India's Trade Dynamics and Revealed Comparative Advantage with the BRICS Nations

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Abstract

In this study the trade dynamics of India with the other BRICS countries have been explored. The exports and imports including trade openness have been exhibited and to understand the growth in exports and imports compound annual growth rate is calculated. The results demonstrate that CAGR had impressively increased however in case of India and China, CAGR of Imports is more than CAGR of exports and in case of South Africa CAGR of exports is more than CAGR of imports. In case of Brazil both export and import are significantly high. Trade openness between India and other BRCS countries has increased. Trade Intensity is calculated and it is obtained that India has huge export intensity with Brazil and Import intensity with China. However with South Africa both export and import intensity is quite high. The study also represents trade complementarity of India with the other BRCS nations exhibiting the revealed comparative advantage (RCA) for certain set of products. Results demonstrate that India exports those commodities to particular BRCS countries in which it enjoys Revealed Comparative Advantage over a particular BRCS country. Results also establishes India exports items in which, it has a comparatively better RCA than a single BRCS country but however RCA remains lesser than one. In this context some commodities, which have both high RCA and high growth rate, are chemicals, consumer goods, metals etc. However, products having low RCA (yet improving RCA) have very high growth in exports for example Fuels which form an integral part of exported items from India to BRCS countries like China and South Africa

Keywords: International Trade, Trade Openness, Trade Complementarity, Trade Intensity, Growth

Introduction

The term BRIC was invented by Jim O'Neil, an economist of Goldman Sachs in 2001 (Wilson, Kelston, & Ahmed, 2010) to denote the developing forces which, alongside the United States, will reflect the five nations. BRIC countries began their dialog in 2006, which takes place at annual meetings of the Heads of State and Government since 2009. In 2011 the BRICS achieved its final configuration with South Africa entering the party, adding a nation from the African continent. BRICS is a community made up of the five big developing countries – Brazil, Russia, India , China and South Africa – which together account for around 42 per cent of the people, 23 per cent of GDP, 30 per cent of the globe and 18 per cent of world trade. Since the start of their dialog in 2006, these countries have tried to create the most inclusive foreign governance, one that will be more fitting for their national interests. For example, the restructuring of the International Monetary Fund quota scheme, which came to include Brazil, Russia, India, and China among the top ten largest shareholders for the first time, will accomplish this target. Over the course of its first decade, BRICS has developed sectorial cooperation in various fields, such as science and technology, trade promotion, energy, health, education, innovation and transnational crime fighting. Today, sectorial collaboration, including more than 30 topic fields, offers major tangible benefits to the citizens of the 5 nations. BRICS are expected to cross the Gross Domestic Product of G6 countries by 2050 (Wilson & Purushothaman, 2003).

India's foreign relations are handled by the MEA (Ministry of External Affairs). India since two decades now has become one of the powerful nations n the world. India caters to second and third ranks in terms of armed forces expenditures in military activities and strong economic base in terms of purchasing power parity and nominal growth rates. India has become a nuclear power and has very strong input in global undertakings. India is a constituent of the BRICS and also chief part of the developing world. Being founding member of several international organizations, The Asian Development bank, The New Development Bank (NDB) set up by BRICS nations is a part of the top twenty countries in the world as well (G20). India almost has trade relations with all parts of the world and especially after 1991 trade liberalization wedged its momentum in the

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mighty nation. Everything has been written regarding the growth of emerging economies (EMEs) in the global south over the last decade. Their continued development and popularity as an investment destination has received considerable interest from academics and politics. India was at the forefront of much of the attention lavished on these EMEs as part of the BRICS (the trailblazing iteration of the EME phenomenon), and as the biggest democracy, too (Bhunia 2014).

The world is changing at a fast pace and to keep up with the same India is part of several organizations which of course includes the BRICS and the study of such countries together to establish several facets of economic altercations is necessary. A study comparing the BRICS nations in terms of their sustainable development scores and also affirms Russia and Brazil to top the list. However India and China top in terms of progress scores giving a huge hope of amendment in converting wealth into well-being so far (Mukherjee and Ahuja, 2017).

Literature Review

Sharma (2013) carried out an analytical study of bilateral exchange between India and Brazil using export and import indexes for the period 2001–2012. Results showed that India's export-intensity indices remained > 1, while the import-intensity indices remained < 1 for most years, suggesting that India's imports into Brazil were found to be lower than anticipated, while India's exports to Brazil were found to be higher than world exports to Brazil. Bhattacharya and Bhattacharya (2007) observed that China's export rate with India was quite high, while its level of imports with India during 1995–2005 was very small, indicating that the Chinese economy exports considerably higher than that which the world exports to India. Chandran (2010) focused on India's foreign trade , particularly concerning the country's bilateral trade relations with other nations. He established the ASEAN Free Trade Agreement of India (IAFTA) and noted the frequency of cooperation between those nations and India. The analyst also examined complementarity of trade between these nations and India to define the competitive advantage that had been revealed. Batra, Amita, and Khan (2005) seek a detailed evaluation of the differences in historical comparative advantage trends for India and China on the global market. Research is timely because India has made significant attempts to liberalize its external exchange since 1991, contributing to the economic transition would have been the consequent rise in global pressures and technology transfer. Vamvakidis (1998) has tried to estimate the growth effect of neighboring countries ' dimensions and accessibility, and found that neighboring countries with massive open economies are experiencing faster growth. In 2001, Goldman Sachs coined the word BRICs (Wilson, Kelston, & Ahmed, 2010) to define, by 2050 (Wilson & Purushothaman, 2003), the four major developing countries of Brazil , Russia , India, and China which Goldman Sachs predicts would surpass the G6 (US, Japan, UK , Germany , France, and Italy) in terms of GDP (in US$). The study set out a series of four key factors that would establish the conditions that the BRIC countries will require for the expected growth. Macro stability, structures, transparency, and schooling are all necessary factors (Wilson & Purushothaman,

