



Mediating Role of Exchange Rates in FDI-Growth Linkages: ARDL Evidence from Tanzania (1990–2023)

Festo. R. Mmasi^{1*} Mohamed Awadh Mohamed², Jacqueline Peter Temba³

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ABSTRACT

In a quest to examine the interrelationship between macro-economic factors in shaping the country's economic trajectory. This research explores how Foreign Direct Investment and exchange rate movements interact to influence economic growth in Tanzania over the period 1990–2023. Utilizing the Autoregressive Distributed Lag (ARDL) model, the research investigates effects on both short-run and the potential for long-run cointegration among the variables. The study utilizes time-series data sourced from the World Bank, with all variables transformed into natural logarithms to ensure linearity and normality of the variables. The results reveal that exchange rate fluctuations significantly impact GDP in the short run, with immediate depreciation exerting a negative effect, while lagged depreciation contributes positively, suggesting a delayed competitiveness effect. Conversely, FDI does not exhibit a statistically significant short-run impact on GDP, and the ARDL bounds test indicates the absence of a robust long-run equilibrium relationship among the variables. These findings imply that while exchange rate management is crucial for short-term macroeconomic stability, the effectiveness of FDI in promoting growth depends on the country's absorptive capacity and structural readiness. The study recommends targeted policies aimed at stabilizing exchange rates, improving institutional quality, and aligning FDI with national development priorities to fully harness its growth-enhancing potential.

Keywords: Foreign Direct Investment, Exchange Rate, Economic Growth, ARDL, Tanzania, Macroeconomic Stability, Time-Series Analysis

JEL codes : F21, F31, O55.

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^{1*} Corresponding author,  Institute of Rural Development Planning, P.O. BOX 11957, Mwanza, Tanzania, festommassy@gmail.com

²  Institute of Rural Development Planning, P.O.BOX 11957, Mwanza, Tanzania, Email: mmohamed@irdp.ac.tz

³  Institute of Rural Development Planning, P.O. BOX 11957, Mwanza, Tanzania, Email: jtemba@irdp.ac.tz

1. INTRODUCTION

Over the past few decades, global economic growth has been significantly influenced by cross-border investment, with Foreign Direct Investment (FDI) playing a pivotal role in driving industrialization, technology transfer, and productivity gains. According to the United Nations Conference on Trade and Development (UNCTAD, 2023), global FDI flows amounted to approximately USD 1.37 trillion in 2022, marking a steady rebound from the COVID-19-induced decline. This resurgence illustrates the resilience of global capital flows and reaffirms the central role of FDI in stimulating economic development, especially in capital-scarce developing regions.

In Africa, FDI has been instrumental in catalyzing growth through infrastructure development, resource exploitation, and enhanced access to global markets. The continent received more than USD 83 billion in FDI in 2022, with significant inflows directed toward the mining, energy, and digital sectors. However, the region continues to face macroeconomic challenges such as political instability, poor infrastructure, and volatile exchange rates, which collectively hamper the sustainability of these investments. Despite these constraints, countries like Tanzania have made notable strides in attracting foreign capital.

Tanzania has experienced a substantial rise in FDI inflows, growing from USD 576 million in 2010 to over USD 1.1 billion in 2022 (World Bank, 2023). This growth has been supported by government-led reforms including the Tanzania Development Vision 2025, liberalization policies, and regulatory reforms aimed at improving the ease of doing business (Awadhi, James, & Byaro, 2022). Major sectors benefiting from FDI include telecommunications, mining, and energy. However, while investment levels have improved, the Tanzanian shilling has depreciated steadily over time from about TZS 700 per USD in 2000 to over TZS 2,500 by 2023 (Bank of Tanzania, 2023). This depreciation raises questions about the ability of exchange rate stability to mediate the effectiveness of FDI in fostering economic growth. Furthermore, despite these investments, Tanzania's GDP growth has remained inconsistent, reflecting a complex interplay of macroeconomic forces.

Several empirical studies affirm the positive role of FDI in promoting economic growth in Tanzania. For instance, Mwakabungu and Kauangal (2023) and Magai (2021) argue that FDI contributes to long-run economic development. However, these studies largely ignore the potential influence of exchange rate volatility, which introduces uncertainty and may deter investment. Irangi (2019) highlights this issue but does not fully explore its implications within a dynamic time-series context. Much of the existing literature also employs cross-sectional or panel data approaches, limiting their ability to reflect the time-specific macroeconomic conditions of individual countries like Tanzania. As such, there exists a critical research gap in understanding how exchange rate fluctuations dynamically influence FDI and, in turn, economic growth.

