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Article

Investigating India's Trade Diversification with BRICS Countries through Herfindahl- Hirschman Index (HHI) Analysis

Anand Shankar Paswan[1], Shaurya Srivastava[2]

1. Assistant Professor, Department of Commerce and Business Administration, University of Allahabad, Prayagraj, India
2. Assistant Professor, Institute of Management, NIRMA University, Ahmedabad, India

* Correspondence: anandpaswanbhu@gmail.com

Abstract: The BRICS nations have evolved as one of the world's most prominent trade blocs, making significant contribution to the international trade, investment and economic cohesion. India, as a founding member of the BRICS nations has nurtured and expanded trade ties with the member of nations over the years. The present study, investigates at the evolving structure of India's trade with the BRICS nations by assessing the level of concentration and competitiveness of major commodities groups by employing Trade Concentration Index (TCI), also known as Herfindahl- Hirschman Index (HHI). The paper examines export and imports concentration tendencies in twenty-one broad commodities groups from 2008 to 2025. Secondary data were obtained from International Trade Centre (ITC) and classified using the Harmonized System (HS) commodities category framework. Herfindahl- Hirschman Index (HHI) has been used to evaluate the degree of concentration and trade competitiveness of India's exports and import with the BRICS nations. The finding reveals that India's export to the BRICS nations are moderately concentrated in a selected commodities group particularly Live Animals and Animal Products, Pulp and Paper Board, and Wood and Articles Thereof, indicating comparatively lower competition and greater export potential in these sectors. However, the majority of export commodity groups demonstrate low concentration values, reflecting diversified trade patterns and a competitive export structure. Similarly, India's imports from the BRICS nations show moderate concentration in selected sectors such as Live Animals and Animal Products, Prepared Foods and Tobacco, and Pulp and Paper products, whereas most import categories indicate low concentration and strong market competition. The study concludes that India's trade composition with the BRICS nations remains largely competitive and diversified, with no evidence of monopolistic concentration. The findings further suggest that effective trade diversification strategies, product innovation, and policy coordination can enhance India's trade competitiveness and strengthen sustainable economic integration within the BRICS framework.

Keywords: Brics, India's Trade, Trade Concentration Index, Herfindahl–Hirschman Index, Export Competitiveness

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1. Introduction

The BRICS region has been one of the fastest developing economy regions of the world and has played a decisive role in shaping the world economy. India is one of the founding members of the BRICS nations and has been sharing a healthy trade relationship

with the BRICS region over the years. According to Jim O'Neill[1], an economist and the former Chairman of Goldman Sachs, coined the concept of the BRIC acronym which includes (Brazil, Russia, India, and China) in a report entitled "**Building Better Global Economic BRICs**" in 2001. Which claimed this alliance as a combination of the fastest emerging economies for investment opportunities. The finding suggest that the four major emerging economies comprising almost 40 percent of the world population, more than a quarter of the world's total land area and 8 percent of global nominal GDP, and 23.3 percent of global GDP (PPP). Further, in October 2003, in another Global Economic report entitled "**Dreaming with BRIC: The Path to 2050**", Jim O'Neill provided a detailed economic roadmap about the four emerging nations that are anticipated to catch up with G7 countries in the next 25 years. O' Neill predicted that by 2035, China could overtake the USA to become the largest economy in the world, and by 2039 the combined GDP of the BRIC economies could become bigger than that of the G7. Further, by 2050, among the current G7 members, only USA and Japan will be in the list of G7, and they can be replaced by China, India, Brazil and Russia, among the top seven economies of the world. While **Clyde Prestoa Witz** that as a consequence of globalization, BRICS economies will be able to incorporate the global economy to the same level as developed economies. The BRIC was officially formed in 2008, and South Africa was added in 2010 as the fifth member, and the BRICS acronym came into existence.

