

ASSESSMENT OF BORDER ROAD INITIATIVE BEFORE AND AFTER ITS INCEPTION ON BRICS AND QUAD: AN EMPIRICAL ANALYSIS

Manoj Kumar¹ and Raj Yadav²

¹DEPARTMENT OF ECONOMICS, GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY,
HISAR, INDIA, MANOJKUMARECONOMICS@GMAIL.COM

²CENTRE FOR RUSSIAN AND CENTRAL ASIAN STUDIES, JAWAHARLAL NEHRU UNIVERSITY,
NEW DELHI, INDIA, RAJYADAVJNU@GMAIL.COM

ABSTRACT

Economic interests of the USA, Japan, Brazil, India, Australia, Russia, and South Africa are trying to threshold their mark in such regions or nations where there is the presence of BRI projects of China before and after the inception. Descriptive statistics using CAGR, and employ ordinary least squares equation involving Gravity Model has been employed in two periods (2006-12 and 2013-2019) to use the sample variables are Export, Import, GDP, Gross Fixed Capital Formation as proxy of investment. This shows that China boost up the investment strategy to build an integrated infrastructure with huge investment, which gave benefits to the member nation. Some of the investments rather than China also flourish the volume of trade in favour of China. The sustainability of bilateral agreements will derive from economic interests and incentives. The groups should focus on the common goals of economic incentives for all.

Keywords: BRI, Investment, Gravity Measurement.

JEL Classification: F02, F13, F15, F21

INTRODUCTION

The BRICS summit concluded to coordinate action at a global level to achieve maximum economic growth. Contradiction is China's BRI project. China's large-scale project is encompassing infrastructure, energy, and trade. The economic presence of China by the Belt and Road Initiative (BRI), throughout Eurasia and around the world has given rise to unpredictable stances of policymakers or think tanks of different nations. This project involved several aspects i.e. economic growth, market development, dominance, export of surplus capacity, and geopolitical claim. The given aspects are working in different etiquettes. Economically unstable and underdeveloped economies are enduring to get mutual benefits from this project. There are chances to get onto the bandwagon of growth, getting investment to enhance their infrastructure and industry, but the sole purpose of BRI is to make the economies inter-dependent on China. Integration of nations through this project with its economy appears to be a mercantilist view. This project has been layered over bilateral and multilateral trade agreements (Joshi, 2018).

There is a bilateral group of five major emerging economies namely BRICS (Brazil, Russia, India, China, and South Africa) that is based on non-interference, equality, and mutual benefits.

Political compliances can be sustained by economic benefits. China is influencing in a way to quest for world dominance by occupying Eurasia by BRI (Wuthnow, 2017), which is dominated by Russia. In this regard, BRICS are not supportive of the BRI project indirectly (Thussu, 2018). Indirectly, BRICS become BRIS (Brazil, Russia, India, and South Africa), bilateral issues may exclude China. Chinese sources do argue that the BRI can help expand China's strategic space and weaken US influence in the Asia Pacific, worry more broadly about current or potential strategic competition especially from the United States, Japan, and India. Japan and India explore Japan's supplements to its alliance with the US, Australia, and India, and its initiatives with India on Vision 25 and Asia Africa Growth Corridor (Nanwani, 2019). BRI has been unveiled in states that are conflict-prone. China is protecting its economic interest with participating nations by security footprints (Yang, 2018). Economic interests of the USA, Japan, Brazil, India, Australia, Russia, and South Africa are trying to threshold their mark in such regions or nations where there is the presence of China. This is the reason to study the economic conditions of these seven countries before and after the inception of BRI projects in China.

As per the review of the literature (Appendix A), this project seems like a mercantilist project which has been involving conflicts among different nations. This project has been layered over existing bilateral trade agreements to promote single nation interests, violation of BRICS summit declarations to coordinate their entities i.e. Mercosur, Eurasian Economic Union, South Asia Free Trade Area, and Southern African Customs Union. As well as China's showing its muscle power to expand economic interests abroad. To combat China's strategy an alliance of four nations has been formed with the name QUAD. First, the issue lies in the coordination of each other before and after the inception of BRI, indirectly the volume of trade is the proxy of coordination between two nations. Second, Investment creates the capacity to contribute to the growth and also creates a surplus that is induced to trade that helps an economy to grow (Md& NN, 2016). Domestic investment, export, and import cause each other and promote long-run growth. (Adhikary, 2011) Found that capital formation has a long-run relationship with export and import. Gross Fixed Capital Formation is used as a proxy of Investment.

RESEARCH METHODOLOGY

Descriptive analysis has been done before and after the inception with the CAGR (Compound Annual Growth Rate) and Figures. Non-violating assumptions of ordinary least squares equation involving Gravity Model of Tinbergen (1962) has been employed in two periods (2006-12 and 2013-2019) data which has been sourced from World Bank, IMF, and CIA yearly. The volume of trade is used as a dependent variable which is the addition of export and import to each other of the two countries. The volume of trade is the proxy of coordination of two nations, Gross Fixed Capital Formation as Investment used respectively. Independent variables are Gravity measure, Gross Fixed Capital Formation of *i* and *j* (GFCF *i* and *j*) nation.

$$\text{Volume of Trade (VT}_i \text{ and } j) = (\text{Export to } i \text{ to } j + \text{Import from } i \text{ to } j) \quad (i)$$

$$\text{Gravity Measure (GM}_i \text{ and } j) = ((\text{GDP}_i \times \text{GDP}_j) / \text{Distance } i \text{ to } j)$$

Tinbergen basic gravity model:

$$X_{ij} = \beta((y_i \times y_j) / d_{i \text{ to } j}) \quad (i)$$

X_{ij} , Volume of Trade; $y_i \times y_j$, GDP(y) of country *i* and *j*; *d*, distance from *i* to *j* country.

