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A Multi-Criteria Decision-Making Approach to Evaluate Trade Performance of Apparel Industry in BIMSTEC Countries During Volatile Trade Environment: Application of CRITIC-based TOPSIS

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ABSTRACT: This study assesses the trade performance of BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) nations in the apparel sector from 2021 to 2023, focusing on knitted (HS-61) and non-knitted (HS-62) clothing accessories. The region contributes majorly in global apparel trade but faces challenges from geopolitical disruptions, such as the COVID-19 pandemic and the Russia-Ukraine war. The study applies a Multi-Criteria Decision-Making (MCDM) approach, utilizing seven key trade indices: Balassa Index (RCA1), Revealed Systematic Comparative Advantage (RSCA), Revealed Comparative Advantage (RCA2), Lafay Index (LFI), Trade Balance Index (TBI), Market Concentration Index (MCI), and Relative Import Advantage (RMA). The CRITIC method is used to assign objective weights to these indices, while the TOPSIS method ranks the BIMSTEC countries based on their relative trade performance. The results reveal that Bangladesh emerged as the top performer in both product categories, driven by strong competitiveness and market diversification. Sri Lanka and India also ranked highly in the knitted category, while Myanmar improved its standing in the non-knitted sector. The findings suggest that countries with better trade diversification and competitiveness are better positioned to withstand volatility. The study offers policy insights for enhancing regional trade resilience to strengthen BIMSTEC's position in the global apparel market.

Keywords: Competitiveness, MCDM, BIMSTEC, volatile trade environment, trade performance, market concentration index (MCI), Relative Import Advantage (RMA).

Contents

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1 Introduction

It is already well established that trade plays a pivotal role in fostering economic growth and development. The dynamics of global trade have undergone considerable changes over the last two decades, primarily due to trade liberalization, increasing income, technological advancement [1]. Among numerous sectors contributing to global trade, the apparel sector is also a significant catalyst for employment generation, export revenue, industrial development, and export growth, particularly in emerging nations. According to recent WTO reports, the global apparel trade experienced a 7.26% increase in 2022, with trade value rising from US$ 537 billion to US$ 576 billion, representing 8% of worldwide total industrial output. Within the landscape of global apparel trade, Asian countries have emerged significant dominant position in manufacturing and export. Several Asian countries, including China, Bangladesh, Vietnam and India are among the world's leading apparel exporters. Their competitive edge of low-cost production, superior manufacturing quality, fast production turnover and strong manufacturing ecosystems, has made these nations a global leader in this sector [2].

Within landscape of Asian apparel trade ecosystem, BIMSTEC nations are gaining importance due to their geographical location and export capabilities. It constitutes a pivotal regional bloc with significant potential for economic cooperation and trade growth. This region encompasses approximately 1.7 billion populations, representing almost 22% of the global populations, with total GDP of US$ 5 trillion [3]. However, in terms of overall trade volume this region has not stood out as a rapidly expanding region bloc, witnessing worldwide trade share slowly rising from 3.5% to 3.7% between 2010 to 2020 [4]. BIMSTEC was established as a regional bloc in June 1997 after the ratification of Bangkok Declaration. The apparel sector plays a significant role in generating economic activity in several BIMSTEC nations, creating employment opportunity and earns export revenue. For instance, during financial year 2022-2023, 84.58% of Bangladesh's total export receipts and 4.1 million jobs, which is 36% of the manufacturing workforce, were employed in apparel industry [5]. In addition, this sector contributes 10.35% of Bangladesh GDP [6]. India is also ranked among the top garment manufacturers globally. In financial year 2022-2023, the export of ready-made garment reached US$ 8127.3 million, reflecting a 10.8% increase compared to financial year 2021-2022 and it remains the second largest employment source after agriculture in the country [7]. According to Central Bank of Sri Lanka, the garment industry accounted for 52 % of overall export earnings in 2021, making it the industry's largest source of foreign currency earnings and creating around 40000 direct employment and 2 million indirect employment opportunities. Similarly, the apparel industry of Myanmar contributed 30% countries total exports in 2021 and is also principal employment provider. Moreover, Nepal, Bhutan and Thailand are also playing a pivotal role in apparel trade among BIMSTEC nations.

Over the past few years, the apparel trade among BIMSTEC countries has faced substantial challenges, which have had a significant impact on sector's growth and stability. Two major global disruptions – the prolonged COVID 19 Pandemic and Russia-Ukraine war. These two sequential crises effect this industry in various dimensions, like Supply chain disruption, increased production cost, unemployment, and other financial losses. For instance, during the Covid period, Bangladesh's apparel export dropped significantly by 17.4% [8]. According to WTO report, there was an 81% decline in garment export order during this period resulting in a US$ 3.1 billion revenue loss [9]. India's apparel and fashion industry also faced similar challenges. According to Kanupriya (2021) [10], the impact of the crisis can be comprehended by analysing both the demand side and supply side aspects. The imposed mandatory lockdown led to the closure of thousands of garment and textile industries, resulting the significant disruptions in supply and demand. As per the report by Apparel Export Promotion Council of India, there was around 82% export order were cancelled. Myanmar garment exports dropped sharply because of cancellation of orders from Europe. However, due to a shortage of raw materials and order cancellation, the Sri Lankan apparel manufacturer switched to producing medical gear. In February 2022, another global trade shock causes by the Russia - Ukraine war. The consequences of this war effect disrupting energy supplies, driving up the transportation costs, resulting in an increase the prices of goods and services in international market. According to OECD report, the trade was just recovering from COVID 19 Pandemic, when this geopolitical conflict began, which caused further instability in international commodity market (Arriola et al., 2023). The conflict had significantly affected the apparel trade of BIMSTEC countries. For instance, before the conflict started, Bangladesh has exported annually US$ 600 million readymade garment to

Russia. However, after the war, numerous sanctions and SWIFT payment suspensions may led to trade collapsed, payment failures and surplus inventory [11]. India also faced a several challenges from this war, including European importers reducing their purchase order because of their own losses in Russian market. The increase in energy prices in international market affects not only India and Bangladesh apparel industries but also affect all other BIMSTEC nations. Therefore, it is crucial to conduct a multidimensional assessment of the apparel industry's trade performance during these volatile periods within the BIMSTEC nations.

In this backdrop, the present study measures the trade performance of BIMSTEC nations in apparel trade during the 2021 to 2023 by incorporating seven widely recognised trade indices. These indices are used as a criterion in MCDM technique. CRITIC method was applied to ascertain the objective weight of each criterion and the TOPSIS was employed to rank the BIMSTEC countries according to their relative trade performance. This comprehensive framework seeks to generate a details analysis of competitive position of BIMSTEC countries in the apparel sector during the period under study. The results are expected to provide policymaker and other stakeholders with significant insights for developing strategies that strengthen trade resilience and improve regional economic integration.