To address this gap, the present study investigates the dynamic relationship between Foreign Direct Investment, exchange rates, and economic growth in Tanzania from 1990 to 2023. Utilizing the Autoregressive Distributed Lag (ARDL) model, the study aims to analyze both short-term interactions and long-term cointegration among these variables. Specifically, the objectives are threefold: first, to examine the short-run relationship between FDI, exchange

rates, and GDP growth; second, to explore whether a long-run equilibrium relationship exists among them; and third, to evaluate how exchange rate volatility affects both FDI inflows and economic growth performance.

In light of these objectives, the study proposes the following hypotheses: (i) there is no significant short-run relationship among FDI, exchange rates, and GDP growth in Tanzania; and (ii) there is no long-run cointegrating relationship between these variables. Testing these hypotheses is crucial not only for academic inquiry but also for policy formulation, as the findings can guide interventions aimed at improving macroeconomic stability, managing currency risk, and enhancing the developmental impact of FDI. Policymakers will benefit from a clearer understanding of how stable exchange rates can amplify the benefits of FDI, while investors can better assess the economic risks and opportunities in Tanzania's evolving market.

The remainder of the paper is structured as follows: Section 2 presents a detailed review of the theoretical and empirical literature on the subject. Section 3 outlines the data, variables, and econometric methodology, with a focus on the ARDL model. Section 4 reports the empirical results, including diagnostic tests and model stability checks. Section 5 discusses the policy implications of the findings, and Section 6 concludes the study with recommendations for future research.

2. LITERATURE REVIEW

2.1. Theoretical underpinning

This study is grounded in two complementary theoretical frameworks: the Investment Development Path (IDP) Theory, developed by John H. Dunning (1981), and the Endogenous Growth Theory, advanced by Paul Romer (1986) and Robert Lucas (1988). These theories provide a robust conceptual lens through which the dynamic relationship between Foreign Direct Investment (FDI), exchange rates, and economic growth can be examined, particularly in the context of a developing country such as Tanzania.

The IDP theory posits that a country's ability to attract and generate FDI evolves alongside its stage of economic development. In the initial stages, developing economies attract inward FDI due to factors such as natural resource endowments, low labor costs, and untapped markets. As the economy matures and local firms build capacity through learning and adaptation, the country eventually transitions into an outward investor. The IDP theory assumes that the evolution of FDI is closely linked to macroeconomic stability, institutional quality, and the strategic positioning of the country in global markets. This theory is particularly relevant to Tanzania, which is in the intermediate stage of this development path, characterized by increasing inflows of FDI, particularly in resource-intensive sectors such as mining and energy. The theory highlights the importance of policy consistency, regulatory clarity, and exchange rate stability in sustaining and leveraging FDI for long-term growth. Empirical evidence from African economies supports the applicability of this framework; for example, Arthur and Addai (2022) found that Ghana's movement along the IDP path was facilitated by stable macroeconomic conditions and institutional reforms, while Magai (2021) emphasized that structural and policy-related factors constrain the effectiveness of FDI in Tanzania.

Complementing the IDP framework is the Endogenous Growth Theory, which attributes economic growth to internal mechanisms such as technological innovation, human capital development, and knowledge spillovers. This theory challenges the neoclassical view that technological progress is exogenous and instead posits that investment in education, research,

and institutional quality leads to sustainable, long-term growth. Within this context, FDI is seen not only as a source of capital but also as a conduit for transferring technology and managerial expertise, provided that the host country has the absorptive capacity to utilize these benefits. For Tanzania, the relevance of this theory lies in its emphasis on the interaction between FDI and the local economic environment. If macroeconomic conditions, especially exchange rate stability, are poorly managed, the potential gains from FDI may not be fully realized. This dynamic is evidenced by studies such as Gala and Rocha (2020), who demonstrate that undervalued but stable exchange rates can enhance competitiveness and domestic investment, and Draz et al. (2019), who underscore the importance of macroeconomic fundamentals, such as inflation control and institutional development, in maximizing FDI effectiveness.

Together, the IDP and Endogenous Growth Theories offer a comprehensive foundation for analyzing how FDI and exchange rates influence economic growth. While the IDP theory contextualizes the structural evolution of FDI in Tanzania's development journey, the Endogenous Growth Theory provides insight into the mechanisms through which FDI can translate into sustained productivity and growth. These theories justify the analytical approach of this study and support its central proposition that both short-term exchange rate dynamics and long-term institutional capacity are critical to understanding the FDI-growth relationship in Tanzania

2.2. Empirical literature review

The empirical relationship between Foreign Direct Investment (FDI), exchange rates, and economic growth has generated substantial scholarly interest, particularly in developing economies. Numerous studies support the hypothesis that FDI is a key driver of economic growth through mechanisms such as capital accumulation, technology transfer, and productivity enhancement. For example, Mwakabungu and Kauangal (2023), using an Autoregressive Distributed Lag (ARDL) approach, found a significant positive long-term relationship between FDI and GDP in Tanzania, although the short-term effects were less pronounced. Similarly, Magai (2021), applying a Vector Error Correction Model (VECM), demonstrated that trade openness and FDI contribute positively to Tanzania's economic growth trajectory over time. These findings reinforce the broader FDI-led growth hypothesis prevalent in the development economics literature.