Taking natural log on both side

$$\ln(X_{ij}) = \beta + \ln(y_i) + \ln(y_j) - \ln(d_{i \text{ to } j}) \quad (\text{ii})$$

Empirical econometrics equation for basic gravity model:

$$\ln(X_{ij}) = \beta + \beta_1 \ln(y_i) + \beta_2 \ln(y_j) - \beta_3 \ln(d_{i \text{ to } j}) + e \quad (\text{iii})$$

Gravity measure in a single equation

$$((\ln(X_{ij})) = \beta + \beta_1 \ln(y_i) + \beta_2 \ln(y_j) - \beta_3 \ln(d_{i \text{ to } j})) \quad (\text{iv})$$

$$(\ln(X_{ij}) = \alpha + \alpha_1 \ln((y_i \times y_j) / d_{i \text{ to } j})) \quad (\text{v})$$

(iv) and (v) given equal results except interpretation

Interpretation of (iv): 1% change in y_i is associated with a β_1 % change in X_{ij} .

Interpretation of (v): 1% change in $((y_i \times y_j) / d_{i \text{ to } j})$ is associated with a α_1 % change in X_{ij} .

$$\ln(\ln(VT_{i \text{ and } j})) = \alpha + \beta_1 \ln(GM_{i \text{ and } j}) \quad (\text{vi})$$

In equation (vi) X_{ij} is the volume of trade (VT) of i and j country, y_i and y_j is the export of i and j country, \ln is the natural log.

In addition, the volume of trade (addition of export and import) is also impacted by domestic investment; import, export or domestic investment reinforce each other to promote economic growth in the long run (Md& NN, 2016), (Adhikary, 2011). (Iftikhar, Nisha, Ali, & Umar, 2016) found that the Gross Capital formation is positively related to export. There are numerous studies which concluded the relation of investment and export as well as import. The fundamental relation of investment with export is positive. Investment creates the capacity as per Keynesian economists which induces the export. Export raises the trade volume of a country. This logic can support adding the Gross Fixed Capital Formation as a proxy of investment in equation (v). Here is one additional variable that is also used with the gravity measurements that is the GFCF of individual nations which also influences the volume of trade as the domestic investment is an important determinant of export. The policy frame for investment shows the trade and investment linkage from different economies also. That's why the trade volume is also influenced by domestic investment, GFCF added as a proxy of domestic investment. The GFCF of the partner country, as well as the self, is being incorporated in the equation (v).

$$\ln(VT_{i \text{ and } j}) = \alpha + \beta_1 \ln(GM_{i \text{ and } j}) + \beta_2 \ln(GFCF_i) + \beta_3 \ln(GFCF_j) + e \quad (\text{vii})$$

Interpretation of (vii): 1% change in $(\ln(GM_{i \text{ and } j}))$ is associated with a β_1 % change in $VT_{i \text{ and } j}$. 1% change in $(GFCF_i)$ is associated with a β_2 % change in $VT_{i \text{ and } j}$. 1% change in $(GFCF_j)$ is associated with a β_3 % change in $VT_{i \text{ and } j}$.

Analytical Interpretation after and before the impact of BRI on BRICS and Quad Countries by CAGR

The present study highlights the impact of the BRI Project on bilateral trade relationships in two different periods (2006-12 and 2013-19). To highlight this relationship, the present study uses the CAGR and log-linear model.

Impact assessment is done by the CAGR in this paper. CAGR is calculated for two specific periods i.e. 2006 to 2012 and 2013-2019. Actual differences between the two periods of CAGR gives the clear impact of China's BRI on QUAD and BRICS nations. The descriptive nature of results are explained using one by one country of QUAD and BRICS.

Table: 01 AUSTRALIA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with BRICS Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Brazil	2006-12	0.078	-0.050	0.028	0.038
	2013-19	0.020	0.039	-0.058	-0.005
China	2006-12	0.336	0.124	0.033	0.096
	2013-19	0.363	0.045	-0.335	0.069
India	2006-12	0.110	0.146	-0.011	0.064
	2013-19	0.062	0.079	-0.017	0.071
Russia	2006-12	0.083	0.424	0.000	0.015
	2013-19	0.004	-0.219	-0.006	0.007
South Africa	2006-12	-0.048	-0.067	-0.031	0.019
	2013-19	0.095	-0.002	-0.024	0.010

Table 01 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for BRICS nations. From the period 2006-2012 to 2013-2019, exports of Brazil, India and Russia to Australia have declined whereas **China and South Africa have emerged out as good performer of exports to Australia**. Imports from Australia have increased in Brazil and South Africa and have declined in case of other BRICS nations. GFCF of Brazil, China, India and Russia has declined and has increased for **South Africa**. GDP of Brazil, China, Russia and South Africa has declined and has increased for India.

Table: 2 AUSTRALIA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with QUAD Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
India	2006-12	0.110	0.146	-0.011	0.064
	2013-19	0.062	0.079	-0.017	0.071
Japan	2006-12	0.120	0.041	-0.019	-0.002
	2013-19	0.027	-0.003	-0.286	0.010
USA	2006-12	0.018	0.062	-0.030	0.007
	2013-19	0.029	0.014	-0.273	0.024

Table 02 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for QUAD nations. From the period 2006-2012 to 2013-2019, exports of India and Japan to Australia have declined and increased for USA. Imports from Australia have decreased in India, Japan and USA. GFCF of India, Japan and USA also declined and the GDP of India, Japan and USA has increased.

It means that the inception of BRI has benefited to one of the BRICS nations i.e. South Africa when seen in consideration with Australia. Relation of QUAD members is not benefited to Australia.

