

From Inflows to Outcomes: Illuminating the FDI-Macro Relationship in BRICS Economies

Shripad Marathe¹, Sanjeeta Parab², Prachi Premanand Kolamkar² and Vishal Gaonkar²

¹Swami Vivekanand Vidyaprasark Mandal's College of Commerce.

²Goa Business School, Goa University.

Abstract: This study empirically analyzes the long-term relationship between Foreign Direct Investment (FDI) and key macroeconomic variables in BRICS countries. Employing a robust ARDL co-integration methodology, the research examines the interplay between FDI and variables such as Gross Domestic Product (GDP), inflation, interest rates, exchange rates, foreign exchange reserves, and industrial production covering the period from March 31, 1999, to March 31, 2022. The findings reveal a significant and enduring equilibrium relationship between FDI and the studied macroeconomic variables. Notably, Brazil and India experience positive spill over effects, as higher FDI inflows correspond to increased exchange rates, GDP, inflation, and interest rates. However, in China and South Africa, although the relationship is positive, statistical significance is not observed. The BRICS economies are currently navigating various challenges on the international front. In light of these challenges, the study highlights the potential benefits of embracing more liberal policies towards Foreign Direct Investment (FDI) to foster growth and overall development in these countries.

Keywords: BRICS, Macro-economic variables, FDI, ARDL, Cointegration, Error Correction Model (ECM)

JEL classification: F15, O19, O24, P45.

INTRODUCTION

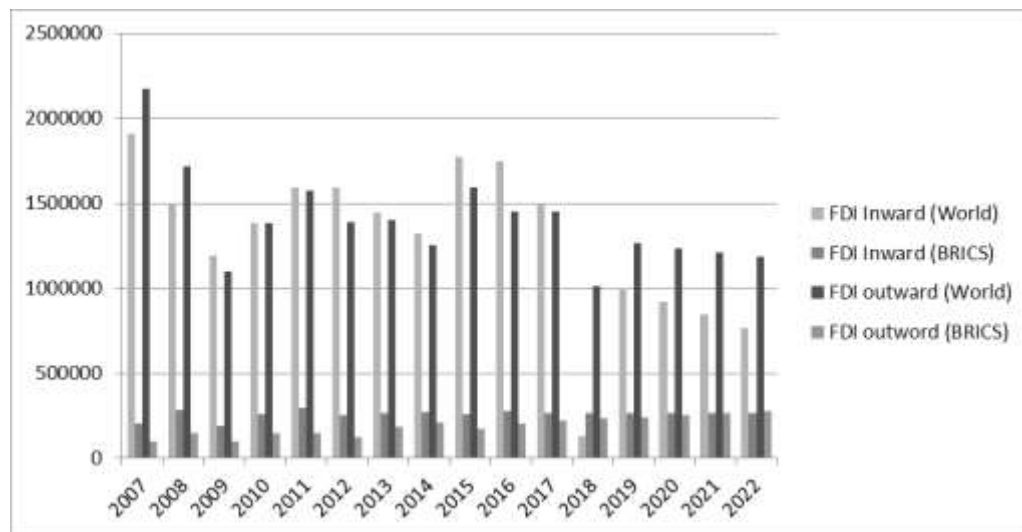
Foreign Direct Investment (FDI) plays a vital role in driving economic growth by bringing in capital, technology, managerial expertise, and access to new markets. It stimulates domestic industries, creates employment, and enhances productivity. Developing countries are increasing their investments, while developed countries seek new markets with cheap labour and high profits. FDI complements domestic investment, improves technology and managerial skills, and enhances export competitiveness. FDI has positive spillover effects, contributes to economic growth, and is crucial for global economic integration. According to the UNCTAD report 2019, Trade and Development showed an average annual growth in FDI over 10% immediately after Global Financial Crises.

Several empirical studies have explored the relationship between FDI and economic growth, emphasizing the role of factors such as local financial markets, human capital, domestic investment, and technological diffusion (Alfaro et al., 2004; Borensztein et al., 1998b). FDI has positively affected host economies, including complementarity with domestic investment (Girma et al., 2004) and spillover effects leading to productivity gains (Haddad & Harrison, 1993). Carkovic and Levine (2002) examine whether FDI accelerates economic growth and identify the channels through which this

acceleration occurs. Their research highlights the potential positive effects of FDI on host economies, emphasizing the importance of understanding these channels. Multinational corporations play a significant role in the interplay between trade, FDI, and firm organization, which is crucial for economic growth (Helpman, 2006). The impact of FDI on economic growth is also influenced by democratic governance (Jensen, 2003) and has potentially positive effects on export-oriented economies (Ram, 1987).

Analyzing the impact of FDI on the BRICS economies (Brazil, Russia, India, China, South Africa) is important as each country has unique characteristics attracting investment. China and India were the fastest-growing economies in 2018 but experienced a loss of growth momentum in 2022 due to trade tensions. Brazil's economy contracted due to recessions, while South Africa showed slow growth. Russia benefited from high oil prices. Among the Emerging economies, China and India were the fastest growing economies of 2018 and have shown signs of loss in growth momentum in 2022 due to a sharp fall in India's GDP growth estimates to 5.8 percent in the first quarter of 2022. Similarly, in China, it fell from 6.6 percent to 6.4 percent in the same quarter because of trade tension with the United States. In contrast, the Brazilian economy shrank by 0.2 percent in the same quarter because of the recessions of 2015-16 and also due to the inability to increase the production output. In the case of South Africa and Russia, South Africa has shown the slowest growth and lowest per capita GDP since 2012, but Russia, which benefited from the high level of Oil Prices and increased GDP from 1.6 percent to 2.3 percent significantly.

