

A Comparative Analysis of Trade Intensity between India and Brazil during Pre and Post-BRICS period

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Abstract—International trade is one of the major determinants of development. The geo-political organizations like BRICS have been significantly contributed for the promotion trade along with economic development with improved political relationship. India and Brazil are the member countries of BRICS having many common features. Having said this, the present paper examined and compared the export, import and trade intensity of India with Brazil. The present study has used secondary time series data with both statistical and econometric techniques. It has been found from the study that the mean of EII is 1.09, the mean of MII is 0.96 and the mean of TII is 1.06 and it indicates that the EII and TII of India with Brazil is higher than the Brazil's trade intensity with the world. The CAGR of EII is 4.97 percent, the CAGR of MII is 4.45 percent and the CAGR of TII is 4.73 percent. The CAGR of PCI is 4.44 percent. Accordingly, EII, MII and TII are grown at faster rate compared to PCNNI. The EII, MII, TII and PCNNI are non-stationary at level and found stationary with first difference. It has been from the ANCOVA models that the EII, MII and TII were less than 1 during the pre-BRICS period and higher than 1 during the post-BRICS period. Accordingly, the formation of BRICS has been made significant impact on export, import and trade intensity of India with Brazil. Therefore, India is having tradable advantage with Brazil and it has to be utilized for the development of the country.

Index Terms—Export Intensity Index (EII), Import Intensity Index (MII), Trade Intensity Index(TII), Compound Annual Growth Rate (CAGR), India and Brazil

I. INTRODUCTION

International trade is the engine of growth. International trade is one of the most dynamic and influential forces shaping the global economy. It

refers to the exchange of goods, services, capital, and technology across national borders, driven by differences in resources, comparative advantages, production costs, geopolitical factors, and consumer preferences, (Heckscher & et.al, 1991).

Initially, the diplomatic relations between India and Brazil were established in 1948. Matter of facts, both India and Brazil are common members of many international organizations such as BRICS, G20, G-4, IBSA, Global Biofuel Alliance, International Solar Alliance, and so on. India and Brazil maintain a strong and dynamic trade relationship since independence. In 2024-25, bilateral trade reached US\$ 12.20 billion, with Indian exports to Brazil amounting to US\$ 6.77 billion and imports from Brazil totaling US\$ 5.43 billion. Total Indian investment in Brazil is estimated at more than US\$ 6 billion and Brazilian investment in India is around US\$ 1billion (Embassy of India, 2026).

Brazil is India's largest trade partner in the Latin American region. India's export to Brazil was 0.88 percent of India's global exports in 2024 and 0.92 percent in 2023. India's import from Brazil was 0.75 percent of India's global imports during 2024 and 0.55 percent in 2023. In contrast, Brazil's exports to India was 1.6 percent in 2024 and 1.4 percent in 2023 of its global exports and Brazil's import from India was 2.8 percent in 2024 and 3 percent in 2023 of its global imports which explains the growing trade intensity between India and Brazil (Sao Paulo, 2025).

Both India and Brazil are competitors in the global market in specific areas like agriculture and supplying raw materials and complementary trade partners, with India providing IT, pharmacy, and agrochemicals, while Brazil supplies agricultural products, bio-fuels, and natural resources. Each other's strengths in sectors like digital tech, energy,

and agriculture to boost trade and strategic cooperation targeting US\$20 billion by 2030 (IBEF, 2025).

In spite of barriers like geopolitical distance and competitors of the global market, Brazil is still one of the important trade partners of India, since Brazil is India's gateway to the MERCOSUR trade bloc and a like-minded democratic partner. This paper aims to examine the trade, export and import intensity between India and Brazil for the period 1995-2024, and makes comparison between pre and post-BRICS period.

II. LITERATURE REVIEW

It has been found from the previous literature on international trade that previous studies largely examined the impact of trade openness (Marie, 2013). Many studies focused on the comparative advantages, policy implications, opportunities and threats, and positive impact of geopolitical factors on international trade and commercial relationships (Wani & Dhami, 2014), (Alessandro & et.al, 2020), (Baumann & al, 2021), (Anshita, 2023) and (Lohani, 2024). Mohamad and others in their article intended to shed light on the potential changes of stock market integration among BRICS countries arising out of the post-BRICS formation; a comparison between pre and post-era. Some studies scrutinized India's trade volume with Brazil employing variables like TII, TRI, and CAGR and so on, and intended to highlight the intra-industry trade specifically in the processed food sector (Paswan, 2025).