2 Literature Review

2.1 Conceptualizing Trade Performance

The notion of trade performance is multidimensional and varies depending on the context. Various studies measure trade performance using trade balance and export growth, while others focus on competitiveness and diversification, considering the structural changes to global trends. As the literature on trade performance evolves, earlier studies have distinguished the concept of trade performance between economic and policy views. From the economic perspective, terms of trade and prolonged sustainability were central to competitiveness, whereas from a policy angle, trade surpluses and deficits are often highlighted as key indicators. These two perspectives collectively capture the dynamic efficiency and static balance of sectoral performance in international trade. For instance, Vianna and Mollick (2021) [12] suggested that terms of trade serve as a significant factor in assessing a country's trade performance. Likewise, Ruzekova et al. (2020) [13] measured trade performance through competitiveness. According to Buckley et al. (1988) [14], Competitiveness itself is a multifaceted concept, encompassing a wide range of elements, including maintaining product quality, operational efficiency, cost effectiveness, continuous innovation, proper infrastructure, and market accessibility, which highlights the evolving nature of global marketplaces and the increasing demand for constant strategic adaptation. Specifically, export competitiveness denotes a nation or region's capacity to penetrate and expand market presence in the international market and drive economic gains [15]. According to Schweinberger (1996) [16], the key theoretical foundation of trade competitiveness is the principle of comparative advantage. Historically, the Ricardian model laid the theoretical foundation for comparative advantage, highlighting the importance of concentrating on goods where a country holds cost advantages. However, this concept is further elaborated in the Ricardian and Heckscher-Ohlin models by applying equilibrium prices for more accurate cost estimation [17]. Since the theory's inception, it has played a pivotal role in explaining the determinants of specialisation in global trade. Therefore, combining the evolving nature of comparative advantage with a multidimensional view of competitiveness can enable us to understand the complexities of modern economic and business landscapes in global markets [18].

2.2 Review of Trade Indices for Measuring Trade Performance

The RCA is one of the trade measures perceived to be dependable and broadly acknowledged as a technique for monitoring comparative advantage [19]. Liesner (1958) [20] originally developed empirical measures of RCA and was later redefined by Balassa (1965) [21]. After Balassa's first work, he later redefined the quantification of RCA to different industries in 1977 and 1989 [22,23]. These are subject to the situations of supply and demand, and thus they describe the trade movements and lead to the specialisation in trade. This method has changed over the years to include new techniques, as well as other indices to provide a more subtle picture of trade well-being. Kathuria (2013) [24] does look at the export competitiveness of the clothing industry of India and Bangladesh through the use of the RCA index from Balassa executed at the HS 4-digit level between 1995 and 2003 in the modern-day literature of trade. The results reveal that both countries have a rising product trend; that is, they both have a comparative advantage, but the growth in Bangladesh is greater. The study also highlighted the reasons hampering India's export growth and proposed policy suggestions to strengthen its competitiveness. Another study by Hasan and Das (2024b) [18] investigated Bangladesh's apparel export competitiveness from 2011 to 2020 using RCA, CAGR, market share, normalised RCA, and trade competitiveness indices. Their findings showed substantial comparative advantages and consistent export growth across several apparel segments. However, the analysis is bounded by its geographic specificity, the exclusion of several critical competitiveness indicators, and issues with data accuracy. A similar study by Das et al. (2024) [25] analysed the competitiveness of leading apparel exporting countries competing with China between 2016 and 2021, employing trade indicators such as RCA, NRCA, CAGR, TC and Market Share. The study concludes that China still has a comparative advantage over almost every country in nearly every category. However, some countries performed better than China in specific categories. Despite this, none of these countries can replace China as the largest apparel exporter. Furthermore, Hasan et al. (2024) [18] measured the competitiveness of Vietnam's apparel exports by incorporating RCA and NRCA in different HS digit classifications. The empirical research results illustrated consistent comparative advantage in most product categories, while several subcategories exhibit comparative disadvantages.

However, Specific criticism of the Balassa index stems from its inherent asymmetry and failure to account for the impact of agricultural policy. Sometimes, the results have a distorted portrayal of trade competitiveness, which is why there is a size bias. To overcome the asymmetry bias associated with the Balassa index, Dalum et al. (1998) [26] introduced the RSCA index as an alternative measure to evaluate trade competitiveness. For example, Das et al. (2024b) [2] investigate the export competitiveness of China's garment industry (HS 61 and 62) by employing quantitative indices such as RSCA, CAGR, market share and NRCA, while emphasising the effect of the Zero-COVID policy. The outcome reveals substantial disruption, with HS 61 products exhibiting positive growth while HS 62 products experiencing a downturn. However, China's overall dominance persists in this industry. Another research by Kantur and Türkekul (2023) [27] utilised indices of RSCA, RTA, TSI and RC to analyse the post-MFA evolving competitive landscape in Türkiye, India, China and the USA yarn and weaving sectors. The finding suggests a decline in Türkiye's competitiveness in cotton yarn and fabric, whereas India and China maintain their competitive position in this sector.

In light of the multifaceted nature of trade performance evaluation, the present study also incorporates Lafay Index (LFI), Market Concentration Index (MCI), Trade Balance Index (TBI) and Relative Import Advantage index (RMA). Although these indices have been limitedly applied in prior empirical apparel industry-related literature, their applicability is validated in other sectors, including agriculture, engineering, and food processing. [28]. Employing the RSCA and Lafay indices, Hossain and Sarkar (2025) [29] analysed trade specialisation and competitive edge of BIMSTEC nations in the raw sugar market from 2005 to 2022. Their research findings showed that Thailand and India possess the most significant comparative advantages due to their demand for increasing value-added marketing strategies. Besides, they highlighted possible competitive or cooperative solutions between these countries. Similarly, Dourandish et al. (2025) [30] explore Iran's potential to emerge as a regional centre for agricultural trade, particularly in horticultural products. Some of the indices used in the study included SRAC, Lafay index, relative import advantage and EAI. The results showed a growing comparative advantage and good export relations with the neighbouring markets such as Iraq, Turkey, and the USA. The study also promoted the use of proximity to geographical regions to make Iran a regional hub through the improvement of legal, infrastructural and business systems. Kocanova (2022) [28] examined Brazilian comparative advantages in the areas of primary commodity exports using the Lafay index in the period of 2001 to 2020. Also, the study identified that Brazil has a formidable comparative advantage in agricultural, food, and minerals products, namely, soybeans, iron ore, among others, with regard to the development of Brazilian export specialisation under variable world commodity prices. Similarly, Smutka et al. (2018) [31] employ the RSCA, Lafay, and the TBI in testing differences in the territorial and commodity structure of Czech agrarian foreign trade. This study says that Czech agriculture is more territorially concentrated, and there is increased commodity diversification. In their research, Hoang (2018) [32] considered the complementarity of agricultural trade in ASEAN countries backdated to 1997-2015 and implemented the Trade

Complementarity Index (TCI), Export Similarity Index (ESI), Relative Import Advantage (RMA), and Spearman rank correlation coefficients. This research paper indicates that the complementarity in this region is not high, whereas complementarity at the international market is high, implying that the states of ASEAN should therefore be keen on increasing cooperation in this region and the competitiveness of the countries in the international market. Also, with the addition of the MCI and competitive intensity index (CI), Zhao et al. (2019) [33] evaluated the concentration of the market and competitive eco-system of the World engineering contracting business between the years 2004 and 2016. The study used a time series model to forecast future trends and realised that different industries had different competition factors.