*Address correspondence to this author at the Goa Business School, Goa University, India; E-mail: prachi.kolamkar@unigoa.ac.in



Source: Authors Compilation from the World Investment Report(2007-2022).

Moreover, recognizing the role of FDI in global economic integration is essential. The BRICS countries are actively engaged in the global economy, and FDI plays a crucial role in their integration. By studying the impact of FDI, policy-makers can understand the links between their economies and global markets, analyze the implications of international investment flows, and develop strategies to leverage globalization for their economic benefit. In summary, studying the impact of FDI on the BRICS economies provides policy-makers with valuable insights into its contribution to economic development, helps attract investment, guides policy formulation, supports sectoral analysis, and facilitates global economic integration. Such knowledge is crucial for making informed decisions, fostering sustainable economic growth, and enhancing the competitiveness of the BRICS economies.

With this background, we delve into the empirical examination of the intricate relationship between FDI and macroeconomic variables, covering the period from March 31, 1999, to March 31, 2022. The paper is structured into five cohesive sections. Section 1 offers an insightful background to contextualize the study. Building upon this foundation, Section 2 provides a comprehensive review of the existing literature on FDI and macroeconomic variables. In Section 3, we elaborate on the employed data sets and research methodology, ensuring robustness in our analysis. Section 4 presents the empirical results, unveiling significant findings. Lastly, Section 5 draws the study to a close, encapsulating key conclusions from our investigation.

LITERATURE REVIEW

In the past, there have been many remarkable studies on the impact of FDI in causing economic growth. Neoclassical Growth models as well as Endogenous Growth models are the foundation for the majority of empirical research on the FDI-growth link (Ozturk, 2007;Felipe, 1999;Blomström et al., 1996;Borensztein et al., 1995a). There is a contradicting viewpoint on the effect of FDI on overall economic growth, i.e., it can either be positive (Toone, 2012; Alfaro et al., 2010; Lee & Chang, 2009;Aitken et al.,1997) or negative (Chang & Mendy, 2012;Griffin, 1970;Singer, 1950;

Chaudhury et al., 2020). According to the modernization theory, FDI positively increases capital investment and knowledge transfer; on the contrary, dependency theory states that FDI leads to the creation of monopolies (Chaudhury et al., 2020). Some studies recognized that FDI inflows boost a country's economic performance due to knowledge transfer and spillover effectiveness (Blomstrom et al.,1992). The analysis by Tintin (2012) reaffirmed the link between FDI and growth, but it also confirmed that developing countries are prone than developed or least developed nations to experience this relationship. Acaravci and Ozturk (2012) examined whether FDI and export had a causal link with economic growth in four of ten European nations using quarterly data from 1994 to 2008. They assessed the impact of FDI and exports on economic growth and concluded that FDI is an important factor in enhancing economic growth in those countries. Furthermore, Ferrer and Zermeno (2015) considered the short-term and long-term relationship between FDI and GDP for Mexico, China, Brazil, Peru, and South Korea, of which a causal relationship was witnessed only in China. Jun (2015) studied the effects of FDI on SAARC countries' annual panel data from 1960 to 2013 (Afghanistan, Bangladesh, India, Nepal, Maldives, Pakistan, Sri Lanka, and Bhutan). The Granger causality results showed that FDI and real GDP had a bi-directional relationship. Due to the constant growth output during this period, SAARC countries attracted greater foreign direct investment.

Khaing (2016) aims to delve into the trends in foreign divestment and how they affect the economy of Myanmar. The ARDL test demonstrates that real GDP and foreign divestment cointegrate. The findings indicate that foreign divestment has a detrimental effect on Myanmar's economic growth over the long and short terms. While analyzing the relationship between human capital and economic growth in Myanmar, this study also discovered that it was negatively significant. Joo (2022) considered the BRICS country from 1987-2018 to study the effect of FDI inflow on economic growth. The results showed that FDI only had a substantial growth influence in the presence of host country characteristics, not on the economic growth of BRICS as a whole. Herzer (2012) studied the manner in which FDI affects 44 de-

veloping nations' GDP growth and concluded that FDI, on the whole, has a negative effect on growth. Still, there are significant regional variations in the impact. Another group of studies revealed an insignificant association between FDI and economic growth in Russia (Ledyeva & Linden, 2006). Similar results were found by Gunby et al. (2017) that FDI is not a key driver of growth in either China or Russia (Lian & Ma, 2013) in the case of the western region of China and (Shahzad et al., 2019) in case of Brazil.

A substantial body of literature supports the hypothesis that the growth-enhancing effects of FDI depend on certain characteristics present in the host economy (Borensztein et al., 1998b; Balasubramanyam & Mahambare, 2003; Carkovic & Levine, 2002; Durham, 2004). FDI from advanced economies improves the environmental performance of both high- and lower-middle-income and low-income host nations (Adeel-Farooq et al., 2021). However, the host economies' environmental performance is negatively impacted by FDI from low- and lower-middle-income countries.

Additional literature on developing countries has quoted mixed results. In accordance with Herzer (2012), FDI generally has an adverse impact on GDP growth in developing countries. Time-series data were utilized by Lian and Ma (2013) to assess the connection between FDI and economic growth in China's Western region. The results show that FDI inflows do not cause economic growth in the recipient economies and that FDI is not much impacted by FDI growth. The impact of FDI on per capita growth in Russia was examined by Ledyeva and Linden (2006). The results of the GMM technique suggest that domestic investment, exports, and the early stages of economic development during the study period account for the majority of the increase and that FDI did not significantly contribute to economic growth. Agrawal (2015) undertook research on the BRICS nations between 1989 and 2012 and concluded there is a sustained link between foreign direct investment and economic growth. Haydaroglu (2016) examined how economic freedom (EF), foreign direct investment (FDI), and economic growth have related in the five BRICS nations—Brazil, Russia, India, China, and South Africa during the period 1995–2013. Panel data analysis is conducted to test the data. The findings show that the EF index is strongly and favourably related to economic growth. Additionally, the

come to respond favourably to FDI. Similar results were found by Nistor (2015) and Maryam and Mittal (2019).