However, the previous studies have not analyzed the trade relationship between India and Brazil for the long term (from 1995 to 2024) and not compared between pre and post- BRICS period. In this regard the present paper entitled 'A Comparative Analysis of Trade Intensity between India and Brazil during Pre and Post-BRICS period'.

III. METHODOLOGY

The study compared and analyzed the trade intensity between India and Brazil using secondary data for the period from 1995 to 2024. The secondary data was sourced from the World Integrated Trade Solution (WITS), the World Bank and the Ministry of Trade and Commerce, Government of India (GOI). Trade intensity indices like Export Intensity Index (EII), Import Intensity Index (MII), Trade Intensity Index (TII), and Compound Annual Growth Rate (CAGR) were used to analyze the bilateral trade strength between India and Brazil for the period from 1995 to 2024. The impact of formation of BRICS on export, import and trade intensity of India with Brazil has been estimated along with per-capita net national income of India using ANCOVA dummy variable regression model.

The following formulas are used for computation of intensities;

$$EII_{ij} = \frac{X_{ij}/X_{iw}}{M_{wj}/M_{ww}}$$

Where;

EII_{ij}= Export Intensity Index; X_{ij}=India's (i) export to Brz(j); X_{iw}=India's export to world(w); M_{wj}=Brazil(j) imports from world; M_{ww}= World Total Imports or exports

$$MII_{ij} = \frac{M_{ij}/M_{iw}}{X_{wj}/X_{ww}}$$

Where;

MI_{ij}=Import Intensity Index; M_{ij}= India's(i)imports from Brazil (j) ; M_{iw} = India's imports from world; X_{wj}=Brazil's exports to the world ; X_{ww}= total World exports

$$TII_{ij} = \frac{X_{ij}/X_{it}}{X_{jt}/X_{wt}}$$

X_{ij} =Total Trade (Exports +Imports) of India with Brazil; X_{it} = Total trade of India with rest of the world;

X_{jt}= Total Trade of Brazil with the rest of the world; X_{wt}= Total World Trade

IV. RESULTS AND DISCUSSION

As a backdrop to the analysis of impact of formation of BRICS on the export, import and trade intensity the trends EII, MII and TII are captured in the line graph and trends are shown in the following line graph;

Graph 1: Trends in EII, MII & TII

The results of the present paper are presented, analyzed and discussed in the following;

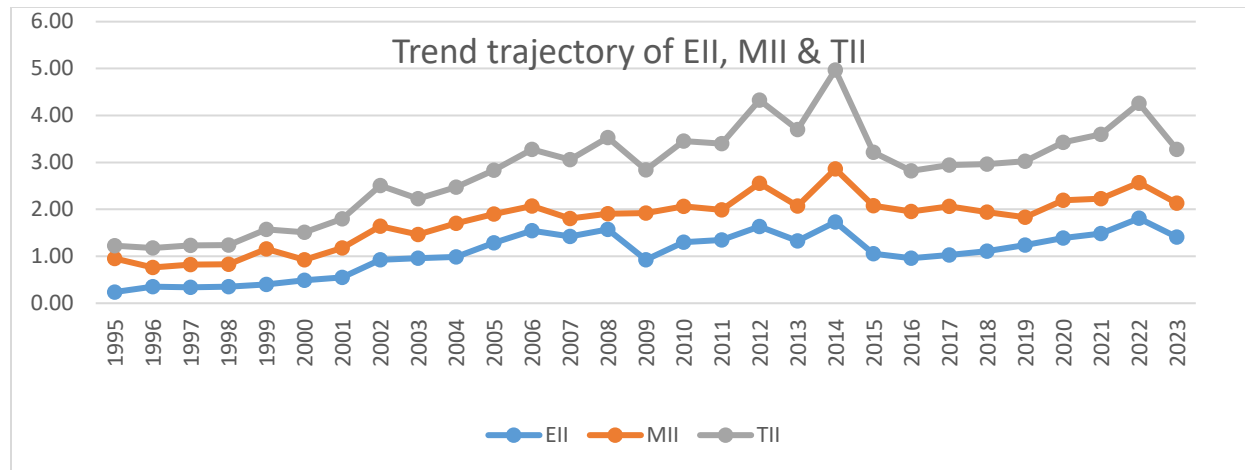


Table 1: Descriptives of EII MII TII and PCI (In Index)

