6.17	0.00
Canada	10.73	0.68	**Indonesia**	4.17	0.44
France	11.04	0.00	**Nigeria**	4.10	0.04
Russia	8.02	0.00	**Turkey**	3.76	0.03
Argentina	6.51	0.00	**Algeria**	3.63	0.00
Ukraine	4.28	0.09	**Italy**	3.51	0.00
Romania	4.17	0.06	**Morocco**	3.16	0.00
Germany	3.29	0.00	**Philippines**	2.97	0.11
India	0.59	1.29	**Japan**	3.08	0.00

Source: Compiled by the authors from the OEC database (2022).

Among the seven BIMSTEC countries, Bhutan exported wheat only once in 2009 and did not import any from 2013 to 2019. Consequently, Bhutan has been deliberately excluded from this analysis for analytical convenience. The status of wheat production during 2013-22 is presented below**.**

Table 2. Wheat Production status during 2013-2022 (value in Tons)

Year	Bangladesh	Bhutan	India	Myanmar	Nepal	Thailand
2013	1255000	5310	93510000	182900	1727346	1500
2014	1303000	5172	95850000	182400	1883147	1312.77
2015	1348000	3730	86530000	179300	1975625	1265.48
2016	1348186	2521	92290000	102636	1736849	1303.89
2017	1311473	3883	98510220	123251.9	1879192	1350.35

2018	1099373	1445.19	99869520	115995.5	1949001	1306.58
2019	1016811	1318.54	103596230	110663	2005665	1320.27
2020	1029000	1623.24	107860510	105457	2185289	1325.73
2021	1085368	1168.94	109586500	99607	2127276	1317.53
2022	1085834	769.78	107742070	100000	2144568	1321.18

Source: FAOSTAT (2022).

Table 2 presents the annual wheat production data for BIMSTEC member nations, excluding Sri Lanka, which does not produce wheat but actively engages in its trade through imports and exports. Bangladesh's production increased from 2013 to 2016, and then declined to 1,085,834 tons in 2022. Bhutan's production has consistently decreased from 5,310 tons in 2013 to 769.78 tons in 2022. Similarly, Thailand's wheat production has shown a continual downward trend. India, the leading wheat producer among BIMSTEC nations, experienced a minor fluctuation in 2015 but has since been on an upward trajectory. Nepal's wheat production has generally increased, with a minor setback in 2016, but has steadily risen. In contrast, Myanmar showed a mixed trend: declining from 2013 to 2016, increasing in 2017, and declining again. These patterns highlight the varying trajectories of wheat production within the BIMSTEC region.

Table 3. Balassa Index scores for India and the Rest of BIMSTEC Countries

Year	Bangladesh	Bhutan	India	Myanmar	Nepal	Sri Lanka	Thailand
2013	0.00000	0.00000	1.40094	0.33384	0.00000	0.07479	0.00053
2014	0.00004	0.05026	1.32962	0.00036	0.00000	0.07475	0.01060
2015	0.00010	0.00000	0.28597	0.00129	0.00000	0.08999	0.00166
2016	0.00002	0.00025	0.07781	0.00062	0.00004	0.03825	0.00013
2017	0.00000	0.04608	0.07633	0.00147	0.00135	0.02883	0.00125
2018	0.00000	0.00000	0.05758	0.00236	0.00581	0.00484	0.00104
2019	0.00003	0.00015	0.08440	0.00265	0.00127	0.01828	0.00008
2020	0.00001	1.07814	0.28912	0.00009	0.00000	0.02395	0.00003
2021	0.00004	0.49695	1.42431	0.00000	0.00082	0.07700	0.00004
2022	0.00002	0.73120	1.60141	0.00000	0.00106	0.30771	0.00006

Source: Estimated by the authors from the OEC database (2022).