As FDI inflows and their stimulation in the economies have drawn the attention of many studies. The existing literature, however, mostly focuses on the relationship between FDI, GDP, trade openness, and the determinants of FDI for a distinct period and diverse set of nations. Studies that focus on the BRICS nations have tried to consider how macroeconomic factors affect FDI inflows. However, the present study attempts to demystify the impact of FDI on the key macroeconomic variables in BRICS countries.

METHODS

The data consist of quarterly observations from 31st March 1999 to 31st March 2022 for the five developing Emerging economies, namely BRICS (Brazil, Russia, India, China, and South Africa). The required data set of selected countries, as presented in Table 3.1, has been obtained from the Bloomberg database, South African Reserve Bank, Central Bank of Brazil, the National Bureau of Statistics of China, Central Bank of Russian Federation, Reserve bank of India and various reports published by the Central bank of respective countries. Drawing from existing literature, a comprehensive set of variables including Gross Domestic Product (GDP), Inflation (INF), Interest rates (IR), Exchange rate (ER), Foreign Exchange Reserve (FER), and Industrial Production (IP) has been identified as potential determinants of FDI inflow. In light of this, estimation models are proposed as follows:

$$\ln(\text{FDI}_t) = \alpha + b_1 \ln(\text{GDP}_{t-1}) + b_2 \ln(\text{FER}_{t-1}) + b_3 \ln(\text{INF}_{t-1}) + b_4 \ln(\text{ER}_{t-1}) + b_5 \ln(\text{IR}_{t-1}) + b_6 \ln(\text{IP}_{t-1}) + e_t \dots \text{Eq. (1)}$$

RESULTS

Based on equation (1), foreign direct investment (FDI) is determined by several factors, including gross domestic product (GDP), exchange rate (ER), foreign exchange reserves (FER), inflation (INF), industrial production (IP), and interest rates (IR). It is inferred that long term effect might be seen between FDI and all Macro-economic Variables. To capture the growth effect, double log function is used and estimated, as shown in Eq. (1). Where all the variables are in natural logarithm and ϵ narrates error term of long term growth model Eq (2).

$$\Delta \ln(\text{FDI}_t) = B_0 + \sum_{i=1}^t B1 \Delta \ln(\text{FDI}_{t-i}) + \sum_{i=0}^t B2 \Delta \ln(\text{GDP}_{t-i}) + \sum_{i=0}^t B3 \Delta \ln(\text{FER}_{t-i}) + \sum_{i=0}^t B4 \Delta \ln(\text{INF}_{t-i}) + \sum_{i=0}^t B5 \Delta \ln(\text{ER}_{t-i}) + \sum_{i=0}^t B6 \Delta \ln(\text{IR}_{t-i}) + \sum_{i=0}^t B7 \Delta \ln(\text{IP}_{t-i}) + B_8 e_{t-1} + u_t \dots \text{Eq. (2)}$$

$$\Delta \ln(\text{FDI}_t) = B_0 + \sum_{i=1}^t B1 \Delta \ln(\text{FDI}_{t-i}) + \sum_{i=0}^t B2 \Delta \ln(\text{GDP}_{t-i}) + \sum_{i=0}^t B3 \Delta \ln(\text{FER}_{t-i}) + \sum_{i=0}^t B4 \Delta \ln(\text{INF}_{t-i}) + \sum_{i=0}^t B5 \Delta \ln(\text{ER}_{t-i}) + \sum_{i=0}^t B6 \Delta \ln(\text{IR}_{t-i}) + \sum_{i=0}^t B7 \Delta \ln(\text{IP}_{t-i}) + \alpha_1 \ln(\text{FDI}_{t-1}) + \alpha_2 \ln(\text{GDP}_{t-1}) + \alpha_3 \ln(\text{FER}_{t-1}) + \alpha_4 \ln(\text{INF}_{t-1}) + \alpha_5 \ln(\text{ER}_{t-1}) + \alpha_6 \ln(\text{IR}_{t-1}) + \alpha_7 \ln(\text{IP}_{t-1}) + e_{t-1} \dots \text{Eq. (3)}$$

results demonstrate that FDI is a statistically significant and positively correlated economic growth. Ansaria and Sensarma (2019) studied the impact of Foreign Direct Investment (FDI) and economic freedom on economic growth in the BRICS economies using quantile regression. It is concluded that economic freedom causes GDP per capita in-

In the equation, the symbol Δ represents changes in FDI and the key macroeconomic indicators. The subscript "t-1" indicates the error correction term (ECT). The sign of the coefficient reflects the rate at which FDI aligns with the long-term trend, which is typically anticipated to be negative. (Katrircioglu, 2010).

Table 3.1 An Overview of the Data Description and Variables Used in the Analysis.

Sr.no.	Country	Macro-economic Variables	Time Period	Source	Symbol
1	Brazil	Exchange Rate to US \$	Q1 1999-Q1 2022	Fred Reserve	ER
		Gross Domestic Product	Q1 1999-Q1 2022	OECD	GDP
2	Russia	Inflation	Q1 1999-Q1 2022	Fred Reserve	INF
3	India	Foreign Exchange Reserve	Q1 1999-Q1 2022	Bloomberg	FXR
4	China	Foreign Direct Investment	Q1 1999-Q1 2022	Fred Reserve	FDI
5	South Africa	Interest Rates	Q1 1999-Q1 2022	Fred Reserve	IR
		Industrial Production	Q1 1999-Q1 2022	Bloomberg	IP

Source: Authors Compilation.

