Trade Intensity and Revealed Comparative Advantage: An Analysis of Intra-BRICS Trade

Abstract

Purpose- In the recent international scenario, the rise of emerging economies in particular Brazil, Russia, India, China and South Africa has gained ample of attention. The global trade flows of the BRICS countries have significantly increased during the last one and half decade. The purpose of this paper is to examine the intra-BRICS and BRICS-EU trade flows.

Methodology- To study the intensity of trade among BRICS countries and with EU, the trade intensity index (TII) is employed for the period 2001-2015. Balassa’s revealed comparative advantage index (RCA) is computed for the assessment of comparative advantages of exports by BRICS countries in the year 2015 in the global markets. A comparative analysis of export similarity is done for India and other BRICS countries in EU.

Findings- The findings of trade intensity showed large bilateral trade flows among BRICS member. Russia has emerged as the main trading partner with EU in BRICS. For the year 2015, the comparative study of RCA at HS-two digits and HS-four digits classification highlights marginal structural changes in the export composition of these countries. The analysis revealed that Brazil and Russia have comparative advantages in natural resource-based products, while India and China possessed comparative advantages in manufactured and processed products. The export similarity index shows the presence of competition between India-China in EU.

Implications- This paper highlights the need for closer cooperation to promote intra-BRICS trade and to make structural transformations in the basket of trading products by them to have trade benefits at large.

Originality- Numerous studies are available on bilateral trade of BRICS members. However, limited studies are available to get a holistic view of intra-BRICS trade. This paper is an attempt to examine the BRICS countries trade profile both at global levels and within the group.

Keywords: BRICS, Trade intensity, RCA, Exports
JEL Classifications: F10, F13, F15, F43
1. Introduction

In the recent years, the contribution of developing countries in the regional and global economic growth has increased significantly. BRICS (Brazil, Russia, India, China and South Africa) the group of five emerging economies from the continents of Asia and Latin America has emerged as a significant group in the recent global engagements. In 2001, Jim O Neil coined the term BRICs acronym for Brazil, Russia, India, and China as the emerging economies with the potential to replace the European economy in terms of market size. South Africa has joined the group in 2010. BRICS countries represent more than a quarter of the world’s land area, 41 percent of the world’s population. On almost every scale, these economies are in line to be the largest group at the global level. BRICS has emerged as an important representative sample for the decision-making at the international level, Truman (2006).

The role of BRICS is vital at the global stage in terms of increasing productivity, foreign investment inflows and creating a potential consumer market. With a cumulative global trade of 20 percent and generating more than 40 percent of global economic growth, the BRICS countries are poised to strengthen the intra-BRICS relationship and with the rest of the world. The Fortaleza Declaration (2014) underlined the importance of intra-BRICS trade and other areas of economic cooperation. With a share of less than 4 percent of world trade in the 1990s, now BRICS represents about 15 percent share in global trade. Their share of world exports has increased to 18.3 percent in 2016 from 8.1 percent in 2001 (Trade Map, ITC). BRICS economies are creating a strong counterbalance to the large economies. In the recent global financial crises, BRICS has shown signs of economic strength and were least affected by the global meltdown, while world’s major economies faced the growth slowdown. The BRICS summit (2017) under the theme of “BRICS: Stronger Partnership for Brighter Future” focused on increasing the trade cooperation among BRICS.

BRICS has made significant progress in integrating with the world economy. Table 1 provides the BRICS member countries’ exports and imports to the world in the year 2015.

| Country | Import Value (2015) USD Million | Export Value (2015) USD Million | Import Ranking | Export Ranking |
|---------|---------------------------------|---------------------------------|----------------|----------------|
| Brazil  | 171446                          | 191126                          | 4              | 30             |
| Russia  | 182781                          | 343907                          | 3              | 25             |
| India   | 390744                          | 264381                          | 2              | 14             |
| BRICS   | World                           | BRICS                           | World          |
| 4       | 30                              | 4                              | 27             |
| 3       | 25                              | 2                              | 17             |
| 2       | 14                              | 3                              | 20             |