Table 3 presents the RCA index scores for India and the other BIMSTEC countries about wheat trade. The data indicate that India is the only BIMSTEC member with a competitive advantage in wheat trade. All other member nations-Bangladesh, Bhutan, Myanmar, Nepal, Sri Lanka, and Thailand-are classified as non-competitive in this sector. A closer examination of the RCA index scores for the 2001-2015 periods reveals that while Bhutan is less competitive in wheat trade compared to India, it is more competitive than the other BIMSTEC nations. This relative positioning highlights Bhutan's intermediate status in wheat trade competitiveness within the region. Similarly, though less competitive than India and Bhutan, Sri Lanka is more competitive in wheat trade than the remaining BIMSTEC member nations. The RCA index is calculated based on the proportion of wheat exports in a country's total export value. A higher share of wheat exports indicates greater competitiveness. Thus, for a country to be deemed competitive in the wheat trade, its exports must constitute a significant portion of its overall exports. India's high RCA scores reflect its substantial wheat

export share, underscoring its dominance and competitive edge in the BIMSTEC wheat market.

Conversely, the lower RCA scores for the other member nations point to their limited wheat export activities, rendering them non-competitive in this sector. To enhance competitiveness, these non-competitive BIMSTEC countries would need to increase their wheat export shares relative to their total exports. This could involve strategic investments in agricultural technology, improved wheat production efficiency, and expanded access to international markets. Such efforts could shift the RCA scores, fostering greater competitiveness in wheat trade across the BIMSTEC region.

Table 4. Lafay Index score for India and BIMSTEC member nations

Year	Bangladesh	Bhutan	India	Myanmar	Nepal	Sri Lanka	Thailand
2013	-1.64990	---	0.20602	-0.14857	-0.04941	-0.65487	-0.10337
2014	-0.98954	0.00204	0.20016	-0.20292	-0.06813	-0.51730	-0.10645
2015	-1.64027	----	0.02456	-0.18359	-0.07298	-0.55315	-0.25174
2016	-1.09139	0.00002	-0.06401	-0.22504	-0.09437	-0.38759	-0.21646
2017	-1.23266	0.00285	-0.07584	-0.21961	-0.07276	-0.45539	-0.13336
2018	-0.87059	----	0.00538	-0.19099	-0.03107	-0.63910	-0.13646
2019	-1.22080	0.00001	0.01028	-0.18067	-0.07325	-0.57093	-0.15840
2020	-1.30295	0.07926	0.04369	-0.21012	-0.15198	-0.87939	-0.17267
2021	-1.21485	0.03764	0.20904	-0.28750	-0.07644	-0.83292	-0.14370
2022	-0.84544	0.05597	0.23593	-0.19604	-0.03068	-0.42900	-0.12211

Source: Compiled by the authors from the OEC database (2022).

In Table 4, the analysis reveals that Bhutan consistently maintained positive values throughout the entire study period, indicating a steady comparative advantage in wheat trade. In contrast, India experienced negative Lafay Index (LFI) values in 2016 and 2017, but its LFI values turned positive in subsequent years. This suggests that while India faced challenges in trade specialization during those specific years, it has generally strengthened its position in inter-industry wheat trade within the BIMSTEC region over time. On the other hand, the LFI values for Bangladesh, Myanmar, Nepal, Sri Lanka, and Thailand remained consistently below zero, signaling that these countries are net wheat importers within the BIMSTEC region. Moreover, it is important to note that though Bhutan showed positive value of LFI; but such positive value is the reflection of negligible export and near to zero import. This suggests that these countries are net wheat importers at the BIMSTEC level, indicating their need for more wheat production and trade competitiveness compared to India. The significant differences in LFI values among BIMSTEC member nations highlight the varying degrees of wheat trade competitiveness within the region. India's positive LFI values indicate its comparative advantage and competitive edge in wheat export. In contrast, the negative LFI values for the other member nations underscore their reliance on wheat imports to satisfy domestic demand. This divergence in LFI values also suggests broader economic and agricultural differences among the BIMSTEC countries, reflecting their respective capacities and efficiencies in wheat production and trade. India's ability to maintain and improve its competitive position is crucial for sustaining its role as the leading wheat exporter in the region.