4. Empirical Results and Analysis

Table 4.1. Stationary Properties of Data.

Variables	BRAZIL		RUSSIA		INDIA		CHINA		SOUTH AFRICA	
	ADF at level	ADF at First Difference	ADF at level	ADF at First Difference	ADF at level	ADF at First Difference	ADF at level	ADF at First Difference	ADF at level	ADF at First Difference
Exchange Rate (ER)	-1.7249 [0.4149]	-7.1699 [0.0000]	-0.1361 [0.9411]	-7.9871 [0.0000]	-0.3422 [0.9128]	-8.4803 [0.0000]	-1.1454 [0.6939]	-6.0656 [0.0000]	-0.8408 [0.8016]	-6.7393 [0.0000]
Foreign Direct Investment (FDI)	-0.7540 [0.8261]	-9.1762 [0.0000]	-1.6359 [0.4596]	-14.5632 [0.0000]	-1.0082 [0.7469]	-9.0696 [0.0000]	-0.7066 [0.8380]	-8.9821 [0.0000]	-4.6891 [0.0000]	-
Foreign Exchange Reserve (FER)	-0.7206 [0.8483]	-12.0718 [0.0000]	-4.1472 [0.0000]	-	-2.5472 [0.1085]	-5.2090 [0.0000]	-2.6201 [0.0900]	-3.1976 [0.0230]	-0.9719 [0.7500]	-3.3028 [0.0181]
Gross Domestic Product (GDP)	-3.8593 [0.0000]	-	-0.4542 [0.8935]	-8.8422 [0.0000]	-1.0671 [0.7251]	-3.0469 [0.0350]	-2.0717 [0.2566]	-8.2649 [0.0000]	-5.0507 [0.0000]	-
Inflation Rate(INF)	-1.3981 [0.5790]	-3.4806 [0.011]	-2.4159 [0.1409]	-10.6207 [0.0000]	-2.1839 [0.2138]	-15.3609 [0.0000]	-1.9578 [0.3040]	-6.4186 [0.0000]	-0.5318 [0.8784]	-4.1792 [0.0000]
Interest Rate (IR)	-2.4276 [0.1376]	-4.4438 [0.0000]	-2.8709 [0.0534]	-8.4968 [0.0000]	-2.0894 [0.2495]	-10.6466 [0.0000]	-3.0103 [0.0382]	-8.7221 [0.0000]	-1.8508 [0.3537]	-5.4232 [0.0000]
Industrial Production (IP)	-2.1561 [0.2025]	-6.2890 [0.0000]	-2.3570 [0.1573]	-6.4137 [0.0000]	-1.2012 [0.6704]	-6.4518 [0.0000]	-8.6706 [0.0000]	-	-4.3360 [0.0008]	-

Note: The numerator represents the t-statistics, while the denominator [] indicates the associated p-values for assessing statistical significance.

Table 4.2. Critical Values for the ARDL Modelling Approach.

K=6	0.10		0.05		0.01	
	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
F ₀	2.33	3.25	2.63	3.62	3.27	4.39

F ₁	2.53	3.59	2.87	4	3.6	4.9
F ₂	1.75	2.87	2.04	3.24	2.66	4.05

Note: The F-statistics F₀, F₁, and F₂ correspond to the Model with Unrestricted Intercept and Restricted Trend, Unrestricted Intercept and Trend, and Unrestricted Intercept and No Trend, respectively. K denotes the regressors in the ARDL model.

Source: Narayan (2005) for F-statistics.

Table 4.3 Bounds Tests for Level Relationships.

Variables	With Deterministic Trends		Without Deterministic Trends	
	F ₀	F ₁	F ₂	Conclusion
F (lnFDI/lnER,lnForex,lnGDP,lnInf,lnIP,lnIR)				
Brazil	2.71b	2.98b	2.08b	H ₀ Rejected
Russia	1.24a	1.40a	1.46a	H ₀ Accepted
India	2.42b	2.76b	2.78b	H ₀ Rejected
China	2.24a	2.53b	1.07a	H ₀ Rejected
South Africa	4.28c	4.75c	2.31b	H ₀ Rejected

Note: The Schwartz Criteria (SC) were used to select the number of delays required for the cointegration test. F₀, F₁, and F₂ are the F-statistics of the Models respectively; 'a','b','c' Indicates that the statistic is below the lower bound, between the lower and upper bounds, or over the upper bound.

DISCUSSION

In Table 4.1, the stationary properties of country-specific macroeconomic variables are reported. The Augmented Dickey-Fuller test was used to test the null hypothesis of unit root presence. The results show that all variables, except Gross Domestic Product in the case of Brazil, are stationary at first difference. In Russia, India, and China, we have a similar result except for some variables stationary at level i.e. Foreign Exchange Reserve in Russia and Industrial Production in China. But interestingly in South Africa, we noticed that many Macro-economic variables reject the null at level i.e. Foreign Direct Investment, Gross Domestic Product and Industrial Production and remaining variables at first difference. The findings of the Unit root test suggest beginning with Bound test and ARDL modelling.

Bounds tests and conditional ECMs

After identifying the ARDL approach using the Unit root test, a set of unrestricted error correction models must be built. Because, as suggested by the Unit root test, all variables are integrated at I(0) or I(1), the bound test can now be used to investigate the long term equilibrium connection with its regressors in Eq.(2). The critical values for F-tests with small samples are obtained from Narayan (2005) and are shown in Table 4.2.