1.1 Importance of BRICS nations as a Trade Bloc and India's contribution

To understand and analyse BRICS as a group, it is necessary to understand how these five emerging giants spread across four continents are situated in the global context. In 2025 BRICS had a combined GDP (US$ nominal value) worth US$ 27.65 trillion, representing nearly 26 percent of global GDP (US$ nominal value). Further, in terms of GDP (Purchasing Power Parity), these five nations account for nearly 39 percent of worldwide GDP (PPP). Together BRICS nations control more than 3.20 billion of population, representing more than 41 percent of the world's population. Whereas, BRICS nations acquire nearly 30 percent of the world land area, BRICS, as a group, account for over 40 percent of the worldwide workforce. Further, the literacy rate in Brazil, China, Russia, and South Africa ranges from 89 to 100 percent. While, India's literacy rate was recorded at 73 percent **(Census 2011)**. Thus, they are poised to surpass all other groups on the global stage on practically every scale[2][3][4].

A healthy upliftment of different commodities groups traded by India among the BRICS nations has been witnessed over the period under study. India's export to the BRICS nations was recorded worth US$ 36566.57 million, which represents 8.19 percent of India's total export to the world was recorded US$ 446551.64 million. While India's imports from the BRICS nations was recorded worth US$ 198887.69 million, command 26.47 percent of India's total import from the world which was worth US$ 751252.92 million (ITC, Trade Map, 2026). Similarly, one of the essential parts is to analyse the commodities groups which have been traded by India with the BRICS nations. Thus, the different types of commodities groups exported and imported by India from the BRICS nations have been analysed from 2008 to 2025. The composition of India's export and import to the BRICS nations have been sub-divided into 21 broad commodities groups of the 99 commodities based on the two-digit Harmonized System (HS) Code of Indian Trade Classification of Directorate General of Foreign Trade (DGFT) under the Ministry of Commerce and Industry, Government of India. While, Herfindahl-Hirschman Index (HHI) has been employed to know which commodities groups India had a high or low concentration level of exports and imports from the BRICS nations during the study period[5][6][7].

1.2 Literature Review

The Trade Concentration Index or TCI is a tool used to see how much a countries trade is focused on a products or partners. It is usually measured using the Herfindahl–Hirschman Index or HHI. The HHI helps us understand if a country relies heavily on a

commodities and markets or has a diverse trade structure. A high HHI value means a country is more dependent on a things while a lower value means it has a more diversified trade. The idea of looking at trade concentration started with **Béla Balassa[**8], the major finding suggest that trade specialization and comparative advantage are important for economic integration were trade liberalization and integration could help countries export diverse products and be more competitive. Later, **Paul Krugman** unfolds how regional integration and economies of scale affect concentration and trade patterns, by using the New Trade Theory. The findings revealed that increased trade integration among different nations frequently leads to specialization in specific domains, impacting trade concentration levels. **Babones and Farabee-Siers[**9] step-up to find out trade partner concentration indices for 183 countries and demonstrated that economies with highly consolidated trade structures are more sensitive to international market movement and global crises. Their findings indicates that diversifying export destinations and products promotes long term economic prosperity. **Brezina**[10] examined export concentration amongst developing and developed nations using the HHI index, based on their research findings, export diversification in the emerging nations was greatly aided by trade liberalization and globalization. While, the Trade Concentration Index has also been used to study trade blocs like BRICS, ASEAN and the European Union. Scholars have used TCI and HHI to see how well regional integration and trade cooperation work among member countries. Likewise, **Mishra[**11] analyzed trade relations among member BRICS nations, they found that the size of the economy and market potential were key to promoting trade within BRICS. Their study showed that BRICS economies are becoming more important in trade and investment. While, Maryam, Banday and Mittal analyzed trade intensity within BRICS[12]. They found that while trade cooperation among BRICS countries increased export structures remained unevenly concentrated. China dominated manufacturing exports while India had an advantage in service-oriented and labor-intensive industries. Extending to their previous work **Maryam and Mittal**[13] examined India's trade relations with BRICS economies, by using trade complementarity and comparative advantage indices. The study found that India's exports are concentrated in a sectors like agriculture, textiles and labor-intensive products. However trade integration with BRICS nations improved over time. While in recent time **Lee Soon-Cheul**[14] examined export diversification and concentration in trade relations between South Korea and India using the HHI. The study found that greater export diversification helped trade performance. However excessive concentration increased vulnerability to market fluctuations and external economic shocks. Similarly, **De Sousa Filho et al.** Analyzed global value chains and intra-BRICS trade in value-added using concentration and specialization measures. Their findings showed that China and India strengthened their positions in global value chains. However Brazil and Russia remained relatively concentrated in medium-technology sectors. The study emphasized that coordinated trade and industrial policies, within BRICS are necessary to reduce concentration and enhance sustainable trade integration.