Table: 03 BRAZIL CAGR (%) of Export, Import, GFCF, GDP, Net Trade with BRICS Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Russia	2006-12	-0.131	0.070	0.000	0.015
	2013-19	0.205	0.049	-0.006	0.007
China	2006-12	0.006	0.219	0.033	0.096
	2013-19	0.202	-0.015	-0.335	0.069
India	2006-12	-1.000	0.203	-0.011	0.064
	2013-19	0.203	-0.094	-0.017	0.071
South Africa	2006-12	-0.207	0.104	-0.031	0.019
	2013-19	0.177	-0.012	-0.024	0.010

Table 03 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for BRICS nations. From the period 2006-2012 to 2013-2019, exports of BRICS to Brazil have increased. Imports from Brazil have decreased in Russia, China, India and South Africa. GFCF of Russia, China, and India declined and increased for South Africa. GDP of Russia, China and South Africa has declined and increased for India.

Table: 04 BRAZIL CAGR (%) of Export, Import, GFCF, GDP, Net Trade with QUAD Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Australia	2006-12	0.034	0.134	-0.008	0.026
	2013-19	0.181	-0.010	-0.029	0.025
India	2006-12	-1.000	0.203	-0.011	0.064
	2013-19	0.203	-0.094	-0.017	0.071
Japan	2006-12	-0.071	0.098	-0.019	-0.002
	2013-19	0.216	-0.086	-0.286	0.010
USA	2006-12	-0.160	0.117	-0.030	0.007
	2013-19	0.146	-0.034	-0.273	0.024

Table 04 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for QUAD nations. From the period 2006-2012 to 2013-2019, exports of all QUAD nations to Brazil have increased. Imports from Brazil to QUAD nations have fallen. GFCF of all QUAD nations also declined, but the GDP of all QUAD nations except for Australia has increased. **In this way, Brazil is not mutually benefited by BRICS as well as QUAD nations.**

Table:05 CHINA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with BRICS Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Russia	2006-12	0.147	0.206	0.000	0.015
	2013-19	-0.022	0.057	-0.006	0.007
Brazil	2006-12	0.217	0.190	0.028	0.038
	2013-19	-0.031	0.064	-0.058	-0.005
India	2006-12	0.145	0.039	-0.011	0.064
	2013-19	0.089	0.011	-0.017	0.071
South Africa	2006-12	0.191	0.562	-0.031	0.019
	2013-19	-0.015	-0.133	-0.024	0.010

Table 05 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for BRICS nations. From the period 2006-2012 to 2013-2019, exports of Brazil, India, Russia and South Africa to China have declined. Imports from China to BRICS nations also declined. GFCF of Brazil, China, India, and Russia declined but increased for **South Africa**. GDP of the Brazil, Russia and South Africa declined but increased for **India**.

Table:06 CHINA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with QUAD Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Australia	2006-12	0.168	0.267	-0.008	0.026
	2013-19	0.037	0.005	-0.029	0.025
India	2006-12	0.145	0.039	-0.011	0.064
	2013-19	0.089	0.011	-0.017	0.071
Japan	2006-12	0.100	0.076	-0.019	-0.002
	2013-19	-0.011	0.017	-0.286	0.010
USA	2006-12	0.110	0.156	-0.030	0.007
	2013-19	0.044	-0.003	-0.273	0.024

Table 06 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for QUAD nations. From the period 2006-2012 to 2013-2019, exports of India, Australia, Japan and USA to China have declined. Imports from China have decreased in India, Japan, Australia and USA. GFCF of India, Japan, Australia and USA also declined, but the GDP of India, Japan and USA increased and decreased for Australia. **In this way, China is not mutually benefited by BRICS as well as QUAD nations.**

Table: 07 RUSSIA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with BRICS Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Brazil	2006-12	0.012	-0.030	0.028	0.038
	2013-19	0.044	-0.079	-0.058	-0.005
India	2006-12	0.125	0.186	-0.011	0.064
	2013-19	0.063	0.039	-0.017	0.071
China	2006-12	0.185	0.162	0.033	0.096
	2013-19	0.098	0.021	-0.335	0.069
South Africa	2006-12	0.603	0.160	-0.031	0.019
	2013-19	-0.012	0.019	-0.024	0.010

Table 07 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for BRICS nations. From the period 2006-2012 to 2013-2019, exports of Brazil increased but for other BRICS nations decreased. Imports from Russia to other BRICS nations decreased. GFCF of Brazil, China and India have declined and increased for **South Africa**. GDP of the BRICS nations decreased except for **India**.

Table:08 RUSSIA CAGR (%of Export, Import, GFCF, GDP, Net Trade with QUAD Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Australia	2006-12	0.101	0.053	-0.008	0.026
	2013-19	0.085	-0.016	-0.029	0.025
India	2006-12	0.125	0.186	-0.011	0.064
	2013-19	0.063	0.039	-0.017	0.071
Japan	2006-12	0.158	0.022	-0.019	-0.002
	2013-19	-0.097	-0.048	-0.286	0.010
USA	2006-12	0.106	0.070	-0.030	0.007
	2013-19	0.051	-0.042	-0.273	0.024

Table 08 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for QUAD nations. From the period 2006-2012 to 2013-2019, exports of Australia, India, Japan and USA to Russia have decreased. Imports from Russia also decreased to QUAD nations. GFCF of India, Japan, Australia and USA also declined, but the GDP of India, Japan and USA increased and decreased for Australia. **In this way, Russia is not mutually benefited by BRICS as well as QUAD nations.**

Table:09 INDIA CAGR (%of Export, Import, GFCF, GDP, Net Trade with BRICS Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Brazil	2006-12	0.184	0.437	0.028	0.038
	2013-19	0.057	-0.029	-0.058	-0.005
Russia	2006-12	0.156	0.073	0.000	0.015
	2013-19	-0.057	0.113	-0.006	0.007
China	2006-12	0.261	0.185	0.033	0.096
	2013-19	-0.090	0.054	-0.335	0.069

South Africa	2006-12	0.195	0.204	-0.031	0.019
	2013-19	0.033	-0.001	-0.024	0.010

Table 09 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for BRICS nations. From the period 2006-2012 to 2013-2019, exports of Brazil, China, Russia and South Africa to India have declined. Imports from India declined for Brazil, China and South Africa but increased for Russia. GFCF of Brazil, China and Russia has declined but increased for **South Africa**. GDP of all the nations decreased.

