Original Research Article

Trade Intensities and Intra-Industry Trade: An Analysis of India-BRCS Group Trade in Processed Food

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Abstract

The present study employs Trade Intensity index and Grubel Lloyd index to examine the India-BRCS group trade dynamics in processed food products from year 2010-2021. The research findings reveal a positive balance of trade for India except in the year 2014-2017. The study finds that lowest trade intensity of India is with Brazil. The results also indicate very less or no intra-industry trade in many processed food products like: fish products, meat products, dairy and poultry products, animal and vegetable oils, etc. The trade between India and China is found to be more homogenized than any other nation taken in the study.
Keywords: Processed Food, India, BRCS, Intra-Industry Trade, Trade Intensity.

1. INTRODUCTION

The Beginning of 21st century marked many developing economies as significant contributors in the worldwide economic expansion and the impressive growth rates of India, Brazil and China also testify this phenomenon. As a result of which, Jim O'Neil of Goldman Sachs created an economic bloc in 2001 by combining the economies of Brazil, Russia, India and China and named it as BRIC. Subsequently, in 2010, South Africa became an integral part of this regional trade agreement (RTA), transforming BRIC into BRICS. Following South Africa's formal inclusion on December 24, 2010, BRICS emerged as a significant organization comprising emerging powerful economies from Asia, Latin America, Europe, and Africa. The collective population of BRICS countries now exceeds 40 percent of the global total, spanning nearly 30 percent of the world's landmass. Notably, the combined gross domestic product (GDP) of these nations, measured in terms of purchasing power parity (PPP), surged from 16 percent in 2000 to over 25 percent in 2010 (Mishra, *et al*., 2015). By 2050, these countries are believed to be well off and prosperous than current major economic powers (Kundu, 2014). However, despite being major contributor in global trade, the intra-BRICS trade still remains comparatively low (Bhat, *et al*., 2022). These nations sometimes suffers from the conflicting interests among themselves given the significant differences in their economic and geopolitical situations. One such example

is of India and China. Both these nations have experienced strained relations in last few years due to their regional and global ambitions. Such issues are one of the many reasons of limited intra-BRICS trade. Hence, it becomes important to enhance the relation and cooperation among BRICS nations because only then there can be increased supply chain interconnectedness and flow of trade and investment. Irrespective of the hindrances, because of similar taste preferences, resource endowment and comparable per capita income, there is a huge scope for economic and trade cooperation among BRICS nations (Singh, 2016).

Being a global leader and rising economy of the world, India's importance in BRICS is central (Maryam and Mittal, 2019). The percentage share of India's intra-BRICS trade to its total trade has gone up from 8 percent in 2002 to 14.4 percent in 2019 (Ministry of Commerce and Industry, 2019). However, even though the India's exports to other BRICS nations have registered an Annual Average Growth Rate (AAGR) of 8 percent from 2008 to 2018, the imports from other BRICS nations to India grew at a rate of 8.8 percent higher than the exports during the same period (Export-Import Bank of India, 2020). India also faces trade deficit with all other nations of BRICS except for Brazil. Thus, there lies an untapped potential of India in BRICS that has not yet been fully explored. In order to improve its trade position in BRICS, India needs to align with the needs and

aspirations of other BRICS nations. Hence, this paper is an attempt to examine the India-BRCS (Brazil, Russia, China, South Africa) trade flows. Although, there is already enough literature available on the India-BRICS trade relations like Dhami and Wani (2019), Kundu (2014), Rasoulinezhad and Jabalameli (2018), Singh (2016), Kansara, *et al.,* (2021), Maryam, *et al.*, (2018), Raghuramapatruni (2015), Lohani (2020) but no study has examined the India-BRCS group trade particularly in processed food. By employing trade intensity index and Grubel Lloyd index, the paper aims to fill the literature gap.

2. METHODOLOGY
2.1 Data Sources
The study examines the trade relations of India with other BRICS nations or BRCS (Brazil, Russia, China, South Africa) group in processed food products using the secondary data sourced from International Trade Centre (ITC), Agricultural and Processed Food Products Export Development Authority (APEDA) and UN COMTRADE for the period 2010 to 2021. The data of processed food products is collected and compiled at 4-digit HS code classification and list of the same is given in appendix (Table A 1.1).

2.2 Trade Intensity Index (TII)
The trade intensity among nations is measured and calculated through trade intensity index (TII). It is defined as the ratio of share of one country's exports to a partner to the share of world exports to the partner (*WITS, World Bank, Trade Indicators, 2010*). If this index gives value greater than one, then it will indicate that trade flow between countries is larger than what is expected and vice-versa.

We have evaluated the trade intensity of India with other BRICS nations in the processed food products for the time period 2010 to 2021 using the following expressions:

$$\mathbf{XII_{ik} = (x_{ik}/X_{iw}) / [m_{kw}/ (M_{ww}-M_{iw})]}$$

Where, $\mathbf{XII_{ik}}$ = export intensity index between country *i* and country *k*; $\mathbf{x_{ik}}$ = country *i's* exports to country *k*; $\mathbf{X_{iw}}$ = country *i's* total exports to *world*; $\mathbf{m_{kw}}$ = *k* country's import from *world*; $\mathbf{M_{ww}}$= total *world* imports; $\mathbf{M_{iw}}$ = country *i's* total import from *world*.

$$\mathbf{MII_{ik} = (m_{ik}/M_{iw}) / [x_{kw}/ (X_{ww}-X_{iw})]}$$

Where, $\mathbf{MII_{ik}}$ = import intensity index between country *i* and country *k* ; $\mathbf{m_{ik}}$ = country *i's* import from country *k*; $\mathbf{M_{iw}}$ = country *i's* total imports from *world*; $\mathbf{x_{kw}}$ = *k* country's total export to *world*; $\mathbf{X_{ww}}$= total *world* exports; $\mathbf{X_{iw}}$ = country *i's* total export to *world.*

$$\mathbf{TII_{ik} = (x_{ik} / X_{it}) / (x_{wk} / X_{wt})}$$

Where, $\mathbf{TII_{ik}}$ = trade intensity index between country *i* and country *k*; $\mathbf{x_{ik}}$ = trade of country *i* with country *k*; $\mathbf{X_{it}}$ = total trade of country *i* with *world*; $\mathbf{x_{wk}}$ = *world* trade with country *k*; $\mathbf{X_{wt}}$ = total *world* trade.