Table 1: BRICS Trade Statistics
As can be followed from table 1, China is the largest importer and exporter both in the world markets and intra-BRICS. Russia and India hold second and and third place as exporters to intra-BRICS. At international levels, these economies of BRICS are important exporters and importers. The ascending cooperation among BRICS countries can be jointly beneficial for each member country. As Brazil and Russia are the major producer and exporter of natural resources, and importers of manufactured and processed goods. While India and China are the major importer of natural resources and main exporters of manufactured and processed goods. On the other, South Africa provides as an important route for India-Brazil trade.

| Country      | Import | Export | RCA | RCA | RCA | RCA |
|--------------|--------|--------|-----|-----|-----|-----|
| China        | 1679564| 2273468| 1   | 2   | 1   | 1   |
| South Africa | 795909 | 693108 | 5   | 38  | 5   | 39  |

*Source: ITC Trade Map*

Given the rising importance of trade between BRICS countries, this paper assesses the intensity of merchandise trade among BRICS countries to determine the deepening cooperation among them. To make a comparative study, trade intensity between European Union (28) and BRICS member countries is analyzed. The revealed comparative advantage (RCA index) of the top ten products of Brazil, Russia, China, and South Africa are calculated both at the aggregate and disaggregate levels. We made comparisons of the RCA values between countries to know the similarities in trade. Further, the degrees of similarity in the export structure (Finger Krenin Index) are computed to understand the comparative strengths and weaknesses of BRICS (Brazil, Russia, China and South Africa) with respect to India in EU markets.

The remainder of the paper is organized as follows. Section 2, provides brief reviews of the literature followed by methodology and data sources in section 3. The findings and interpretations are presented in section 4 and concluding remarks in Section 5.

### 2. Review of Literature

In this section, we have briefly reviewed recent selected studies on the bilateral trade, intra-BRICS trade, and other trading blocs.

*Utkulu et al., (2004)* examined RCA and Competitiveness, Turkey with EU/15 for the period 1990-2003. The study observed high RCA in seven products out of 63 categories. There was no effect of economic crises of 1994, 1999, 2001 on comparative advantage structure. *Batra and Khan* (2005) examined the RCA index for the manufacturing sector of India and China for the period 2000 to 2003 at HS two and six digits. The analysis revealed the differences in the pattern of comparative advantages at a different level of disaggregation. The commodities sectors like organic chemicals, cotton, and salt were among the top 100 commodities at various levels.
China, organic and inorganic chemicals, nuclear reactors, were among the top 100 commodities based on RCA value. In the manufacturing sector, China enjoyed the maximum advantage and India in agriculture and allied sectors, irrespective of the level of disaggregation. In another comparative study of China and India, Wignaraja G (2011) also found the evidence for the divergent pattern of comparative advantage for the year 2009 between India and China in the global market. Tian W and Miaojie (2012) observed the trade pattern of China and India, since the year 2000. The study examined trade openness ratio and trade balance to capture the trade pattern. The study observed a high trade openness ratio in both countries. The study concluded that Indian exports were mainly of techno-related products, but its proportion is smaller to China. On the other hand, the processing trade played a dominant role in the Chinese exports.

Shinoj and Mathur (2008) examined India’s comparative advantage in the major agricultural commodities exports with respect to Asia over the period 1991-2004. The findings of this study highlighted that over the years, India’s comparative advantage in the agriculture and allied sector fallen and it is losing to other Asian countries. Serin et al., (2008) in a study investigated RCA and competitiveness in selected products i.e., tomato, olive oil and fruit juice industries for Turkey and EU for the period 1995-2005. The findings showed for EU and Turkey, only in fruit juice and olive oil markets high comparative advantages were present. Havlik et al., (2009) assessed global trade position between BRICS and Triads’ trade in goods and services. The findings highlighted the fall of Triad’s global shares in trade and with the BRICS countries. However, the role of the EU in BRICS trade, especially with Russia was found to be substantial. Chandaran (2010) examined the trade complementarity and similarity of trade between India and ASEAN in the context of the RTA. For the analysis, the study applied the trade intensity and RCA indices for eight ASEAN countries in 16 major commodity groups from the year 1990 onwards. The findings for ASEAN showed that its export intensities were higher than the import intensities with India. The country-wise analysis of trade intensity showed that the value of India’s export intensity was greater than one for Indonesia, Malaysia, Mayan, Singapore, Thailand, and Vietnam. With countries, namely, Brunei, Cambodia, and Lao PDR, India’s import intensities were low. The study concluded that as India enjoyed an advantage in minerals, manufactured items like chemicals, iron & steel, gems & jewelry it can export them to ASEAN and can import crude oils, electronic components, etc. Between India and ASEAN, an intense competition was present in the textile and clothing sector.