However, other researchers have emphasized that the positive impact of FDI is often contingent upon macroeconomic conditions, particularly exchange rate stability. Exchange rate volatility is considered a critical risk factor that influences the investment decisions of multinational corporations. Irangi (2019), examining Tanzanian data from 1990 to 2017, concluded that exchange rate instability undermines FDI inflows by increasing uncertainty and deterring long-term commitments. Similarly, Hafidh and Soud (2024) found that while exchange rate depreciation may promote investment in export-oriented industries, it simultaneously discourages FDI in import-intensive sectors. These findings suggest that the role of exchange rates is not uniform and that sectoral dynamics and investor expectations must be considered when analyzing the FDI-growth nexus.

The literature also reveals dynamic interdependencies among the three variables, FDI, exchange rates, and economic growth, highlighting the complexity of their interactions. Arthur and Addai (2022), in a study on Ghana using a trivariate Vector Autoregressive (VAR) model, identified bidirectional causality between FDI and GDP, with exchange rate shocks influencing both. Likewise, Gala and Rocha (2020), employing panel data from emerging markets, found that undervalued and stable exchange rates tend to attract FDI, which in turn stimulates domestic investment. Conversely, Draz et al. (2019), applying Generalized Method of Moments (GMM) estimations across South Asian economies, argued that while exchange rates matter, other macroeconomic fundamentals such as inflation control, interest rate management, and institutional capacity play a more significant role in attracting and leveraging FDI.

Overall, the empirical literature presents a nuanced picture of the FDI-growth relationship, with exchange rate dynamics emerging as a pivotal but context-dependent variable. Although many studies affirm the positive contribution of FDI to economic growth, others highlight the mediating effects of macroeconomic stability and the structural characteristics of the host economy. The divergence in findings underscores the need for country-specific analysis that captures both short- and long-run dynamics. This study responds to that call by applying a time-series ARDL framework to Tanzanian data from 1990 to 2023, enabling a comprehensive evaluation of the interaction between FDI, exchange rates, and GDP growth within a localized and temporally sensitive context.

2.3. Conceptual Framework

The conceptual framework presented in Figure 1 demonstrates the hypothesized mediating role of exchange rate in the relationship between Foreign Direct Investment (FDI) and GDP growth. FDI is assumed to influence exchange rate behavior through changes in capital inflows, currency demand, and investor confidence. In turn, the exchange rate, whether stable or volatile, affects the extent to which FDI contributes to economic growth by impacting macroeconomic stability, trade competitiveness, and market predictability. This mediating relationship integrates both the Investment Development Path (IDP) theory, which links FDI with structural economic shifts, and the Endogenous Growth Theory, which recognizes the importance of macroeconomic conditions in leveraging external investment. This framework enables a nuanced exploration of how FDI and exchange rates interact dynamically to influence Tanzania's economic performance over time.

Figure 1. Conceptual Framework of the Study



Source: Author's construct (2025).

3. METHODOLOGY

3.1 Data Sources and Type of Data

Time-series data spanning the years 1990 to 2023 are employed in this study, obtained from the World Bank's World Development Indicators (WDI) database. The dataset includes three key macroeconomic variables: Foreign Direct Investment (FDI) inflows (as a percentage of GDP), real exchange rate (RER), and real Gross Domestic Product (GDP) growth rate. The World Bank is recognized for its credibility and reliability, as it provides internationally standardized and country-specific macroeconomic indicators. The choice of time-series data enables an in-depth investigation of the dynamic interactions among FDI, exchange rates, and economic growth in Tanzania over more than three decades. Since macroeconomic variables often exhibit trends and structural shifts, it is crucial to assess their stationarity before proceeding with econometric modeling.

3.2 Measurement of variables

In this study, key macroeconomic variables are selected to analyze the dynamic relationship between Foreign Direct Investment (FDI), Exchange Rates, and Economic Growth in Tanzania. The variables are carefully measured to ensure consistency and reliability in econometric analysis. Table 1 provides a detailed description of each variable, its measurement approach, expected sign, and data source.