QTable:10 INDIA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with QUAD Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Australia	2006-12	0.184	0.109	-0.008	0.026
	2013-19	0.057	0.038	-0.029	0.025
Japan	2006-12	0.128	0.156	-0.019	-0.002
	2013-19	0.030	0.041	-0.286	0.010
USA	2006-12	0.205	0.076	-0.030	0.007
	2013-19	-0.060	0.090	-0.273	0.024

Table 10 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for QUAD nations. From the period 2006-2012 to 2013-2019, exports of Australia, Japan and USA to India have declined. Imports from India also declined to Australia and Japan but increased to USA. GFCF of Japan, Australia and USA also declined, but the GDP of Japan and USA increased and decreased for Australia. **In this way, India is not mutually benefited by BRICS except for Russia and by QUAD nations except for USA.**

Table:11 SOUTH AFRICA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with BRICS Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Brazil	2006-12	0.102	0.004	0.028	0.038
	2013-19	-0.080	-0.023	-0.058	-0.005
India	2006-12	0.210	0.219	-0.011	0.064
	2013-19	0.055	-0.037	-0.017	0.071
China	2006-12	0.260	0.124	0.033	0.096
	2013-19	-0.020	0.008	-0.335	0.069
Russia	2006-12	0.198	-0.210	0.000	0.015
	2013-19	0.008	0.038	-0.006	0.007

Table 11 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for BRICS nations. From the period 2006-2012 to 2013-2019, exports of Brazil, India, China and Russia to South Africa have declined. Similar is the case with Imports from South Africa to the BRICS nations. GFCF of all the BRICS nations have declined. GDP of all except for India has decreased. **In this way, South Africa is not mutually benefited by BRICS.**

Table:12 SOUTH AFRICA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with QUAD Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Australia	2006-12	-0.087	-0.001	-0.008	0.026
	2013-19	-0.005	-0.013	-0.029	0.025
India	2006-12	0.210	0.219	-0.011	0.064
	2013-19	0.055	-0.037	-0.017	0.071
Japan	2006-12	-0.023	-0.012	-0.019	-0.002
	2013-19	-0.032	-0.062	-0.286	0.010

USA	2006-12	0.019	0.045	-0.030	0.007
	2013-19	-0.009	-0.029	-0.273	0.024

Table 12 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for QUAD nations. From the period 2006-2012 to 2013-2019, exports of all QUAD nations to South Africa have declined except for Australia. Imports of QUAD nations from South Africa have declined. GFCF of all QUAD nations declined. GDP of all QUAD nations except for Australia has increased. **In this way, South Africa is not mutually benefited by QUAD.**

Table:13 JAPAN CAGR (%) of Export, Import, GFCF, GDP, Net Trade with BRICS Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Brazil	2006-12	0.074	0.149	0.028	0.038
	2013-19	-0.059	-0.060	-0.058	-0.005
India	2006-12	0.012	0.114	-0.011	0.064
	2013-19	0.052	-0.042	-0.017	0.071
Russia	2006-12	0.019	0.155	0.000	0.015
	2013-19	-0.054	-0.087	-0.006	0.007
China	2006-12	0.073	0.087	0.033	0.096
	2013-19	0.022	-0.009	-0.335	0.069
South Africa	2006-12	-0.013	-0.021	-0.031	0.019
	2013-19	-0.057	-0.038	-0.024	0.010

Table 13 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for BRICS nations. From the period 2006-2012 to 2013-2019, exports of all BRICS nations except for India to Japan have declined. Imports from Japan to the BRICS nations have declined. GFCF of all the BRICS nations has declined except for South Africa. GDP of all BRICS nations except for India has decreased. **In this way, Japan is not mutually benefited by BRICS. However, India has somewhat reaped a few benefits.**

Table:14 JAPAN CAGR (%) of Export, Import, GFCF, GDP, Net Trade with QUAD Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Australia	2006-12	0.048	0.113	-0.008	0.026
	2013-19	0.004	-0.012	-0.029	0.025
India	2006-12	0.012	0.114	-0.011	0.064
	2013-19	0.052	-0.042	-0.017	0.071
USA	2006-12	-0.004	0.012	-0.030	0.007
	2013-19	0.012	0.026	-0.273	0.024

Table 14 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for QUAD nations. Exports of Japan to QUAD nations have increased except for Australia. Imports have declined except for USA. GFCF of all QUAD nations have declined. GDP of all QUAD nations except for Australia has increased. No mutual benefit has been recorded for Japan from QUAD.