1.3 Objective of the Study

1. To assess India's Export Concentration Index with the BRICS nations
2. To assess India's Import Concentration Index with the BRICS nations

2. Material and Methods

2.1 Trade Concentration Index (TCI)/ (Herfindahl - Hirschman Index or HHI Interpretation)

HHI is a concentration metric named after the two world famed economists, Orris C. Herfindahl and Albert O. Hirschman[15]. HHI is a measure of a company's size in proportion to its industry, as well as measures the level of competitiveness among those industries. It is a commonly used economic term applied generally in competition law, antitrust and technology management. It is calculated by the sum of the squares of the

market shares of firms competing in a market within an industry and adding the results numbers. A greater value of HHI means greater concentration, less competition and more market control held by individual firms, whereas a smaller value indicates the opposite. The HHI ranges from close to 0 to 10000 points, signposting "0" as Perfect Competition and moving to "100" percent as a Monopoly state.

HHI Expression

$$HHI = \sum_{i=1}^{n} s_i^2$$

In the context of our Study: Trade Concentration Index (TCI)

$$TCI = \sum_{i=1}^{n} s_i^2$$

Whereas,

HHI/TCI = Sum of squares of the trade shares (export and import) of *N* number of years for commodities groups i (particular commodity groups for all major twenty-one commodities groups)

$\sum_{i=1}^{n} s_i^2$ Proportional Share of the Commodity i in the commodity's total export or import bundle during the period under study.

HHI value has been described in the following range:

HHI < 100 = Highly Competitive
HHI > 100 but HHI < 1000 = Low concentrated
HHI > 1000 but HHI < 1800 = Moderately Concentrated

Empirical Finding

Table 1. Level of Exports Concentration using Trade Concentration Index (TCI)/ (HHI) Interpretation

SL.No	Exports Commodities Groups	TCI	Concentration	Concentration Level of TCI
1	Live Animals and Animal Products	1467.45	Moderate	TCI value is between (1000 and 1800) Moderately Concentrated
2	Pulp and Paper Board	1433.62	Moderate	
3	Wood and Articles Thereof	1402.64	Moderate	
4	Minerals	994.52	Low	
5	Gems and Jewellery	937.85	Low	
6	Textiles	896.34	Low	
7	Plastics and Rubber	883.64	Low	TCI value is between (100 and 1000) Low Concentrated
8	Vegetable Products	883.57	Low	
9	Transport Equipment	874.67	Low	
10	Engineering Goods	871.44	Low	
11	Chemicals Products	864.56	Low	

12	Mica, Ceramic, Glass and Glassware	855.66	Low
13	Electronic Goods	851.35	Low
14	Vegetable Oil	846.31	Low
15	Miscellaneous Manufactured items	841.10	Low
16	Leather and Allied items	837.78	Low
17	Machinery	831.78	Low
18	Other Commodities	831.51	Low
19	Prepared Foods and Tobacco	825.72	Low
20	Footwear and Head Gear	825.01	Low
21	Optical, Photographic, Surgical and Musical Instruments	822.85	Low

Source: Author's calculation

Table 4.1 exhibits the concentration of individual commodities groups exported by India to BRICS nations by employing the Herfindahl-Hirschman Index (HHI). The output reveals that during the period under study, India's export has a moderate concentration or advantage in three commodities groups over the BRICS nations. The Live animals witnessed the highest export concentration and Animal Products with a moderate concentration value of 1467.45; Pulp and Paper Board with a TCI value of 1433.62; and Wood and wood products have a moderate advantage with a TCI value of 1402.64. The finding suggests that these commodities groups have been moderately concentrated and not equally exported by India to the BRICS nations, revealing that these products have more export potential between India and the BRICS nations.