Table 4.3 provides the findings of the bound test for a level relationship between FDI and its regressors, as explained in

Equation (1). The bound test was carried out on three different models which are restricted deterministic trends, unrestricted deterministic trends and without deterministic trends. All the scenarios will present unrestricted intercept Pesaran et al (2001).

The analysis presented in Table 4.3 demonstrates the application of the ARDL modeling approach to establish level relationships in the model, excluding Russia. The results of the bound F-test suggest that the null hypothesis in Equation (3) can be rejected. Among the BRICS countries, except for Russia, all macroeconomic factors exhibit a significant long-term association with FDI as the dependent variable. Consequently, the ARDL method is used to calculate the long-run coefficient, while conditional ECMs are employed to investigate the short-run coefficient and ECTs for each country.

Following the presence of a co-integration relationship among the variables considered, we must ensure the reliability and stability of the model with serial correlation test and plot of CUSUM (Cumulative Sum of Recursive Residuals) before moving to estimate long and short run coefficients. To investigate the potential presence of serial correlation within each model, we employ the Breusch-Godfrey Serial Correlation LM Test. The test is conducted under the assumption of the null hypothesis of no serial correlation. If F-statistic is more than 1 percent, 5 percent and 10 percent, we do not reject the null. Table 4.4 suggests that there is no autocorrelation in the given model because F statistics are more than acceptable levels. Whereas for the Stability test, we have

used CUSUM plots for the estimated ARDL model. The plot explains that CUSUM statistic lies between the 5% critical

bound, implying that the selected ARDL model is stabled and can be used for further investigation.

Table 4.4. Estimation of ARDL Models and Robustness Analysis.

Test Statistics F-Statistics	Dependent Variable			
	Brazil ARDL (1, 4, 0, 1, 1, 2, 0)	India ARDL (1, 0, 0, 1, 1, 0, 0)	China ARDL (1, 4, 0, 1, 1, 2, 0)	South Africa ARDL (1, 0, 0, 1, 1, 0, 0)
Serial Correlation*	0.9336 [0.4511]	0.9231 [0.4559]	0.0476 [0.9956]	0.8746 [0.5466]

*The residual serial correlation Lagrange multiplier test. Figures in parentheses represent p-values. The Schwarz Bayesian Criterion was used to select the ARDL model.

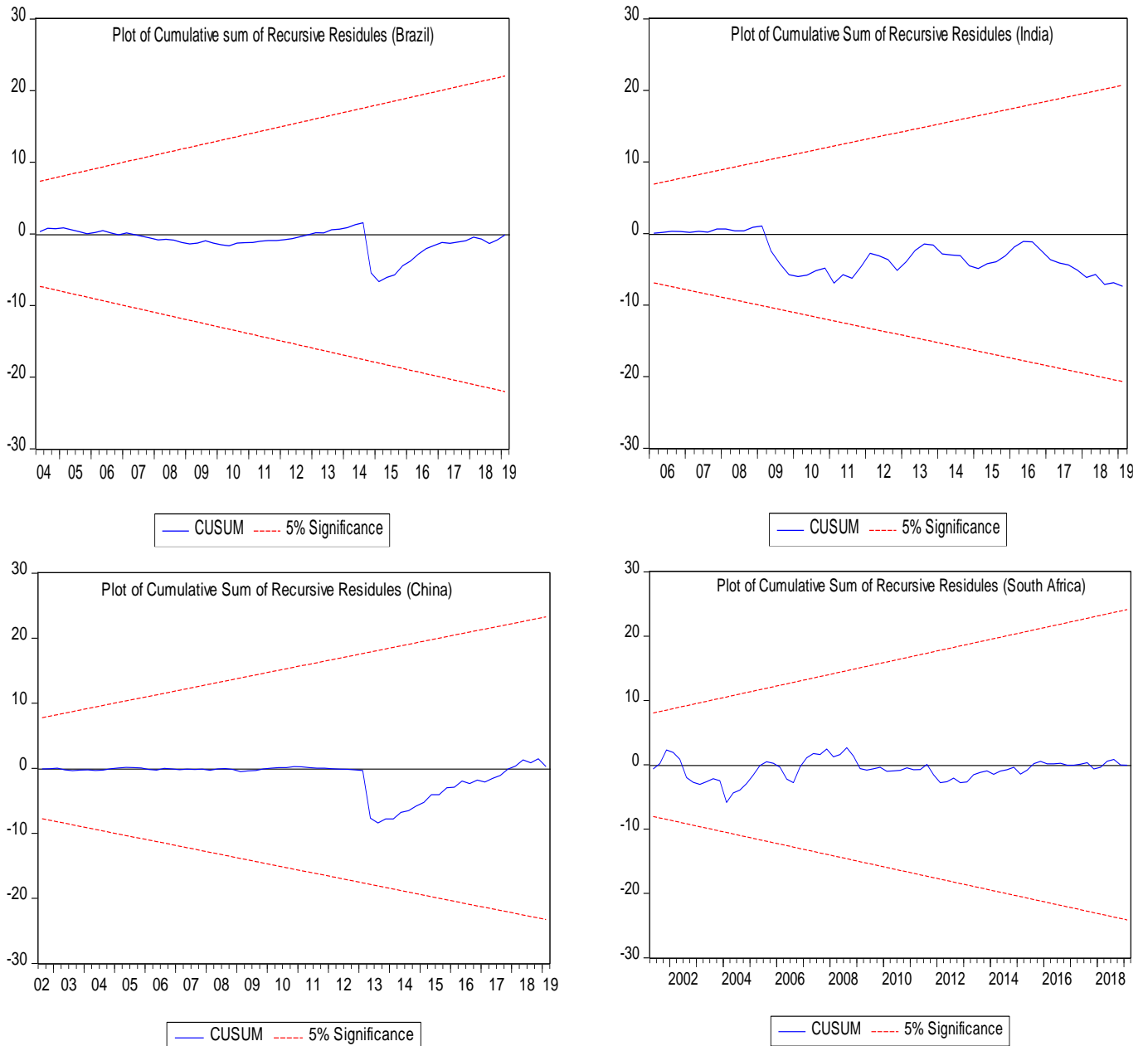


Fig. (2). CUSUM plot for India, China, Brazil and South Africa (FDI as a dependent variable).