Pant (2011) examined the issues of trade and technology between India and BRICS countries for the period 1995-2007. This study examined the sustainability of intra-BRICS trade, the substitutability, and complementarity in merchandise trade and the main issues in technological collaboration between BRICS countries. The ratio of net intra-BRICS to net BRICS trade with the rest of the world at four-digit levels showed an increasing trend as the test of sustainability of trade. Revealed Comparative Advantage showed the little scope of substitutability and complementarity in trade of BRICS countries. Based on the findings the study suggested for the establishment of PTA, among BRICS member countries.
Singh et al., (2011) in his study applied different indices such as the market share, regional orientation, competitiveness, etc., elaborated the idea of the BRICS union under PTA. Based on the findings the study suggested for the establishment of PTA, among BRICS member countries. Yuan and Zhao (2011) examined the composition and destination of the BRICS trade with a special focus on China. The findings showed a high level of trade dependency for BRICS led by China. For China, South Africa, and Russia, exports are channelized towards the developed nations as opposite case to India and Brazil. Ana (2013) presented an analysis of the comparative advantage of ASEAN and China. The study employed revealed symmetric comparative advantage index along with the trade balance index. Overall results showed the trade patterns of China were more established and stable in comparison to ASEAN’s trade pattern. Radulescu et al., (2013) studied the importance of BRICS as a group of emerging economies at the global level. The study highlighted the importance of BRICS with little impact of the global financial crises on these economies as compared to the massive negative impact on the developed economies. The study emphasized on the cooperation between these emerging economies, as a major tool for strengthening to combat the global affairs. Tereza De Castro (2013) examined the export introversion, trade complementarity, regional orientation, and comparative advantage for BRICS and Triad between the periods 2001 to 2010. The findings showed trade complementarity greater than 50 for the majority of BRICS, showing a potential for further trade arrangements between them. Brazil and South Africa have diverted trade from Triad countries to China and India in product minerals, fuels, oils, distillations etc. Chatterjee et al., (2014) employed Finger-Krenin Index, Relative export competitive pressure index, Revealed Comparative Advantage index for BRICS with special emphasis to India for the period 2009-2013. The study found India has revealed comparative advantage in products like lac, raisins, gum etc. were high. Between India and BRICS countries, low competition was present. Raghuramapatruni (2015) used Trade Intensity Index, Revealed Comparative Advantage Index, and Trade Dependency Index for BRICS for 1995-2012. The analysis highlighted that BRICS are complementary in nature rather than competitive with respect commodity trade. Ahmad et al., (2017) employed Revealed Comparative Advantage and Bilateral Revealed Comparative Advantage for China and India for the period 1985-2012. The study identified 12 products for both countries with RCA index value greater than one. However, both countries are competing in global merchandise trade. At SITC 4, 135 products identified with RCA greater than one for India & China. Numerous studies are available on the bilateral trade analysis of BRICS countries more specifically for China and India. However, limited studies have been conducted for a holistic view of intra-BRICS, BRICS-European Union trade analysis. This study is an attempt to find the pattern of intra-BRICS trade, BRICS-EU trade intensity and comparative advantages in global markets for the latest period 2001 to 2015.
3. Methodology and Data sources

The paper has adopted three methodologies- trade intensity index (TII), revealed comparative advantage (RCA) and Finger-Krenin Index (FKI). The term BRICs coined in the year 2001 by Jim O’Neill, therefore we have selected the period 2001-2015 to analyse the status of BRICS merchandise trade. For the analysis, the secondary data sets are obtained from the online database of ITC trade map, UNCOMTRADE.