On the other hand, India has a lower concentration value, or we can say that India has more prevailing competition in the market and healthy demand and supply mechanism function during India's export to BRICS nations. Thus, it can be inferred from the output of HHI that India has a lower concentration value on eighteen commodities groups, with Minerals and Gems and Jewellery value being near to moderate concertation level with TCI value 994.52 and 937.85 respectively. While, other commodities groups with low TCI value of Textiles with 896.34; Plastics and Rubber 883.64; Vegetable Products 883.57; Transport Equipment 874.67; Engineering Goods 871.44; Chemicals Products 864.56; Mica, Ceramic, Gloss and Glassware 855.66; Electronic Goods 851.35; Electronic Goods 851.35; Vegetable Oil 846.31; Miscellaneous Manufactured items 841.10; Leather and Allied items 837.78; Machinery 831.78; Other Commodities 831.51. While the bottom three commodities groups with low TCI values were Prepared Foods and tobacco with 825.72; Footwear and Head Gear with 825.01 and optical, photographic, surgical and Musical Instruments with a TCI value of 822.85. The output exhibits that the scope of export potential for these products is low, and higher competition exists in the overall composition of the products.

Thus, it can be concluded from the finding that India's exports to the BRICS nations have a high degree of competitiveness and different commodities groups have healthy demand with a sufficient supply in the market. While there are no commodities groups in which India export have a monopoly, duopoly, oligopoly, or we can say the high level of concentration value as all the commodities indices are below the 1800 value. Thus, from India's perspective, it can be recommended that government top authorities take corrective steps so more Indian products can reach the BRICS market with more intensity so Indian commodities groups can witness upliftment in HHI or TCI value in future.

Table 2. Level of Imports Concentration using Trade Concentration Index (TCI)/ HHI Interpretation

SL.No	Exports Commodities Groups	TCI	Concentration	Concentration Level of TCI
1	Live Animals and Animal Products	1754.17	Moderate	TCI value is between (1000 and 1800) Moderately Concentrated
2	Pulp and Paper Board	1458.62	Moderate	
3	Wood and Articles Thereof	1415.33	Moderate	
4	Prepared Foods and Tobacco	1119.07	Moderate	
5	Vegetable Products	922.06	Low	
6	Gems and Jewellery	910.04	Low	
7	Transport Equipment	889.45	Low	
8	Chemicals Products	852.10	Low	
9	Engineering Goods	839.62	Low	
10	Machinery	831.94	Low	
11	Vegetable Oil	814.73	Low	
12	Mica, Ceramic, Glass and Glassware	813.49	Low	TCI value is between (100 and 1000) Low Concentrated
13	Textiles	810.30	Low	
14	Plastics and Rubber	788.39	Low	
15	Electronic Goods	786.97	Low	
16	Miscellaneous Manufactured items	782.23	Low	
17	Optical, Photographic, Surgical and Musical Instruments	772.65	Low	
18	Footwear and Head Gear	740.02	Low	
19	Leather and Allied Items	730.42	Low	

20	Other Commodities	704.14	Low
21	Minerals	518.23	Low

Source: Author's calculation

For the above analysis of the commodities trade by India from the BRICS nations, it is essential to look into the other side of the trade, i.e., India's import of different commodities from the BRICS nations. Table 4.2 express the Herfindahl-Hirschman Index (HHI); this segment illustrates the status of India's import of twenty-one commodities groups imported by India from the BRICS nations. The findings suggest that BRICS countries had a substantial or moderate concentration on four commodities groups over India during the study. Live animals and animal products had the highest import concentration with a moderate concentration level of 1754.17; followed by Pulp and Paper Board with a TCI value of 1458.62; Wood and Articles Thereof with a TCI value of 1415.33, and lastly by Prepared foods and tobacco, with a TCI value of 1119.07. The output illustrates that these commodities groups have more import potential, and India can import from the BRICS nations.