2.3 Review of MCDM Techniques in Trade Performance and Competitiveness Studies

Diverse objectives exist where international trade tries to pursue such goals as creating an equitable society, environmental sustainability and economic growth. A dynamic environment is required to assess trade performance in an organised fashion that could handle various factors in parallel. Such complications have been well addressed by the use of MCDM techniques. MCDM is the decision-making framework that deals with problems defined with multiple and, in most cases, conflicting criteria. In international trade, the interests of the parties involved in the trade can be based on economic issues such as GDP or trade balance, environmental conditions like carbon emissions and even social ones like labour standards. The selection of criteria requirements should correspond to the nature of the particular evaluation, and they may be quantitative or qualitative. As an example, research on the trade competitiveness of textile exporters involved such factors as market share and net exports [34]. Once the criteria are ascertained, the next process is to provide a number of weights to each criterion depending on its relative importance. There exist numerous approaches to do this, to mention a few: the Criteria Importance Through Intercriteria Correlation (CRITIC) method, the Entropy method, and the Fuzzy Analytic Hierarchy Process (FAHP). The weighting method is selected based on the nature of the criteria and the availability of data. After the determination of the weights, the aggregation of the criteria to measure the overall performance of the different alternatives is then done. Some of these MCDMs are the Technique of Order of Preference by Similarity to Ideal Solution (TOPSIS), multi-attribute border approximation area comparison (MABAC) and VIKOR method. All the methods differ by aggregation; TOPSIS focuses on the ideal and anti-ideal solution and infrequently draws close to the ideal location, whereas VIKOR instead concentrates on compromise solutions (Akdamar et al., 2024; Xu et al., 2024) [35,36]. For example, Işik et al. (2018) [37] compared 22 emerging economies by incorporating AHP and TOPSIS methods, where high-tech exports are the decisive performance indicators. The finding demonstrates that the Philippines ranks first in high-tech exports, while Turkey ranks 17th out of 22 countries. The finding also suggests that Turkey need to adopt policies to increase its share of high-tech exports. Another study by Karabiyik and Karabiyik (2018) [38] assesses the trade performance of OECD countries using the TOPSIS and AHP methods from 1999 to 2014, with key indicators including terms of trade, trade balance, and export volume per capita. The study's outcome reveals that Norway, Ireland, and Germany are emerging as top performers. Turkey, the USA, and Greece are underperforming. Akdamar et al. (2024) [35], analysing the maritime trade performance of 20 nations with the most ports of call, ranked the nations using the VIKOR approach. It weighted six indicators using the CRITIC method. The findings indicated development opportunities and offered insights into each nation's relative performance. Applying the CRITIC-MAIRCA, a hybrid MCDM approach, Fidan (2021) [39] attempted to identify the optimal international investment location for Turkey's manufacturing exporters in his study. The study utilises eight international target markets and nine criteria for the evaluation framework. The results demonstrate that Romania emerged as a premier investment location for opening offices, stores, and warehouses. Furthermore, applying the AHP and TOPSIS approach, Kahreman (2021) [40] assesses the agricultural performance among the top 10 OECD countries from 2000 to 2019. The criteria incorporated in the study are food inflation, trade balance and employment. The conclusion drawn from the research demonstrates that Italy achieved the highest performance and ranked second in 2019, whereas the US ranked first in 2019. The findings also suggest that strong agricultural performance is influenced by various socio-economic factors, not only trade volume. Therefore, implementing MCDM in international trade provides a systematic framework to measure trade performance. Through evaluating various criteria and applying sophisticated methodologies, decision-makers can obtain significant insights regarding the comparative performance of diverse countries and markets.

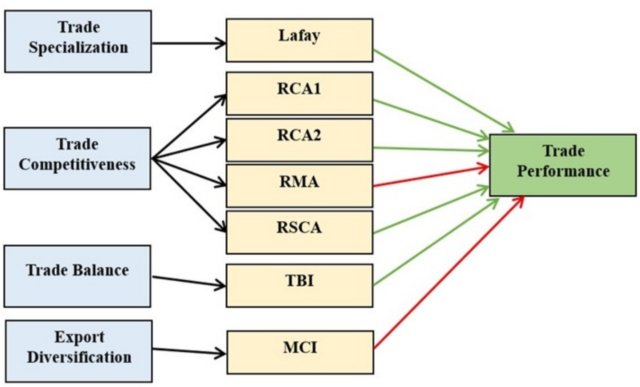
2.4 Research Gap and Objective

Based on the existing literature survey, numerous studies have investigated trade competitiveness at the country level [18]. Conducting comparative evaluation with BIMSTEC member countries is an aspect with little appreciation, especially with reference to the apparel industry. In addition, the focus of previous studies has been centred on global leaders in the exportation of apparel, basing little on the intra-BIMSTEC comparison [25]. Also, a few studies analysed the dynamics of the trade of the apparel industry under a volatile trade environment, especially in the period 2021 to 2023. This study fills the above mentioned research gap by integrating a strong MCDM research, and both CRITIC and TOPSIS are used to determine the performance of the trades of the apparel sector within the BIMSTEC region.

After analysing the existing literature and considering the research gap, it is anticipated that the study will achieve two principal objectives. First, it strives to create a multidimensional approach to the evaluation of apparel industry trade performance in BIMSTEC countries. This framework will absorb seven key trade indices to examine the performance of the sector in the volatility of the trade witnessed between 2021 and 2023. Secondly, the research will come up with a comparison and ranking of the BIMSTEC members on their apparel performance regarding trade using the CRITIC-TOPSIS MCDM approach. It is with the above objectives that the research is hoping to have an overall view regarding how trade takes place in the area, especially when there is so much volatility in the world regarding trade.

2.5 Conceptual Framework

Figure 1: Conceptual Framework



Source*: *Authors' Construction

Figure 1 shows the conceptual framework of this study. Here, Lafay, RCA1, RCA2, RSCA, and TBI indices are beneficial criteria as indicated by the green colour. Whereas, RMA and MCI are non-beneficial criteria as indicated in red colour.

3 Data and Methodology

3.1 Data

The present study employs country-level trade data from the OEC database from 2021 to 2023. The research focuses specifically on the apparel sector of the BIMSTEC region to gain a holistic overview of trade dynamics within the region. Two-digit Harmonised System (HS) codes 61 and 62, representing Kitted and Non-Knitted clothing accessories, are used in the study. HS is an internationally accepted product classification system adopted by more than 200 countries and economies. It provides the foundational custom tariff structure and structured international trade data accumulation for approximately

98% of globally traded goods [41]. In addition to quantitative data, the current research incorporates various national and international industry reports, academic publications, and pertinent empirical findings to provide contextual comprehension and validate the methodical framework.

3.2 Methodology

3.2.1 Selection of Trade Indices as Evaluation Criteria To assess the trade performance of BIMSTEC countries in the apparel sector, this study employs the MCDM approach. Seven widely recognised trade indices were selected as evaluation criteria, including the RCA1, RSCA, RCA2, Lafay index, TBI, MCI, and RIM index.

Revealed Comparative advantage (RCA1)

The RCA index helps to decide a nation's relative advantage or disadvantage within a particular product or industry compared to the global average, which exhibits competitiveness [21]. The index facilitates understanding a country's export patterns and specialisation in specific products or services. Researchers use this matrix to measure the comparative advantage of different commodities [24,29]. The values of this index range from zero to infinity. A value less than 1 signifies the comparative advantage, and above 1 indicates a comparative disadvantage.

$$RCA = \frac{\left(\frac{X_{ij}}{X_i}\right)}{\left(\frac{X_{wj}}{X_w}\right)}$$

In this equation, X_{ij} refers to the export of specific product j by country i; X_i denotes the overall export value of country i; X_{wj} signifies the world export of product j; X_w Indicates the total world export of all products.

Revealed Systematic comparative advantage (RSCA)

To address the asymmetry bias associated with the Balassa index, Dalum et al. (1998) [26] introduced the RSCA index as an alternative measure to overcome the critique of the RCA index of Balassa. The transformed formulation of the index is expressed as follows.

$$RSCA = \frac{B-1}{B+1}$$

The RSCA index value lies between -1 and +1, where positive values, i.e., values from 0 to 1, signify comparative export advantage. Conversely, negative values, ranging from -1 to 0, represent the comparative export disadvantage. The symmetric distribution around zero helps to reduce the potential bias.