Table 1. Description, Measurement, and Expected Signs of Variables

Variable	Measurement	Expected Sign	Source
Foreign Direct Investment (FDI)	Percentage of GDP	Positive (+)	World Bank's World Development Indicators (WDI)
Official Exchange Rate	LCU per US\$, period average	Uncertain (+/-)	World Bank
Gross Domestic Product Growth Rate (GDP Growth)	Annual percentage growth rate	N/A (Dependent Variable)	World Bank's World Development Indicators (WDI)

3.3 Econometric Model Selection and Justification

This study employs the Autoregressive Distributed Lag (ARDL) model to analyze the dynamic relationship between Foreign Direct Investment (FDI), exchange rates (EXR), and GDP growth in Tanzania. The ARDL model is particularly well-suited for this study because it can simultaneously estimate short-run and long-run dynamics, allowing for a clearer understanding of the immediate and delayed impacts of FDI and exchange rate fluctuations on GDP. One of the key advantages of the ARDL model is its flexibility to handle variables of different integration orders ($I(0)$ and $I(1)$), making it ideal for time-series data that may include both stationary and non-stationary variables. Given the relatively small sample size (33 years of data), the ARDL model's ability to deliver reliable results with a limited number of observations is another reason for its selection. Furthermore, the decision to include only the core variables FDI, exchange rates, and GDP was based on a focused research objective. Introducing control variables such as inflation, interest rates, or government expenditure could introduce multicollinearity, complicating the interpretation of the primary relationships between these variables. Additionally, the inclusion of too many variables might reduce the statistical power of the model. This approach is in line with previous studies, such as Magai

(2021), Mbwambo et al. (2024), and Gala & Rocha (2020), that employed similar models focusing on key macroeconomic factors. The theoretical framework of Investment Development Path (IDP) Theory and Endogenous Growth Theory emphasizes the crucial role of FDI and macroeconomic stability, particularly exchange rate management, in fostering sustainable growth in developing economies. By focusing on these key variables, this study provides a clear and concise analysis of their dynamic interactions, setting the stage for more comprehensive models in future research that may incorporate additional control variables as needed.

3.4 Model Specification and Estimation Steps

Define key variables of the model

$$GDP_t = FDI_t \beta^1 RER_t \beta^2 \dots \dots \dots 01$$

GDP Growth Rate (GDP_t) means Annual percentage change in real GDP, Foreign Direct Investment (FDI_t) as Percentage of GDP, Exchange Rate (RER_t) - Official exchange rate (LCU per USD, period average) and β^1 and β^2 are elasticities

To ensure robustness and linearity, variables were then transformed into the natural logarithms as per Equation 2 below

$$\ln GDP_t = \alpha + \beta^1 \ln FDI_t + \beta^2 \ln RER_t + \epsilon_t \dots \dots \dots 02$$

Where α is constant, and t is the error terms that include all other variables that affect economic growth but are not explicitly explained by the model also Computation descriptive statistics, including mean, standard deviation, minimum, and maximum values.

3.5 Stationarity Testing

Check for stationarity using the Augmented Dickey-Fuller (ADF) test., The general form of the ADF test equation is:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum \delta_i \Delta Y_{t-i} + \epsilon_t \dots \dots \dots 03$$

where: Y_t is the variable being tested, ΔY_t is the first difference, t is the time trend, ϵ_t is the error term. If variables are stationary at level [I(0)] or at first difference [I(1)], ARDL is appropriate.

3.6 Model Specification

The ARDL model is specified as:

$$\ln GDP_t = \alpha + \sum_{i=1}^p \beta_i \ln GDP_{t-i} + \sum_{i=0}^q \gamma_i \ln FDI_t - i + \sum_{i=0}^r \delta_i \ln RER_t - i + \epsilon_t \dots \dots \dots 04$$

where α is the intercept, β_i , and δ_i are coefficients, and ϵ_t is the error term.

3.7 Bounds Cointegration Test

To test for a long-run relationship, we use the ARDL Bounds Test based on the following unrestricted Error Correction Model (ECM):

$$\Delta GDP_t = \alpha + \sum_{i=0}^p \beta_i \Delta \ln GDP_t - i + \sum_{i=0}^q \gamma_i \Delta \ln FDI_t - i + \sum_{i=0}^r \delta_i \Delta RER_t - i + \lambda ECT - 1 + \epsilon_t \dots \dots \dots 05$$

Where $ECt - 1$ is the lagged error correction term and If the F-statistic exceeds the upper bound, the variables are cointegrated.

3.8 Estimation of Long-Run and Short-Run Dynamics

If cointegration is confirmed, estimate long-run coefficients from:

$$\ln GDP_t = \alpha + \sum_{i=0}^q \gamma_i \ln FDI_t - i + \sum_{i^r=0}^r \delta_i \ln RER_t - i + \epsilon_t \dots\dots\dots 06$$

Estimate short-run dynamics

$$\Delta \ln GDP_t = \alpha + \sum_{i=1}^p \beta_i \Delta \ln GDP_t - i + \sum_{i=0}^q \gamma_i \Delta \ln FDI_t - i + \sum_{i^r=0}^r \delta_i \Delta RER_t - i + \epsilon_t \dots\dots\dots 07$$

Estimate long-run dynamics using the Error Correction Model (ECM):

$$\Delta \ln GDP_t = \alpha + \sum_{i=1}^p \beta_i \Delta \ln GDP_t - i + \sum_{i=0}^q \gamma_i \Delta \ln FDI_t - i + \sum_{i^r=0}^r \delta_i \Delta RER_t - i + \lambda ECt - 1 + \epsilon_t \dots\dots\dots 08$$

where λ (error correction coefficient) shows the speed of adjustment to the long-run equilibrium.