Conceptual Framework:

The literature survey revealed that, the role of TQM in innovation and producing quality products with the least cost is significant in manufacturing organizations. Further, the review of literature confirmed that the relationship between TQM and organizational performance has been found positive and significant in manufacturing organizations. The literature survey also helped the researcher to identify four important elements of TQM and three indicators of organizational performance. Research variables are presented in Table 1 and Figure 1 presents the conceptual framework for the study.

Objectives of the Study

The primary objective of the study involves understanding the trade dynamics of India with other BRCS countries (Brazil, Russia, China and South Africa).

Methodology and Analysis

The research is carried out with the help of secondary data obtained from various data base resources available that includes the World Bank (World Integrated Trade Solutions, WB) website, the International Trade Centre (ITC) and numerous research papers. The data for general time series analysis in case of analyzing the trade dynamics is collected from 2001 to 2018 respectively. However, data collected to compare and study revealed comparative advantage is done from 1991 to 2018. Log-Lin regression model is used to define relative change in dependent variable due to absolute change in independent variable which also determines the semi elasticity of the dependent variable. Bar graphs, 4 quadrant matrix and tables are used in order to represent and compare data.

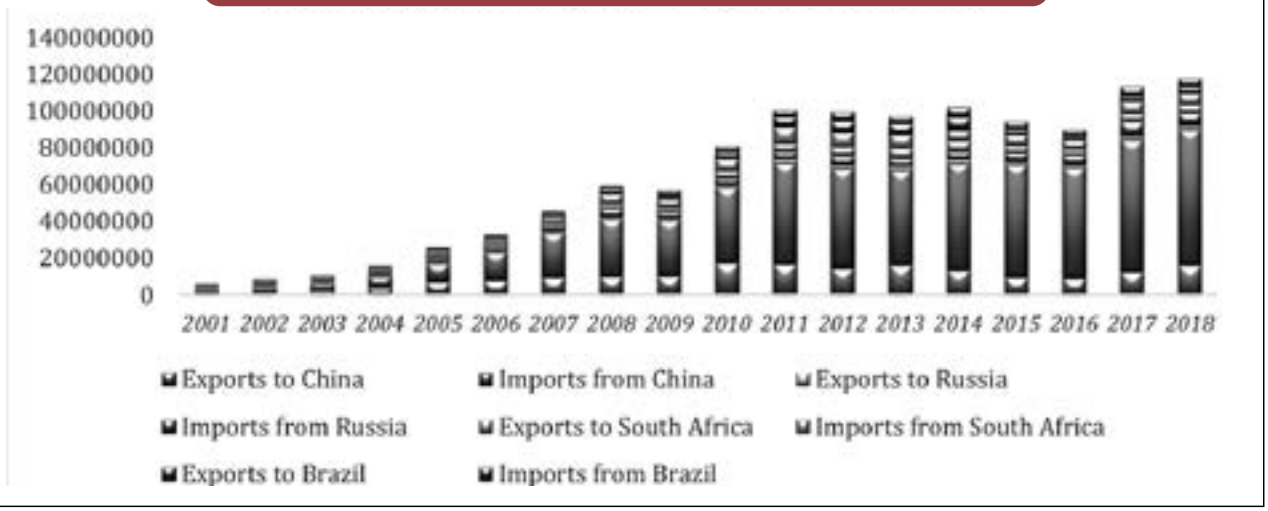
India's trade dynamics with BRICS Nations

The table below demonstrates exports of the Indian economy to the BRICS countries of the world namely China, Russia, South Africa and Brazil.

