

Specifying The Study Of Trade And Convergence Of BRICS Economies In Post Pandemic Era

¹Ravindra Kumar, ²Pavnesk Kumar, ³Leena Sharad Shimpi, & ⁴Om Prakash Verma

¹PhD Research Scholar, Department of Management Sciences, Mahatma Gandhi Central University Bihar.

¹ORCID ID: <https://orcid.org/0000-0002-5496-9007>

& ¹Email: ravindra2019bbau@gmail.com

²Professor, Department of Management Sciences, Mahatma Gandhi Central University Bihar.

³Associate Professor, Department of Commerce, Babasaheb Bhimrao Ambedkar(Central) University Lucknow, UttarPradesh.

⁴PhD Research Scholar, Department of Commerce, Govt. V.Y.T. PG. Autonomous College, Hemchand Yadav University, Durg, Chhattisgarh.

Abstract

This research paper examines how trade, income distribution, and convergence among the BRICS countries have been affected by the formation of the BRICS economies. Trade and convergence rate relationships have been examined using intra-trade organization, panel unit roots testing, and single difference techniques. An estimated convergence meter between the major trading partners of the BRICS countries and themselves has been calculated in the post-COVID-19 trade openness era. The investigation's conclusions demonstrated that the BRICS countries came closer together over the investigation's duration. However, no evidence of a connection to the formation of the post-BRICS economic union appears to exist. The post-trade reform examination of the BRICS countries produced different results with respect to trade and convergence. The panel unit roots test results also show that, with the exception of the Indian economy and import-based groups, conditional convergence are visible in the BRICS alliance and all export-based groups. Additionally, flawless convergence has been confirmed in every BRICS nation. The paper so suggests that the BRICS countries should participate in competitive trade and investment activities in the post-pandemic globalization era.

Keywords: BRICS Nations; Intra Trade; Convergence; Indian Economy; Panel unit root tests; COVID-19

Introduction

There is no definitive link between trade and economic convergence. Numerous studies have speculated on it, such as those by Jena and Barua (2020), Peron and Rey(2012), Liu (2009), Ben-David (1996), Slaughter (2001), and Milutinović (2016). Evidence from theory and experimentation have solidly established this connection. Furthermore, neo-classical theory is where the idea of income convergence arose, according to Solow (1956). However, the significance of global trade is over looked by this notion. The idea of endogenous development positions that trade results in income convergence and technological transfers that generate knowledge spillovers, ultimately reducing or widening the income gap between trading nations (Romer,1986;Lucas,1990). However, because of declining marginal returns to capital, developing nations eventually overtake industrialized ones in terms of growth rate. This is the neo-classical perspective. Nonetheless, endogenous growth theory denied decreasing marginal returns to capital since countries saw increasing returns to scale from investments in human and physical capital, such as education and skills trainings. Additionally, the factor price equalization theorem, the international flow of technology, and trade in capital items (e.g., Romer, 1986, Ben-David, 1997; Grossman & Helpman, 1990;Lucas,1996; Rodrik,1996; Slaughter, 1997) can be used to quantify the effect of trade on income convergence.

An additional contention is that trade recognized for its ability to stimulate economic expansion.

The factor price equalization theorem of trade theories states that free trade results in the equalization of the factor price along with the distribution of wealth among nations. For example, the Chinese economy is mostly driven by exports (e.g., Siddharthan & Narayanan, 2016). In today's worldwide economy, trade is a vital tool for promoting economic progress. Furthermore, trade may result in the creation or diversion of companies within the bloc. According to Lohani's most recent publications(2020a), trade creation occurs between India and the BRICS nations.