3.1 Formulas

3.1.1 Trade Intensity Index
To determine whether the value of trade between two countries exceeds or falls behind what would have expected based on their relative importance in world trade this index is used (World Bank, 2016c). In this paper, WITS (2013) trade intensity index is used, which is defined as the share of one country’s exports going to a partner divided by the share of world exports to the same partner country.

The Trade Intensity Index is calculated as:

\[ TII_{ij} = \frac{X_{ij}}{X_{it}} / \frac{X_{wj}}{X_{wt}} \]

Where \( TII_{ij} \) is the trade intensity index of country i with the country j. \( X_{ij} \) and \( X_{wj} \) are the values of country i’s export and world exports to country j and \( X_{it} \) and \( X_{wt} \) are the values of the country i’s total exports and world’s total exports respectively. The value of the index lies between zero and infinity (+∞). If the index value is less than one, it indicates the lower degree of bilateral trade between the partner countries. The index with a value greater than one indicates the high intensity of trade between the partner countries.

3.1.2. Revealed Comparative Advantage
To measure the comparative advantage of a country in products the Balassa’s Index of revealed comparative advantage (1965) is most widely accepted approach. The revealed comparative advantage (RCA) index is defined as:

\[ RCA_{ij} = \frac{X_{ij}/X_{it}}{X_{wj}/X_{wt}} \]

Where, \( X_{ij} \) and \( X_{wj} \) are the values of country i’s exports of product j and world exports of product j and \( X_{it} \) and \( X_{wt} \) are country’s total exports and world’s total exports. If the value of RCA index is greater than one, the country has revealed comparative advantage in that product and vice-versa. The advantage of using comparative advantage is that it considers an intrinsic advantage of a particular export commodity and is consistent with changes in an economy’s relative factor endowment and productivity, Batra (2005).
3.1.3. Finger Krenin Index

Finger Krenin (1979) gave the formula to measure the export similarity between the two countries or group of countries in the third market. The FKI is defined as:

\[ S(ij,k) = \left( \sum_i \min \left( \frac{X_{1ik}}{X_{tk}} , \frac{X_{1jk}}{X_{tk}} \right) \right) \times 100 \]

This is a measure of export similarity of export patterns of two countries i and j to market k. Here, X denotes the exports of commodity 1. So, \( \frac{X_{1i}}{X_{tk}} \) is the share of commodity 1 in country i’s export to country k and \( \frac{X_{1j}}{X_{tk}} \) is the share of country j’s export to country k. The value of index ranges from zero to hundred. If the index value is zero, it implies complete dissimilar export pattern between two countries. However, the index with hundred values shows the complete export similarity between the two countries. If the index value between two countries rises over times, it indicates convergence of the two countries export structure with a rise in competition between them (Song 2000).

4. BRICS Trade Intensity Estimates and Analysis

BRICS together nominal GDP is similar to EU and USA and predicted to overtake EU and USA in the coming years. The BRICs’ role in the world trade is expanding faster than the world trade overall, also the trade within BRICs has accelerated sharply, Jim O’Neill (2011). The latest trade statistics shows China as the main trading partner with the BRICS countries. In Brazil, China is the largest trading partner with surpassing the economies like USA, Argentina, Japan, etc. In Russia, along with the European countries, China is the part of the major trading partners. Similarly, for India and South Africa, China is the part of the top trading partners list.

One of the main reasons for BRICS formation is to discuss global challenges and coordinate actions without the interference of groups like the OECD. The trade intensities for intra-BRICS computed to observe how far BRICS as a group has emerged over the span of fifteen year. To make a comparative assessment, the results of BRICS-EU trade intensity are also given in the following section.