Table 4.5. Level Coefficients in the Long-Run Models Through the ARDL Approach.

	Dependent Variable	Regressors						
	lnFDI	lnER	lnForex	lnGDP	lnInf	lnIP	lnIR	Intercept
Brazil	-	-5.23*	-1.71	29.84**	-83.26*	-2.60	-0.09**	-188.03***
India	-	10.59***	1.47	-10.42	-86.68*	-3.68	2.12	-376.57**
China	-	3.28	1.07	-0.59	-7.21	-0.05	0.14	30.68
South Africa	-	-0.87	3.35	39.71	-6.25	-17.07	-4.18	-1.12

Source: Authors' own calculations.

Significance Levels Denoted by *, **, and *** for Statistical Significance at 1%, 5%, and 10% Levels, Respectively.

Table 4.6. Error Correction (Conditional) Models through the ARDL Approach.

Panel (A) Brazil				Panel (B) India			
Dependent Variable: FDI (1, 4, 0, 1, 1, 2, 0) ^a selected based on Schwarz Bayesian Criterion				Dependent Variable: FDI (1, 0, 0, 1, 1, 0, 0) ^a selected based on Schwarz Bayesian Criterion			
Regressor	Coefficient	Standard Error	T-Test	Regressor	Coefficient	Standard Error	T-Test
FDI _{t-1}	0.5397	0.0941	5.7308	FDI _{t-1}	0.6800	0.0802	8.4753
GDP	29.8434	13.9215	2.1436	ER	10.5941	5.6741	1.8670
GDP _{t-1}	12.6784	20.6255	0.6146	FOREX	1.4773	1.5642	0.9444
GDP _{t-2}	5.2652	23.1094	0.2278	GDP	-10.4201	8.5979	-1.2119
GD _{t-3}	-0.4329	22.6752	-0.0190	GDP _{t-1}	26.8347	9.9330	2.7015
GDP _{t-4}	-37.9653	14.5973	-2.6008	INF	-86.6816	17.1187	-5.0635
FOREX	-1.7138	1.1415	-1.5012	INF _{t-1}	47.3439	15.5557	3.0435
ER	-5.2388	1.8782	-2.7892	IP	-3.6840	7.2454	-0.5084
ER _{t-1}	5.4745	2.4179	2.2641	IR	2.1257	1.7447	1.2183
INF	-83.2695	27.7887	-2.9965	C	-376.5400	148.0308	-2.5436
INF _{t-1}	64.7163	24.2344	2.6704	ECT _{t-1}	-0.3199	0.0597	-5.3575
IP	-2.6093	11.2614	-0.2317				
IP _{t-1}	-11.8897	14.4045	-0.8254				
IP _{t-2}	23.6326	10.0098	2.3609				
IR	-2.0961	0.9255	-2.2645				
C	-188.0311	93.1158	-2.0193				
ECT _{t-1}	-0.4609	0.0786	-5.8514				
Adj. R2= 0.9387, S.E. of Regr. = 1.39, AIC = 3.68, SBC= -4.17, F-stat. = 78.70, F-prob. = 0.000, D-W stat. =1.99				Adj. R2= 0.9554, S.E. of Regr. = 1.73, AIC = 4.05, SBC=4.35, F-stat. =189.47, F-prob. = 0.000, D-W stat. =2.23			

^a Denotes p lag structures in the model.

Table 4.5 provides the level coefficient in the long term periods. In Brazil, the long-term coefficient of exchange rate and inflation is as expected -5,23 and -83,26 respectively, which are statistically significant at the level of significance of 1 per cent. Whereas GDP and Interest rate i.e. 29.84 and -0.09

respectively, are significant at 5 percent. In the case of India, we can see similar results where the Exchange rate with 10.59 is significant at 10 percent and Inflation with -86.68 significant at 1 percent, whereas all other variables coefficient is positive but not significant. In contrast to China and

Table 4.6a. Error Correction (Conditional) Models through the ARDL Approach (Continued).

Panel (C) China				Panel (D) South Africa			
Dependent Variable: FDI (1, 4, 0, 1, 1, 2, 0) ^a selected based on Schwarz Bayesian Criterion				Dependent Variable: FDI (1, 0, 0, 1, 1, 0, 0) ^a selected based on Schwarz Bayesian Criterion			
Regressor	Coefficient	Standard Error	T-Test	Regressor	Coefficient	Standard Error	T-Test
FDI _{t-1}	0.8725	0.0607	14.3602	FDI _{t-1}	-0.6186	0.1109	-5.5744
CER	3.2879	4.9828	0.6598	FDI _{t-2}	-0.3909	0.1248	-3.1306
FOREX	1.0786	0.7056	1.5286	FDI _{t-3}	-0.4154	0.1108	-3.7478
GDP	-0.5963	1.0105	-0.5901	ER	-6.7387	12.3102	-0.5474
INF	-7.2121	6.5757	-1.0967	GDP	59.0155	71.2291	0.8285
IP	-0.0534	0.3520	-0.1519	INF	-2.8986	14.9077	-0.1944
IR	0.1483	1.9431	0.0763	IR	-8.2954	13.6791	-0.6064
C	30.6881	32.4339	0.9461	FOREX	2.4673	14.7968	0.1667
ECT _{t-1}	-0.1274	0.0433	-2.9404	IP	-10.9496	14.6440	-0.7477
				C	-1.7861	1.8638	-0.9583
				ECT _{t-1}	-0.4669	0.0998	-14.6925
Adj. R2= 0.9384, S.E. of Regr. = 1.58, AIC = 3.84, SBC= 4.08, F-stat. =156.79, F-prob. = 0.000, D-W stat. =2.01				Adj. R2= 0.8706, S.E. of Regr. = 1.73, AIC = 6.05, SBC=7.12, F-stat. =49.77, F-prob. = 0.000, D-W stat. =1.96			