However, on the other hand, BRICS nations have a smaller or lower concentration on India's import value, indicating that there is more prevalent competition in the market and a strong demand and supply mechanism work during India's imports from BRICS nations. As a result of the HHI output, it can be deduced that India has lower concentration values for the Seventeen commodities groups, with Vegetable Products and Gems & Jewellery in the 900 range with HHI values of 922.06 and 910.04, respectively. Followed by Transport Equipment with 889.45; Chemicals Products 852.10; Engineering Goods 839.62; Machinery 831.94; Vegetable Oil 814.73; Mica, Ceramic, Gloss and Glassware 813.49; Textiles 810.30; Plastics and Rubber 788.39; Electronic Goods 786.97; Miscellaneous Manufactured items 782.23; Optical, photographic, surgical and Musical Instruments 772.65; Footwear and Head Gear 740.02. At the bottom, three commodities groups with lower HHI or TCI values were Leather and Allied items 730.42; Other Commodities 704.14 and Minerals with a TCI value of 518.23.

Minerals, Gems, and Jewellery values are close to moderate concertation levels with TCI values of 994.52 and 937.85, respectively. Textiles 896.34; Plastics and Rubber 883.64; Vegetable Products 883.57; Transport Equipment 874.67; Engineering Goods 871.44; Chemicals Products 864.56; Mica, Ceramic, Gloss and Glassware 855.66; Electronic Goods 851.35; Vegetable Oil 846.31; Miscellaneous Manufactured items 841.10; Leather and Allied items 837.78; Machinery 831.78; footwear and headgear, with a TCI value of 825.01; and optical, photographic, surgical, and musical instruments, with a TCI value of 822.85.

Thus, from the findings, it can be inferred that India's imports from the BRICS countries are highly competitive. Different commodities groups have robust demand with a suitable supply share in the market. While no commodities groups in which BRICS nations dominate the Indian market or lack competition, monopolistic nature of competition or greater level of concentration value as all commodities indices are below the 1800 value apart from Live animals and animal products whose value is near to high concentration value of 1800. Thus, from India's perspective, top government officials are taking remedial action so that the complete dominance of BRICS products in the Indian market can be avoided and healthy competition can be attained.

3. Results and Discussion

In conclusion the analysis of Herfindahl-Hirschman Index (HHI) exhibits that India's export to the BRICS nations has a moderate concentration level on three commodities groups which includes Live animals and Animal Products; Pulp and Paper Board and Wood and Wood Products, which exhibits bit less competition of these products in India's export to the BRICS nations. Whereas, there are eighteen commodities groups on which

India has higher competitive, or we can say low concentration level which includes Gems and Jewellery; Textiles; Plastics and Rubber; Vegetable Products; Transport Equipment; Engineering Goods; Chemicals Products; Mica, Ceramic, Glass and Glass; Electronic Goods; Electronic Goods; Vegetable Oil; Miscellaneous Manufactured items; Leather and Allied items; Machinery; Other Commodities; Prepared Foods and tobacco; Footwear and Head Gear and optical, photographic, surgical and Musical Instruments

While, Herfindahl-Hirschman Index (HHI) further reveals that India's import from the BRICS nations has a moderate concentration level in four commodities groups which include Live animals and Animal Products; Pulp and Paper Board; Wood and Wood Products, and Prepared foods and tobacco which exhibits bit lower competition of these products in India's import from the BRICS nations. Whereas there are seventeen commodities groups on which India has higher competition or low concentration level. It includes Gems and Jewellery; Textiles; Plastics and Rubber; Vegetable Products; Transport Equipment; Engineering Goods; Chemicals Products; Mica, Ceramic, Glass and Glass; Electronic Goods; Electronic Goods; Vegetable Oil; Miscellaneous Manufactured items; Leather and Allied items; Machinery; Other Commodities; Footwear and Head Gear and optical, photographic, surgical and Musical Instruments.

4. Conclusion

Thus, in concluding remark through proper management of exportable, potential, or unexploited market products exported by India to the world and the BRICS nations can be effectively utilized at the lowest possible cost, reducing excessive tariff rates on comparative advantages products, effective management of essential and luxuries products planning and control, developing new products through strategic planning by adaptations and innovations to impart greater acceptability to the products. Furthermore, the established and existing commodities groups must be critically examined against the objectives they were expected to achieve in the market and their past performance. Thus, it is essential that the composition of the commodities groups planning and evaluation must be a continuous process so the growing demand of the commodities groups must be further uplifted and fewer demand products can be included in the future.

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