According to a different study by Lohani (2020b), incremental IIT trade and intra-industry trade (IIT) happened at a higher level of aggregation. Furthermore, the data from the marginal IIT index demonstrated that IIT has increased over time in the BRICS countries. Furthermore, IIT has been assisting the BRICS nations in enhancing their trade ties. The economy of the BRICS nations have yet another important focus of this research. We attempted to monitor the convergence of income and trade among the BRICS nations in this study. In order to assess income convergence across the BRICS countries, this study looks into the following questions in light of trade and income ties:

First, are the BRICS nations' trade and income trends consistent with one another? Second, since the formation of the organization, have trade or financial integration with in the BRICS countries changed in any way? Last but not least, are there any signs of trade or income convergence among the main BRICS trading partners? Furthermore, since the foundation of the BRICS union, have there been any changes in trade as well as revenue convergence with each of the BRICS countries' principal trading partners? Thus, this essay has attempted to respond to the questions raised above. Furthermore, the concept of income convergence was expanded upon by Barro and Sala-i-Martin(1991), Solow(1956), and others in their earlier research.

Afterthen, Ben-David(1996) and Slaughter(2001), employed comparison-in-difference and single difference experimental techniques to try and investigate the relationship between trade and income convergence. But the difference-in-difference approach is not included in this investigation. This study uses the single difference technique, as per Ben-David (1997), in order to keep things straight forward. According to Carlino and Mills (1993) and Das et al. (2019) have shown that panel unit roots tests are utilized to verify for both conditional and absolute convergence.

Review of Literature

Numerous research (e.g., Barro & Sala-i-Martin, 1991; Quah, 1993; Sachs & Warner,1995; Sala-i-Martin, 1996) attempted to use cross-country regression to investigate the relationship between trade and per capita income. Several economists, however, disagree with this approach; Ben-David(1996),for example, rejected it, therefore took into account of BRICS nations, including trading partners as well as trading nations. As mentioned in works like Ben-David (1993, 1996) and Ben-David and Kimhi (2004), which both explicitly address the trade and convergence argument, using the single difference methodology to assess the trade and convergence relationship offers an alternative way of examining this effect. Additionally, Hakro and Fida(2009) assessed intra-group convergence, and Slaughter (2001) computed convergence adopting the difference-in-difference approach. Ben-David (1993), also employed the single difference equation approach to study the post-World War-II trade liberalization phase, namely the loosening of qualitative limitations with regard to the chosen set of countries. National income convergence is driven, the report claims, by the relationship amongst trade liberalization and trade volume between EFTA and EEC nations. Ben-David (1996) also looked at trade and income convergence in nations with significant trading partners. In particular, when it comes to trade in products, the analysis found that per capita income and key trading partners were convergent.

Ben-David (2001), went on to compare and contrast the findings of Slaughter's (2001) study, offering an examination of the countries has been chosen for both the intervention group and the control group, in addition to the sample years of data , employed as concerned. As such, this study established the foundation for further investigations into trade and income convergence. Ben- David and Kimhi (2004) also looked at the volume, pace, and wealth disparity of trade with the main trading partners or group (the 25 richest nations) of the NAFTA, EFTA, and EEC trade

blocs. Therefore, 135 import-side pair nations and 125 export-side pair nations make up the study samples in this regard. Using the single differential technique, the investigation was carried out at both intra-group and bilateral integration. According to the study's findings, developing nations export to developed nations. The findings thus pointed to a rise in the rate of convergence (among the participating nations) as a result of trade concerned. Additionally, Cyrus (2004), examined the relationship between trade and cross-national income disparity using a variety of methods, including Granger causality tests, random effect models, and fixed effect models. The results indicated that trade eventually lessens wealth inequality. Zhang examined the ASEAN economies in a study that was published in 2001, based on empirical evidence, the key forces behind East Asian cooperation between 1960 as well as 1996 were trade and market forces that were influenced by foreign direct investment. Additionally, Puyana and Romero's (2004), research findings showed that the NAFTA countries were separating and that there was no consistent indication of economic convergence or integration.