Description	EII	MI	TII	PCI
Mean	1.086028	0.963862	1.056739	61134.78
Median	1.172325	0.977465	1.081811	56771.47
Maximum	1.808688	1.808688	1.808688	108786.2
Minimum	0.238942	0.333614	0.272842	29933.68
Std. Dev.	0.45686	0.445425	0.433448	23554.96
Jarque-Bera	2.089542	2.127718	1.376711	2.325916
Probability	0.351772	0.345121	0.502402	0.31256

Source: Results are computed through EViews using WITS data.

The above table presents the status and growth of EII, MII, TII and PCI. It has been found from the table that the mean of EII is 1.09 and it indicates that the EII of India with Brazil is higher than the Brazil's export intensity with the world. The mean of MII is 0.96 and it indicates that the MII of India with Brazil

is little lower than the India's import intensity with the world. The mean of TII is 1.06 and it indicates that the TII of India with Brazil is higher than the Brazil's trade intensity with the world. Accordingly, India has stronger trade relationship with Brazil. The PCI is 61134.78 rupees at constant prices.

Table 2: Growth of Trade Intensity and PCNNI (In %)

Description	EII	MI	TII	PCI
CAGR	4.97	4.45	4.73	4.44
SE	0.007	0.006	0.006	0.001
t-value	6.444	6.461	7.688	61.863
P-value	0.000	0.000	0.000	0.000

Source: Results are computed through EViews using WITS data.

The growth of EII, MII, TII and PCI is given in the above table. It has been found that the CAGR of EII is 4.97 percent and significant at one percent level. The CAGR of MII is 4.45 percent and significant at one percent level. The CAGR of TII is 4.73 percent and significant at one percent level. The CAGR of

PCI is 4.44 percent and significant at one percent level. Therefore, the growth of export, import and trade intensities of India with Brazil are higher than the growth of PCI. At the same time, EII is higher than the MII and TII. Accordingly, India has strong and increasing export intensity with Brazil.

Table 3: ADF Test for Stationarity (Test Values)

Sl. No.	Variables	t-statistic	P-value	Level	Model
1	EII	-7.405	0.000	$I \sim (I)$,	$\Delta y_t = y_{t-1} + e_t$
2	MII	-6.728	0.000	$I \sim (I)$,	$\Delta y_t = y_{t-1} + e_t$
3	TII	-8.184	0.000	$I \sim (I)$,	$\Delta y_t = y_{t-1} + e_t$
4	PCNNI	-2.950	0.012	$I \sim (I)$,	$\Delta y_t = y_{t-1} + e_t$

Source: Results are computed through Eviews using WITS data.

The stationarity of the selected variable is presented above. It is found that EII, MII, TII and PCI are non-stationary at level and stationary with the first

difference with the models of no drift and no trend. Accordingly, all the variables are integrated of order one.

Table 4: Impact of BRICS and PCNNI of India on EII (Co-efficient Values)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.850122	0.1091	7.79212	0.0000
DUMMY	0.468048	0.145288	3.221523	0.0034
DPCI	8.47E-06	2.49E-05	0.340269	0.7364
Log likelihood: -10.9144				
F-statistic: 6.154259, Prob (F-statistic): 0.006484				

Source: Results are computed through EViews using WITS data.

The impact of formation of BRICS on export intensity of India with Brazil has been estimated along with per-capita net national income of India using ANCOVA dummy variable regression model. The dummy represents post-BRICS period and the constant (Bench Mark) represents the pre-BRICS period. It is found from the F-test that the F-statistic (6.154) is significant at 1 percent level. Therefore, the independent variables; dummy and PCNNI are relevant and significant in the model. The constant of the model is significant at 1 percent level. Therefore, the EII of India with Brazil is 0.850 and significant. Accordingly, the export intensity of India with Brazil was less than 1 which explains the less export intensity of India with Brazil before the formation of

BRICS. The co-efficient of dummy is 0.468 and significant at 1 percent level. Therefore, the difference in EII between pre and post-BRICS period is 0.468 and this difference is highly significant. Accordingly, during the post-BRICS period the EII of India with Brazil is 1.318 and significantly high by 0.468. Hence, the EII is higher than 1 which explains high export intensity of India with Brazil after the formation of BRICS. Therefore, BRICS formation has been made significant impact on export intensity of India with Brazil. The co-efficient of PCNNI is positive but not significant even at 10 percent level. Accordingly, the per-capita net national income has failed to significantly influence the export intensity of India with Brazil.