3.9 Diagnostic Tests

To ensure model validity, conduct a serial Correlation Test (Breusch-Godfrey LM test) H0: No serial correlation vs H1: Serial correlation exists, Heteroscedasticity Test (Breusch-Pagan Test) H0: Homoscedasticity vs H1: Heteroscedasticity exists, Ramsey RESET Test for Model Specification H0: Model is correctly specified vs H1: Model is mis specified, Normality Test (Jarque-Bera Test) H0: Residuals are normally distributed vs H1: Residuals are not normally distributed

3.10 Stability Testing

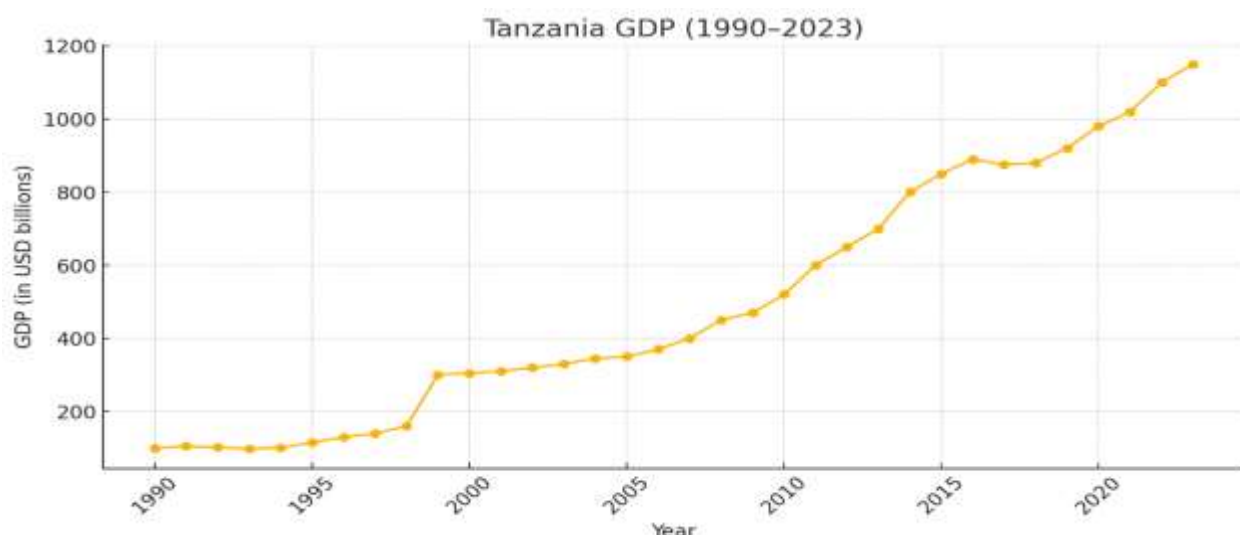
Use the CUSUM (Cumulative Sum) test and the CUSUMQ (CUSUM of Squares) test to check model stability. If plots remain within critical bounds, the model is stable. (Ajala et al ,2023).

4. RESULTS

4.1 Descriptive Statistics

Figure 2 below shows Tanzania's GDP from 1990 to 2023, with years correctly labeled on the X-axis. It shows a clear upward trend, indicating both inconsistent and consistent economic growth over the decades, with notable acceleration after the early 2000s.

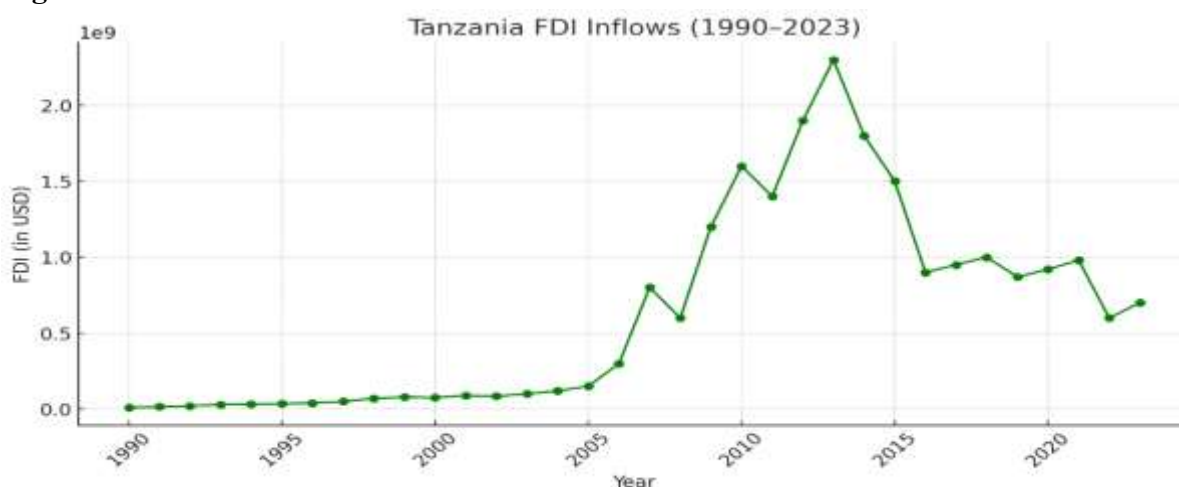
Figure 2: Tanzania's GDP from 1990 to 2023.