Indian exports in 2001 was 922542 thousand US

dollars to China which eventually augmented until 2011, 2014 and 2015, when the export value decreased majorly due to the various causes. Global slowdown in trade shrieked the demand for exports of all developing countries and India had to play a role as well. In case of Russia exports have fluctuated exhibiting decreases in the years of 2002 to 2004 and generally in 2014, 2015 as well which is close to same in the case of Indian exports to South Africa and Brazil as well. However exports to South Africa and Brazil has also reduced in 2009 due to global financial crisis. Exports to Russia has increased from 839595 thousand USD to 2331420 thousand In case of UK from 2196629 USD in 2001 to 9780043 USD in 2018.India's exports to South Africa was 326689 USD in 2001 which eventually amplified to 4013636 thousand USD in 2018 respectively. India's exports

Graph 1: Indian Exports and Imports with BRCS nations



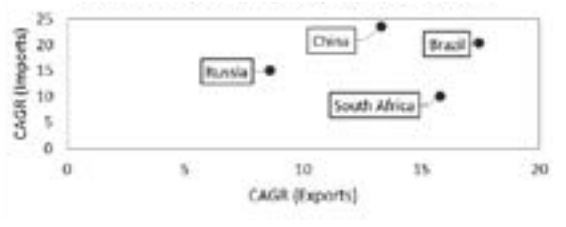
Source: Calculated by the Author (International Trade Centre, Data Centre for countries, 2018).

to Brazil similarly raised from 230498 to 3561877 thousand USD in 2018 correspondingly

Indian imprts in 2001 was 1827549 thousand US dollars to China which eventually augmented with considerable fluctuations and reached unto 73738222 USD. In case of Russia imports have fluctuated but however demonstrated increase from 478586 to 6847458 USD in 2018 respectively. Imports from South Africa and Brazil has also increased from 1403487 to 6610006 USD in 2018 and 270996 to 4617881 USD in 2018 correspondingly.

Imports from China has flaunted the highest degree from China through due course of time and amongst all the BRICS nations India imports the maximum from China and also the increase in imports have accelerated considerably.

Graph 2: CAGR of Indian Exports and Imports with other BRICS nations



Source: Output of Factor Analysis

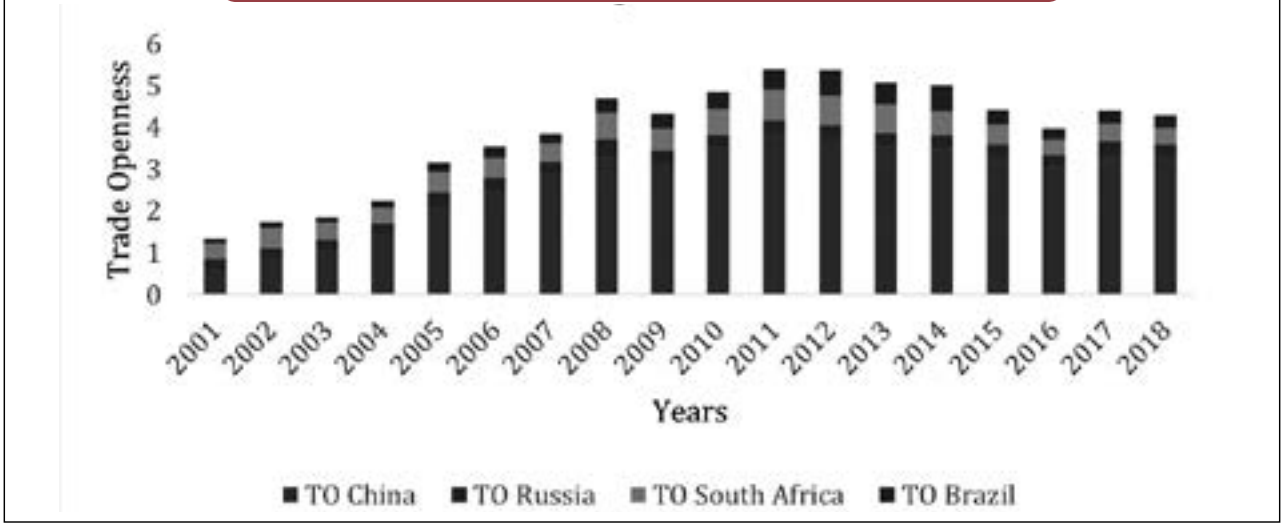
The compound annual growth rate of Indian exports in case China for eighteen years since 2001 is 13.297 percent. However in cases of Brazil, South Africa and Russia the rates accounted to 17.45, 15.83 and 8.604 percent respectively. The compound annual growth rate of Indian exports in case China for eighteen years since 2001 is 23.253 percent. However in cases of Brazil, South Africa and Russia the rates accounted to 20.376, 10.05 and 15.11 percent respectively.

Trade openness is calculated between India and BRICS and finally movements have been noticed. If country a is the country with which trade openness of India is calculated formulae used to calculate trade openness is as follows:

Here country a, is Brazil, Russia, China and South Africa and trade openness is calculated separately. Trade Openness with China has considerable increased and from 2001, which was, .5 has increased to 3.28 in 2018 respectively. Trade openness with South Africa, Brazil and Russia has also increased.