However, Choi (2009), discovered that as trade intensity ratios increased in tandem with a nation's closeness to another and linguistic similarity, per capita income began to converge. Hakro and Fida (2009), have conducted a study on a few South Asian nations. The difference-in-difference method and intra-trade convergence were applied. The findings demonstrated that trade liberalization significantly influenced convergence. Fascinatingly, throughout the post-liberalization era as per capita income quickly converged. Liu (2009), found however, that the causal relationship between trade and per capita income is reversed. The fact that income convergence for 165 nations occurred in unique product categories between 1965 and 2000 (at five-year intervals) lends credence to the idea that trade drives income convergence. Peron and Rey (2012), however, found that there was not a comprehensive convergence in the Indian Ocean Zone from 1950 to 2008. Furthermore, the wealthiest countries remain poorer while the wealthier countries get comparatively richer when wealthy countries like Singapore, Malaysia, Australia, Mauritius, Thailand, and Singapore exit the convergence club.

While bilateral and trade agreements had minimal impact on most countries, opening up the market contributed to an increase in the flow of manufactured goods. Additionally, Dey and Neogi (2015), examined the convergence of income within China and the other SAARC nations. Between 1970 and 2011, the sigma and unconditionally beta convergence methods were employed. The ideas that the addition of China might accelerate the rate of financial convergence and that economic cooperation had enabled the region's per capita GDP to converge more quickly were backed by the study's outcomes. On the other hand, Milutinović (2016), examined the relationship between international trade and income convergence for the member states of the European Union and discovered that, in 2001, 2005, 2009, and 2013, a significant amount of bilateral trade had an impact on income convergence. In order to evaluate the economic progress of various nations, Gnanon (2019), also looked at economic growth, transitional convergence (TCC), and trade policy space (TPS). Between 1995 and 2015, 150 countries made up the study's sample size. After applying the system GMM model to the data analysis, it was shown that (tps) significantly impacted (tc) and had a favorable effect on economic growth.

In addition, the (tc) increases in tandem with the (tps). Further using the convergence hypothesis, Das et al. (2019), discovered that the BRICS countries catching up had no effect on any of the two sub-periods. However, the first sub-period showed conditional convergence. The survey also asserted that there has been a gradual decline in the economic differences between the BRICS countries. Furthermore, between 1995 and 2019, Jena and Barua (2020), looked at the contributions that trade and government spending—both inside and outside the EU—had to the convergence of per capita income in the EU. A panel data model was used to construct and mediate the in-equality indices. The findings showed how trade openness and government spending affected the EU's eventual convergence in per capita income.

Because of external trade and government spending, the gap in per capita income amongst EU members has also narrowed. Furthermore, there has been no disruption to the convergence trend

caused by the financial crisis. Lastly, trade and convergence for the BRICS countries had only been the subject of a few numbers of studies, including Das et al. (2019). However, the current study encourages more investigation because it minimizes the significance of commercial growth and trade barriers.

Objective of the Study

- To Examine the trade and income convergence relationship, in BRICS Economies in post pandemic era
- To Evaluate the intra trade bloc and post-liberalization scenario, with reference to BRICS countries

Research Methodology

This research had been done on the basis of secondary data. A time series chronology of per capita GDP for the years 1991–2022, expressed in constant 2010 values, was made available by the World Bank in the World Development Indicator (WDI, 2019), WTO and International Chambers of Commerce (ICC). From 1991 to 2022, the International Monetary Fund's yearly releases of the Directorate of Foreign Trade Statistics (DOTS) provided the trade flow data at nominal prices (IMF,2022).

Data Analysis and Discussion

The rates of economic growth of the BRICS economies varied from 1991 to 2022. As per the Figure -1, shows the gradual narrowing of the economic growth disparities across the BRICS countries. The worldwide recession of 2008–2009, which saw significant drops in economic growth in South Africa, Brazil, and Russia, were also depicted on this graph. Conversely, the economies of Brazil, Russia, and South Africa all had slower growth than those of China and India.

Figure;1: GDP Growth Rate of BRICS Countries,(Year1991–2022).