Source: Data from the Bank of Tanzania (2025).

Figure 3 below shows Tanzania's FDI inflows from 1990 to 2023 with clearly labeled years, enabling a better understanding of temporal trends. FDI rose gradually during the 1990s, surged sharply between 2006 and 2014, and peaked around 2013. However, inflows have shown volatility in recent years, with a noticeable decline post-2015, reflecting potential shifts in investment climate or global economic conditions.

Figure 3. Tanzania's FDI from 1990 to 2023.



Source: Data from the Bank of Tanzania (2025).

Figure 4 below displays the trend of Tanzania's exchange rate (TZS per USD) from 1990 to 2023. It reveals a consistent depreciation of the Tanzanian shilling over the years, rising from around TZS 200/USD in 1990 to over TZS 2,400/USD by 2023. The depreciation accelerated notably after 2015, indicating increased pressure on the currency. This trend reflects structural economic challenges, inflationary pressures, and external trade imbalances, all of which have implications for the cost of imports, investor confidence, and the overall macroeconomic environment.

Figure 4. Tanzania's Exchange Rate (EXR) against the US Dollar from 1990 to 2023.



Source: Data from the Bank of Tanzania (2025).

Table 2. The Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
lnGDP	34	6.23	.685	5.036	7.099
lnFDI	34	19.38	2.859	9.21	21.459
lnEXR	34	6.967	.695	5.273	7.792

Table 2. All variables, lnGDP, lnFDI, and lnEXR, were transformed into natural logarithms to enhance linearity and normality. lnGDP shows low variability and a narrow range, indicating stable economic growth. lnFDI reveals high variability and a wide range, reflecting significant fluctuations in foreign direct investment. lnEXR also shows moderate variability with a broad range, suggesting notable exchange rate volatility. Overall, all variables exhibit characteristics consistent with a normal distribution, confirming their suitability for econometric analysis.

4.2 Stationarity Testing

The table below shows results from the unit root test indicate the order of integration for the variables lnGDP, lnFDI, and lnEXR. The test statistic for lnGDP is -4.305, which is more negative than the critical values at the 1%, 5%, and 10% significance levels, with a p-value of 0.0004, indicating that lnGDP is stationary at first difference, or I(1). In contrast, both lnFDI and lnEXR have test statistics of -4.921 and -5.197, respectively, which are also more negative than the critical values at all significance levels, with p-values of 0.0000. This suggests that both lnFDI and lnEXR are stationary at level, or I(0). These results are essential for model selection, confirming that lnGDP required differencing while lnFDI and lnEXR can be analyzed without transformation, facilitating the use of the ARDL model for further analysis .

Table 3. Augmented Dickey-Fuller Test Results

variables	Test-Statistic		Critical Value (1%)	Critical Value (5%)	Critical Value (10%)	p-value	Order of integration
lnGDP	-4.305	***	-3.702	-2.980	-2.622	0.0004	I(1)
lnFDI	-4.921	***	-3.696	-2.978	-2.620	0.0000	I(0)

lnEXR	-5.197	***	-3.696	-2.978	-2.620	0.0000	I(0)
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Notes: *(P<0.01)**

Lag Order Selection

The lag selection criteria for lnGDP over the period from 1994 to 2023 indicate that Lag 1 is optimal, as evidenced by the Likelihood Ratio (LR) statistic of 115.55 (p-value = 0.000), which is statistically significant at the 1% level, and the lowest values for AIC (-1.97435), HQIC (1.94447), and SBIC (-1.88094). While Lag 2 shows a positive LR statistic (1.147), it is not statistically significant (p = 0.284) and has higher information criteria values, making it less suitable. Lag 3 and Lag 4 also have higher AIC, HQIC, and SBIC values, with insignificant LR statistics, confirming that they are not optimal. Therefore, Lag 1 is selected as the optimal lag as shown in table 4a.