Table 5. Summary of Welch ANOVA findings on parameters related to trade Indices of BIMSTEC nations during 2013-2022

Sl No.	Trade Indices	Statistic	Bangladesh	Bhutan	India	Myanmar	Nepal	Sri Lanka	Thailand	F-statistic	Prob (F-statistic)
1	Balassa	*Mean*	.00003	.24030	.66275	.03427	.00104	.07384	.00154	F(3.95,6,24.00)	0.007
		N	10	10	10	10	10	10	10		
2	Lafay	*Mean*	-1.20584	.02540	.07952	-.20450	-.07211	-.59197	-.15447	F(70.17,6,26.02)	0.000
		N	10	7	10	10	10	10	10		

Source: Compiled from the authors' estimation.

In Table 5, Initially, the study applied a one-way ANOVA model to test whether any significant statistical differences between Balassa and Lafay index among the selected countries; but due to lack of normality (Shapiro-Wilk normality test statistic W=0.76454 for Balassa index and W=0.88179 for Lafay with p-value less than 0.05) and lack of Homoskedasticity (Bartlett test of homogeneity of variances also shows Bartlett's K-squared = 346.44 and 67.736 for Balassa and Lafay indices with p-value<0.05); we have applied the Welch's ANOVA with Games-Howell Post-Hoc estimation. It is found that though the Welch ANOVA shows statistical differences among the countries in terms of the Balassa index, this study hardly finds any pair-wise statistical significance among the countries. However, for the Lafay index out of 21(twenty-one)-pairs of countries, this study found that except for two pairs, all are statistically significant. In this study, we have separately compared the pair-wise statistical difference between countries in terms of both the Balassa and Lafay index. This study found that the Balassa index hardly showed any pair-wise statistically significant differences during the study period. As the Balassa index measures the export of a product in relation to the world's exports, this study concluded that the relative position in terms of export share of any country with respect to the other countries in the BIMSTEC region hardly shows a significant change in the global trade market of wheat. On the other hand, the Lafay index measures exports and imports of the same countries; this study found some changes in the relative position of the countries in terms of export and import share in the trade basket of respective countries.

This is presented below in Table 6 and 7 for the Balassa and Lafay indexes, respectively.

Table 6. Summary of Games-Howell Post-hoc estimation related to the Balassa Index of BIMSTEC nations during 2013-2022

Sl No.	Between Countries	estimate	conf. low	conf. high	p.adj	p.adj.signify
1	Bangladesh- Bhutan	0.240	-0.217	0.698	0.500	ns
2	Bangladesh- India	0.663	-0.131	1.456	0.117	ns
3	Bangladesh- Myanmar	0.034	-0.089	0.158	0.934	ns
4	Bangladesh- Nepal	0.001	-0.001	0.003	0.578	ns
5	Bangladesh- Sri Lanka	0.074	-0.029	0.176	0.209	ns
6	Bangladesh- Thailand	0.002	-0.002	0.005	0.749	ns
7	Bhutan- India	0.422	-0.418	1.262	0.620	ns
8	Bhutan- Myanmar	-0.206	-0.666	0.254	0.679	ns
9	Bhutan- Nepal	-0.239	-0.697	0.218	0.504	ns
10	Bhutan- Sri Lanka	-0.166	-0.626	0.293	0.831	ns
11	Bhutan- Thailand	-0.239	-0.696	0.219	0.506	ns
12	India- Myanmar	-0.628	-1.423	0.166	0.150	ns

13	India- Nepal	-0.662	-1.455	0.132	0.118	ns
14	India- Sri Lanka	-0.589	-1.383	0.205	0.191	ns
15	India- Thailand	-0.661	-1.455	0.132	0.119	ns
16	Myanmar- Nepal	-0.033	-0.157	0.090	0.942	ns
17	Myanmar- Sri Lanka	0.040	-0.104	0.183	0.965	ns
18	Myanmar- Thailand	-0.033	-0.156	0.091	0.946	ns
19	Nepal- Sri Lanka	0.073	-0.030	0.175	0.219	ns
20	Nepal- Thailand	0.001	-0.003	0.004	0.999	ns
21	Sri Lanka- Thailand	-0.072	-0.175	0.030	0.225	ns

Note: p-value >0.05 means Normality assumption for ANOVA is satisfied; and
p-value<0.05 means Homoskedasticity assumption for ANOVA is satisfied
#: result was insignificant at second level; and hence no question of post hoc estimation
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Source: Compiled from the authors' estimation.