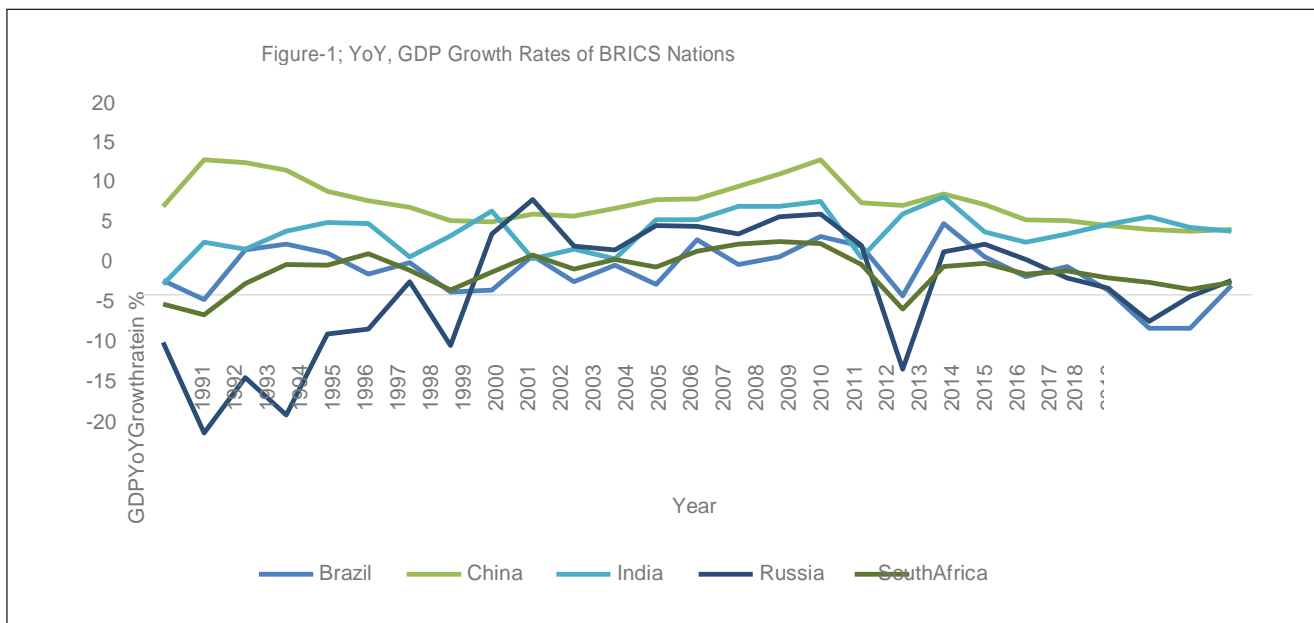


Figure-1. BRICS Countries' GDP Growth Rate,1991–2022.

Source of Data; The author (self-calculation using the World Bank data base wdi as of March 2022).

Figure -1, depicts the income distribution between the major trading partners of the BRICS countries as well as within the BRICS bloc, both of which have declined overtime. Income

dispersion is calculated using the mean dispersion among groups, such as intra-bloc and important trading partner groups that comprise in the BRICS countries in the present year. As explained in the article on the creation of the trading group and list of countries (Tables 1-3), show the main trading partners of the BRICS countries. The 2010 research period, which began after the BRICS were founded, is divided by the vertical line. Furthermore, after trade liberalization was enacted in each of the BRICS countries, the income inequality with those countries' main trading partners has decreased, as seen by this graph.

Moreover, China initiated commercial liberalization in 1987, and South Africa, Brazil, and India soon followed in 1991–1992. Nevertheless, following its 1991 independence from the USSR, Russia started to liberalize its trade policy in 1992. As a result, in 1991 is seen as the year that the BRICS nations liberalized period consistency. According to this mathematical equation,

$$(I_{i,t} - I_t) = \varphi(I_{i,t-1} - I_{t-1}) + \epsilon_{i,t} \quad (1)$$

where $I_{i,t}$ refers to country i 's log per capita GDP in year t and I_t denotes average log per capita GDP of a trading group in year t . φ reflects coefficient of convergence (divergence) of the model. $\varphi < 1$ indicates convergence whereas $\varphi > 1$ shows divergence.