4.1. Brazil

The values of the trade intensity index between Brazil and BRICS are found lower than one for the period 2001 to 2015, but higher with individual countries [figure1]. The bilateral trade between Brazil and Russia reveals the high intensity of trade between the period 2001 to 2015, except for three consecutive years i.e., 2011, 2012 and 2013. For the period 2001-15, the intensity of trade with India is found high only in 2002 and 2009, highlighting a lower bilateral trade flow between Brazil and India. The bilateral trade flows of Brazil with China have improved over the years with the index value greater than one from 2007 to 2015. South Africa has larger bilateral trade flows with Brazil.
4.2. Russia
Russia’s intensity of trade with BRICS countries individually and BRICS as a group shows the lower values [figure 2]. The trade intensity of Russia was high with India between the years 2001 and 2004 and with China for the years 2001 to 2003 only. The index values between Russia and Brazil are found lower lying between 0.21 and 0.54. The intensity of trade with South Africa is found to be smaller with low TII values [figure 2]. The analysis of Russia’s bilateral trade flows with BRICS as a whole highlights the lower TII values.

4.3. India
The trade intensity analysis for India with BRICS as a whole is quite lower as compared to bilateral trade flows with each country [figure 3]. The trade flow of India with Brazil is larger with TII value greater than one for the whole period, except for the three years 2001, 2002 and 2009. With Russia, the trade intensity remained high for the years 2001 to 2004, but later decelerated reaching to 0.55 in 2015. Similarly, with China except for the year 2005, the TII values are found less than one, implying the low exports between India and China. The intensity of trade between India and South Africa is higher with the TII value reaching higher to 3.42 in 2014.

4.4. China
The value of TII between China for BRICS is found lower than one for the study period, 2001 to 2015 as compared to bilateral countries [figure 4]. The analysis for China and Brazil reveals higher trade intensity post-2005, showing the improvement of bilateral trade flows between them. The values of TII between China and Russia are greater than one continuously from 2001 to 2015 that refers to higher bilateral trade flows between China and Russia. However, the intensity of trade of China with India shows fluctuating behaviour with lower TII values for the period 2001 to 2005 and higher values for the period 2005 to 2011. China’s bilateral trade flows with South Africa have improved post-2005 over the years [figure 4].

Figure 1: TII between Brazil and BRICS

Figure 2: TII between Russia and BRICS

Note: Author’s calculation using data from ITC
4.5. South Africa

Figure 6 infers the lower values of TII for South Africa with BRICS as a whole. The TII between South Africa and Brazil are low except for the years 2001, 2002 and 2006. The bilateral trade for South Africa was high with India between 2001 and 2015, with highest value 1.91 in the year
2015. The intensity of trade with China is found to be lower except between the period 2007-13. The findings reveal the lowest trade intensity between South Africa and Russia [figure 6].

4.6. Brazil, Russia, India, China and South Africa’s TII with EU
EU has bilateral relations with individual countries of BRICS such as EU-Brazil summits, EU-Russia Cooperation Agreement, India-EU strategic partnership, EU-China Trade and Cooperation Agreement. The negotiations between EU and BRICS members are carried through bilateral discussions. So, the EU-BRICS intensity trade of flows is examined. The trade intensity index is computed for Brazil, Russia, India, China and South Africa bilaterally with the EU for the period 2001-15. The analysis reveals higher trade flows between Russia and EU, with the index value greater than one between the years 2001-15 [figure 6]. On the other, Russia’s trade flows were found lower with BRICS countries [figure 3]. The values of the trade intensity index are lower than one for Brazil, India, China and South Africa indicating fewer trade flows with the EU. However, the index value is greater than zero for all the years, showing the moderate flow of trade between EU and Brazil, Russia, India, China and South Africa. The index value for these countries except for Russia highlights large intra-BRICS (bilateral) trade flows comparatively with EU trade.

5. Revealed Comparative Advantage

In this section, the structure of comparative advantage of BRICS countries in the global market is examined. The pattern of comparative advantage is captured by using Balassa (1965) index of comparative advantage for the two and four digit level of HS classification in the year 2015. The top ten products (HS-two digit level) based on higher RCA values for the year 2015 RCA are given in table 2.