2.3 Grubel-Lloyd Index (GLI)
The study analyses the Intra-Industry trade in processed food of India with other BRICS nations using the Grubel-Llyod Index for the period 2010-2021. This index measures the extent of intra-industry trade (Grubel and Llyod, 2007). After export and import value for a particular sector and the period is known, it is calculated as:

$$\mathbf{GL_i = 1- (|X_i- M_i|) / (X_i + M_i); \ 0 \le GL_i \le 1}$$

Where, $\mathbf{X_i}$ = value of export of good i; $\mathbf{M_i}$ = value of import of good i. Bars here represent the absolute value. A high IIT suggests that countries are trading predominantly within the same industry and are more industrially homogenized.

3. RESULTS
3.1 India-BRCS group trade in processed food (2010-2021)
The Indian food processing industry serves the substantial demand for food in BRCS group. According to data from the Agricultural and Processed Food Products Export Development Authority (APEDA), in the fiscal year 2020-21, India exported processed food products valued at $44.17 million to Brazil, $1919.62 million to China, $426.31 million to Russia, and $78.73 million to South Africa. Graph 1 shows the trends in trade of India with BRCS group in processed food products. The exports from India to BRCS group increased from US$ 1.02 billion in 2010 to US$ 2.45 billion in 2021, indicating a compound annual growth rate of 7.5 percent. On the other hand, imports also grew from US$ 0.96 billion to US$ 1.44 billion during the same time period but at a comparatively lower CAGR of 3.42 percent. However, India also experienced negative trade-balance with BRCS group from 2014 to 2017. Thus, the overall view of trends indicates that trade in processed food products with other BRICS nations has been in favour of India, so far.
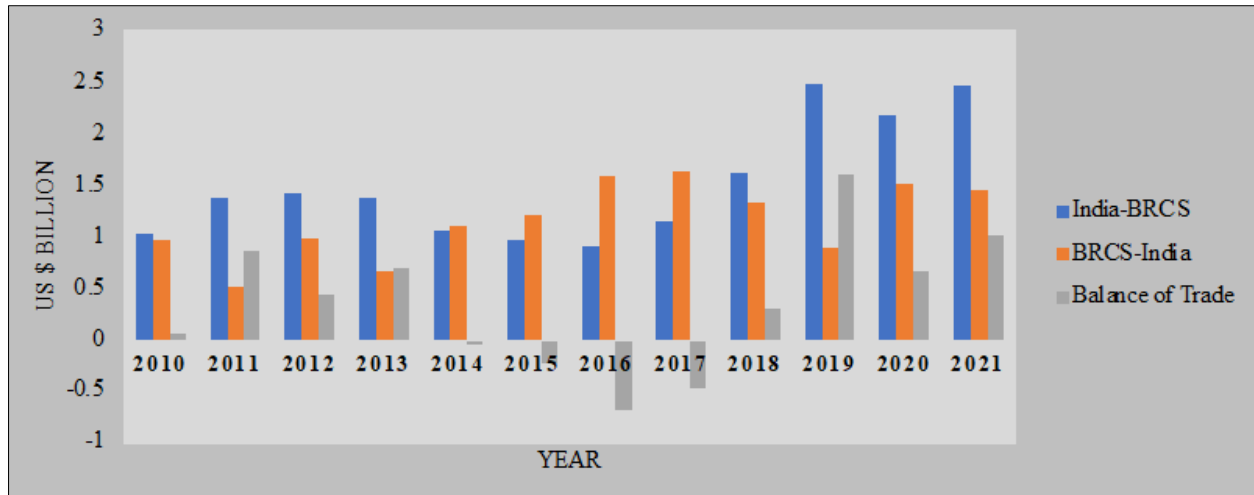
Figure 3.1: Trade between India and BRCS Group in Processed Food (2010 to 2021)
Source: Authors' own calculation of data accessed from UN COMTRADE

3.2 India's Trade Intensity with other BRICS Nations in Processed Food Products (2010-2021)

This study aims to analyse the trade intensity between India and other BRICS nations, particularly in processed food products from 2010 to 2021.

3.2.1 India's Trade Intensity with Brazil in Processed Food Products

Figure 3.2 illustrates the key trends of India's export, import and trade intensity with Brazil in processed food products at 4-digit HS code level from 2010 to 2021.
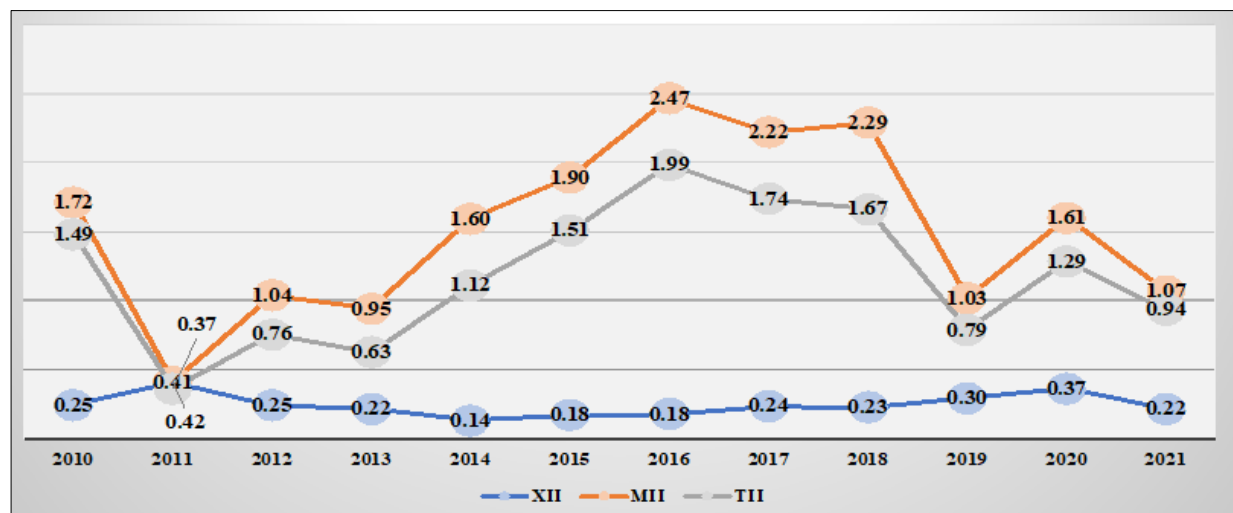