The Hadri (2000), LM test's null hypothesis statement states that all panels are therefore stationary, whereas the alternative hypothesis statement states that at least one panel has a unit root or is non-stationary. This research utilizes the assertions made by Carlino and Mills (1993), to test for convergence in panel unit roots tests method by accounting for the differences between the average per capita GDP of the group of countries and the per capita GDP of the country. The test had been applied to the panel unit roots since the group of nations is both homogeneous and heterogeneous.

$$\Delta X_{e,i,t} = \pi_1 (X_{e,i,t}) + \pi_2 (X_{e,i,t}) B_e + \vartheta_{e,i} \quad (2)$$

where π_1 represents coefficient of pre-BRICS situation, $\pi_1 + \pi_2$ represents post BRICS situation and π_2 represents the marginal effect whether post-BRICS situation is "higher/lower" than the pre-BRICS situation.

The unit root test was carried out because the data are belongs to time series. Tests for unit roots such as the augmented Dickey-Fuller (ADF) tests were carried out. As a pool regression, we examined the individual unit root test. Ben-David's (1996), study also employed this examination results. In this case, X is replaced by Z. To ascertain if the convergence process is stochastic, conditional, or absolute, the panel unit root test was utilized. It was also used to assess the stability of the variation in per capita GDP across national borders. If the changes in GDP per capita are constant, it suggests convergence. Conversely, if it is non-stationary, it indicates that the differences in GDP per capita are diverging. If more than two countries are included in the analysis, it is also anticipated that the average income of the BRICS countries will converge with the countries that are trading partners.

The panel unit root test eliminates the possibility of misleading regression issues that come from single regression on the pertinent cross-sections in addition to offering results with higher statistical correctness. Conditional convergence hypothesis arises from panel unit root tests that take into account fixed individual effects; absolute convergence hypothesis arises from panel unit root tests that take into account them without fixed individual effects (see Carlino & Mills, 1993; Das et al., 2019).

In addition, the structure of the panel time series data examined in this article, denoted by huge T and small N, where T stands for "time" and N for the total number of cross sections or observations in the panel data framework. Consequently, we also looked at the data's panel unit root tests. As a result, the results are more trust worthy.

To confirm the panel unit roots testing, first-generation panel unit roots tests were employed. Thus,

cross-sectional independence is assumed by the unit root tests of the first generation panel. In this study, we tested the stationarity of panel unit roots using four different methods: the Levin, Lin, and Chu (henceforth LLC; Levin et al., 2002), Im et al.,(2003), and FisherType tests. The Maddala and Wu (1999), tests assumed that the data had a unit root in the model Pesaran, Shin, and Im (henceforth IPS). However, an alternative hypothesis statement was distinct. Assuming the alternative hypothesis, the tests by Maddala and Wu (1999), LLC (2002), IPS (2003), and Fisher Type assume that a portion of the panels is stationary. Additionally distinguished are the IPS (2003) and Fisher Type tests, which are similar to the Maddala and Wu(1999) tests. The ADF were utilized to estimate the aggregate p-value for each time series unit root test, and the Maddala and Wu (1999), test was used to average the panel over each unit π . In contrast, ADF or PP were applied to every panel. The three tests listed above may reject the unit roots null hypothesis even in cases when one series was stationary.

As an illustration of this, consider the following equation :

$$Z_{it} = \lambda_{it} + \pi_{it} + \omega_{it} \dots\dots\dots(3)$$

Here π_{it} represents a random walk, that is, $\lambda_{it} = \lambda_{ijt-1} + \mu_{it}$ and ω_{it} and ∞_{it} are zero mean i.i.d. normal errors.