Revealed Comparative advantage (RCA2)

The traditional RCA index of Balassa is often criticised in academic literature because it does not capture the impact of countries' economic policies. Additionally, the asymmetric index evaluates competitiveness solely based on export flow. Buturac (2008) [42] and Ignjatijević et al. (2015) have developed a new RCA measure incorporating import and export values and applying an algorithm to overcome the limitation of the Balassa index.

$$RCA = \ln\left(\frac{X_j}{m_j}\right) \times \left(\frac{\sum_{j=1}^{n} X_j}{\sum_{j=1}^{n} m_j}\right)$$

In the above equation, X_j Represent the specific country's export value of product j and m_j Denotes the specific country's import value of product j. while, $\sum_{j=1}^{n} X_j$ signifies the total export value of all the products in a specific country and $\sum_{j=1}^{n} m_j$ Represents the total import value of all the products in a specific country.

Lafay index

In response to the practical constraints associated with Balassa, Lafay (1992) [43] introduced an index that integrates trade flow and production dynamics. This index evaluates a country's specialisation level in a specific product. Notably, the index ensures symmetry across all products within a country, and the aggregate across all sectors must be zero. The index's positive value represents a product's strong specialisation and comparative advantage. In contrast, the negative value reflects a product or commodity's lower level of specialisation and comparative disadvantage.

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

In the above formula, x_j Represent the export of a particular product and m_j Exhibit the importance of a particular product. N denotes the number of products.

Trade balance index (TBI)

The TBI index is a standard indicator to evaluate a country's trade performance. The index determines whether the specific country is a net importer or exporter of particular products. The index ranges between -1 and +1. The value >0 represents that the country is a net exporter. At the same time, a negative value suggests that the country has a net import dependency.

$$TBI_j = \frac{x_j - m_j}{x_j + m_j}$$

Here, x_j indicates the export of a particular product and m_j Embodies the importance of a particular product.

Market concentration index (MCI)

The MCI serves as a valuable tool for analyzing export diversification. The application of MCI for a specific product implies the degree of diversification or concentration of a country's export across various international markets. The value of the index varies from 0 to 100. The high value of MCI indicates export concentration, i.e., the specific product export is directed predominantly towards a few countries, which increases susceptibility to demand shocks [44]. Conversely, a lower index value indicates a more equitable distribution of specific product exports across numerous countries. Therefore, for a particular country or region, a lower value of MCI is generally preferred for sustainable export performance. The index is formulated as below [45,46]

$$MCI_{ij} = 100\left(\sum_m \left(\frac{\exp_{ij_m}}{\exp_{ij}}\right)^2\right)^{0.5}$$

Here, MCI_{ij} Indicates the market concentration index for country i's export of specific product j. exp_{ij} Refers to country i's export of product j to country m. exp_{ij} Signifies country i's total export of product j to the world market.

Relative import advantage (RMA)

The conventional RCA indices predominantly examine the export competitiveness. Vollrath (1991) [47] proposed that the RMA index evaluate trade performance by considering import dimensions. According to Song and Gazo (2013) [48], countries with an RMA index value less than 1 imply comparative import advantage. The index value exceeding 1 signifies that the country has a comparative disadvantage in importing the specific product.

$$RMA_j^B = \left(\frac{M_j^B/M_n^B}{M_j^R/M_n^R}\right)$$

In the above equation, RMA_j^B Implies the relative import advantage of product j by country B.M_j^B Refers to the import of specific product j by country B. M_n^B Represent the total imports of country B except product j. M_j^R Total import of product j by the rest of the world except country B. M_n^R Indicate the total import of all products except product J, by all countries except country B.

3.2.2 Method The CRITIC method was applied to ascertain each criterion's objective weight, accounting for both the contrast intensity and the conflict between criteria. The TOPSIS method was employed to rank the BIMSTEC countries according to their relative trade performance. This unified framework enables a comprehensive and robust analysis of trade competitiveness under volatile trade conditions

CRITIC Method

Among the several weighting procedures of MCDM, the CRITIC method is one of the well-recognized methods that assesses the objective weight of criteria. Diakoulaki et al. [49] introduced this method in 1995. The approach mitigates the shortcomings of the subjective weighting biases by determining the criteria weight from the data structure. In the CRITIC method, we calculate the normalised value (SD) column-wise and inter-column correlation coefficient variability to analyse contrast among criteria [50].

Step 1: Construct the decision Matrix

$$Y = \begin{bmatrix} y_{11} & y_{12} & \cdots & y_{1m} \\ y_{21} & y_{22} & \cdots & y_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ y_{m1} & y_{m2} & \cdots & y_{mm} \end{bmatrix} \tag{3.1}$$

Seven robust indices are used as criteria to form the decision matrix of HS-61 and HS-62 products. The same can be found in Table 1 and Table 9, respectively.

Step:2 Compute the normalized decision matrix.

$$y_{ij}^Q = \frac{y_{ij} - \min(y_{ij})}{\max(y_{ij}) - \min(y_{ij})} \tag{3.2}$$

In the second step, we first identified each criterion's best and worst value. For beneficial criteria $\max(y_{ij})$ value and for non-beneficial criteria $\min(y_{ij})$ Value is the best. In contrast to the beneficial criteria $\min(y_{ij})$ value and for non-beneficial criteria $\max(y_{ij})$ Value is the worst. In the equation (3.2) y_{ij}^Q denote the normalized value of the decision matrix, and the outcomes for HS-61 and HS-62 products are shown in Tables 2 and 10, respectively.

Step 3: Determine the Standard deviation (Sj) of each criterion.

$$S_j = \sqrt{\frac{1}{m-1}\sum_{i=1}^{m}(y_{ij} - \bar{y}_j)^2} \tag{3.3}$$

Step 4: Formulate an m x m correlation matrix R, containing the correlation coefficient between the y_j and y_k .

$$R = [r_{jk}]_{m\times m} \tag{3.4}$$

$$r_{jk} = \frac{\sum_{i=1}^{m}(y_{ij} - \bar{y}_j)(y_{ik} - \bar{y}_k)}{\sqrt{\sum_{i=1}^{m}(y_{ij} - \bar{y}_j)^2 \sum_{i=1}^{m}(y_{ik} - \bar{y}_k)^2}} \tag{3.5}$$

In equation(3.5) We compute the pairwise correlation coefficient among all criteria to assess the degree of conflict between them. r_{jk} Denotes the correlation between criteria. The results of the equation (3.5) for HS-61 and HS-62 products are presented in Tables 3 and 11, respectively.

Step 5: Ascertain the strength of the information of each criterion. (L_j)

$$L_j = s_j \sum_{k=1}^{m} (1 - r_{jk}) \tag{3.6}$$

At this stage, first we compute the measure of conflict caused by criterion j compared to the rest of the criteria. Thereafter, measure the level of information conveyed by each criterion, which is shown in equation (3.6).

Step 6: Computation of Criteria weights (w_j)

$$w_j = \frac{L_j}{\sum_{k=1}^{m} L_k} \tag{3.7}$$

We determine the criteria weight in the final stage using equation (3.7). The results are made visible for HS-61 and HS-62 products in Tables 4 and 12, respectively.