Figure 3.2: Bilateral Trade Intensities between India and Brazil in Processed Food (2010 to 2021)
Source: ITC, Trade Map Data

Although, Brazil has been one of the major trade partners of India in many commodities, exports of processed food products from India to Brazil have remained notably less. India's export of processed food products to other BRICS nations stood at US$ 2467.1 million in 2021, out of which Brazil's share was 1.79 percent, least among other BRICS nations. India's export intensity index (XII) with respect to Brazil revealed very low concentration of Indian processed food products in Brazil's markets, as the values remained below 1 throughout the study period. Starting with 0.25 in 2010, the index value peaked at modest value 0.37 in 2020 and further declined to 0.21 in 2021.

On the other hand, Brazil emerged as the leading exporter with 62.75 percent share in India's total imports of processed food products from other BRICS nations and second largest in the world after Indonesia. The values of India's import intensity index (MII) with respect to BRICS nations indicates the India's strong dependence on Brazilian processed food products. Starting with 1.72, the MII fell significantly in 2011 to 0.41, majorly because of fall in India's imports of sugar cane and related products from Brazil. However, after this significant dip the MII improved to 2.47 in 2016 and 2.29 in 2018. However, in 2021 the MII again dropped to 1.07. Thus, the findings suggest that while India has

been highly dependent on Brazil's processed food products, this reliance has reduced in the recent years.

After the analysis of export and import intensity between India and Brazil in processed food products, their overall impact on the global trade also needs to be analysed. This can be examined with the help of Trade Intensity Index (TII), which will help to understand how much bilateral trade between India and Brazil contributes to world trade. The TII index followed a fluctuating trend during the study period. Starting with 1.49 in 2010, TII peaked at 1.99 in 2016, indicating India and Brazil traded more with each other, than rest of the world. However, from 2016 onwards, TII fluctuated significantly, eventually settling at 0.94 in 2021.

Overall, it can be concluded here that, Brazil is the major import partner for India, with its 62.75 percent share in India's total imports of processed food products from other BRICS nations. While, India's export relationship remained weak with Brazil during the entire study period, the significance of their bilateral trade with respect to world has also declined in the recent years.

3.2.2 India's Trade Intensity with Russia in Processed Food Products

Russia's trade in processed food products is mainly concentrated towards Belarus, given their geographical, cultural and historic connect. The trends in the export, import and trade intensity index (as shown in figure 3.3) of India with Russia with respect to processed food products, reveals fluctuating bilateral trade patterns during 2010 to 2021.
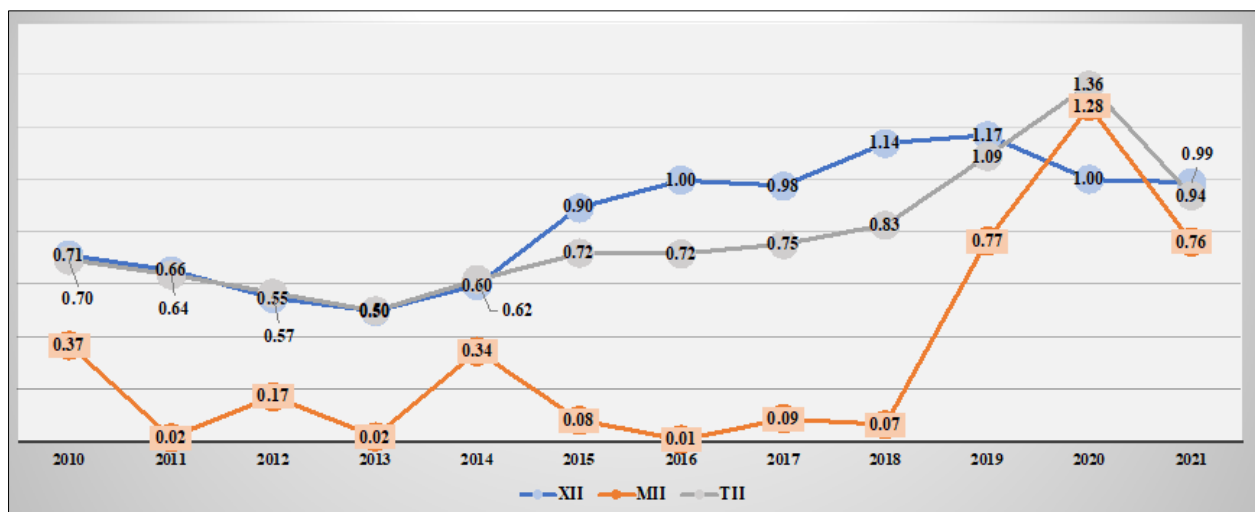

Figure 3.3: Bilateral Trade Intensities between India and Russia in Processed Food (2010 to 2021)
Source: ITC, Trade Map Data

Russia stood as the second largest importer of processed food products, with 17.26 percent share in India's total exports to other BRICS nations in 2021. XII consistently declined from 0.71 in 2010 to 0.55 in 2013. This suggests that, the concentration of India's processed food products in Russian market has declined during these years. However, there's a marked recovery in export intensity in 2014 (0.60), which grows to 0.90 by 2015 and reaches 1.00 by 2016. From 2017 to 2019, the XII remained relatively strongly with value increased above 1. During covid-19 disruption, export intensity declines slightly but remains strong at 1.00 in 2020 and 0.99 in 2021.