Table 5: Impact of BRICS and PCNNI of India on MII (Co-efficient Values)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.592239	0.064495	9.182664	0.0000
DUMMY	0.801653	0.085888	9.333713	0.0000
DPCI	-1.27E-05	1.47E-05	-0.86271	0.3962
Log likelihood: 4.330189				
F-statistic: 45.73116, Prob (F-statistic): 0.000				

Source: Results are computed through EViews using WITS data.

The impact of formation of BRICS on import intensity of India with Brazil has been estimated along with per-capita net national income of India using ANCOVA dummy variable regression model. It is found from the F-test that the F-statistic (45.731) is significant at 1 percent level. Therefore, the independent variables; dummy and PCNNI are relevant and significant in the model. The constant of the model is significant at 1 percent level. Therefore, the MII of India with Brazil is 0.592 and significant. Accordingly, the import intensity of India with Brazil was less than 1 which explains the less import intensity of India with Brazil before the formation of BRICS. The co-efficient of dummy is 0.802 and

significant at 1 percent level. Therefore, the difference in MII between pre and post-BRICS period is 0.802 and this difference is highly significant. Accordingly, during the post-BRICS period the MII of India with Brazil is 1.394 and significantly high by 0.802. Hence, the MII is higher than 1 which explains high import intensity of India with Brazil after the formation of BRICS. Therefore, BRICS formation has been made significant impact on import intensity of India with Brazil. The co-efficient of PCNNI is negative and not significant even at 10 percent level. Accordingly, the per-capita net national income has random negative impact on import intensity of India with Brazil.

Table 6: Impact of BRICS and PCNNI of India on TII (Co-efficient Values)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.791314	0.093199	8.490601	0.0000
DUMMY	0.539548	0.124112	4.347260	0.0002
DPCI	4.92E-06	2.13E-05	0.231492	0.8187
Log likelihood: -6.345951				
F-statistic: 10.78721, Prob (F-statistic): 0.0003				

Source: Results are computed through EViews using WITS data.

The impact of formation of BRICS on trade intensity of India with Brazil has been estimated along with per-capita net national income of India using ANCOVA dummy variable regression model. It is found from the F-test that the F-statistic (10.787) is significant at 1 percent level. Therefore, the independent variables; dummy and PCNNI are relevant and significant in the model. The constant of the model is significant at 1 percent level. Therefore, the TII of India with Brazil is 0.791 and significant. Accordingly, the trade intensity of India with Brazil was less than 1 which explains the less trade intensity of India with Brazil before the formation of BRICS. The co-efficient of dummy is 0.539 and significant at 1 percent level. Therefore, the difference in TII between pre and post-BRICS period is 0.539 and this difference is highly significant. Accordingly, during the post-BRICS period the TII of India with Brazil is 1.33 and significantly high by 0.539. Hence, the TII is higher than 1 which explains high trade intensity of India with Brazil after the formation of BRICS. Therefore, BRICS formation has been made significant impact on trade intensity of India with Brazil. The co-efficient of PCNNI is positive and not significant even at 10 percent level. Accordingly, the

per-capita net national income has random positive impact on trade intensity of India with Brazil.

V. CONCLUSION

The present paper examined and compared the export, import and trade intensity of India with Brazil. It has been found from the study that the mean of EII is 1.09, the mean of MII is 0.96 and the mean of TII is 1.06 and it indicates that the EII and TII of India with Brazil is higher than the Brazil's trade intensity with the world. The CAGR of EII is 4.97 percent, the CAGR of MII is 4.45 percent and the CAGR of TII is 4.73 percent. The CAGR of PCI is 4.44 percent. Accordingly, EII, MII and TII are grown at faster rate compared to PCNNI. The EII, MII, TII and PCNNI are non-stationary at level and found stationary with first difference. It has been from the ANCOVA models that the EII, MII and TII were less than 1 during the pre-BRICS period and higher than 1 during the post-BRICS period. Accordingly, the formation of BRICS has been made significant impact on export, import and trade intensity of India with Brazil. Therefore, India is

having tradable advantage with Brazil and it has to be utilized for the development of the country.

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