'a' indicates p lag structures in the model.

South Africa, we have similar results where all variables are having a negative or positive coefficient but not significant.

Finally, Table 4.6 and Table 4.6 a provides an estimation of ECM's and ECT's. It is observed that ECTs are negative and statistically significant in all countries, but all ECTs are less than 50%; indicating that there are some important determinants that make FDI react to its long-term equilibrium other than the studied macroeconomic variables.

In Brazil, the estimated ECT is -0.46 ($p < 0.01$) expresses that FDI in Brazil reacts quarterly through channels of all the Macroeconomic variables under study to its long-term equilibrium by 46 per cent adjustment speed. This scenario exhibits similarity to the other countries, as evident from the findings in Table 4.6 and Table 4.6a. South Africa (-0.4669) and Brazil (-0.4602) show the highest estimated error correction terms (ECT), followed by India (-0.3199) and China (-0.1274). The short-run dynamics of the ARDL process are further elucidated in Table 2.6 and Table 2.6a. It is observed that the macroeconomic variables, FDI, and their respective lags demonstrate a mixed reaction, encompassing both positive and negative relationships.

CONCLUSION

This empirical study investigates the long-term relationship between Foreign Direct Investment (FDI) and selected macroeconomic variables in the BRICS countries. The analysis focuses on key indicators such as Gross Domestic Product (GDP), Inflation (INF), Interest Rates (IR), Exchange Rate (ER), Foreign Exchange Reserve (FER), and Industrial Production (IP). By utilizing the robust ARDL co-integration

methodology proposed by Pesaran et al. (2001), the study offers valuable insights.

The findings of the study reveal a significant and stable long-term relationship between FDI and all the examined macroeconomic variables. Specifically, a higher influx of FDI has been observed to correspond with an increase in Brazil's exchange rate, GDP, inflation, and interest rate. Similarly, in India, FDI exhibits a positive association with the exchange rate and inflation. However, the relationship in China and South Africa, although positive, lacks statistical significance. This suggests the presence of other factors or complexities that necessitate further investigation.

These results emphasize the significance of FDI in influencing various macroeconomic aspects within the BRICS countries. The positive impacts on exchange rates, GDP, inflation, and interest rates indicate the potential for FDI to stimulate economic growth and contribute to the overall development of these nations. Nonetheless, the non-significant relationship in China and South Africa highlights the need for a deeper understanding of the underlying dynamics and additional factors at play.

Furthermore, future research should explore the intricate dimensions of FDI's impact on both intra-BRICS and interrelated economies. A comprehensive understanding of the broader implications and dynamics of foreign investment will provide valuable insights for policymakers and researchers. In conclusion, this study's rigorous analysis contributes to reputable publications aiming to inform policymakers and researchers about the nuanced relationship between FDI and macroeconomic variables in BRICS coun-

tries. It underscores the importance of targeted policies to attract FDI and highlights the potential benefits of foreign investment in driving economic growth and development. However, policymakers must carefully consider potential risks and design strategies that ensure a balance between attracting investments and safeguarding national interests. In summary, adopting more liberal policies towards FDI in the BRICS countries holds significant potential for fostering economic growth, technological advancements, competition, and job creation.