Russia again stood second as India's major import destination of processed food products among other BRICS nations from 2001 to 2021. Russia contributed 21.03 percent share in India's total imports of processed food products. India's Import intensity (MII) with Russia remains low but stable between 0.37 in 2010 and 0.02 in 2013. From 2014 to 2016, the MII experienced significant fluctuations in this period. After

hitting a low of 0.02 in 2013, it bounced back to 0.34 in 2014 but again fell to 0.01 in 2016. From 2017 to 2019, the MII improved significantly, rising from 0.09 in 2017 to a substantial 0.77 in 2019. The MII experienced a significant jump, where it peaked the value of 1.28, before declining again to 0.76 in 2021.

There have been strong trade relations among India and Russia for decades, particularly in the areas such as oil and gas, defense, pharmaceuticals, etc. However, in recent years, both these economies have been exploring and diversifying their economic relations in other areas as well which includes agriculture and processed food. From 2010 to 2014, the TII declined from, reflecting a general reduction in the importance of India-Russia bilateral trade. However, in subsequent years, the TII started increasing from 0.60 in 2014 to 0.72 in 2015 and 2016 and peaking at 1.36 in 2020. The decline to 0.94 in 2021 reflects the stabilization of trade flows after the pandemic shock.

Thus, it can be concluded here that, even though the share of Russia in India's total imports of processed food products from other BRICS nations is comparatively more than the Russia's share in India's exports to BRICS, the XII stood above 1 for the most of the years, while, the MII stood above 1only during 2020. This indicates that Russia is more dependent on Indian processed food products. Similarly, the value of TII also suggests that bilateral trade between India and Russia is more than expected, although its significance declined in 2021.

3.2.4 India's Trade Intensity with China in Processed Food Products

India and China are two the major key players in the world economy. With their immense population and growing economic power, these countries are also known as the backbone of Asia. Both these nations have been the major contributor in world exports, with China placed at rank one and India at 17 in 2021. While, in terms of world imports, China is placed at number two

after United States of America and India at number seven.

India and China have been significant trade partners over the years. China was the third largest export destination of India in 2001 after Netherlands. While, among BRICS nations, China is placed at number one. China holds 77.77 percent share in India's total exports of processed food products to other BRICS nations in 2021. Figure 3.4 illustrates the key trends of India's export, import and trade intensity with China in processed food products at 4-digit HS code level from 2010 to 2021. India's export intensity with China in processed food products started high with the value 1.84 in 2010, which later continued to fall in the subsequent years, reaching the lowest 0.56 in 2016. During 2017 to 2019, there was a healthy growth in the India's export intensity with China, when XII increased to 1.28 in 2019. But due to covid-19 and political and geopolitical tensions between India and China, the export intensity again reduced to 0.90 in 2021.
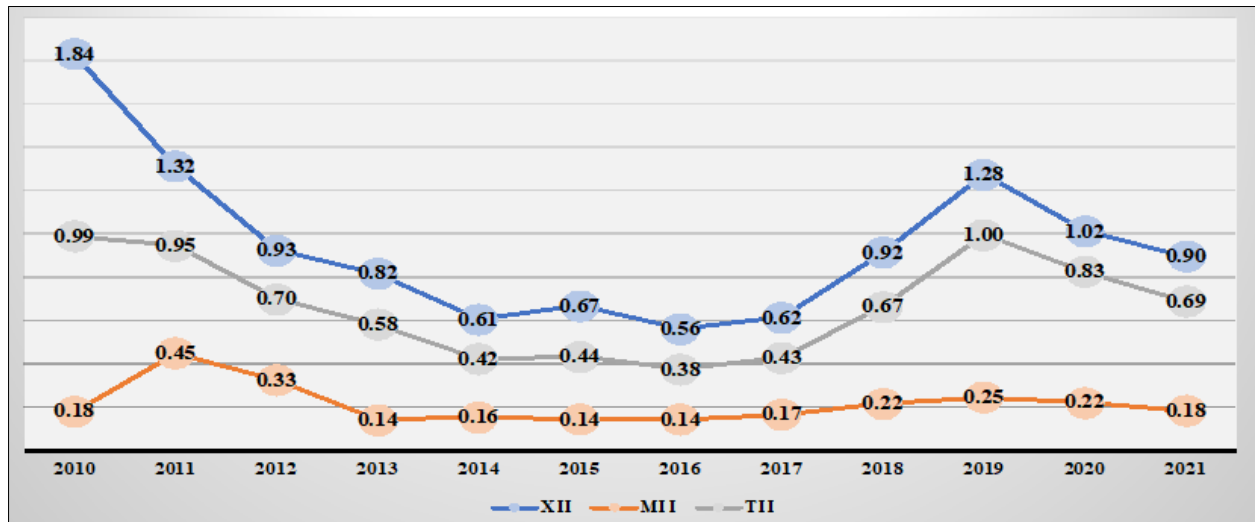

Figure 3.4: Bilateral Trade Intensities between India and Russia in Processed Food (2010 to 2021)
Source: ITC, Trade Map Data

On the other hand, China is the third largest exporter of processed food products to India among other BRICS nations. China contributed 14.68 percent share in the India's total imports of processed food products in 2021. The import intensity between India and China in processed food products remained relatively weak throughout the study period. Although there were some periods when the value of MII increased (0.18 in 2010 to 0.33 in 2012), but it never stood above 1. This indicates that, the India's imports of processed food products from China might have increased but they were not very highly concentrated in the Indian market.

The significance of bilateral trade between India and China with respect to world has been measured with the help of trade intensity index (TII). The trade intensity between India and China remained moderate during the study period. Like XII, the TII also

consistently fell between 2010 to 2014. By 2016, TII registered lowest value of 0.38, although it recovered to 1.00 in 2019. In 2020 and 2021, the relative importance of trade between India and China declined, as TII again fell below 1 during these two years.

3.2.5 India's Trade Intensity with South Africa in Processed Food Products

India and South Africa together are not just connected politically or economically, they also share historical and cultural ties with each other. India was the first country to form formal diplomatic relations with South Africa during the end of its apartheid regime in 1994. South Africa is also the second largest trade partner of India in the African continent.