India mainly exports insecticides, fungicides, disinfectants etc. and is experiencing trade surplus only with Brazil since eighteen years altogether. However statistics from 2001 jointly portrayed a surplus demonstration but since 2015 India is experiencing a trade deficit with Brazil. India's export values out passed the import values from

Graph 3: India's Trade Openness with BRCS



Source: Calculated by the Author (International Trade Centre, Data Centre for countries, 2018).

$$\text{Trade Openness I/a} = \frac{\textit{India's export to country a+India's import from country a*}}{\textit{GDP of India}} * 100$$

Brazil majorly due to decrease in Brazil's exports of petroleum and crude products which is one of the top most importing goods from the country by India. With rest of the BRICS nations India's value of imports are greater than exports. China is one of the biggest world exporters and hence imports from the country, of India have considerably increased ultimately leading to trade deficit. Among major import include plastic products, electrical products, nuclear reactors, organic chemicals etc. and India exports Ferro alloys, electrical equipment's, iron and steel, chemicals etc. to China. India imports valued products from Russia like defense (cartridges, air gun pellet etc.) products, diamonds, fertilizers etc. India also imports valued products like petroleum, gems, edible fruits and nuts, chemicals etc. from South Africa. However amongst BRICS nations India is the only country demonstrating trade imbalances exhibiting the highest trade deficit almost among all other BRICS nations. If China was excluded in this analysis of BRICS and India 's trade, trade openness is quite less for with other nations insisting the fact that other BRICS countries (other than China) are not natural trade partners of India.

Intensity of Trade with other BRICS Countries

Countless statistical manifestations are obtainable to assess trade between two nations. One of the utmost prevalent approaches is the trade intensity index (Brown 1949; Kojima 1964). The index emerges in two forms, the export intensity index (XII) and import intensity index (MII). They are demarcated as follows:

Equation I: $XII_a = (x_{ab} / Xaw) / \{M_{bw} / (M_w - M_{aw})\}$

Equation II: $MII_a = (m_{ab} / Maw) / \{X_{bw} / (X_w - X_{aw})\}$

Where XII_a is the country *a*'s export intensity index, MIIa the country a's import intensity index, *xab* the country a's exports to country b, *Xaw* the country a's total exports to the world, *Mbw* the country *b*'s total imports from the world, Mw the world total imports, *Maw* the country a's total imports from the world, mab the country a's imports from country *b, Xbw* the country *b*'s total exports to the world, X_w the world total exports, X_{aw} country a's total export to the world.

Export and import intensity indicators reveal the ratio of the portion of country i's trade with country j relative to the share of the world with country j. An index of greater (less) than unity has been inferred as an symptom of larger (smaller) than predictable trade flow between two parties.

Above table demonstrates export and import intensity of India with selected developing countries of the world like China, Russia and South Africa. The export Intensity of India to China has decreased in due course of time and has untapped potential. However import intensity of India from China has increased is more than unity. India should export more to China and import less. India has decreased export intensity to Russia and the import intensity has potential unexplored and unexploited. Both export and import intensity of India with South Africa is definitely significant and considerably more than unity. Nevertheless export and import intensity of India with Brazil is considerably very high respectively. India out of all BRCS nations enjoys trade surplus with

Table 1: Export and Import Intensity Index of India with BRICS Countries

Year	China		Russia		South Africa		Brazil	
	EII	III	EII	III	EII	III	EII	III
2001	0.539	0.825	2.854	0.575	1.817	6.481	85.492	0.558
2002	0.678	0.893	2.088	0.602	2.343	9.392	109.189	0.623
2003	0.799	0.846	1.561	0.602	1.746	6.306	88.215	0.438
2004	0.894	0.93	1.023	0.61	2.293	4.057	99.291	0.625
2005	1.135	0.97	0.746	0.613	2.661	4.152	137.533	0.542
2006	0.986	1.072	0.612	0.419	3.049	3.165	173.621	0.460
2007	0.944	1.261	0.44	0.477	2.536	3.111	189.096	0.342
2008	0.785	1.104	0.36	0.476	2.495	3.753	236.960	0.293
2009	0.721	1.164	0.394	0.52	2.147	4.271	76.522	0.865
2010	0.848	1.111	0.413	0.384	2.983	3.555	109.654	0.678
2011	0.568	1.125	0.367	0.302	2.491	3.327	166.692	0.562
2012	0.504	0.979	0.422	0.325	2.969	3.011	227.144	0.823
2013	0.461	0.93	0.42	0.288	3.042	3.077	195.165	0.630
2014	0.398	1.005	0.449	0.342	3.33	2.616	192.773	0.995
2015	0.348	1.119	0.538	0.544	2.722	3.229	76.927	0.888
2016	0.338	1.263	0.6	0.734	2.614	3.009	74.481	0.855
2017	0.397	1.236	0.55	0.864	2.878	3.029	95.639	0.910
2018	0.456	1.104	0.581	0.569	2.548	2.615	79.829	0.719

Brazil, which is evident (Export Intensity is more than Import Intensity).

Trade Complementarity Index

The definition of a competitive advantage applies to a country's capacity to generate a good / service not just with greater efficiency, as Ricardo originally suggested, but even better commodity difference than certain countries in a defined trading region (Lafay, 1987).One of the central concepts of trade economics is that of "comparative advantage." First defined by David Ricardo, the idea claims that countries are better off because they are skilled in goods that they can produce comparatively more competitive – with lower cost of production – than others. When this occurs, then the idea goes, global welfare can expand.