Table 4a: Lag selection criteria (lnGDP)

Sample: 1994 thru 2023

Number of obs = 30

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-26.1609	None	None	None	0.358036	1.81073	1.82567	1.85744
1	31.6153	115.55*	1	0.0	0.008131*	-1.97435*	1.94447*	1.88094*
2	32.1888	1.147	1	0.284	0.00837	-1.94592	-1.90109	-1.8058
3	32.2301	0.08265	1	0.774	0.00893	-1.88201	-1.82224	-1.69518
4	32.926	1.3917	1	0.238	0.009127	-1.86173	-1.78702	-1.6282

Note: * optimal lag, Endogenous: lnGDP, Exogenous: _con

The lag selection criteria for the lnFDI with the sample period from 1994 to 2023 indicate that Lag 1 is the optimal lag, as demonstrated by the Likelihood Ratio (LR) statistic of 47.588 (p-value = 0.000), which is statistically significant at the 1% level, and the lowest FPE (0.190757), AIC (1.18092), and HQIC (1.21081) values. Lag 2 also shows promising results, with a significant FPE (0.18624) and the lowest AIC (1.15649) and HQIC (1.20131) values, though it has a less significant LR statistic (2.7332, p = 0.098) compared to Lag 1. Lag 3 and Lag 4 are less optimal, as indicated by higher FPE, AIC, HQIC, and SBIC values, along with insignificant LR statistics (p = 0.454 and p = 0.607, respectively). Therefore, Lag 1 is selected as the optimal lag as shown in table 4b.

Table 4b: Lag selection criteria (lnFDI)

Sample: 1994 thru 2023

Number of obs = 30

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-39.5079				.871685	2.70053	2.71547	2.74723
1	-15.7139	47.588*	1	0.000	.190757	1.18092	1.21081	1.27434*
2	-14.3473	2.7332	1	0.098	.18624*	1.15649*	1.20131*	1.29661
3	-14.0672	.5601	1	0.454	.195578	1.20448	1.26425	1.39131
4	-13.9352	.26399	1	0.607	.207549	1.26235	1.33706	1.49588

Note: * optimal lag, Endogenous: lnFDI, Exogenous: _con

The lag selection criteria for $\ln\text{EXR}$ over the period from 1994 to 2023 indicate that Lag 1 is the optimal lag, as evidenced by the Likelihood Ratio (LR) statistic of 136.95 (p -value = 0.000), which is statistically significant at the 1% level, and the lowest FPE (0.002782), AIC (-3.04675), and HQIC (-3.01686) values. Lag 2 also shows promising results with a significant LR statistic of 3.7883 ($p = 0.052$), but it has slightly higher FPE (0.002623) and AIC (-3.10636) compared to Lag 1. Lag 3 and Lag 4 are less optimal, as indicated by higher FPE, AIC, HQIC, and SBIC values, along with less significant LR statistics ($p = 0.224$ and $p = 0.074$, respectively). Therefore, Lag 1 is selected as the optimal lag as shown in Table 4c.

Table 4c: Lag selection criteria ($\ln\text{EXR}$)

Sample: 1994 thru 2023

Number of obs = 30

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-20.7743	None	None	None	0.250015	1.45162	1.46656	1.49833
1	47.7012	136.95*	1	0.0	0.002782	-3.04675	-3.01686	-2.95334
2	49.5954	3.7883	1	0.052	0.002623	-3.10636	-3.06153*	-2.96624*
3	50.3345	1.4782	1	0.224	0.002671	-3.08897	-3.0292	-2.90214
4	51.9318	3.1945	1	0.074	0.002571*	-3.12878*	-3.05407	-2.89525

Note : * optimal lag, Endogenous: $\ln\text{EXR}$, Exogenous: $_cons$

Cointegration Test

In Table 5 below, the results of the ARDL bounds test suggest a long-run relationship between the variables at the 5% significance level, as indicated by the F-statistic (6.279) surpassing the upper bound critical value (4.85). However, this relationship does not hold at the 1% level, where the critical value rises to 6.36, meaning the evidence for long-term cointegration weakens at higher confidence levels. Additionally, the t-statistic (-1.066) exceeds all necessary values for $I(0)$, implying that the error correction term is insignificant and deviations from equilibrium are not corrected over time. Economically, this suggests that while short-term fluctuations or adjustments between the variables might be present, there is no strong mechanism to restore long-run balance, possibly due to factors like policy changes or external shocks affecting the variables. (Mbwambo et al.,2024)

From an economic standpoint, these results imply that while short-term dynamics exist within the model, indicating that changes in one variable could affect another over a shorter period, there is insufficient evidence to confirm a stable long-term equilibrium. This could mean that in the short run, factors such as exchange rate fluctuations and FDI inflows may influence GDP growth, but in the long run, these relationships are less stable or predictable. The lack of long-term cointegration signals potential instability or external influences that prevent a consistent and sustained economic adjustment, suggesting that while the economy may adjust in the short term, the long-term path remains uncertain and sensitive to broader economic shifts.