Figure 3.5 illustrates the export, import and trade intensity between India and South Africa, particularly in processed food products.
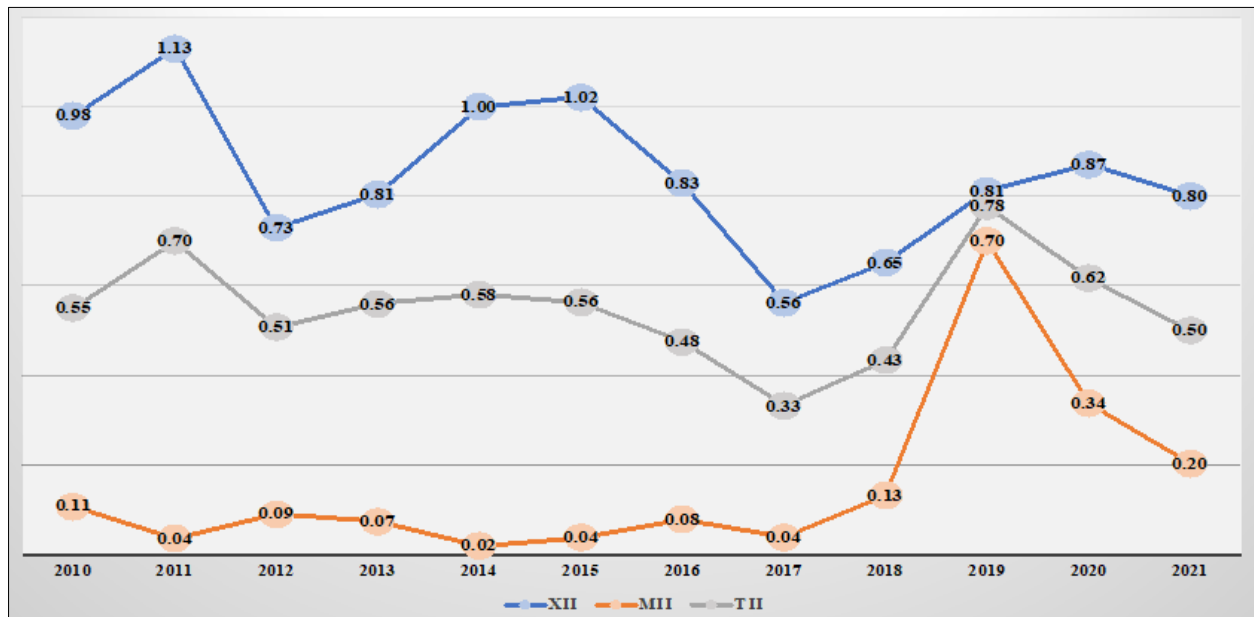

Figure 3.5: Bilateral Trade Intensities between India and South Africa in Processed Food (2010 to 2021)
Source: ITC, Trade Map Data

South Africa contributed 3.20 percent in India's total export of processed food products to other BRICS nations in 2021. The export intensity index (XII), indicates the level of concentration of Indian processed food products in the South African market, relative to its exports globally. Initially, the XII increased from 0.98 in 2010 to 1.13 in 2011, indicating a strong export relationship between India and South Africa. During 2014 and 2015, the XII hovered around 1, following a decline in the preceding years. For the next 2 consecutive years, the XII declined significantly and reached lowest point in 2017, when the value of XII stood at 0.56. However, in the last few years, the XII improved marginally but still remained below 1, showing moderate export from India to South Africa.

On the other hand, the import intensity index (MII) shows India's dependence on South African processed food products. The MII stood below 1 throughout the study period, indicating low concentration of South Africa's processed food products in Indian market. Initially, the MII decreased from 0.11 in 2010 to 0.04 in 2012, reaching its lowest of 0.02 in 2014. However, from 2017 to 2019, there was a continuous increase in the MII, peaking at 0.70 in 2019 After this high, the MII fell to 0.34 in 2020 and further declined 0.20 in 2021.

Similarly, the TII has followed a fluctuating and declining trend during the study period. The TII increased from 0.55 in 2010 to 0.70 in 2011, indicating a brief strengthening of India-South Africa bilateral trade relations. However, in 2012, the TII dropped to 0.51. For

next three consecutive years (2013 to 2016), there was a slight improvement in the TII, stabilizing as both countries maintained their trade relations despite global economic challenges. However, in 2017, the TII reached its lowest point at 0.33. From 2018 to 2020, the TII followed a V shape recovery, reaching its peak in 2019 (0.78). During 2020 to 2021, the TII declined marginally with its values lying at 0.62 and 0.50, respectively.

Thus, it can inferred here that the trade relationship between India and South Africa, particularly in processed food products has weekend over time, with a fall in the value of all three indices.

3.3 India's Intra-Industry Trade in Processed Food Products with other BRICS Nations from 2010 to 2021

Modern economies these days are producing and focussing more on the trade of products belonging to the same industry known as Intra-Industry trade. This arises in order to take the advantage of economies of scale in production. These economies of scale enable countries to be specialised in fewer varieties and styles, which in turn, leads to enhanced efficiency, diversification of product range, technological advancement, trade balance improvement and economic integration among trading partners.

Tables (2-4) are showing the GLI values calculated to measure the extent of intra-industry trade between India and BRCS group in processed food products from 2010 to 2021.

3.3.1 India's IIT with Brazil

As shown in table 3.1, there is no IIT between India and Brazil in Fish Products (FP), Meat Products (MP), Sugar Preparations and Honey (SH), Animal and Vegetable Oils (OS), Processed Vegetables (PV), Dairy and Poultry Products (DP) and Beverages (BS), as values of GLI hovered at zero or close to zero. IIT in Processed Fruits (PF) and Cereal Preparations (CP) is very low i.e., 03 percent and 12 percent, respectively. IIT in Residues and Animal Feed (RS) has reduced from 76 percent in 2010 to 49 percent in 2021 while it has increased from 09 percent to 52 percent in Coffee, Tea and Cocoa Products (CC) and 38 percent to 135 percent in Other Edible Products (OT) during same time period.