TOPSIS Method

After determining the criteria weights, the next step is to rank the alternatives. The TOPSIS approach was applied to do this. The TOPSIS approach determines the closeness of each alternative to the ideal option based on the concepts of ideal and anti-ideal solutions. This methodology is a useful MCDM tool for decision-making since it provides a methodical approach to evaluate and rank solutions according to overall performance [51]. The following steps are presented below in a sequential manner to understand the conceptual framework of the study.

Step 1: Calculating normalised decision matrix (NDM)

$$r_{ij} = \frac{y_{ij}}{\sqrt{\sum_{i=1}^{n} y_{ij}^2}} \tag{3.8}$$

In this step, first, we measure and normalize the decision matrix using vector normalization (r_{ij}) procedure, which is shown in equation (3.8), and the outcomes for HS-61 and HS-62 products are presented in Tables 5 and 13, respectively.

Step 2: Computation of weighted normalized decision matrix (T_{ij}).

$$T_{ij} = r_{ij} \times W_j \tag{3.9}$$

The second step involves constructing a weighted normalized decision matrix, which is obtained by multiplying the Criterion weight calculated through CRITIC with each normalized value. Equation (3.9) depicts the formulation. The outcomes of Eq. (3.9) for HS-61 and HS-62 products are displayed in Tables 6 and 14, respectively.

Step 3: Determining the ideal positive and negative values of each criterion.

$$B^+ = \{(\max T_{ij} | j \in J), (\min T_{ij} | j \in J^-)\} \tag{3.10}$$

$$B^- = \{(\min T_{ij} | j \in J), (\max T_{ij} | j \in J^-)\} \tag{3.11}$$

In step 3, we compute the ideal positive (B^+) and negative (B^+) of each criterion by applying Equations (3.10) and (3.11). Where B+ indicates the highest performance and B^- The lowest performance attainable of each criterion for HS-61 and HS-62 products. The same can be found in Tables 7 and 15, respectively.

Step 4: Assessing the proximity of the ideal and non-ideal solutions.

$$S_i^+ = \sqrt{\sum_{j=1}^{m} (T_{ij} - T_j^+)^2} \tag{3.12}$$

$$S_i^- = \sqrt{\sum_{j=1}^{m} (T_{ij} - T_j^-)^2} \tag{3.13}$$

In the fourth step, Euclidean distances are computed for each element of the weighted decision unit from its respective ideal and non-ideal value. Here, S_i^+ Indicate the distance of the decision unit from the positive ideal solution. And S_i^- Implies the distance of the decision unit from the negative ideal solution.

Step 5: Determine performance score and ranking of alternatives.

$$Z_i = \frac{S_i^-}{S_i^- + S_i^+} \tag{3.14}$$

In the final stage, we calculate the performance score of each alternative (z_i) by utilizing equation (3.14) for both the products. Thereafter, rank the alternatives based on their respective performance score value. The results of HS-61 and HS-62 products are presented in Tables 8 and 16, respectively.

4 Results & Discussion

4.1 Knitted Clothing Accessories (HS-61)

Table 1 presents the decision matrix, constructed by averaging the values of the selected indices over three years of volatile trade environment.

Table 1: **Decision Matrix**

Country	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
India	1.7560909	0.273894	1.44885	0.876794	0.791008	33.26548	0.13652
Bangladesh	42.083844	0.953563	4.325205	23.14721	0.992984	27.32092	0.114386
Bhutan	0.0034046	-0.99322	-2.0039	-0.17938	-0.99438	47.00041	0.42435
Myanmar	9.5843656	0.811039	2.601416	5.082849	0.886182	29.74911	0.534191
Nepal	2.2898919	0.374966	-0.12899	0.291983	-0.51456	32.22126	0.845883
Sri Lanka	21.440899	0.910765	2.941921	11.61129	0.958557	37.43145	0.340391
Thailand	0.5075625	-0.327313	1.258139	0.164631	0.479498	39.12319	0.212381

Source: Authors' Computation

After the formation of the Table-1, we now use CRITIC and TOPSIS method to find criteria weights of selected trade indices and the Performance Score of Countries.

- **CRITIC Result**

Table 2: **Normalized Decision Matrix**

Country	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
India	0.041651	0.650875	0.545535	0.045278	0.89837	0.697931	0.969741
Bangladesh	1	1	1	1	1	1	1
Bhutan	0	0	0	0	0	0	0.576261
Myanmar	0.227682	0.92679	0.727641	0.225589	0.94626	0.876613	0.426102
Nepal	0.054336	0.702793	0.296236	0.020207	0.241434	0.751432	0
Sri Lanka	0.509441	0.978016	0.781441	0.505461	0.982677	0.48624	0.691037
Thailand	0.011981	0.342149	0.515403	0.014748	0.741624	0.400276	0.866035

Source: Authors' Computation

Table 3: **Correlation coefficient of selected criteria**

Criteria	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
RCA1	1	0.683465	0.799392	0.999396	0.565477	0.547242	0.387594
RSCA	0.683465	1	0.865647	0.674027	0.764428	0.850892	0.027324
RCA2	0.799392	0.865647	1	0.804255	0.931804	0.749016	0.461506
LFI	0.999396	0.674027	0.804255	1	0.577884	0.536632	0.415553
TBI	0.565477	0.764428	0.931804	0.577884	1	0.636436	0.565995
MCI	0.547242	0.850892	0.749016	0.536632	0.636436	1	0.010359
RMA	0.387594	0.027324	0.461506	0.415553	0.565995	0.010359	1

Source: Authors' Computation

Table 4: **Measurement of Criteria weights**

Criteria	Measure of Conflict	Standard deviation (sd)	Quantity of information	Criteria weights
RCA1	2.017434	0.371901	0.750286	0.127249
RSCA	2.134217	0.371125	0.792061	0.134334
RCA2	1.38838	0.330579	0.45897	0.077842
LFI	1.992254	0.37425	0.745601	0.126455
TBI	1.957976	0.402237	0.787571	0.133573
MCI	2.669423	0.337107	0.899881	0.15262
RMA	4.131668	0.353812	1.461832	0.247928

Source: Authors' Computation

- **TOPSIS Result**

Table 5: **Normalized Decision Matrix**

Country	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
India	0.0363711	0.142282	0.223979	0.033202	0.361068	0.352288	0.116482
Bangladesh	0.8716155	0.495354	0.668637	0.876534	0.453264	0.289334	0.097597
Bhutan	0.0000705	-0.51595	-0.30978	-0.00679	-0.4539	0.497743	0.362065
Myanmar	0.1985057	0.421316	0.402155	0.192476	0.404512	0.315049	0.455784
Nepal	0.0474269	0.194786	-0.01994	0.011057	-0.23488	0.341138	0.721727
Sri Lanka	0.4440711	0.473122	0.454794	0.439694	0.437549	0.396406	0.29043
Thailand	0.0105123	-0.16994	0.194497	0.006234	0.218875	0.414322	0.181208

Source: Authors' Computation

Table 6: **Weighted Normalized Matrix**

Country	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
India	0.004628	0.019113	0.017435	0.004199	0.048229	0.053766	0.028879
Bangladesh	0.110912	0.066543	0.052048	0.110842	0.060544	0.044158	0.024197
Bhutan	0.000009	-0.069310	-0.024114	-0.000859	-0.060629	0.075966	0.089766
Myanmar	0.025260	0.056597	0.031304	0.024340	0.054032	0.048083	0.113002
Nepal	0.006035	0.026166	-0.001552	0.001398	-0.031374	0.052065	0.178936
Sri Lanka	0.056508	0.063556	0.035402	0.055601	0.058445	0.060500	0.072006
Thailand	0.001338	-0.022828	0.015140	0.000788	0.029236	0.063234	0.044927