The RCA analysis revealed that each individual country of BRICS has different products of comparative advantages. Brazil has shown the comparative advantage in agriculture and allied products such as products of the milling industry; malt; starches; insulin; wheat gluten, Meat, Fish, seafood, manufacture of plaiting materials, edible fruit, nuts, etc. The study reveals that Russia’s pattern of comparative advantages is in products like fertilizers, mineral fuels, mineral oils, nickel articles, arms and ammunition, and others [table 2]. The analysis for Brazil and Russia at the two digits of HS classifications illustrates these countries has comparative advantage in natural resources products. The products lac, gums, resins, cotton, carpets, cereals and other agricultural and allied products along with some manufacturing and processed products are among the top ten products for India with higher comparative advantages. China has a far better comparative advantage mainly in the manufacturing sector in products like headgear, umbrellas, printed books, newspapers, footwear, cement, asbestos, furniture and others as shown in table 2. South Africa holds the higher comparative advantage in products like ores, slag, edible fruits, nuts, explosives, wool, animal hair, pulp of woods, etc. The analysis of RCA at HS-two digit highlights that Brazil, India,
Russia, China and South Africa hold comparative advantages in diverse product categories. The findings show BRICS countries are not competing with each other in world markets. These results are in line with the results obtained for RCA analysis of BRICS countries (Chateerjee et al., 2014).

Table 2: RCA of Top Ten Products at HS-Two digits (2015)

| Brazil | Russia | India | China | South Africa |
|--------|--------|-------|-------|--------------|
| Milling industry products (20.64) | Fertilizers (6.49) | Lac; gums, resins and other vegetable saps and extracts (9.14) | Headgear and parts thereof (5.78) | Ores, slag, and ash (10.28) |
| Meat, fish and seafood, food preparations (16.77) | Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral (5.52) | Cotton (8.28) | Umbrellas, walking sticks, seat-sticks, whips, etc (5.52) | Edible fruit and nuts; peel of citrus fruit or melons (6.51) |
| Manufactures of plaiting materials; basket ware, etc. (11.81) | Nickel and articles thereof (5.01) | Carpets and other textile floor coverings (7.22) | Cork and articles of cork (4.88) | Furniture; signs; prefabricated buildings (5.41) |
| Edible fruit and nuts; peel of citrus fruit or melons (10.78) | Arms and ammunition; parts and accessories thereof (4.05) | Vegetable textile fibers; paper yarn and woven fabrics (4.75) | Printed books, newspapers, pictures, etc (3.87) | Explosives; pyrotechnic; matches; pyrophoric, etc. (5.05) |
| Live animals (9.82) | Cereals (2.64) | Other made-up textile articles; sets; worn clothing, etc. (4.68) | Footwear, gaiters and the like; parts of such articles (3.78) | Wool, animal hair; horsehair yarn and fabric thereof (5.01) |
| Salt; sulphur; earth, stone, plaster, lime, and cement (9.10) | Wood and articles of wood; wood charcoal (2.39) | Vegetable plaiting materials; vegetable products (4.23) | Stone, plaster, cement, asbestos, mica or similar materials (3.31) | The pulp of wood, fibrous cellulosic material, etc. (4.16) |
| Beverages, spirits and vinegar (7.41) | Other base metals; cermets; articles thereof (2.23) | Cereals (4.15) | Furniture; signs; prefabricated buildings (3.28) | Pearls, precious stones, metals, etc. (4.00) |
| Rubber and articles thereof (6.40) | Iron and steel (2.22) | Pearls, precious stones, metals, coins, etc. (3.88) | Impregnated, coated, covered or laminated textile fabrics (3.17) | Iron and steel (3.30) |
| Coffee, tea, maté, and spices (4.80) | Products not elsewhere specified (2.17) | Coffee, tea, maté, and spices (3.76) | Articles of apparel and clothing accessories, not knitted or crocheted (3.16) | Nickel and articles thereof (2.75) |
| Residues, waste of food industries, | Aluminum and articles thereof | Man-made staple fibers (3.38) | Raw hides and skins (other than fur skins) | Beverages, spirits and vinegar (2.74) |
As the pattern of comparative advantage varies at different levels of aggregations, in this study we also computed the revealed comparative advantage index for these counties at HS-four digits in the year 2015 as given in table 3.