Table 3.1: Intra-Industry Trade between India and Brazil in Processed Food Products (2010-2021)

Product Year	FP	MP	RS	SH	CC	OS	CP	PV	PF	DP	BS	OT
2010	0	0	0.76	0	0.09	0.22	0	0.02	0.02	NA	0	0.38
2011	0	0	0.31	0.63	0.25	0.19	0	0.01	0.01	NA	0.5	0.26
2012	0	NA	0.63	0	0.80	0.11	0	0	0	0	0	0.20
2013	0	NA	0.84	0	0.29	0.14	0	0	0	NA	0	0.56
2014	0	0	0.71	0	0.12	0.02	0	0	0.22	NA	NA	1.68
2015	NA	NA	0.72	0.10	0.05	0	0.8	0	0.06	NA	0	0.74
2016	NA	NA	0.53	0	0	0.02	0	0	0.27	NA	0	0.87
2017	NA	NA	0.59	0	0	0.08	NA	0.04	0.01	NA	0	0.95
2018	0	NA	0.42	0.01	0.47	0.03	0.66	0	0	NA	0	1.6
2019	0	0	0.45	0.28	0.54	0.05	0	0	0.46	NA	0	1.49
2020	NA	0	0.59	0	0.15	0.03	0.04	0	0.38	0	0.01	1.61
2021	0	0	0.49	0	0.52	0	0.12	0	0.03	NA	0	1.35

Source: Authors' own calculation of data accessed from ITC database.

Note: 0 = Perfect inter-industry trade; 1= Perfect intra-industry trade; NA= no trade in said product and year.

3.3.1 India's IIT with Russia

The GLI Values in table 3.2 indicate no IIT between India and Russia in Fish Products (FP), Meat Products (MP), Residues and Animal Feed (RS), Processed Vegetables (PV), Processed Fruits (PF) and Dairy and Poultry Products (DP) from 2010 to 2021. The IIT in Residues and Animal Feed (RS) fell drastically from 67 percent in 2011 to zero in 2021, 163 percent to zero in Sugar Preparations and Honey (SH) during the same time period. Animal and Vegetable Oils (OS), Cereal Preparations (CP), Beverages (BS) and Other Edible Products (OT) have very low IIT between the two countries. These findings thus suggest that, although some processed food product categories experienced initial growth in intra-industry trade, trade between India and Russia in processed food products has overall declined over the years.

Table 3.2: Intra-Industry Trade between India and Russia in Processed Food Products (2010-2021)

Product Year	FP	MP	RS	SH	CC	OS	CP	PV	PF	DP	BS	OT
2010	0	NA	0	0	0	0.31	0	0	0	0	0	0.58
2011	0	NA	0.67	1.63	0	0.13	0	0	0.01	0	0	0.73
2012	0	0	0.43	0.25	0	0.44	0.75	0	0.01	0	0.49	1.47
2013	0	NA	0	0	0	0	0	0	0	0	0.93	0.90
2014	0	0	0.03	0	0.02	0.22	0	0	0	0	0.68	0.95
2015	0	0	0.11	0	0	0.81	0	0	0	0	0.69	0.92
2016	0	0	0.04	0	0	0.05	0	0	0	NA	0.25	0.80
2017	0	0	0	0	0	0.45	0	0	0	NA	0.58	1.23
2018	0	0	0	0	0	0.86	0	0	0	NA	0.15	0.66
2019	0	0	0	0	0.22	0.14	0	0.01	0.01	NA	0.82	0.03
2020	0	0	0.31	0	0	0.05	0.18	0	0	NA	0.97	0.05
2021	0	0	0	0	0	0.09	0.28	0	0	NA	0.16	0.10

Source: Authors' own calculation of data accessed from ITC database.

Note: 0 = Perfect inter-industry trade; 1= Perfect intra-industry trade; NA= no trade in said product and year.

3.3.2 India's IIT with China

India and China have been significant trade partners over the years. China was the third largest export destination of India in 2001 after Netherlands. While, among BRICS nations, China is placed at number one.

Table 3.3: Intra-Industry Trade between India and China in Processed Food Products (2010-2021)

Product Year	FP	MP	RS	SH	CC	OS	CP	PV	PF	DP	BS	OT
2010	0.08	0.02	0.22	1.31	1.1	0.04	2.19	1.6	1.98	0.22	0.34	1.19
2011	0.77	0.13	0.26	0.07	1.74	0.59	1.19	1.23	0.67	0	0.89	0.38
2012	0.03	0	0.20	0.16	0.98	0.44	0.78	1.85	1.39	0	0.8	0.16
2013	0.08	0	0.30	0.11	0.58	0	1.25	1.45	1.32	0	1.59	1.22
2014	0.02	0	0.59	0.40	0.48	0.01	0.47	0.72	0.5	0	0.53	0.53
2015	0.42	NA	0.61	0.64	0.41	0.01	0.81	1.58	1.84	0	1.53	1.59
2016	0.77	0	0.31	0.13	0.85	0.01	1.07	2.01	2.37	NA	1.13	1.16
2017	0.70	0	0.48	0.15	1.06	0.03	1.45	1.03	3.75	NA	0.13	1.35
2018	0.87	0	0.04	0.08	1.44	0.07	2.3	0.8	1.63	0	0.83	1.55
2019	0.95	NA	0.19	0.06	0.98	0.08	2.68	2.06	1.89	0	0.96	0.81
2020	0.34	NA	0.32	0.19	0.79	0.02	1.54	0.44	1.26	0	0.66	1.48
2021	0.75	0	0.65	0.03	1.51	0.03	1.76	0.95	0.87	0	0.52	1.86

Source: Authors' own calculation of data accessed from ITC database.
Note: 0 = Perfect inter-industry trade; 1= Perfect intra-industry trade; NA= no trade in said product and year.

Table 3.3 presents the trends in intra-industry trade between India and China in processed food products from 2010 to 2021 using the grubel-lloyd index. India has more than 100 percent IIT with China in Coffee, Tea and Cocoa products (CC), Cereal Preparations (CP) and Other Edible Products (OT) and more than 50 percent IIT in Fish Products (FP), Residues and Animal Feed (RS), Processed Vegetables (PV), Processed Fruits (PF) and Beverages (BS). There is no IIT in Meat Products (MP), Sugar Preparations and Honey (SH), Animal and Vegetable Oils (OS) and Dairy and Poultry Products (DP) throughout the study period.