Table 6 presents the results of the Games-Howell post-hoc analysis for the Balassa Index of BIMSTEC nations over the period from 2013 to 2022. This table outlines pair wise comparisons of the Balassa Index scores between different countries within the BIMSTEC region, offering insights into the relative competitiveness of each nation. The table includes confidence intervals (low and high), p-values (p.adj), and significance levels (p.adj.signify). A notation of 'ns' next to the p.adj value indicates that the differences between the countries being compared are not statistically significant. For instance, the comparison between Bangladesh and Bhutan yields a p-value of 0.500, suggesting no significant difference in their Balassa Index scores. This pattern of non-significant differences is observed across several country pairs, implying that many BIMSTEC nations demonstrate comparable levels of competitiveness as measured by the Balassa Index.

Table 7. Summary of Games-Howell Post-hoc estimation related to Lafay Index of BIMSTEC nations during 2013-2022

Sl No.	Between Countries	estimate	conf. low	conf. high	p.adj	p.adj.signify
1	Bangladesh- Bhutan	1.231	0.904	1.558	0.000	***
2	Bangladesh- India	1.285	0.951	1.620	0.000	***
3	Bangladesh- Myanmar	1.001	0.674	1.328	0.000	***
4	Bangladesh- Nepal	1.134	0.807	1.461	0.000	***
5	Bangladesh- Sri Lanka	0.614	0.267	0.961	0.000	***
6	Bangladesh- Thailand	1.051	0.724	1.379	0.000	***
7	Bhutan- India	0.054	-0.089	0.197	0.816	ns
8	Bhutan- Myanmar	-0.230	-0.287	-0.172	0.000	***
9	Bhutan- Nepal	-0.098	-0.154	-0.041	0.001	***
10	Bhutan- Sri Lanka	-0.617	-0.810	-0.424	0.000	***
11	Bhutan- Thailand	-0.180	-0.246	-0.114	0.000	***
12	India- Myanmar	-0.284	-0.427	-0.141	0.000	***
13	India- Nepal	-0.152	-0.294	-0.009	0.035	*
14	India- Sri Lanka	-0.671	-0.886	-0.457	0.000	***
15	India- Thailand	-0.234	-0.378	-0.090	0.002	**
16	Myanmar- Nepal	0.132	0.080	0.185	0.000	***

17	Myanmar- Sri Lanka	-0.387	-0.580	-0.195	0.000	***
18	Myanmar- Thailand	0.050	-0.013	0.113	0.177	ns
19	Nepal- Sri Lanka	-0.520	-0.712	-0.327	0.000	***
20	Nepal- Thailand	-0.082	-0.145	-0.020	0.006	**
21	Sri Lanka- Thailand	0.437	0.244	0.631	0.000	***

Note: p-value >0.05 means Normality assumption for ANOVA is satisfied; and
P-value<0.05 means Homoskedasticity assumption for ANOVA is satisfied
#: result was insignificant at second level; and hence no question of post hoc estimation
Signif.codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Source: Compiled from the authors' estimation.

In contrast, Table 7 presents the results of the Games-Howell post-hoc analysis for the Lafay Index of BIMSTEC nations over the same period. Similar to Table 6, this table provides pairwise comparisons, but it focuses on trade specialization as reflected in the Lafay Index. Unlike the Balassa Index, which shows minimal differences in competitiveness, Table 7 reveals that most country pairs exhibit statistically significant differences, as indicated by the asterisks next to the p-values. For example, the comparison between Bangladesh and Bhutan, with a p-value of 0.000, indicates a significant difference in their Lafay Index scores. This suggests that while the Balassa Index may not highlight substantial disparities in competitiveness, the Lafay Index underscores more significant variations in trade specialization within the BIMSTEC region. This divergence in findings between the two indices underscores the different dimensions of economic performance they measure competitiveness versus trade specialization and their respective implications for regional economic analysis.