The values of RCA index value for Brazil are found higher at the disaggregate levels comparative to aggregate levels in the year 2015. Brazil still holds comparative advantages in agricultural product categories at disaggregate levels. However, the new products are added in Brazil’s top ten products of comparative advantage at HS-four such as mate, soya beans, articles of the gut, gold beater’s skin, bladders or tendons, flexible tubing of base metal, with or without fittings, vegetable waxes, and others.

The analysis for Russia revealed advantages in products like iron ores, asbestos, nuclear reactors, pig iron, and others non-metallic products. Russia holds higher RCA index values at HS-four digits. Most of the top ten products at the HS-two digit retain their places at HS-four digit for Russia. India’s comparative advantage pattern has changed at HS-four digit levels. From the agricultural products, the manufacturing products like organic compounds, woven fabrics, etc., get a place in top ten products with higher comparative advantages [table 3], with higher RCA values. China enjoyed high comparative advantages at disaggregate levels in manufacturing sectors. New products are added to top ten products list for China. Similarly, South Africa’s comparative advantage patterns are in similar products categories of HS-two, but with higher RCA values. South Africa has got higher comparative advantages in the export of minerals in world markets.

The findings of comparative advantage reveal higher index value at the disaggregate levels for BRICS countries in the global market. However, the structures show similarity at the aggregate and disaggregate levels for all countries, except India. The comparisons of comparative advantage between HS-two digit and HS-four digit levels show the pattern of comparative advantage are in different product categories for each country, highlighting less competition among them in global markets. The comparative advantage findings highlight the specialization in the world market by BRICS countries in different products.

| Brazil | Russia | India | China | South Africa |
|--------|--------|-------|-------|--------------|
| Mate (36.83) | Iron ores and concentrates, incl. roasted iron pyrites (29.83) | Separate chemically defined organic compounds (42.18) | Articles of goldsmiths’ or silversmiths’ wares and parts thereof, of precious metal (10.01) | Chromium ores and concentrates (141.00) |
| Soya beans, whether or not broken (34.14) | Asbestos (excluding) | Human hair, unworked, whether or | Bismuth and articles thereof, n.e.s.; | Granulated slag “slag sand” from the |

Note: Figures in parentheses are RCA indices

Source: Author’s calculation using data from ITC
| Description                                                                 | RCA Indices |
|----------------------------------------------------------------------------|-------------|
| Articles of gut, gold beaters skin, bladders or tendons (34.75)            | 26.40       |
| Nuclear reactors; fuel elements, isotope separator (17.37)                  | 26.40       |
| Flexible tubing of base metal, with or without fittings (31.81)            | 29.63       |
| Pig iron and spiegeleisen, in pigs, blocks or other primary forms (17.31)  | 29.63       |
| Vegetable waxes except for triglycerides, insect waxes and spermaceti (30.42) | 29.63       |
| Precious-metal ores and concentrates (15.23)                                | 29.63       |
| Cane or beet sugar and chemically pure sucrose, in solid form (29.39)       | 29.63       |
| Semi-finished products of iron or non-alloy steel (12.86)                  | 29.63       |
| Meat and edible offal of domestic factory (22.30)                          | 29.63       |
| Ferrous products from reduction of iron ore and pig iron (11.23)           | 29.63       |
| Alloy steel in ingots in primary forms or other forms (20.48)              | 29.63       |
| Mineral or chemical potassic fertilizers (9.91)                            | 29.63       |
| Oil-cake and other solid residues, whether or not ground or in the form of pellets (18.92) | 29.63       |
| Unwrought nickel (8.87)                                                    | 29.63       |
| Groundnut oil, fractions, not modified (18.05)                             | 29.63       |
| Bombs, grenades, mines, missiles, ammunition, etc (7.87)                   | 29.63       |
| Note: Figures in parentheses are RCA indices                               |             |
| Source: Author's calculation using data from ITC                           |             |
6. Finger Krenin Index