Revealed Comparative Advantage Index illustrates how reasonable is a product in nations export related to the goods share in world trade. A commodity with high RCA is competitive and can be exported to countries with low RCA. Since Balassa's pioneering

Table 2: Comprehensive Demonstration of Analysis of Trade Between India and BRCS

Country	Type	Trade Statu	Trade Openness	CAGR Export	CAGR Import	Status of Trade Intensity (Export) in 2018	Status of Trade Intensity (Import) in 2018	Remarks
China	BRICS	Deficit	Increase	13.9	23.5	Lesser han Unity	Greater than Unity	Imports more exploited than exports
Russia	BRICS	Deficit	Increase	8.6	15.11	Lesser than Unity	Lesser than Unity	Exports and imports both under exploited
South Africa	BRICS	Deficit	Increase	15.8	10.05	Greater than Unity	Greater than Unity	Exports and imports both exploited
Brazil	BRICS	Surplus	Increase	17.4	20.3	Greater than Unity	Lesser than Unity	Export exploited more than imports

Table 3: Mean RCA (Revealed Comparative Advantage) of all BRICS Countries from Highest to Lowest

Brazil Mean RCA of Goods		Russia Mean RCA of Goods		India Mean RCA of Goods		China Mean RCA of Goods		South Africa Mean RCA of Goods	
Minerals	9.50	Fuels	4.62	Stone and Glass	5.33	Footwear	5.33	Stone and Glass	7.60
Food Products	4.17	Raw materials	2.97	Minerals	3.81	Hides and Skins	3.68	Minerals	6.95
Vegetable	3.98	Metals	2.09	Textiles and Clothing	3.67	Textiles and Clothing	2.78	Intermediate goods	2.07
Animal	2.55	Wood	1.28	Hides and Skins	3.46	Miscellaneous	1.57	Raw materials	2.02
Raw materials	2.50	Intermediate goods	1.24	Vegetable	2.26	Consumer goods	1.53	Metals	1.89
Footwear	2.18	Stone and Glass	1.12	Intermediate Goods	1.76	Mach and Elec	1.47	Vegetable	1.67
Wood	1.99	Minerals	0.96	Footwear	1.68	Capital goods	1.12	Food Products	1.20
Hides and Skins	1.70	Animal	0.95	Animal	1.43	Metals	0.86	Wood	0.96
Metals	1.49	Consumer goods	0.80	Consumer goods	1.26	Plastic or Rubber	0.75	Fuels	0.83
Intermediate goods	1.48	Chemicals	0.68	Chemicals	1.19	Stone and Glass	0.66	Miscellaneous	0.78
Transportation	0.83	Vegetable	0.46	Metals	1.11	Intermediate goods	0.65	Hides and Skins	0.73
Plastic or Rubber	0.63	Miscellaneous	0.34	Food Products	0.90	Wood	0.58	Animal	0.73
Stone and Glass	0.63	Plastic or Rubber	0.32	Raw materials	0.90	Animal	0.49	Transportation	0.64
Chemicals	0.60	Food Products	0.29	Plastic or Rubber	0.56	Vegetable	0.47	Chemicals	0.58
Consumer goods	0.57	Hides and Skins	0.23	Fuels	0.52	Chemicals	0.44	Consumer goods	0.46
Capital goods	0.49	Transportation	0.15	Transportation	0.33	Food Products	0.43	Textiles and Clothing	0.37
Fuels	0.40	Capital goods	0.11	Capital goods	0.29	Minerals	0.42	Plastic or Rubber	0.35
Mach and Elec	0.35	Textiles and Clothing	0.10	Mach and Elec	0.28	Raw materials	0.28	Capital goods	0.29
Textiles and Clothing	0.35	Mach and Elec	0.09	Miscellaneous	0.27	Transportation	0.20	Mach and Elec	0.25
Miscellaneous	0.31	Footwear	0.05	Wood	0.22	Fuels	0.17	Footwear	0.18

work (1965), the standard method for measuring comparative advantages has been to calculate a Revealed Comparative Advantage (RCA) index based on trade flows.

Equation III: $RCA_{ab} = \{(xab / X_{ax})\} / \{(x_{wb} / X_{wx})\}$

Where x_{ab} and X_{ax} are the values of country a's exports of product b and country's total exports and where xwb and Xwx are world exports of product b and world total exports. A value of less than unity implies that the country has a revealed comparative disadvantage in the product. Similarly, if the index exceeds unity, the country is said to have a revealed comparative advantage in the product. A rating of less than cohesion is representative of the nation devouring a reported competitive product disadvantage. If the index approaches cohesion, the nation is assumed to have a disclosed comparative advantage in the commodity, accordingly.

Mean (Average taken) RCA scores of BRICS countries have been calculated from 1991 to 2018 and in the following table have been represented.

The mean RCA of BRICS nations when calculated from 1991 to 2018 enabled us ranking in accordance with products having highest RCA's. However, the reason why India's RCA in products are compared with RCA in products are compared with RCA in products of other countries in order to analyze how India is currently exporting and has more scope in exporting certain set of commodities to other BRCS countries. This could possibly be done by assessing the products embracing better RCA's in India than other BRCS countries, that products having low RCA's in other BRCS countries can possibly be imported from India in case India demonstrates a better RCA particularly in that product group.