Table:15 USA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with BRICS Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Brazil	2006-12	0.120	0.036	0.028	0.038
	2013-19	-0.001	0.016	-0.058	-0.005
India	2006-12	0.051	0.117	-0.011	0.064

Russian	2013-19	0.090	0.052	-0.017	0.071
	2006-12	0.047	0.092	0.000	0.015
China	2013-19	-0.099	-0.027	-0.006	0.007
	2006-12	0.123	0.059	0.033	0.096
South Africa	2013-19	-0.012	0.015	-0.335	0.069
	2006-12	0.063	-0.002	-0.031	0.019
	2013-19	-0.045	-0.004	-0.024	0.010

Table 15 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for BRICS nations. From the period 2006-2012 to 2013-2019, exports of all BRICS nations except for India to USA have declined. Imports from USA to the BRICS nations have declined. GFCF of all the BRICS nations except for South Africa has declined. GDP of all BRICS nations except for India has decreased. **In this way, USA is not mutually benefited by BRICS.**

Table:16 USA CAGR (%) of Export, Import, GFCF, GDP, Net Trade with QUAD Nations

COUNTRY	PERIOD	EXPORT	IMPORT	GFCF	GDP
Australia	2006-12	0.009	0.008	-0.008	0.026
	2013-19	-0.004	0.013	-0.029	0.025
India	2006-12	0.051	0.117	-0.011	0.064
	2013-19	0.090	0.052	-0.017	0.071
Japan	2006-12	0.020	0.001	-0.019	-0.002
	2013-19	0.026	0.009	-0.286	0.010

Table 16 shows the performance of export, import, GFCF and GDP before and after the inception of BRI for QUAD nations. Exports of USA to QUAD nations have increased except for Australia. Imports have grown except for India. GFCF of all QUAD nations have declined. GDP of all QUAD nations except for Australia has increased. USA as such has not mutually benefited from QUAD.

After and before the impact of BRI on BRICS and Quad Countries by Log-Linear Model

The present study highlights the impact of the BRI Project on BRICS and Quad nations trade relationship in two different periods (2006-12 and 2013-19). To highlight this relationship, the present study uses the log-linear model. The study analyses the impact of gravity measures, domestic gross capital formation and partner countries gross capital formation on the bilateral trade relationship between BRICS nations and Quad nations. Results and Interpretation (only statistically significant at 1%, 5% or 10% level of significance are taken into consideration)

Brazil with BRICS

China

- From 2006 to 2012, with 1 per cent increase in GFCF of Brazil, on average, Volume of Trade significantly ($p < 0.10$) increased by 2.9 per cent, ceteris paribus.
- From 2013 to 2019, with 1 per cent increase in GFCF of Brazil, on average, Volume of Trade significantly ($p = 0.05$) increased by 1.67 per cent, ceteris paribus.

Brazil with QUAD

Japan

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between Brazil and Japan, on average, Volume of Trade significantly ($p < 0.05$) increased by 12 per cent, *ceteris paribus*.
- From 2013 to 2019, with 1 per cent increase in GFCF of Japan, on average, Volume of Trade significantly ($p < 0.05$) decreased by 9 per cent, *ceteris paribus*.

USA

- From 2006 to 2012, with 1 per cent increase in GFCF of the USA, on average, Volume of Trade significantly ($p < 0.10$) decreased by 2.5 per cent, *ceteris paribus*.
- From 2013 to 2019, with 1 per cent increase in Gravity Measure between Brazil and USA, on average, Volume of Trade significantly ($p < 0.05$) increased by 7.8 per cent, *ceteris paribus*.
- From 2013 to 2019, with 1 per cent increase in GFCF of the USA, on average, Volume of Trade significantly ($p < 0.10$) decreased by 5 per cent, *ceteris paribus*.

India with BRICS

Russia

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between India and Russia, on average, Volume of Trade significantly ($p < 0.10$) increased by 2.2 per cent, *ceteris paribus*.
- From 2006 to 2012, with 1 per cent increase in GFCF of Russia, on average, Volume of Trade significantly ($p = 0.05$) increased by 1.3 per cent, *ceteris paribus*.

South Africa

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between India and South Africa, on average, Volume of Trade significantly ($p = 0.05$) increased by 2.1 per cent, *ceteris paribus*.

India with QUAD

Japan

- From 2013 to 2019, with 1 per cent increase in GFCF of India, on average, Volume of Trade significantly ($p < 0.01$) increased by 3.8 per cent, *ceteris paribus*.

USA

- From 2013 to 2019, with 1 per cent increase in GFCF of India, on average, Volume of Trade significantly ($p = 0.01$) increased by 3.07 per cent, *ceteris paribus*.

China with BRICS

Brazil

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between China and Brazil, on average, Volume of Trade significantly ($p < 0.05$) increased by 2.15 per cent, *ceteris paribus*.

- From 2013 to 2019, with 1 per cent increase in GFCF of China, on average, Volume of Trade significantly($p < 0.10$) increased by 4.96 per cent, ceteris paribus.

Russia

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between China and Russia, on average, Volume of Trade significantly($p < 0.05$) increased by 4.8 per cent, ceteris paribus.
- From 2013 to 2019, with 1 per cent increase in GFCF of China, on average, Volume of Trade significantly($p = 0.01$) increased by 5.15 per cent, ceteris paribus.

South Africa

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between China and South Africa, on average, Volume of Trade significantly($p = 0.10$) decreased by 2.5 per cent, ceteris paribus.
- From 2013 to 2019, with 1 per cent increase in GFCF of China, on average, Volume of Trade significantly($p < 0.05$) increased by 8.4 per cent, ceteris paribus.

China with QUAD

Australia

- From 2013 to 2019, with 1 per cent increase in GFCF of Australia, on average, Volume of Trade significantly($p < 0.05$) increased by 6.2 per cent, ceteris paribus.

Japan

- From 2013 to 2019, with 1 per cent increase in GFCF of Japan, on average, Volume of Trade significantly($p < 0.01$) increased by 3 per cent, ceteris paribus.

USA

- From 2013 to 2019, with 1 per cent increase in GFCF of the USA, on average, Volume of Trade significantly($p = 0.10$) increased by 1.8 per cent, ceteris paribus.