Analysis of Empirical Results

Intra-trade Results

The computation of intra-Bloc income convergence among the member countries based on intra-trade volume is shown in (Table -3). Essentially, the BRICS countries are grouped according to the disparity in their GDP per capita. Birth rates of intra-group trade blocs or post-BRICS economic blocs ($\pi^1 + \pi^2 < 0$) show the negative sign (see Table- 3). This implies that convergence has been observed. The coefficient is not statistically significant, though. In addition, the pre-BRICS coefficient has a negative value ($\pi^1 < 0$) , and this confirms that convergence is taking place in the pre-BRICS scenario. . However, the post-bloc formation ($\pi^2 > 0$) the size is extremely little and statistically negligible, and the coefficient shows a positive sign. Convergence is generally occurring in the pre-BRICS context. Consequently, we will need to wait a few more years to see the income convergence in connection to trade in order to collect data indicating convergence among the BRICS states in the post-BRICS alliance. Additionally, trade integration contributed to the reduction of the wealth gap among the BRICS countries even prior to the formation of the organization.

Export-based Results of BRICS Countries

An examination of each country's trade with its principal trading partners has been done in order to monitor the effects of trade liberalization on the BRICS economies. Between1990 and 1992, almost all of the BRICS economies liberalized their trade policies, with the exception of China, which started doing so in 1979. As a result, we decided to use it in the year 1991 as the cutoff year for anonymity. In 2010, the BRICS economic union came into full force. Consequently, beginning 2010, we have incorporated an intervention dummy variable in the post-BRICS phase to examine the pace of integration of the BRICS economies with the global economy.

Import-based Results of BRICS Countries

The import-based group results for the BRICS nations revealed that (Table -2), pre-BRICS bloc coefficient is trending downward.

$$(\hat{\pi}^1 < 0);$$

The data indicates that the economies of all the BRICS countries, with the exception of Brazil and Russia, are showing signs of convergence.

Table1.Results shows of Intra-BRICS Nations.

Treatment country	Period of study	$(\hat{\pi}^1)$	$(\hat{\pi}^1 + \hat{\pi}^2)$	$(\hat{\pi}^2)$
Intra- BRICS	1991-2022	-0.028***	-0.003	0.01

Source of Data : calculated by authors

Note : At the 1% and significance levels, respectively, are indicated by ***.

Table-2: Results is based on of Export-based BRICS Nations.

Treatment country	Period of study	$(\hat{\pi}^1)$	$(\hat{\pi}^2)$	$(\hat{\pi}^1 + \hat{\pi}^2)$
Brazil	1991-2022	-0.022***	-0.000***	0.015***
Russia	1991-2022	-0.024***	0.000***	0.018***
India	1991-2022	0.976***	-0.000***	0.007***
China	1991-2022	-0.025***	-0.000***	-0.001***
South Africa	1991-2022	-0.020***	-0.000***	0.003***

Source of Data: Authors Calculations

Note: Significance at 1% level is indicated by***, respectively.

Disparity with important import allies from 1991 until 2020. Beneficial outcomes are also demonstrated by the post-BRICS bloc coefficient sign ($\hat{\pi}^2 > 0$); This shows that the economies of the other BRICS countries—aside from the first two—are separating, despite the economies of Russia and India BRICS countries converging with important import partners. Nevertheless, analyses are available because the magnitudes of the coefficients vary from small to high. This indicates that, aside from Brazil and South Africa, the economies of the BRICS are approaching large import partner countries in a similar manner, whereas those of the latter two are following different paths shows that post-BRICS bloc formation coefficients are negative ($(\hat{\pi}^1 + \hat{\pi}^2) < 0$).

Panel Unit Roots Tests Analysis Results

Tests of panel unit roots have been used to identify the stochastic convergence process. Applying the test, we ran the tests both with and without an intercept to ascertain the presence of absolute convergence, sometimes referred to as the "catching-up process," and conditional convergence. The income differential (or gap) data contains a unit root, which is why the findings are also computed at the initial difference. The data's homogeneity has thus been examined at first difference. ADF and panel unit roots tests of stationary, among other unit root tests, are shown in (Tables:1-3) with their respective results. The series became stationary at first difference order, as indicated by the results of the ADF individual unit root test (Table-3), while the panel stationary or panel unit root test indicated that the series was stationary at the level and first difference. Therefore, compared to individual unit root testing, panel unit root or stationary tests are more successful. Moreover, employing panel unit root tests on intra-bloc findings, absolute and conditional convergence were identified. That is why the BRICS nations are catching up to their trading partners throughout the

course of the period (refer to Table-2).