As the EU is a significant trade partner with BRICS countries, we tried looking at the pattern of export similarity in EU for BRICS countries individually and compared with India. The analysis is conducted for the period 2001-15 by employing Finger Krenin Index (FKI) as it is widely used to measure the extent of export similarity. The FKI values for India and Brazil is between 0.31 and 0.38, indicating low similarity of exports between India and Brazil to EU. This means that at the aggregate levels Brazil and India are not competing much in EU at any significant level. The FKI values for India-Russia are substantially low, indicating the diversified exports by both countries in EU. The index value for India-China is high in comparison to other countries in the EU. The FKI values remained from 0.46 to 0.52, showing moderate export competitiveness between both countries in the EU’s market. The FKI in Table 4 varied between 0.36 to 0.42 for India and South Africa, showing a slow tendency to increase over time. This means that export similarity between India and South Africa in the EU’s market was moderate and receding after the year 2009.

| Years | India-Brazil | India-Russia | India-China | India-South Africa |
|-------|--------------|--------------|-------------|--------------------|
| 2001  | 0.31         | 0.14         | 0.46        | 0.36               |
| 2002  | 0.31         | 0.12         | 0.46        | 0.38               |
| 2003  | 0.33         | 0.14         | 0.44        | 0.41               |
| 2004  | 0.35         | 0.17         | 0.44        | 0.44               |
| 2005  | 0.36         | 0.20         | 0.45        | 0.46               |
| 2006  | 0.40         | 0.20         | 0.48        | 0.45               |
| 2007  | 0.41         | 0.23         | 0.46        | 0.48               |
| 2008  | 0.42         | 0.22         | 0.49        | 0.51               |
| 2009  | 0.38         | 0.25         | 0.48        | 0.50               |
| 2010  | 0.38         | 0.30         | 0.47        | 0.42               |
| 2011  | 0.39         | 0.29         | 0.49        | 0.43               |
| 2012  | 0.41         | 0.28         | 0.49        | 0.43               |
| 2013  | 0.38         | 0.27         | 0.49        | 0.42               |
| 2014  | 0.40         | 0.22         | 0.51        | 0.46               |
| 2015  | 0.38         | 0.21         | 0.52        | 0.42               |

Note: Author’s calculation using data from ITC.

7. Conclusions

In this paper, the analysis of trade intensity index highlighted Brazil and South Africa’s trade intensity with BRICS has improved since 2001, while China, India and Russia, have deteriorated. The country-wise analysis of bilateral trade intensity reveals that there are larger trade flows from Brazil to South Africa, India to South Africa, and China to Russia. However, the Russian trade intensity is found lower in BRICS countries, but large with the European Union. The value of trade intensity index is moderate between BRICS member countries and the...
EU. The findings of trade intensity analysis reflect the need for closer cooperation to promote more intra-BRICS trade.

Revealed Comparative Advantage (RCA) has been analysed both at the two and at the four digits level of HS classifications for BRICS countries for the year 2015. The results assert that the pattern of comparative advantage varies at a different level of disaggregation of products. The products that are ranked in top ten based on the higher RCA values at HS-two are not necessarily been able to retain their place at the HS-four digit levels. Brazil enjoys comparative advantage in agriculture and allied products, while India has higher comparative advantages in products like lac, gum, silk, cotton, etc. The analysis for Russia shows a comparative advantage in products like Nickel, fertilizers, arms, and ammunition, and others. For China, the manufacturing products such as apparels, footwear, toys, are the top products with higher RCA values. South Africa reveals the comparative advantage mainly in mineral resource based products in the global markets. The RCA analysis shows the specialization by BRICS countries in different product categories in the world markets. As the EU is a significant trade partner with BRICS countries, we tried to look at the pattern of export similarity in EU for the BRICS countries with reference to India. The findings illustrate that the exports of Brazil, Russia and South Africa are quite diversified in the EU as compared to India. On the other, the FKI values for India and China show the moderate export competitiveness between them in the EU, with a rising export similarity pattern.

The findings of this paper show that over the years the trade flow among the BRICS has improved with exception to Russia. One reason of lower Russian trade with BRICS may be its stronger trade relations with EU. This study highlight the need to take essential steps by BRICS countries to make structural transformations in the basket of trading products to gain trade benefits at large. To promote the trade ties and to strengthen the relationships, BRICS countries must consider a free trade agreement.

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