Source: Authors' Computation

Table 7: **Ideal best and Ideal worst of Criteria**

Criteria	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
Ideal Best	0.110912	0.066543	0.052048	0.110842	0.060544	0.044158	0.024197
Ideal Worst	0.000009	-0.069310	-0.024114	-0.000859	-0.060629	0.075966	0.178936

Source: Authors' Computation

Table 8: **Performance Score of Countries**

Country	$\mathbf{S}_i^+$	$\mathbf{S}_i^-$	$\mathbf{P}_i$	Rank
India	0.162427	0.210836	0.564845	3
Bangladesh	0	0.297778	1	1
Bhutan	0.262730	0.089170	0.253396	7
Myanmar	0.152618	0.196133	0.562387	4
Nepal	0.244818	0.105325	0.300806	6
Sri Lanka	0.094098	0.231144	0.710682	2
Thailand	0.187727	0.172923	0.479475	5

Source: Authors' Computation

Table 4 presents the CRITIC results of objective weights of selected trade indices for product category 61 among BIMSTEC countries. From the table we can see that RMA index receives highest weight

(0.247), followed by MCI (0.152), indicating that these two indices are played a significant role in capturing the trade performance during volatile trade environment from 2021 to 2023. The RMA index measure the countries' relative import intensity for a particular product. In contrast, MCI represents the degree of concentration or diversification of countries' product. The TBI and RSCA indices is also gain considerable weights with the value 0.133 and 0.134 respectively, highlighting their significance in understanding the net trade balance outcomes and trade competitiveness. The others trade performance indicators such as RCA1, Lafay and RCA2 indexes, were relatively less impactful. Their respective weights are 0.127, 0.126, and 0.077 respectively.

Table 8 shows the performance score of countries under Product category 61. Wrights derived from CRITIC method applied in TOPSIS. The findings demonstrate that Bangladesh is identified as a top performing country in this product category, highlighting its strong import competitiveness as evidenced by very low RMA index value, equitable market spread and positive trade balance of the product. Sri Lanka gets the second position, indicating an outstanding trade performance in this product category. However, moderately high MCI and RMA index value kept the country next to Bangladesh. India's high comparative advantage, favorable trade balance, strong trade specialization and significant import efficiency position the country in third place among the BIMSTEC countries in the volatile trade environment.

Furthermore, Myanmar secures the fourth position by exhibiting strong competitiveness, high trade specialization, positive trade balance and acceptable market diversification, However, the country penalized by high RMA index value. Thailand and Nepal ranked fifth and sixth place, respectively. Bhutan occupied the bottom of the ranking due to very low competitiveness, negative trade balance, highly concentrated product market and negative trade specialization value in this product category.

Therefore, overall findings highlighted that, under a volatile trade environment, the import side trade competitiveness and market diversification are important parameters for success of Knitted clothing accessories. However, countries with a high import competitive advantage and broad export destinations, such as Bangladesh, Sri Lanka, India are well-positioned to endure volatility.

4.2 Non-Knitted Clothing Accessories (HS-62)

In Table-9, we formed the decision matrix by averaging the three years value of the selected trade indices.

Table 9: **Decision Matrix**

Country	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
India	2.076983	0.349864	1.559929	0.915356	0.819494	33.22911	0.137799
Bangladesh	38.49282	0.949324	3.62202	18.42751	0.982571	31.80451	0.256507
Bhutan	0.004146	-0.99174	-1.95133	-0.21649	-0.99273	50.63796	0.597775
Myanmar	19.28645	0.901228	3.705417	9.297677	0.963262	28.37608	0.330815
Nepal	3.083451	0.495532	-0.15482	0.307182	-0.59439	31.24452	1.361008
Sri Lanka	15.3833	0.877772	2.266608	7.107151	0.900142	41.55943	0.601908
Thailand	0.285748	-0.55564	0.319365	0.011234	0.131548	36.24304	0.261494

Source: Authors' Computation

After the formation of the Table-9, we now use CRITIC and TOPSIS method to find criteria weights of selected trade indices and the Performance Score of Countries.

- **CRITIC results**

Table 10: **Normalized Decision Matrix**

Country	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
India	0.053856	0.69117	0.62072	0.060708	0.917442	0.782003	1
Bangladesh	1	1	0.985257	1	1	0.845996	0.902954
Bhutan	0	0	0	0	0	0	0.62396
Myanmar	0.500986	0.975222	1	0.510307	0.990224	1	0.842205
Nepal	0.080005	0.766215	0.317587	0.028088	0.201658	0.87115	0
Sri Lanka	0.399576	0.963111	0.745647	0.392815	0.95827	0.407806	0.620581
Thailand	0.007317	0.224673	0.401413	0.012214	0.569167	0.646618	0.898877

Source: Authors' Computation

Table 11: **Correlation coefficient of selected criteria**

Criteria	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
RCA1	1	0.709405	0.807545	0.998465	0.645854	0.390323	0.274377
RSCA	0.709405	1	0.864226	0.693187	0.753647	0.686712	-0.01438
RCA2	0.807545	0.864226	1	0.816644	0.936867	0.676222	0.445752
LFI	0.998465	0.693187	0.816644	1	0.665849	0.378096	0.324722
TBI	0.645854	0.753647	0.936867	0.665849	1	0.55143	0.617295
MCI	0.390323	0.686712	0.676222	0.378096	0.55143	1	0.060427
RMA	0.274377	-0.01438	0.445752	0.324722	0.617295	0.060427	1

Source: Authors' Computation

Table 12: **Measurement of Criteria weights**

Criteria	Measure of Conflict	Standard deviation (sd)	Quantity of information	Criteria Weight
RCA1	2.174032	0.370692	0.805896	0.12616
RSCA	2.307202	0.396696	0.915257	0.14328
RCA2	1.452744	0.366712	0.532739	0.0834
LFI	2.123038	0.375399	0.796987	0.12477
TBI	1.829058	0.415086	0.759216	0.11885
MCI	3.256792	0.343612	1.119072	0.17519
RMA	4.291806	0.339862	1.458620	0.22835

Source: Authors' Computation

- TOPSIS result

Table 13: **Normalized Decision Matrix**

Country	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
India	0.045278	0.171864	0.251884	0.041889	0.376754	0.340886	0.081847
Bangladesh	0.839141	0.466338	0.584854	0.843286	0.451727	0.326272	0.152354
Bhutan	0.000090	-0.487176	-0.315084	-0.009907	-0.456395	0.519478	0.355054
Myanmar	0.420443	0.442712	0.598320	0.425484	0.442849	0.291101	0.196490
Nepal	0.067219	0.243421	-0.024999	0.014057	-0.273265	0.320527	0.808383
Sri Lanka	0.335355	0.431164	0.365993	0.325240	0.413831	0.426344	0.357508
Thailand	0.006229	-0.272948	0.051568	0.000514	0.060478	0.371805	0.155316

Source: Authors' Computation

Table 14: **Weighted Normalized Matrix**

Country	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
India	0.005712	0.024625	0.021007	0.005226	0.044779	0.059720	0.018689
Bangladesh	0.105868	0.066818	0.048777	0.105215	0.053690	0.057159	0.034789
Bhutan	0.000011	-0.069804	-0.026278	-0.001236	-0.054245	0.091007	0.081075
Myanmar	0.053044	0.063433	0.0499	0.053086	0.052635	0.050998	0.044868
Nepal	0.008480	0.034878	-0.002085	0.001754	-0.032479	0.056153	0.184590
Sri Lanka	0.042309	0.061778	0.030524	0.040579	0.049186	0.074691	0.081635
Thailand	0.000786	-0.039109	0.004301	0.000064	0.007188	0.065136	0.035466