Russia with BRICS

India

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between Russia and India, on average, Volume of Trade significantly($p = 0.10$) decreased by 3.2 per cent, ceteris paribus.
- From 2013 to 2019, with 1 per cent increase in GFCF of India, on average, Volume of Trade significantly($p < 0.10$) increased by 5.8 per cent, ceteris paribus.
- From 2013 to 2019, with 1 per cent increase in GFCF of Russia, on average, Volume of Trade significantly($p = 0.05$) increased by 3.6 per cent, ceteris paribus.

China

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between Russia and China, on average, Volume of Trade significantly($p = 0.10$) decreased by 1.4 per cent, ceteris paribus.
- From 2013 to 2019, with 1 per cent increase in GFCF of China, on average, Volume of Trade significantly($p < 0.10$) increased by 5.6 per cent, ceteris paribus.

- From 2013 to 2019, with 1 per cent increase in GFCF of Russia, on average, Volume of Trade significantly ($p < 0.01$) increased by 2.8 per cent, ceteris paribus.

Russia with QUAD

Australia

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between Russia and Australia, on average, Volume of Trade significantly ($p < 0.10$) increased by 2.9 per cent, ceteris paribus.
- From 2013 to 2019, with 1 per cent increase in GFCF of Australia, on average, Volume of Trade significantly ($p < 0.10$) increased by 4.7 per cent, ceteris paribus.

Japan

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between Russia and Japan, on average, Volume of Trade significantly ($p = 0.01$) increased by 5.16 per cent, ceteris paribus.

South Africa with BRICS

India

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between South Africa and India, on average, Volume of Trade significantly ($p < 0.05$) increased by 2.15 per cent, ceteris paribus.

Russia

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between South Africa and Russia, on average, Volume of Trade significantly ($p < 0.10$) increased by 6.5 per cent, ceteris paribus.

South Africa with QUAD

USA

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between South Africa and USA, on average, Volume of Trade significantly ($p < 0.10$) increased by 2.06 per cent, ceteris paribus.

Australia with BRICS

China

- From 2013 to 2019, with 1 per cent increase in GFCF of China, on average, Volume of Trade significantly ($p < 0.10$) increased by 6.17 per cent, ceteris paribus.

Russia

- From 2013 to 2019, with 1 per cent increase in GFCF of Australia, on average, Volume of Trade significantly ($p = 0.10$) increased by 12.3 per cent, ceteris paribus.

South Africa

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between Australia and South Africa, on average, Volume of Trade significantly ($p < 0.10$) increased by 7.2 per cent, ceteris paribus.

Australia with QUAD

Japan

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between Australia and Japan, on average, Volume of Trade significantly ($p < 0.10$) increased by 3.7 per cent, ceteris paribus.

USA

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between Australia and USA, on average, Volume of Trade significantly ($p < 0.05$) increased by 1.77 per cent, ceteris paribus.

Japan with BRICS

India

- From 2013 to 2019, with 1 per cent increase in GFCF of India, on average, Volume of Trade significantly ($p < 0.10$) increased by 3.5 per cent, ceteris paribus.

Brazil

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between Japan and Brazil, on average, Volume of Trade significantly ($p = 0.10$) increased by 11.3 per cent, ceteris paribus.
- From 2013 to 2019, with 1 per cent increase in GFCF of Japan, on average, Volume of Trade significantly ($p < 0.05$) decreased by 7.7 per cent, ceteris paribus.

China

- From 2013 to 2019, with 1 per cent increase in GFCF of China, on average, Volume of Trade significantly ($p < 0.05$) increased by 3.15 per cent, ceteris paribus.

Russia

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between Japan and Russia, on average, Volume of Trade significantly ($p = 0.01$) increased by 6.7 per cent, ceteris paribus.

Japan with QUAD

Australia

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between Japan and Australia, on average, Volume of Trade significantly ($p < 0.10$) increased by 3.7 per cent, ceteris paribus.

USA

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between Japan and USA, on average, Volume of Trade significantly ($p = 0.01$) increased by 2.4 per cent, ceteris paribus.

USA with BRICS

India

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between USA

and India, on average, Volume of Trade significantly($p < 0.05$) increased by 1.27 per cent, *ceteris paribus*.

- From 2013 to 2019, with 1 per cent increase in Gravity Measure between USA and India, on average, Volume of Trade significantly($p < 0.10$) decreased by 1.46 per cent, *ceteris paribus*.
- From 2013 to 2019, with 1 per cent increase in GFCF of the USA, on average, Volume of Trade significantly($p < 0.10$) increased by 2.3 per cent, *ceteris paribus*.
- From 2013 to 2019, with 1 per cent increase in GFCF of India, on average, Volume of Trade significantly($p < 0.01$) increased by 2.20 per cent, *ceteris paribus*.

Brazil

- From 2006 to 2012, with 1 per cent increase in GFCF of the USA, on average, Volume of Trade significantly($p < 0.10$) increased by 2.01 per cent, *ceteris paribus*.
- From 2013 to 2019, with 1 per cent increase in Gravity Measure between USA and Brazil, on average, Volume of Trade significantly($p < 0.05$) increased by 10 per cent, *ceteris paribus*.
- From 2013 to 2019, with 1 per cent increase in GFCF of the USA, on average, Volume of Trade significantly($p = 0.05$) decreased by 7.7 per cent, *ceteris paribus*.

South Africa

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between USA and South Africa, on average, Volume of Trade significantly($p < 0.10$) increased by 1.97 per cent, *ceteris paribus*.

Russia

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between USA and Russia, on average, Volume of Trade significantly($p = 0.05$) increased by 3.7 per cent, *ceteris paribus*.

USA with QUAD

Australia

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between USA and Australia, on average, Volume of Trade significantly($p = 0.01$) increased by 2.2 per cent, *ceteris paribus*.

Japan

- From 2006 to 2012, with 1 per cent increase in Gravity Measure between USA and Japan, on average, Volume of Trade significantly($p < 0.01$) increased by 2.7 per cent, *ceteris paribus*.