Conclusions

The study highlights India's significant role as a wheat exporter, demonstrating robust comparative advantages in the global wheat trade, particularly within the BIMSTEC region. India outperforms other BIMSTEC nations in terms of wheat trade competitiveness. Analyzing revealed comparative advantages and product specialization from 2013 to 2022, the study underscores India's production levels and trade specialization in wheat, an essential cereal product. The study employs the Balassa Index and Lafay Index to quantify both the degrees of export specialization and the effects of product diversification or overall trade specialization based on exports and imports of wheat. The Balassa index, which is meant to examine the export share and represent the total export of any country, shows little significant changes during the study period. Accordingly, this study concludes that the relative share of exports of countries in the BIMSTEC region is more or less stable during the study period. However, the Lafay index, meant to examine any country's relative share of exports and imports, showed significant statistical differences among the countries in the BIMSTEC region. Combining the results derived from the Balassa and Lafay index, this study concluded that though the export share is more or less stable among the countries, they improved their trade balance statistics by relatively reducing their import share compared to their change of growth export share. Promoting agricultural trade, particularly in wheat, among BIMSTEC members can enhance regional value, strengthen connectivity, and improve product quality. Governments should implement comprehensive policies to ensure self-sufficiency and boost foreign earnings through wheat exports. A limitation of the study is its focus on effects rather than causes of comparative advantages. Future research could employ advanced econometric models like the Trade Intensity Index, Gravity Model, or Product Sophistication Index to explore underlying factors. Addressing these gaps could provide

more nuanced insights into trade specialization dynamics.

Conflict of interest

The authors have declared that there is no conflict of interest pertaining to the publication of this paper.

Acknowledgements

We are grateful to two anonymous reviewers for thoroughly revision of the paper in its present form.

References

Aksoy, A. and Kaymak, H. C. (2021). Competition power of Turkey's tomato export and comparison with Balkancountries. *Bulgarian Journal of Agricultural Science, 27* (2), 253–258.

Ainur, A., and Diana, M. (2015). Assessment of the Competitiveness of Kazakhstan's Exports. *Mediterranean Journal of Social Sciences*, *6*(6), 443-447. http://dx.doi.org/10.5901/mjss.2015.v6n6p443

Demir, N., and Aksoy, A. (2021). Competitive Power of Turkey's Aquaculture Sector and Comparison with Other Leading Countries. *Marine Science and Technology Bulletin, 10*(3), 258–268. https://doi.org/10.33714/masteb.937890

Alessandrini, M., Fattouh, B., Ferrarini, B., and Scaramozzino, P. (2011). Tariff liberalization and trade specialization: Lessons from India. *Journal of Comparative Economics*, 39(4), 499-513. https://doi.org/10.1016/j.jce.2011.03.004

Balassa, B. (1986). Comparative Advantage in Manufactured Goods: A Reappraisal. *The Review of Economics and Statistics*, 68(2), 315-319. https://doi.org/10.2307/1925512

Balassa, B. (1965). Trade Liberalisation and "Revealed" Comparative Advantage1. *The Manchester School, 33*(2), 99–123. *Portico*. https://doi.org/10.1111/j.1467-9957.1965.tb00050.x

Benesova,I., Maitah, M., Smutka, L., Tomsik, K., andIshchukova, N. (2017). Perspectives of the Russian agricultural exports in terms of comparative advantage. *Agricultural Economics (ZemědělskáEkonomika), 63*(7), 318–330. https://doi.org/10.17221/344/2015-agricecon

Bhattacharya, S. K., and Bhattacharyay, B. N. (2007). An empirical analysis on prospects and challenges of BIMSTEC-Japan trade integration. *Journal of Asian Economics*, *18*(3), 509-536. https://doi.org/10.1016/j.asieco.2007.03.001

Bhalla, G. S., Hazell, P., and Kerr, J. (1999). *Prospects for India's cereal supply and demand to 2020. International Food Policy Research Institute*, 29 p.

Brooks, D. H., & Menon, J. (2008). Infrastructure and Trade in Asia: An Overview. *Infrastructure and Trade in Asia. Cheltenham: Asian Development Bank Institute and Edward Elgar Publishing*, 256 p. https://doi.org/10.4337/9781848442733

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.

Chaudhary, A. (2016). Revealed comparative advantage index: an analysis of export potential of Indian textiles industry in the post MFA period. *American Journal of Economics*, *6*(6), 344-351.