Source: Authors' Computation

Table 15: **Ideal best and Ideal worst of Criteria**

Criteria	RCA1	RSCA	RCA2	LFI	TBI	MCI	RMA
Ideal Best	0.105868	0.066818	0.049900	0.105215	0.053690	0.050998	0.018689
Ideal Worst	0.000011	-0.069804	-0.026278	-0.001236	-0.054245	0.091007	0.184590

Source: Authors' Computation

Table 16: **Performance Score of Countries**

Country	S_i^+	S_i^-	P_i	Rank
India	0.150994	0.222564	0.595794	4
Bangladesh	0.017275	0.286482	0.943128	1
Bhutan	0.253275	0.103515	0.290129	7
Myanmar	0.078775	0.248726	0.759466	2
Nepal	0.242664	0.115381	0.322253	6
Sri Lanka	0.114726	0.213639	0.650614	3
Thailand	0.195044	0.169000	0.464229	5

Source: Authors' Computation

Table 12 demonstrates the measurement of criteria weights of non-knitted clothing accessories (HS-62). From this table, it is observed that the RMA index achieved the maximum CRITIC weights out of seven criteria, with the value of 0.228, followed by MCI index, with the value of 0.175. Like the knitted apparel, non-knitted apparel also gets same criterions are maximum weights. Which indicates that during the volatile trade environment (2021 to 2023) import competitiveness and product market diversification trade indices plays more vital role than conventional export centric indices. The RCA1 and RSCA and Lafay indices are also achieve substantial weights with value 0.126, 0.143 and 0.124 respectively, highlighting their significance in understanding the trade competitiveness and specialisation. On the other hand, RCA2 and TBI exhibits lower CRITIC weights, indicating that these metrics are less influential for measuring trade performance during the study period, with weight value of 0.083 and 0.118.

Table 16 illustrate the performance scores of countries for HS -62 product. From this table, we observed that Bangladesh successfully retains top position in both knitted and non-knitted product categories, highlighting its excellency in apparel sector. Myanmar's secure second place and made considerable improvement in HS 62 product category by demonstrating strong competitiveness, high trade specialization, better market diversification and positive trade balance. Sri Lanka holds the third place, sustaining its resilient apparel trade performance with persistent competitiveness and diversified export market. India is a significant contributor to apparel export and ranked forth non knitted product. Despite its strong overall trade competitiveness, indices like RMA and MCI may have adversely affected its relative position within this product category.

Furthermore, Thailand ranked the fifth position, followed by Nepal and Bhutan. These countries exhibit difficulties in maintaining their performance due to highly concentrated product markets and low trade competitiveness.

5 Conclusion

This study offers a comprehensive analysis of the trade performance of BIMSTEC nations in the apparel sector from 2021 to 2023, focusing on knitted (HS-61) and non-knitted (HS-62) clothing accessories. The findings indicate that Bangladesh has emerged as the leader in both product categories, owing to its strong import competitiveness, market diversification, and trade specialization. Sri Lanka and Myanmar also performed well, particularly in the non-knitted apparel sector, while Bhutan ranked at the bottom due to its low competitiveness and limited market diversification. India, Thailand, and Nepal displayed moderate performance, with Thailand and Nepal lagging behind in comparison to other BIMSTEC countries. The study utilized a MCDM approach, using trade indices such as RCA1, RSCA, RCA2, Lafay, TBI, MCI, and RMA to assess the countries' performance in terms of competitiveness, specialization, and market diversification. The CRITIC method was used to assign objective weights to these indices, and it revealed that RMA and MCI indices received the highest weights. This suggests that import competitiveness and market diversification are more crucial indicators of trade performance during volatile trade conditions than traditional export-focused indicators.

Policy Implication

The results of the study provide some meaningful policy insight to enhance the apparel trade among BIMSTEC nations. To boost the intra-regional apparel trade, the countries should improve comprehensive transport infrastructure, establish harmonized textile standards, increase the number of trade promotion training programs and facilitate capacity building initiatives. Countries with superior trade performance ought to concentrate on maintaining competitiveness through the advancement of production technology, adhering to international sustainable standards, investing in product innovation and diversification of markets. In contrast, low-performing countries should focus on mitigating the underlying concerns, such as inadequate production capacity, limited market diversification, and poor infrastructure. To strengthen their position in regional and global supply chains, the countries must adopt targeted strategies, such as improving the efficiency of labor, setting up export-driven apparel clusters, and increasing foreign direct investment in this sector.

Limitation & Further Scope

The present study acknowledged a few limitations that need to be considered. In this study, we utilize HS-2-digit classification of products to measure trade performance, which does not capture the detailed identification of products. Another limitation is that the study considers only seven trade indices. Employing more trade-related indicators along with advanced econometric models could have strengthened this study in various dimensions of apparel sector trade performance.

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References

1. Vasily Erokhin. Rising economic powers among economies in transition: is there enough space on the global market? In *Foreign Direct Investments: Concepts, Methodologies, Tools, and Applications*, pages 2009–2034. IGI Global, 2020.
2. Sudipta Das, Md Rokibul Hasan, and Debanjan Das. The weave of challenges: China's apparel export competitiveness in the face of zero-covid policy. *International Journal of Global Business and Competitiveness*, 19(1):37–48, 2024.
3. Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC). Brief on bimstec, 2025.
4. K. A. U. Zaman and S. Sharmin. Intraregional trade and sustainable development goals: Bay of bengal initiative for multi-sectoral technical and economic cooperation. In *Springer eBooks*, pages 995–1025. 2024.
5. BGMEA. A success story: The bangladeshi garment sector has made remarkable progress in recent years, 2023. Accessed 15 June 2025.
6. Bangladesh Bank. Quarterly review on readymade garments (rmg): April–june of fy23, 2023. Accessed 15 June 2025.
7. Indian Trade Portal. Indian trade portal, n.d. Retrieved June 15, 2025.
8. Md Sharif Hossain and Shah Alam. Impacts of covid-19 on the garment sector of bangladesh. *American Journal of Industrial and Business Management*, 12(3):443–487, 2022.
9. M. I. Mostafiz, M. Musteen, A. Saiyed, and M. Ahsan. Covid-19 and the global value chain: Immediate dynamics and long-term restructuring in the garment industry. *Journal of Business Research*, 139:1588–1603, 2021.
10. Kanupriya. Covid-19 and the indian textiles sector: issues, challenges and prospects. *Vision*, 25(1):7–11, 2021.
11. AG Kumar, A Rajayya, and LR Rose. Chapter: Russia-ukraine conflict and global trade. In *Recent Research in Management, Accounting and Economics (RRMAE)*, pages 846–850. Routledge, 2025.
12. A. C. Vianna and A. V. Mollick. Threshold effects of terms of trade on latin american growth. *Economic Systems*, 45(4):100882, 2021.
13. V. Ruzekova, Z. Kittova, and D. Steinhauser. Export performance as a measurement of competitiveness. *Journal of Competitiveness*, 12(1):145–160, 2020.
14. Peter J Buckley, Christopher L Pass, and Kate Prescott. Measures of international competitiveness: A critical survey. *Journal of marketing management*, 4(2):175–200, 1988.
15. L. Farinha, S. Nunes, J. J. Ferreira, and A. Fernandes. Understanding the foundations of the global competitive advantage of nations. *Competitiveness Review: An International Business Journal Incorporating Journal of Global Competitiveness*, 28(5):503–517, 2018.
16. A. G. Schweinberger. Procompetitive gains from trade and comparative advantage. *International Economic Review*, 37(2):361, 1996.
17. E. Siggel. International competitiveness and comparative advantage: A survey and a proposal for measurement. *Journal of Industry, Competition and Trade*, 6(2):137–159, 2006.
18. Md Rokibul Hasan, Ishtehar Sharif Swazan, and Debanjan Das. Beyond the seams: evaluating competitiveness and comparative advantage in vietnam's apparel industry. *Journal of Chinese Economic and Foreign Trade Studies*, 17(1):4–28, 2024.
19. Ufuk Gunes Bebek. Rca: Choosing the right measure. *Department of Economics, University of Birmingham*, 2017.
20. Hans H Liesner. The european common market and british industry. *The Economic Journal*, 68(270):302–316, 1958.
21. Bela Balassa. Tariff protection in industrial countries: an evaluation. *Journal of Political Economy*, 73(6):573–594, 1965.