REFERENCES

- Acaravci, A., & Ozturk, I. (2012). Foreign direct investment, export and economic growth: Empirical evidence from new EU countries. *Romanian Journal of Economic Forecasting*, 2(2), 52-67.
- Adeel-Farooq, R. M., Riaz, M. F., & Ali, T. (2021). Improving the environment begins at home: Revisiting the links between FDI and environment. *Energy*, 215, 119150.
- Agrawal, G. (2015). Foreign direct investment and economic growth in BRICS economies: A panel data analysis. *Journal of Economics, Business and Management*, 3(4), 421-424.
- Aitken, B., Hanson, G. H., & Harrison, A. E. (1997). Spillovers, foreign investment, and export behavior. *Journal of International Economics*, 43(1-2), 103-132.
- Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: the role of local financial markets. *Journal of international economics*, 64(1), 89-112.
- Alfaro, L., Chanda, A., Ozcan, S. K., & Sayek, S. (2010). Does foreign direct investment promote growth? Exploring the role of financial markets on linkages. *Journal of Development Economics*, 91(2), 242-256.
- Ansaria, M. G., & Sensarma, R. (2019). The Interactive Effect of Foreign Direct Investment and Economic Freedom on Economic Growth in BRICS: A Quantile Regression Approach. *Electronic copy available at: <https://ssrn.com/abstract=3479182>*.
- Balasubramanyam, V., & Mahabare, V. (2003). Foreign Direct Investment in India. *Lancaster University Management School Working Paper 2003/001, Economics Department, Lancaster University Management School*.
- Blomstrom, M., Lipsey, R. E., & Zejan, M. (1992, August). What Explains Developing Country Growth? *NBER Working Paper Series*.
- Blomström, M., Lipsey, R. E., & Zejan, M. (1996). Is Fixed Investment the Key to Economic Growth? *The Quarterly Journal of Economics*, 111(1), 269-276.
- Borensztein, E., Gregorio, J. D., & Lee, J. E. (1995). How Does Foreign Direct Investment Affect Economic Growth? *NBER working paper*.
- Borensztein, E., De Gregorio, J., & Lee, J. (1998). How does foreign direct investment affect economic growth? *Journal of international Economics*, 45(1), 115-135.
- Carkovic, M., & Levine, R. (2002). "Does foreign direct investment accelerate economic growth? *Working Paper, Department of Finance, University of Minnesota, Minneapolis*.
- Chang, C. C., & Mendy, M. (2012). Economic growth and openness in Africa: What is the empirical relationship? *Applied Economics Letters*, 19(18), 1903-1907.
- Chaudhury, S., Nanda, N., & Tyagi, B. (2020). Impact of FDI on Economic Growth in South Asia: Does Nature of FDI Matters? *Review of Market Integration*, 12(1-2), 51-69.
- Durham, J. (2004). "Absorptive capacity and the effects of foreign direct investment and equity foreign portfolio investment on economic growth". *European Economic Review*, 48(2), 285-306.
- Felipe, J. (1999). Total factor productivity growth in East Asia: A critical survey. *The Journal of Development Studies*, 35(4), 1-41.
- Ferrer, C. E., & Zermeño, E. V. (2015). Foreign direct investment and gross domestic product growth. *Procedia Economics and Finance*, 24, 198-207.
- Girma, S., Greenaway, A., & Kneller, R. (2004). Does exporting increase productivity? A microeconomic analysis of matched firms. *Review of International Economics*, 12(5), 855-866.
- Griffin, K. (1970). Foreign Capital, Domestic Savings and Growth in Less Developed Countries. *Bulletin of Oxford Institute of Economics and Statistics*, 32, 99-112.
- Gunby, P., Jin, Y., & Reed, W. R. (2017, February). Did FDI Really Cause Chinese Economic Growth? A Meta-Analysis. *World Development*, 20, 242-255.
- Haddad, M., & Harrison, A. (1993). Are there Positive Spillovers from Direct Foreign Investment? Evidence from panel data for Morocco. *Journal of Development Studies*, 42, 51-74.
- Haydaroglu, C. (2016). The Effect of Foreign Direct Investment and Economic Freedom on Economic Growth: The Case of BRICS Countries. *Research in World Economy*, 7(1), 1-10.
- Helpman, E. (2006). Trade, FDI, and the Organization of Firms. *Journal of economic literature*, 44(3), 589-630.
- Herzer, D. (2012). How Does Foreign Direct Investment Really Affect Developing Countries' Growth? *Review of International Economics*, 20(2), 396-414.
- Jensen, N. M. (2003). Democratic governance and multinational corporations: Political regimes and inflows of foreign direct investment. *International organization*, 3, 587-616.
- Joo, B. A., Shawi, S., & Makina, D. (2022). The interaction between FDI, host country characteristics and economic growth? A new panel evidence from BRICS. *Journal of Economics and Development*, 24(3), 247-261.
- Jun, S. (2015, March). The Nexus between FDI and Growth in the SAARC Member Countries. *Journal of East Asian Economic Integration (JEAI)*, 19(1), 39-70.
- Khaing, Z. Z. (2016). The Impact of Foreign Divestment on Economic Growth in Myanmar: Evidence from ARDL. *Masters thesis, University of Huddersfield*.
- Ledyeva, S., & Linden, M. (2006). Foreign direct investment and economic growth: Empirical evidence from Russian regions. *BOFIT Discussion Papers 17*, 5-34.
- Lee, C. C., & Chang, C. P. (2009, November). FDI, financial development, and economic growth: international evidence. *Journal of Applied Economics*, 12(2), 249-271.
- Lian, L., & Ma, H. (2013). FDI and economic growth in Western region of China and dynamic mechanism: based on time-series data from 1986 to 2010. *International Business Research*, 6(4), 180-186.
- Maryam, J., & Mittal, A. (2019). Foreign direct investment into BRICS: an empirical. *Transnational Corporations Review*, 1-8.
- Nistor, P. (2015). FDI implications on BRICS economy growth. *Emerging Markets Queries in Finance and Business*, 32, 981-985.
- Ozturk, I. (2007). Foreign Direct Investment - Growth Nexus: A Review of the Recent Literature. *International Journal of Applied Econometrics and Quantitative Studies*, 4(2), 79-98.
- Ram, R. (1987). Exports and economic growth in developing countries: evidence from time-series and cross-section data. *Economic development and cultural change*, 36(1), 51-72.
- Shahzad, U., Hussain, M., Qin, F., & Muhamadi, S. (2019). Role of FDI and Foreign Remittances in Boosting and Economic Growth: Evidence from Brazil. *European Online Journal of Natural and Social Sciences*, 8(1), 118-127.
- Singer, H. (1950). The distribution of gains between investing and borrowing countries. *American Economic Review*, 40(2), 473-485.
- Tintin, C. (2012). Does foreign direct investment spur economic growth and development? A comparative study. (Unpublished master's thesis), *Institute of Foreign Studies, Vrije Universiteit Brussel*.
- Toone, J. E. (2012). Mirage in the Gulf?: Examining the Upsurge in FDI in the GCC and its Legal and Economic Implications for the MENA Region. *Emory International Law Review*, 26(2), 678-731.