DES, (2022). *Directorate of Economic and Statistics Online Database, India*. Retrieved from: https://desagri.gov.in/

Erlat, G., and Erlat, H. (2008). How has specialization in Turkish exports evolved? A study based on Galtonian regressions. *Topics in Middle Eastern and North African Economies*, 1-23.

Erokhin, V., Diao, L., and Du, P. (2020). Sustainability-Related Implications of Competitive Advantages in Agricultural Value Chains: Evidence from Central Asia-China Trade and Investment. *Sustainability*, 12(3), 1-29. https://doi.org/10.3390/su12031117

Esquivias, M. A. (2017). The Change of Comparative Advantage of Agricultural Activities in East Java Within the Context of Asean Economic Integration. *Agris On-Line Papers in Economics and Informatics, 9*(1), 33-47. https://doi.org/10.7160/aol.2017.090103

FAO, (2022). *FAOSTAT Online Database, FAO, Rome*. Retrieved from: http://faostat.fao.org/

Falkowski, K. (2017). Long-Term Comparative Advantages of the Eurasian Economic Union Member States in International Trade. *International Journal of Management and Economics*, *53*(4), 27-49. https://doi.org/10.1515/ijme-2017-0024

Fertö, I., and Hubbard, L. J. (2003). Revealed Comparative Advantage and Competitiveness in Hungarian Agri-Food Sectors. *The World Economy*, *26*(2), 247-259. https://doi.org/10.1111/1467-9701.00520

Fertő, I. (2008). The evolution of agri-food trade patterns in Central European countries. *Post-Communist Economies, 20*(1), 1-10. https://doi.org/10.1080/14631370701865680

Gandhi, V. P. (1997). Technology, Cost Reduction, and Returns in Agriculture: A Study of Wheat and Rice in Punjab. Vikalpa: *The Journal for Decision Makers, 22*(2), 35-48. https://doi.org/10.1177/0256090919970207

Gandhi, V. P., Zhou, Z. Y., and Mullen, J. (2004). Wheat economy of India: Will demand be a constraint or supply? *Economic and Political Weekly*, *39*(43), 23–29. http://www.jstor.org/stable/4415713

Gopal, N., Jeyanthi, P., Geethalakshmi, V., and Unnithan, G. R. (2009). Indian finfish exports–an analysis of export performance and revealed comparative advantage. *Agricultural Economics Research Review*, *22*(2), 291–298. http://dx.doi.org/10.22004/ag.econ.57413

Ghosh, P., Golder, U., Rahman, Md. S., and Rumaly, N. (2024). Mezzanine momentum: A cross continental examination of corporate financing trends. Journal of Economics and Management, 46, 387-423. https://doi.org/10.22367/jem.2024.46.15

Haldar, A. (2022). *Globalisation, Asian Regionalism and BIMSTEC: An International Political Economy Perspective*. Contiguity, Connectivity and Access, 141–158. https://doi.org/10.4324/9781003365020-14

Havrila, I., and Gunawardana, P. (2003). Analysing Comparative Advantage and Competitiveness: An Application to Australia's Textile and Clothing Industries. *Australian Economic Papers, 42*(1), 103–117. https://doi.org/10.1111/1467-8454.00189

Kanaka, S., andChinadurai, M. (2012). A study of comparative advantage of Indian agricultural exports. *Journal of Management and Science*, *2*(3), 175-183.

Ishchukova, N., andSmutka, L. (2013). Revealed comparative advantage of Russian agricultural exports. *Acta Universitatis Agriculturae et Silviculturae MendelianaeBrunensis, 61*(4), 941-952. https://doi.org/10.11118/actaun201361040941

Jambor, A., and Babu, S. (2016). *The Competitiveness of Global Agriculture. Competitiveness of Global Agriculture*, 99–129. https://doi.org/10.1007/978-3-319-44876-3_6

Jayawickrama, A., and Thangavelu, S. M. (2010). Trade linkages between China, India and Singapore. *Journal of*

Economic Studies, *37*(3), 248–266. https://doi.org/10.1108/01443581011061267

Kharas, H. (2010). The emerging middle class in developing countries. OECD Development Centre Working Papers. https://doi.org/10.1787/5kmmp8lncrns-en

Kaur, N., and Sarin, V. (2017). Comparative advantages and competitiveness of Indian agricultural products exports to asean in context of India's look east policy. *International Journal of Agricultural and Statistical Sciences*, *13*(1), 159-167.