22. Bela Balassa. 'revealed'comparative advantage revisited: An analysis of relative export shares of the industrial countries, 1953–1971. *The Manchester School*, 45(4):327–344, 1977.

23. Bela Balassa. Policy responses to exogenous shocks in developing countries. In *New Directions in the World Economy*, pages 32–38. Springer, 1989.

24. Lalit Mohan Kathuria. Analyzing competitiveness of clothing export sector of india and bangladesh: Dynamic revealed comparative advantage approach. *Competitiveness Review: An International Business Journal*, 23(2):131–157, 2013.

25. Sudipta Das, Md Rokibul Hasan, and Debanjan Das. Who is the next china? comparative advantage analysis from top ten apparel exporting nations. *Competitiveness Review: An International Business Journal*, (ahead-of-print), 2024.

26. Bent Dalum, Keld Laursen, and Gert Villumsen. Structural change in oecd export specialisation patterns: de-specialisation and 'stickiness'. *International Review of Applied Economics*, 12(3):423–443, 1998.

27. Çiğdem Kantur and Berna Türkekul. Comparative advantage of yarn and weaving industries: Evidence for türkiye and top exporters. *Fibres & Textiles in Eastern Europe*, 31(1), 2023.

28. DOMINIKA KOCÁNOVÁ. The importance of primary commodities in the foreign trade of brazil in the 21st century. *Ecomomic Review/Ekonomické Rozhl'ady*, 51(4), 2022.

29. Md Monzur Hossain and Ankur Sarkar. Bimstec's incipient competitive advantage and trade specialisation in raw sugar. *Economic Annals*, 70(244):57–86, 2025.

30. Arash Dourandish, Afsaneh Nikoukar, and Milad Aminizadeh. Investigating the production and export capacities of iran's horticultural products to create a regional hub. *Agricultural Economics and Development*, 32(3), 2025.

31. L. Smutka, M. Maitah, and M. Svatos. Changes in the czech agrarian foreign trade competitiveness - different groups of partners' specifics. *Agricultural Economics (Zemědělská Ekonomika)*, 64(9):399–411, 2018.

32. Viet Hoang. Assessing the agricultural trade complementarity of the association of southeast asian nations countries. *Agricultural Economics/Zemědělská Ekonomika*, 64(10), 2018.

33. Z. Zhao, X. Guo, and R. Chang. Market concentration and competitive intensity of the international engineering contracting industry. *Journal of Construction Engineering and Management*, 145(5), 2019.

34. İ. Özaytürk and E. K. Özekenci. Analysis of trade competitiveness of the world's leading textiles exporters by hybrid mcdm methods. *İşletme Araştırmaları Dergisi*, 16(1):166–186, 2024.

35. Emrah Akdamar, Ersin Fırat Akgül, Maruf Gögebakan, and Evrim Işık. Temporal analysis of factors influencing countries' maritime trade performance with critic-based vikor method. *Journal of ETA Maritime Science*, 12(2), 2024.

36. Xinxin Xu, Yixin Zhang, Zeshui Xu, Huchang Liao, and Zhibin Tong. Multi-attribute decision making based on vikor with probabilistic linguistic term sets: An application to the risk evaluation of foreign direct investment. *Plos one*, 19(3):e0294758, 2024.

37. Nihat Işık, Özgür Engeloğlu, and Serhat Karaoğlan. Gelişmekte olan piyasa ekonomilerinin ihracat performansının bulanık ahp ve topsis yöntemi ile değerlendirilmesi. *Anadolu Üniversitesi Sosyal Bilimler Dergisi*, 18(3):113–128, 2018.

38. Can KARABIYIK and Büşra KUTLU KARABIYIK. Benchmarking international trade performance of oecd countries: Topsis and ahp approaches. *Gaziantep University Journal of Social Sciences*, 17(1), 2018.

39. Hüseyin Fidan. Critic ve mairca çok kriterli karar verme yöntemi ile uluslararası hedef pazar seçimi. *Karamanoğlu Mehmetbey Üniversitesi Sosyal ve Ekonomik Araştırmalar Dergisi*, 23(41):291–309, 2021.

40. Yusuf KAHREMAN, Yener ÜNAL, and Emine Demet EKİNCİ HAMAMCI. Agricultural sector foreign trade performance analysis by the fuzzy analytical hierarchy process method: Selected oecd countries. *Cumhuriyet University Journal of Economics & Administrative Sciences/Cumhuriyet Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 22(2), 2021.

41. Rafael Cornejo, Surendar Singh, and Jeremy Harris. Do revisions to the harmonized system lead to distortions in rules of origin? a case study of india's selected free trade agreements. *Legal Issues of Economic Integration*, 50(2), 2023.

42. Goran Buturac. Komparativne prednosti i izvozna konkurentnost hrvatske prerađivačke industrije. *Economic research-Ekonomska istraživanja*, 21(2):47–59, 2008.

43. Gerard Lafay. Comparative advantages. *International trade modelling*, page 209, 1992.

44. J. L. M. D. Silva and D. B. V. Montalván. Exportações do rio grande do norte: Estrutura, vantagens comparativas e comércio intra-indústrial. *Revista de Economia e Sociologia Rural*, 46:547–568, 2008.

45. James Love. Export instability in less developed countries: consequences and causes. *Journal of Economic Studies*, 14(2):3–80, 1987.

46. Enkang Li, Yingyi Ma, Yi Wang, Yu Chen, and Bo Niu. Competition among cities for export trade brings diversification: The experience of china's urban export trade development. *PloS one*, 17(9):e0271239, 2022.

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

48. Mingyao Song and Rado Gazo. Competitiveness of us household and office furniture industry. *International Journal of Economics and Management Engineering*, 3(2):47, 2013.

49. Danae Diakoulaki, George Mavrotas, and Lefteris Papayannakis. Determining objective weights in multiple criteria problems: The critic method. *Computers & operations research*, 22(7):763–770, 1995.

50. Irik Mukhametzyanov. Specific character of objective methods for determining weights of criteria in mcdm problems: Entropy, critic and sd. *Decision Making: Applications in Management and Engineering*, 4(2):76–105, 2021.

51. Sławomira Hajduk and Dorota Jelonek. A decision-making approach based on topsis method for ranking smart cities in the context of urban energy. *Energies*, 14(9):2691, 2021.

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