India has a high RCA in products such as stone and glass (5.33) , minerals (3.81), Textile and clothing (3.67), Hides and Skin (3.46), vegetable (2.26), intermediate goods (1.76), Footwear (1.68), Animal (1.43), Consumer Goods (1.26), Chemicals (1.19) and Metals (1.11).Among the top ten exported products of India in 2018 were fuels, Consumer goods, Chemicals, machinery and electrical items, metals, capital goods and also transportation equipment. All these products also constitute to be the most exported

Table 4: Change in RCA from 1991 to 2018 to show the status (Increase/Decrease of RCA) of BRICS Countries

Countries	Brazil		Russia		India		China		South Africa	
Commodities	Increased	Decreased	Increased	Decreased	Increased	Decreased	Increased	Decreased	Increased	Decreased
Capital goods		-0.09		-0.02	0.27		1.34		0.13	
Consumer goods		-0.32	0.25		0.25			-1.07	0.28	
Intermediate goods		-0.57		-0.45		-0.16	0.01			-0.15
Raw materials	1.91		0.78		0.7			-0.81		-0.46
Animal	2.18			-0.65		-0.48		-0.72		-0.51
Chemicals		-0.18		-0.46	0.92		0.02			-0.05
Food Products		-1.18	0.23			-0.45		-0.57		-0.31
Footwear		-4.18	0.04			-0.24		-5.15	0.11	
Fuels	0.69			-0.24	0.47			-0.51		-0.86
Hides and Skins	0.17			-0.43		-1.98		-2.77		-0.32
Mach and Elec		-0.21		-0.03	0.24		1.43		0.07	
Metals		-1.94		-1.25	0.49		0.3			-1.17
Minerals		-0.28		-0.43		-4.99		-0.97		-1.04
Miscellaneous	0.08			-0.09	0.23			-0.23	0.13	
Plastic or Rubber		-0.2		-0.02	0.52		0.26		0.16	
Stone and Glass		-0.21		-0.28		-2.8	-0.1			-0.23
Textiles& Clothing		-0.42		-0.15		-0.73		-1.65		-0.27
Transportation	0.52			-0.11	0.46		0.24		0.92	
Vegetable	3.41		0.6			-0.54		-1.19	0.21	
Wood	1.84		0.43		0.2		0.19			-0.25

Source: *Prepared by the author (World integrated trade solution, World Bank)*

products from India to other BRCS countries which will be eventually analyzed in this research paper.

The change in RCA is calculated by deducting the RCA of a specific commodity in 1991 from the RCA of the same commodity in 2018.The revealed comparative advantage reveals the share of a countries exports in comparison to the world exports of a particular commodity or set of commodities. India has shown increase in RCA scores in commodities like capital goods, consumer goods, chemicals, fuels, machinery and electrical equipment's, metals, plastic and rubber, transportation. The RCA of commodities which India has experienced an increase in when reviewed in case of other countries RCA's, we could get some matches in terms of decrease , maybe creating a scope for India to exports. The RCA of capital goods have decreased in Brazil and Russia and that of consumer goods has decreased in case of both Brazil and China. The decrease in RCA of intermediate goods in Brazil and Russia was more than that of India.

However China experienced a decrease in RCA of raw materials and also fuel. Similarly Russia and South Africa

Table 5: Top Six Export (Product-Wise) from India to BRCS along with their Mean RCA and Changev

India and Brazil							India and China						
Commodities	India's Export To Brazil in 2018	% of Total Export	RCA Brazil	Change RCAB	RCA India	Change RCAI	Commodities	India's Export To Brazil in 2018	% of Total Export	RCA Brazil	Change RCAB	RCA India	Change RCAI
Intermediate goods	2042427.84	0.29	1.48	-0.57	1.76	-0.16	Intermediate goods	8249052.39	0.25	0.65	0.01	1.76	-0.16
Chemicals	1596501.10	0.22	0.6	-0.18	1.19	0.92	Consumer goods	3781897.16	0.12	1.53	-1.07	1.26	0.25
Consumer goods	817858.937	0.11	0.57	-0.32	1.26	0.35	Chemicals	3637757.20	0.11	0.44	0.02	1.19	0.92
Capital goods	671358.609	0.09	0.49	-0.09	0.29	0.27	Fuels	3120145.56	0.10	0.14	-0.51	0.52	0.47
Textiles and Clothing	488235.869	0.07	0.35	-0.42	3.67	-0.73	Raw materials	2738198.01	0.08	0.28	-0.81	0.9	0.7
Mach and Elec	332668.136	0.05	0.35	-0.21	0.28	0.24	Textiles and Clothing	1837912.90	0.06	2.78	-0.165	3.67	-0.73