Lafay, G. (1992). The measurement of revealed comparative advantages. *International Trade Modelling*, 209–234.

Oberoi, S. (2019). Dynamics of Trade Specialization and Trade Performance of ASEAN–India Free Trade Agreement. *Journal of International Commerce, Economics and Policy*, *10*(1), 1950003. https://doi.org/10.1142/s1793993319500030

OEC, (2022). *OEC Online Database*, Retrieved from: https://oec.world/en

Pilinkienė, V. (2014). Evaluation of International Competitiveness Using the Revealed Comparative Advantage Indices: The Case of the Baltic States. *Mediterranean Journal of Social Sciences, 5*(13), 353-359. https://doi.org/10.5901/mjss.2014.v5n13p353

Rasch, F. A. (2016). *Asian Case Studies*: *Lessons from Malaysian Industries. amii. us.,* 291p.

Ramadas, S., Kiran Kumar, T. M., and Pratap Singh, G. (2020). Wheat Production in India: Trends and Prospects. *Recent Advances in Grain Crops Research*. https://doi.org/10.5772/intechopen.86341

Rana, V., Ram, S., Sedhil, R., Nehra, K., and Sharma, I. (2015). Physiological, Biochemical and Morphological Study in Wheat (Triticum aestivum L.) RILs Population for Salinity Tolerance. *Journal of Agricultural Science*, *7*(10), 1-10. https://doi.org/10.5539/jas.v7n10p119

Kumar, N. R., Singh, B. P., Khurana, S. M., and Pandey, N. K. (2005). Impact of WTO on potato export from India. *Agricultural Economics Research Review*, *18*(2), 291-304. http://dx.doi.org/10.22004/ag.econ.58478

Saboniene, A. (2009). Lithuanian export competitiveness: comparison with other Baltic States. *Engineering Economics*, *62*(2), 1-9. https://www.inzeko.ktu.lt/index.php/EE/article/view/11617

Sarma, J. S., and Gandhi, V. P. (1990). *Production and consumption of foodgrains in India: Implications of accelerated economic growth and poverty alleviation*. *International Food Policy Research Institute*, 81 p. https://doi.org/10.1177/156482659101300102

Serin, V., and Civan, A. (2008). Revealed comparative advantage and competitiveness: A case study for Turkey towards the EU. *Journal of Economic and Social Research*, *10*(2), 25-41.

Sidhu, D. S., and Byerlee, D. (1991).Technical change and wheat productivity in post-Green Revolution Punjab. *Economic and Political Weekly*, 159-166.

Sims, H. (1988). Political regimes, public policy, and economic development: Agricultural performance and rural change in two Punjabs. *Sage Publications, New Delhi*, *30*(119), 715-716.

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.

The Statesman. (1998). Look East, Act East-II. Bangkok, Thailand. *Newspaper.*

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. https://doi.org/10.17221/177/2015-agricecon

Vollrath, T. L. (1991). A theoretical evaluation of alternative trade intensity measures of revealed comparative advantage. *Weltwirtschaftliches Archiv, 127*(2), 265–280. https://doi.org/10.1007/bf02707986

Yilmaz, B. (2005). The Foreign Trade Pattern and Foreign Trade Specialization in the European Union: A Comparison of Six New Member/Candidate Countries and the EU/15. *Eastern European Economics*, *43*(5), 74-100. https://doi.org/10.1080/00128775.2005.11041118

Yilmaz, B., and Ergun, S. J. (2003). The foreign trade pattern and foreign trade specialization of candidates of the European Union. *Ezoneplus working paper*, 19 p. https://hdl.handle.net/10419/22133

Yogesh, H. C., and Srivastava, S. (2020). An Application of Markov Chain Model to Study on Trade Direction of Export of FCV Tobacco from India. *Acta Scientific Agriculture, 4*(9), 73–77. https://doi.org/10.31080/asag.2020.04.0894

World Population Prospects. (2022). United Nations Department of Economic and Social Affairs*, Population Division*. Retrieved 17 July 2022.