Table: 17 significant variables

Country from i to j	2006-2012 (contribution to total Volume of Trade of i and j country)	2013-2019 (contribution to total Volume of Trade of i and j country)	Bilateral Groups
Brazil to China	GFCF of Brazil positively	GFCF of Brazil positively	BRICS
Brazil to Japan		GM, GFCF of Japan positively	BRICS
Brazil to USA	GFCF of USA positively	GM, GFCF of USA positively	QUAD
India to Russia	GM, GFCF of Russia positively		BRICS
India to South Africa	GM positively		BRICS
India to Japan		GFCF of India positively	QUAD
India to USA		GFCF of India positively	QUAD
China to Brazil		GFCF of China, GM positively	BRICS
China to Russia	GM positively	GFCF of China positively	BRICS
China to South Africa		GM negatively, GFCF of China positively	BRICS
China to Australia		GFCF of Australia positively	QUAD
China to Japan		GFCF of Japan positively	QUAD
China to USA		GFCF of USA positively	QUAD
Russia to India		GM negatively, GFCF of India and Russia both positively	BRICS ^{id}
Russia to China		GM negatively, GFCF of China and Russia both positively	BRICS
Russia to Australia		GFCF of Australia as well as GM positively	QUAD
Russia to India	GM positively		BRICS
South Africa to India	GM positively		BRICS
South Africa to Russia		GM positively	BRICS
South Africa to the USA	GM positively		QUAD
Australia to China		GFCF of China positively	BRICS

Australia to Russia		GFCF of Australia positively	BRICS
Australia to South Africa	GM positively		BRICS
Australia to the USA	GM positively		QUAD
Australia to Japan	GM positively		QUAD
Japan to India		GFCF of India positively	BRICS
Japan to Brazil		GFCF of Japan negatively, GM positively	BRICS
Japan to China		GFCF of China positively	BRICS
Japan to Russia	GM positively		BRICS
Japan to Australia	GM positively		QUAD
Japan to the USA	GM positively		QUAD
USA to India	GM positively	GFCF of USA and India both positively, GM negatively	BRICS ^A
USA to Brazil	GFCF of USA positively	GFCF of the USA negatively, GM positively	BRICS
USA to Russia	GM positively		BRICS
USA to South Africa	GM positively		BRICS
USA to Australia	GM positively		QUAD
USA to Japan	GM positively		QUAD

CONCLUSION

As the results are discussed in this paper, investment not alone benefits the internal factors of an economy, it benefits other economies also. In this regards China's Belt and Road Initiative (BRI) directly or indirectly stimulate the turmoil of the world economy. The role of BRI before inception and after inception changes the dynamics of different economies. Bilateral agreements have been focused on the mutual benefits of their respective interests. Bilateral groups of economic relations will be long-lasting depending on the benefits of trade, output, and investment. Insecurity of any challenge can't flourish the benefits of their interest. The formation of QUAD nations will sustain the economic interests. Major initiative as infrastructure development to integrate the different economies is a two-sided sword. This is a zero-sum game of geo-political interest. Political integration can be sustained by the benefits of economies. Incentives from bilateral agreements sustain the group of BRICS economies.

Before the inception of BRI, the investment of Brazil, Russia of BRICS groups contributes the most total volume of trade significantly with China and India respectively. And USA of QUAD groups contributes the most total volume of trade significantly with Brazil.

In this period the gravity measures of India to Russia, South Africa; China to Russia; Russia to Japan; South Africa to India, USA; Australia to Japan, USA; Japan to Russia, USA;

the USA to India, South Africa, Russia, Australia, and Japan has been positively significant enriched the volume of trade.

Here USA, India, and Japan respectively were on advantage to getting the benefits of gravity measures.

In this result the contribution of China was negligible. China did not give any major contribution to the total volume of trades with different economics as investment and gravity measure.

After the inception of BRI, the investment of Brazil to China, USA to Brazil, India; India to Japan, USA, Russia; Japan to Brazil; China to Japan, Brazil, Australia, Russia, South Africa; Australia to China, Japan, USA, Russia; India; Russia to India has been the significant positive impact the world trade.

Gravity measure also favors the volume of trade from Japan to Brazil; USA to Brazil, India; China to Brazil, South Africa, USA; South Africa to China, Australia; India to Russia, USA; China to Russia; Australia to Russia; Russia to South Africa respectively.

It means that the CAGR value of difference after and before the inception of BRI has benefited one of the BRICS nation's i.e. South Africa when seen in consideration with Australia. Relation of QUAD members has not benefited Australia. Brazil, Russia, the USA, South Africa, and Japan is not mutually benefited by BRICS as well as QUAD nations. India is not mutually benefited by BRICS except for Russia and by QUAD nations except for the USA. However, India has somewhat reaped a few benefits.

This shows that China is getting the benefits of BRI mostly from Brazil and South Africa. Somehow it seems that the hegemony of the USA is under threat.

How the QUAD nations will survive because Brazil, Russia, and South Africa paved the way for gravity measures to expand their volume of trade with QUAD nation, where Brazil and South Africa are the key trade partners of China.

The rule of economics is that without incentives or the common interest of groups will not survive longer. This shows that China boost up the investment strategy to build an integrated infrastructure with huge investment, which gave benefits to the member nation of BRICS and QUAD group. Some of the investments rather than China also flourish the volume of trade in favor of China.

The sustainability of bilateral agreements will derive from economic interests and incentives. The groups should focus on the common goals of economic incentives i.e. the access of selected markets with the nation's branding of selected commodities, revise the trade agreements with some relaxation in tariffs in the competitive environment, relaxations on intellectual properties rights.