India and Russia							India and South Africa						
Commodities	India's Export To Brazil in 2018	% of Total Export	RCA Brazil	Change RCAB	RCA India	Change RCAI	Commodities	India's Export To Brazil in 2018	% of Total Export	RCA Brazil	Change RCAB	RCA India	Change RCAI
Consumer goods	897965.22	0.19	0.8	0.25	1.26	0.25	Consumer goods	2412939.59	0.30	0.46	0.28	1.26	0.25
Chemicals	662003.389	0.14	0.68	-0.46	1.19	0.92	Transpor-tation	1048907.33	0.13	0.64	0.92	0.33	0.46
Capital goods	607662.030	0.13	0.11	-0.02	0.29	0.27							
Intermediate goods	510845.69	0.11	1.24	0.45	1.76	-0.16	Chemicals	911488.812	0.11	0.58	-0.31	1.19	0.92
							Capital goods	850905.577	0.11	0.29	0.13	0.29	0.27
Mach and Elec	448074.901	0.10	0.09	-0.03	0.28	0.24	Intermediate goods	698410.759	0.09	2.07	-0.15	1.76	-0.16
Vegetable	328277.913	0.07	0.46	0.6	2.26	-0.54	Fuels	552288.769	0.07	0.83	-0.86	0.52	0.47

Source: *Prepared and compared by the author.*

has also experienced the same in case of fuels. There is a decrease in RCA of chemicals and metals in Brazil, Russia and also South Africa and machine and electrical equipment's and plastic and rubber goods in case of Brazil and Russia. However Russia has experienced a decrease in RCA in transportation. An extension of this analysis is demonstrated in the table below exhibiting the top six exported commodities from India to the other BRCS countries matched with their RCA.

Among the top six exported commodities to Brazil from India in 2018 mentions of intermediate goods, chemicals, consumer goods, capital goods, textile and clothing and also machine and electrical items is very relevant to the analysis. The RCA in case of intermediate goods, chemicals, consumer goods, and textiles well explain why India has an advantage in exporting such items to Brazil in lieu of Brazils low RCA of such product. However the export of capital goods and machine and electrical equipment's in spite of having low RCA according to the analysis may be attributed to decrease of Brazils RCA of such commodities and increase of India's RCA.RCA in case of chemicals, consumer goods, intermediate goods and especially vegetables is high and is a perfect export to be doe to Russia (low RCA in such products).Export of capital goods and machines can be attributed to the reason that India has a higher RCA in such products in comparison to Russia. India has high RCA (Greater than One) in case of Intermediate goods and chemicals which in comparison to China is high (China has low RCA, lower than one in case of such commodities).These constitute among the top six exports however India also exports textile and clothing to China because the RCA in case of the same is greater than that of China's RCA of textile and clothing. India also exports consumer goods, raw materials and fuels to China. In case of fuels the RCA is greater than that of India and so is the in the case of Raw materials. However in he case of consumer goods there is a decrease in RCA of consumer goods in case of China over the years and according to the analysis that may be attributed as a reason for the same. India's RCA for consumer goods and chemicals is greater than one and that is South Africa's is less than one clearly indicating that India has a high scope of exports of such items to South Africa. So has happened as they are among the top six exports from India to South Africa. However, India also exports transportation items according to South Africa, as the demand of South African economy is so high in case of automobile parts, repairs and cars and many commercial agreements (not explored in this research paper) made easier for Indian traders to export and especially vehicles etc. which constitute to be almost 10% of exports (Daoui 2019).Other exports include capital goods and also fuels.

The next and the last part of the analysis incorporates a genera study of product wise exports from India to the world including their growth rates , semi elasticity to support the outcomes of how India's exported goods have performed over the years, and India exports goods which India is supposed to export. The analysis is carried out with the help of Log-Lin regression model which estimates the relative change in the regress and with respect to the repressor. In our case the repressor is the time and the regress and are all those commodities which are taken up in this study in order to analyze their RCA and exported quantity of India over other BRCS countries.

We are using in this case a log-Lin model.

The model Begins with $Y_t = Y_0 (1+r)t$

R is compound (overtime) rate of growth of Y. Taking the natural logarithm we get

$\text{Ln } Y_t = \text{Ln } Y_0 + t \text{ Ln } (1+r)$

Now letting $\beta 1 = \text{Ln } Y_0$ & $\beta_2 = \text{Ln } (1+r)$

$\text{Ln } Y_t = \beta_1 + \beta_2 t$

Adding the disturbance term we obtain

$\text{Ln } Y_t = \beta_1 + \beta_2 t + \mu$

β_2 = (Relative change in Regressand)/(Absolute change in Regressor)

It is change in growth rate of Y for an absolute change in X (in our case t) and β2*100 also denotes semi elasticity of the dependent variable with respect to the independent variable. In our case we have used the product wise exports from India to the rest of the world in due course of time from 1991 to 2018 to calculate the semi elasticity of the products. The following table demonstrates result of the log-Lin regression model carried out.