3.3.5 India's IIT with South Africa
India and South Africa's intra-industry trade in processed food products has been presented in the table

3.4. The data reveals that there had been absolutely no IIT between these countries in Meat products (MP) and Fish Products (FP) during the period under consideration, indicating no bilateral trade in these categories. IIT in Residues and Animal Feed (RS) increased from 07 percent in 2010 to 85 percent in 2017 but later reduced to mere 01 percent in 2021. IIT in Sugar Preparations and Honey (SH), Coffee, Tea and Cocoa Products (CC), Animal and Vegetable Oils (OS), Processed Vegetables (PV) and Dairy and Poultry Products (DP) was high but later reduced to zero in 2021. IIT between India and South Africa is highest in Other Edible Products (OT) with value standing at 95 percent in 2021.

Table 3.4: Intra-Industry Trade between India and South Africa in Processed Food Products (2010-2021)

Product Year	FP	MP	RS	SH	CC	OS	CP	PV	PF	DP	BS	OT
2010	0	0	0.07	0.28	0.46	0.75	0.05	0.03	0.85	0	1.13	0.17
2011	0	0	0.02	0.78	1.29	0.02	0	0	2.51	0.95	0.18	0.29
2012	0	0	0.23	1	1.16	0.40	0.03	0	2.05	0	0.54	1.47
2013	0	0	0	0.01	1	0	0.05	0.59	0.96	0	1.47	0.92
2014	0	NA	0	0	1.82	0	0	0.28	0.09	0	0.32	0.74
2015	0	NA	0	0.37	0.76	0.	0	0.21	0.59	0	0.17	0.95
2016	0.02	NA	0.01	0.06	0.86	0.76	0.01	0.31	0.8	0	0.65	1.39
2017	0.02	0	0.85	0	0.54	0	0.23	0	0.15	0	1.14	1.56
2018	0.15	0	0.08	0.02	0.95	0	0.51	0	1.16	0	0.53	1.47
2019	0.18	0	0.05	0.5	0.55	0	0.40	0	0.21	0	0.69	0.94
2020	0.04	0	0.01	0.5	0.15	0	0.66	0	0.12	0	0.03	0.81
2021	0.06	0	0.01	0	0	0	0.48	0	0.27	0	0.49	0.95

Source: Authors' own calculation of data accessed from ITC database.
Note: 0 = Perfect inter-industry trade; 1= Perfect intra-industry trade; NA= no trade in said product and year.

Table 3.5: Trade Intensity and Intra-Industry trade between India and other BRICS nations (2010-2021)

Metric	Brazil	Russia	China	South Africa
India's Exports to Individual BRICS nations (2021)	1.79% of BRICS total	17.26% of BRICS total	77.77% of BRICS total	3.20% of BRICS total
Export Intensity Index (XII)	Low, peaking at 0.37 in 2020; dropped to 0.22 in 2021	Started at 0.71 in 2010; reached 1.00 in 2016, stable ~1 in 2018-2021	High at 1.84 in 2010, lowest at 0.56 in 2016; 0.90 in 2021	Fluctuated; peaked at 1.13 in 2011; dropped to 0.56 in 2017; below 1 in 2021

Metric	Brazil	Russia	China	South Africa
Import Intensity Index (MII)	High dependency; peaked at 2.47 in 2016, declined to 1.07 in 2021	Stable, low values; peaking at 1.28 in 2020, declined to 0.76 in 2021	Low concentration; remained below 1, highest at 0.45 in 2011	Low, consistently below 1; peaked at 0.70 in 2019, then declined to 0.20 in 2021
Trade Intensity Index (TII)	Fluctuated; peaked at 1.99 in 2016, dropped to 0.94 in 2021	Declined initially, recovery peaking at 1.36 in 2020; 0.94 in 2021	Consistently declined until 2016, recovered to 1.00 in 2019; 2021 at 0.69	Fluctuating and declining trend; peaked at 0.78 in 2019; dropped to 0.50 in 2021
Intra-Industry Trade (IIT)	Fish, Meat, Sugar, Oils, Vegetables, Dairy, Beverages: Low to zero; Fruits, Cereal: Low; Residues: Declined from 76% (2010) to 49% (2021); Coffee, Tea, Cocoa: 09% (2010) to 52% (2021)	Fish, Meat, Residues, Vegetables, Fruits, Dairy: Low to zero; Oils, Cereal, Beverages: Very low; Residues: 67% in 2011 to 0% in 2021	Fish, Residues, Vegetables, Fruits, Beverages: Above 50%; Coffee, Cereal, Other Edible: Above 100%; Meat, Sugar, Oils, Dairy: Zero throughout period	Meat, Fish: No IIT; Residues: 07% (2010) to 1% (2021); Sugar, Coffee, Oils, Vegetables, Dairy: Zero by 2021; Other Edible: Highest at 156% in 2016; 95% in 2021

Source: The authors

CONCLUSION

There has been a notable shift in people's consumption habits, transitioning from primarily relying on cereals to embracing a more diverse and nutritious diet that includes fruits, vegetables, milk, fish, meat, and poultry products (Devi, 2014). This shift has given rise to the emergence of the food processing industry as a burgeoning sector in India. Between 2010 and 2015, there was a substantial surge in the export of processed food products from India, outpacing the exports of fresh or raw food items. Notably, in 2018, the exports of processed food products exceeded the total exports of agricultural products by a factor of 1.6 (Shukla, *et al.*, 2020). Also, given the importance of BRICS for India, the study has thus examined the trade flows between India and other BRICS nations, particularly in processed food products.

While analysing the data it was found that CAGR of exports in processed food products from India to BRCS group is higher than the CAGR of imports from BRCS group to India from 2010 to 2021. Thus, indicating a positive balance of trade except in the year 2014-2017. The trade intensity between India and Brazil is the lowest. Trade flows between India and Russia have improved over the years while trade between India and China and India and South Africa is showing a fluctuating trend.