Appendix A: Review of Literature

Sr. No.	Author/Researcher, Year)	Concluded that
1	(Lai, Lin, & Sidaway, 2020)	The financial needs of BRI also raise importance for the geography of financial markets and business services in the global financial network.
2	(Le, Tran, & Duc, 2019)	The respondents from both sectors agreed that the initiative could foster textile export and the development of infrastructure. Apart from that, the main challenge is recognized as the poor competitiveness of Vietnamese textile firms on the international commercial playground.
3	(Mukwaya & Mold, 2019)	Evaluated that the total export and welfare could increase. BRI would increase intra-regional trade in Eastern Africa.
4	(Hurley, Morris, & Portelance, 2018)	8 countries out of 68 are at particular risk of debt distress based on an identified pipeline of project lending associated with BRI. Debt owed to official and quasi-official Chinese creditors. There is a need for higher concentration in debt.
5	(Gong, Gu, & Teng, 2019)	shows that the current investment in information and communication technologies (ICTs), as well as digital connectivity and digital economy, has been a positive influence on the implementation of Sustainable Development Goals in the recipient counties. Investment in ICTs facilitates economic growth in the least developed economies.
6	(Wuthnow, 2017)	The direct interpretation of the evidence is that China is seeking spheres of influence in a way to quest for world dominance starting by occupying the Eurasian Heartland. Though usually not stated so boldly, Chinese sources do argue that the BRI can help expand China's strategic space and weaken US influence in the Asia Pacific. Despite an optimistic official narrative, Chinese strategists note that Chinese and partner states and property are subject to the risks of operating in turbulent areas and worry more broadly about current or potential strategic competition from other major powers, especially the United States, Japan and India. The geopolitical view has been given carefully by the author.
7	(Farooq, Tongkai, Jiengang, & Feroz, 2018)	Despite the generally positive impact of the Chinese economic presence in Africa over the past decades, both China and African countries need each other in development and continue to make inroads into Africa, home to minerals, oil, and other resources that help feed China's phenomenal economic growth.
8	(Lu, Rohr, Hfner, & Knack, 2018)	The positive association between transport infrastructure and connectivity and bilateral trade. The existence of a rail network between trading partners has been associated with a large impact on improving trade. The density of infrastructure is also increasing.
9	(Kong, Cochrane, Meighan, & Walsh, 2019)	Macroeconomic fallout is severe, and difficulties servicing debt are likely to increase a country's borrowing costs, many BRI projects are in countries that carry relatively

- 10 (Rana, 2017) **high risk.**
The funding arrangements include aid and loan, and the potential gains for the countries, and the region that are to participate in the connectivity and infrastructure oriented project. It is being created as an '**international public good**', by BRI, even though **China has not yet engaged in participatory, comprehensive and equal dialogue among all that are current and potential beneficiaries of BRI actions.**
- 11 (Konings, 2018) The better connections and lower trade costs that come with them could have a significant global impact. **It reduces the trade costs between countries involved in the BRI and increases world trade.**
- 12 (Yan, 2018) The connectivity between countries benefits the public and private sector from three dimensions i.e. **cross border flow of goods and services which have a high degree of both the inputs into economic activity and the outputs from economic activity**, capital and people.
- 13 (Jusoh, 2018) The BRI projects assist ASEAN and its member states to draw investment into productive sectors. **BRI projects imbalance the trade between ASEAN and China. Trade is in the favour of China.**
- 14 (Hamzah, 2018) China's legal system is most similar to the hybrids. This may challenge the ideal of 'one legal framework' to find a single common ground. **China is facing several disputes and legal issues in deals and contracts with ASEAN.**
- 15 (Casarini, 2018) **Southeast Asia becomes the main target of BRI's investment. It directly impacts the trade of western nations.** Artificial islands and installing military facilities in the South China sea escalate tensions in the ASEAN countries.
- 16 (Loong, 2018) China is facing a diminishing growth rate and the **ASEAN countries have the potential for new markets and new investors for BRI.**
- 17 (Tay, 2018) **The Chinese Renminbi (RMB) is going through a period of volatility and in the long run with its internationalization not only inevitable but likely to gain further momentum as a result of BRI.** China expects an annual US\$20-30bn in BRI related investment which is made by Chinese financial institutions that will help RMB to gain.
- 18 (Pongsudhirak, 2018) The policymakers remain supportive of BRI, although **there are local concerns about a potential debt trap and a raw deal with disadvantageous terms.**
- 19 (Nanwani, 2019) Japan and India, together and singly, concerning BRI as well as the different aspects of policy for interrelationship, politics, and institution have been discussed at the global level. **These countries' discussion explores Japan's additions to its central alliance with the US, Australia and India in security, and its initiatives with India on Vision 25 and the Asia-Africa Growth Corridor.** India is also following its non-alignment foreign diplomacy policy.

- 20 (OECD, 2018) The need for investment to 2030 provided by China to build infrastructure and funding, have a positive impact. **The feature of BRI is a mutual benefit that will help to develop the market for China's products in the long term and to alleviate industrial excess capacity in the short term.**
- 21 (Yang, 2018) **The BRI has been launched in conflict-prone states, where there are security needs. Chinese private firms and western security forces are continuing to protect China's economic interest abroad.**
- 22 (Joshi, 2018) 70 per cent of the world population, energy sources and GDP lies in Eurasia. **Integration of nations through BRI with its economy appears to be a mercantilist project. This project has been layered over bilateral trade agreements that seek to promote Chinese trade.**
- 23 (Thussu, 2018) The commentary looks at the implications for BRICS in connection with China's Belt and Road Initiative (BRI) and argues that communications are not vital to this infrastructure project. **BRICS nations are not in support of China's BRI.**
- 24 (Devonshire-Ellis, 2019) The key point of the BRICS 2019 Summit Declaration is to **coordinate actions at a global level to reach maximum economic growth.**

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