In the analysis β1 usually defines the log of dependent variable considered (different in different cases) in the beginning of the study. However, as we can notice here the values appear significant at 1% level of significance and the highest growth rate appearing to have been credited to fuels. Correspondingly the semi elasticity of fuel exports is very high (23%) signifying for an absolute change in time period the fuel exports will change the maximum, and it has. It is now one of the largest exported commodities from India. India mostly exports mineral oils including fuels which have showed a significant change in revealed comparative advantage as well. However, the semi elasticity of consumer goods (12%) and capital goods (16%) is very high as well. Capital goods exports outperformed in the export basket of India in 2019 (Singh 2019). There is a significant positive change in RCA and they form a significant part of exports of Indian Economy. Chemicals and pharmaceuticals are top of the talk now. Indian export basket is undergoing change now is more concentrated on chemicals machinery etc. (Burrange and Chaddha 2015). Machinery and electrical exports from India with a semi elasticity of 14% represents good growth. Electrical manufacturing and equipment emerging as major contributor in increase in exports of capital goods sector (Singh 2019).Transportation export from India (13%) mainly accounted for a great value. Motor vehicles one of the largest volume of Indian transport equipment exports was for the fiscal year

Table 6: Regression Results

	β_1	S.E (β_1)	β_2	S.E (β_2)	R^2 (%)	Change in RCA
Ln Ex CAPG	13.5*	0.1*	0.16*	0.006*	96	0.27
Ln Ex CONG	15.56*	0.92*	0.12*	0.005*	96	0.25
Ln Ex IG	15.7*	0.07*	0.1*	0.004*	96	-0.16
Ln Ex RawM	14.4*	0.1*	0.1*	0.006*	91	0.7
Ln Ex An	13.3*	0.09*	0.1*	0.005*	93	-0.48
Ln Ex CHEM	13.9*	0.06*	0.13*	0.004*	98	0.92
Ln Ex FP	13.3*	0.13*	0.09*	0.008*	85	-0.45
Ln Ex FOOT	12.7*	0.06*	0.08*	0.003*	95	0.24
Ln Ex FUEL	11.9*	0.36*	0.23*	0.02*	82	0.47
Ln Ex H&S	13.56*	0.05*	0.05*	0.003*	93	-1.98
Ln Ex M&E	13.4*	0.09*	0.14*	0.005*	96	0.24
Ln Ex MET	13.6*	0.12*	0.14*	0.007*	93	0.49
Ln Ex MIN	13.2*	0.22*	0.08*	0.01*	62	-4.99
Ln Ex P&R	12.5*	0.1*	0.13*	0.006*	95	0.52
Ln Ex S&G	14.8*	0.07*	0.11*	0.004*	95	-2.8
Ln Ex T&C	15.4*	0.04*	0.08*	0.002*	97	-0.73
Ln Ex TRANS	12.5*	0.14*	0.17*	0.009*	93	-0.46
Ln Ex VEG	14.2*	0.1*	0.09*	0.006*	90	-0.54
Ln Ex WOOD	11.1*	0.07*	0.13*	0.004*	97	0.2

Source: *Calculated by the author*

2019 (Jaganmohan 2019).When countries have high RCA's in case of some products and they constitute the highest exports as well, this is exactly what David Ricardo explained in the theory of revealed comparative advantage to be. In case of India, It has high RCA in chemicals, Consumer Goods and also Metals which constitute to be among the top exports also but what about India's exports of Fuels, Capital goods and also machine and electrical equipments, which has lower RCA (lesser than one, however positive change in RCA has been observed over the years). The explanation for this disparity may be what? Why would a country export something more effectively produced by other countries en masse? There is much to talk over. For example, distortive policy policies, such as trade barriers, may promote unsustainable development in a specific sector or alter the balance in exports from a region, as might high exchange costs associated with product transport or border clearance.

Conclusion

India's trade with the BRICS nations is close to significant majorly because of China. India and China are significant trading partners but however India does not enjoy trade surplus with any of the BRCS countries expect with Brazil. India's export value to Russia is quite less than its import values and trade intensity bifurcated reveals more import intensity than export and in both the cases less than unity (unexploited trade). Russian markets are said to be mostly dominated by China (Nicolas Trickett, The Diplomat 2017).India's import intensity with China is larger than its export intensity which is also less than unity exhibiting instances of unexploited exports. Trade deficit of India is increasing and is quite large in comparison to other BRICS countries. India's trade with South Africa however reveals a picture of exploited trade but the CAGR of exports is greater than CAGR of imports. India has trade deficit with South Africa. With Brazil in the recent past India enjoyed trade surplus but in recent years majorly after 2015 India has been exhibiting trade deficit. This can be attributed by the global slowdown affecting Indian exports altogether.

The analysis was carried out initially as a whole over the years considering overall exports and import values. This analysis was however followed by a second different facet altogether. The revealed comparative advantage of Indian products in comparison with the products of other BRCS countries gives a scope to identify the favorable commodities to be exported by India to the other BRCS nations. Evidences reveal that the commodities, which had higher RCA in India and lower in other BRCS countries, were eventually exported from India to the particular nations. This is however interesting that India also has high semi elasticity of certain commodities and is engaged in exporting them to the world including the BRCS countries. In this context some commodities, which have both a high RCA and high growth rate, are chemicals, consumer goods, metals etc. However products having low RCA (yet improving RCA) have very high growth in exports for example Fuels which form an integral part of exported items from India to BRCS countries like China and South Africa. In this context capital goods also form an integral part of India exports attributing to improving condition of RCA status. Other aspects including trade barriers and government policies are however not a part of this study. There is however immense scope of trade between the BRICS countries howsoever and this topic still have several components to explore.

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