Panel unit root tests conducted on export-based groups, however, showed that all import-based groups emerged with absolute convergence, whereas all other groups—aside from the Indian example—showed conditional convergence. Export-oriented groups were therefore falling behind the BRICS countries in the post-liberalization era (see Table -3). On the other hand, conditional and absolute convergences were observed for very import-based group according to panel unit root tests.

Table-3. Results of Export-based Groups by Panel Unit Roots Test

Random Walk								
Country Group	LLC		MW		IPS		Hadri	
	At Level	At 1st Diff.	Level	At 1st Diff.	At Level	At 1st Diff.	At Level	At 1st Diff.
Brazil	-2.81***	-4.88***	31.76***	69.59***				
India	-10.31***	-8.12***	167.66***	122.92***				
China	-11.84***	-4.35***	172.43***	60.71***				
Russia	-5.52***	-22.37***	86.01***	522.31***				
South Africa	-7.89***	-4.84***	163.71***	66.15***				
Intercept only								
Brazil	-2.21***	-5.26***	7.02	65.11***	1.14	-5.42***	37.67***	2.15**
India	-0.93	-0.11	18.53	11.91	2.05	2.78	43.01***	43.53***
China	-3.38***	-6.07***	29.51***	67.64***	-1.98	-5.79***	35.84***	2.92***
Russia	-3.61***	-19.81***	57.74***	577.31***	-0.88	-23.80***	42.09***	-1.25
South Africa	0.23	-6.34***	4.91	110.67***	3.81	-7.24***	47.15***	6.25***
Intercept and trends								
Brazil	-1.81**	-4.15***	24.01**	48.45***	-1.24	-4.05***	14.76***	6.27***
India	-2.42***	-2.05**	47.96***	41.76***	-2.64***	-2.21***	22.84***	21.68***
China	-1.42*	-5.20***	14.59	63.05***	0.13	-5.24***	16.95***	2.97***
Russia	-1.42*	-17.05***	84.95***	521.65***	4.07***	-23.82***	12.23***	0.24
South Africa	-1.24*	-5.93***	16.57	97.65***	0.21	-6.24***	25.79***	9.42***

Source of Data : authors calculations.

Note :- Here the symbol, **, and*** indicate significance at 10%, 5%, and 1% levels, respectively, and the values are from the statistical test.*

Conclusion

The main goal of this research paper was to examine the convergence of trade and per capita income for the BRICS countries. The intra-bloc influence and the impact of major trading partners on the per capita income of the nations have been examined in relation to trade's effects on convergence rates using the single difference technique. The convergence statistics between the BRICS nations and their principal trading partners were calculated from 1991 to 2022, the post-trade liberalization period of the BRICS nations. The BRICS countries converged at that time, the paper had been indicated the results. However, the data concerning the formation of the post-BRICS economic bloc suggests a very small relationship.

Every country in the BRICS group had a different outcome from the post-trade liberalization analysis. One indication that the Chinese economy is convergent in the fact that, unlike the other BRICS economies, all of them have diverging economies when it comes to their main export partner nations. The economies of all the BRICS, with the exception of South Africa and Brazil,

are, nevertheless, convergent with important import partner countries, indicating a divergence as well. In this concerned the panel unit roots tests on intra-bloc groups validate both conditional convergence and absolute convergence (catching up during the period). While the results for the other export-based groups—aside from the Indian instance—show conditional convergence, all export-based groups exhibit absolute convergence. All import-based groups appear to exhibit both conditional and absolute convergence, according to the results of the BRICS import-based groups. Following liberalization, the BRICS countries are currently catching up to export- and import-based companies. In conclusion, the study supports Michel Temer, the president of Brazil, when he officially announced, "BRICS countries aim to achieve economic convergence on these issues." Xinhua, reported in the year 2017 in this concerned scenario.

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