The study then examined the intra-industry trade between India and BRCS group using the Grubel Lloyd Index in processed food products. The results indicate very less or no intra-industry trade in many processed food products like: fish products, meat products, dairy and poultry products, animal and vegetable oils and processed vegetables. The trade between India and China is found to be more homogenized than any other nation taken in the study.

However, even though, India's trade with other BRICS nations in processed food products has improved over time, India has not been able to cash this opportunity to a large extent. The major factors behind it are tariff and non-tariff barriers (NTBs) faced by India from other BRICS nations. India's processed food products face an average tariff of 6-15 percent (Export-Import Bank of India, 2019) from Brazil, China and South Africa. As per a report published by EXIM Bank, Brazil is imposing an average tariff rate of 13 percent, China is imposing an average tariff rate of 19 percent and South Africa is imposing an average tariff rate of 10 percent on imports of processed food from India. Similarly, India being an active member of BRICS is facing harsh non-tariff barriers from other nations of this economic bloc. In terms of specific products, export of frozen bovine meat and egg products face rejections from Russia, even though these products follow all the OIE guidelines that are required and necessary for veterinary certifications. Export of products like spices, fishery products, etc. faces delays in China as it takes very long time in finalizing the protocol regarding phytosanitary measures and certifications. Likewise, in South Africa, the South African National Regulator for Compulsory Specifications (NRCS) has made a compulsory specification for frozen items like fish, marine mollusks and other products. These specifications delay the clearance of India's export in South Africa. The processed food accounts for 10.4 percent (MOFPI, 2021) in India's total export share, thus India's trade strategy should consider bilateral and multilateral negotiations on tariff reductions. This can be achieved through Free Trade Agreements (FTAs) or preferential trade agreements with specific BRICS countries. A sector-specific agreement focusing on agricultural and processed food products could be proposed to lower tariffs and promote trade. India should also work through diplomatic and trade channels to streamline the process of meeting sanitary and phytosanitary (SPS) requirements. Establishing joint committees with BRICS

partners to standardize and expedite certifications, particularly for food safety and animal health, can help reduce delays. To boost India's intra-industry trade with other BRICS nations, India should promote the value-added processed food products through R&D in food processing technologies, innovation in packaging, etc., to cater the needs of the BRICS market. The government should also continue to invest in modernizing the food processing sector through schemes like the Pradhan Mantri Kisan Sampada Yojana (PMKSY), which aims to build infrastructure for food processing clusters, cold chains, and modern storage facilities. Additionally, providing financial support to small and medium enterprises (SMEs) in the processed food sector, along with technological upgrades, would increase India's export competitiveness.

APPENDIX

Table A1.1

> **The following are the HS codes for various product groups:**
> - **Fish products** (FP): 03+1604+1605
> - **Meat products** (MP): 02+1601+1602+1603
> - **Residues and animal feed** (RS): 23
> - **Sugar preparations and honey** (SH): 1701+1702+1704+0409
> - **Coffee, tea and cocoa products** (CC): 902+903+1803+1804+1805+1806+2101
> - **Animal and vegetable oils** (OS): 15
> - **Cereal preparations** (CP): 1101+1102+1103+1104+1107+1108+1109+1904+1905
> - **Processed vegetables** (PV): 0712+1105+1106+2001+2002+2003+2004+2005
> - **Processed fruits** (PF): 0811+0812+0814+1903+2006+2007+2008+2009
> - **Dairy and poultry products** (DP): 0401+0402+0403+0404+0405+0406+0407+0408
> - **Beverages** (BS): 2203+2204+2205+2206+2207+2208+2209
> - **Other edible products** (OT): 0410+13+1901+1902+2102+2103+2104+2105+2106

List of Acronyms

AAGR	Annual Average Growth Rate
APEDA	Agricultural and Processed Food Products Export Development Authority
BRICS	Brazil, Russia, India, China, and South Africa
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GLI	Grubel-Lloyd Index
IIT	Intra-Industry Trade
ITC	International Trade Centre
MII	Import Intensity Index
NRCS	National Regulator for Compulsory Specifications
NTBs	Non-Tariff Barriers
PMKSY	Pradhan Mantri Kisan Sampada Yojana
PPP	Purchasing Power Parity
RTA	Regional Trade Agreement
SMEs	Small and Medium Enterprises
SPS	Sanitary and Phyto-sanitary Measures
TII	Trade Intensity Index
XII	Export Intensity Index

REFERENCES
- Devi, K. (2014). Trade Performance of Indian Processed Foods in the International Market. *Procedia - Social and Behavioral Sciences, 133*, 84–92.
- Export-Import Bank of India. (2019). Non-Tariff Measures on Indian Exports (Part 1).
- Kansra, P., Kumar, P., Mahapatra, S.K. and Oberoi, S. (2021). Economic concert, cooperation and trade specialisation of India in comparison with rest of BRICS nations. *International Journal of Trade and Global Markets, 14*(6), 580–602.

- Kumar, A., Mazumdar, R., and Kaur, S. (2017). *International trade in processed foods: an Indian perspective (Working Paper No.61)*. Export-Import Bank of India.
- Kundu, P. (2014). BRICS: Prospects and challenges.
- Maryam, J. and Mittal, A. (2019). An empirical analysis of India's trade in goods with BRICS. *International Review of Economics, Springer; Happiness Economics and Interpersonal Relations (HEIRS), 66*(4), 399-421.
- Non-Tariff Barriers Faced by Indian Agricultural Products. (n.d.). *Agriculture and Processed Food Products Export Development Authority*.
- Raghuramapatruni, R. (2015). Revealed Comparative Advantage A Study on BRICS. *Arabian Journal of Business and Management Review, 5*(5), 1-7.
- Singh, K. (2016). Intra-BRICS Trade intensities: An Analytical study. *IOSR Journal of Humanities and Social Science, 21*(6), 103-114.
- Trade Indicators. (2010). Wits.Worldbank.Org.
- UNCTAD-United Nations Conference on Trade and Development. (2020). Non-Tariff Measures in Australia, China, India, Japan, New Zealand and the Republic of Korea: Preliminary Findings.