This perspective is supported by Morina et al. (2020), who argue that exchange rate volatility can create uncertainty, further complicating long-term growth dynamics.

Table 5: Pesaran/Shin/Smith (2001) ARDL Bounds Test

H0: no levels relationship						F	6.279	
						t	-1.066	
Critical Values (0.1-0.01), F-statistic, Case 3								
[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01	k
3.17	4.14	3.79	4.85	4.41	5.52	5.15	6.36	k-2
Critical Values (0.1-0.01), t-statistic, Case 3								
[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01	K
-2.57	-3.21	-2.86	-3.53	-3.13	-3.80	-3.43	-4.10	k-2

Note: accept if $F < \text{critical value for } I(0)$ regressors and reject if $F > \text{critical value for } I(1)$ regressors. accept if $t > \text{critical value for } I(0)$ regressors and reject if $t < \text{critical value for } I(1)$ regressors and k: # of non-deterministic regressors in long-run relationship Critical values from Pesaran/Shin/Smith (2001)

ARDL Short run Model Summary

The model summary shows that the regression model fits the data well, with an R-squared of 0.9902, meaning 99.02% of the variation in GDP is explained by the independent variables. The adjusted R-squared of 0.9883 further confirms the robustness of the model after adjusting for the number of predictors. The F-statistic (543.44) is highly significant with a p-value of 0.0000, indicating that the overall model is strongly related to the dependent variable. Additionally, the Root Mean Squared Error (RMSE) is 0.0720, suggesting a good fit with minimal prediction error. The model's log-likelihood value is 43.320562, which supports the validity of the model specification as per table 6

ARDL Short run Regression Results

The regression results from the ARDL(1,1,1) model reveal that $\ln GDP$ (L1) has a significant positive effect on GDP, with a coefficient of 0.921, meaning that a 1% increase in past GDP leads to a 0.921% increase in current GDP. $\ln EXR$ shows a strong negative relationship with GDP, with a coefficient of -1.067, indicating that a 1% increase in the exchange rate leads to a 1.067% decrease in GDP in the short run. The lagged value of $\ln EXR$ (L1) has a positive coefficient of 1.036, suggesting that past exchange rates positively influence current GDP. However, $\ln FDI$ and $\ln FDI$ (L1) have insignificant coefficients, with no meaningful short-run effect on GDP as evidenced by their p-values (0.917 and 0.716, respectively). The intercept term ($_cons$) is statistically significant, indicating a positive baseline growth rate of 0.791%. as per table 6 below.

Table 6 . ARDL $\ln GDP$, $\ln FDI$, $\ln EXR$, lags(1,1,1) aic regression short-run results.

Variable	Coefficient	Std. Error	t-Statistic	P-value	95% Lower	Conf. Interval Upper
$\ln GDP$ (L1)	0.921	0.074	12.4	0.000	0.768	1.073
$\ln FDI$		0.014	-0.11	0.917	-0.029	0.027
$\ln FDI$ (L1)	0.005	0.013	0.37	0.716	-0.021	0.031
$\ln EXR$	-1.067	0.242	-4.4	0.000	-1.565	-0.57
$\ln EXR$ (L1)	1.036	0.206	5.04	0.000	0.614	1.457
$_cons$	0.791	0.22	3.59	0.001	0.339	1.243

Number of obs = 33
 F(5, 27) = 543.44
 Prob > F = 0.0000
 R-squared = 0.9902
 Adj R-squared = 0.9883
 Root MSE = 0.0720

Log likelihood = 43.320562

ARDL Post Estimation

Test for autocorrelation was done by using Durbin Watson d-statistic (6, 33) = 1.907937. with a DW statistic of 1.907937, which is slightly below 2, it suggests no significant positive autocorrelation and indicates that residuals are generally uncorrelated, though there might be a very mild negative autocorrelation. This is generally a good result, showing that the model does not suffer from serious autocorrelation problems, which could otherwise affect the validity of the regression results.

The results of White's test for heteroskedasticity show that the null hypothesis of homoskedasticity cannot be rejected, as the p-value for the heteroskedasticity test is 0.7468, which is well above the commonly used significance level of 0.05. This suggests that there is no evidence of heteroskedasticity in the model, meaning the variance of the residuals is constant. As shown in table 7

Additionally, the decomposition of the test shows that both skewness (p-value = 0.6291) and kurtosis (p-value = 0.2659) do not provide evidence of non-normality, as their p-values are also high. The total test statistic of 20.20 with a p-value of 0.7818 further supports the conclusion that the model does not suffer from heteroskedasticity or significant departures from normality as shown in table 7 below

Table 7. White's Test Results

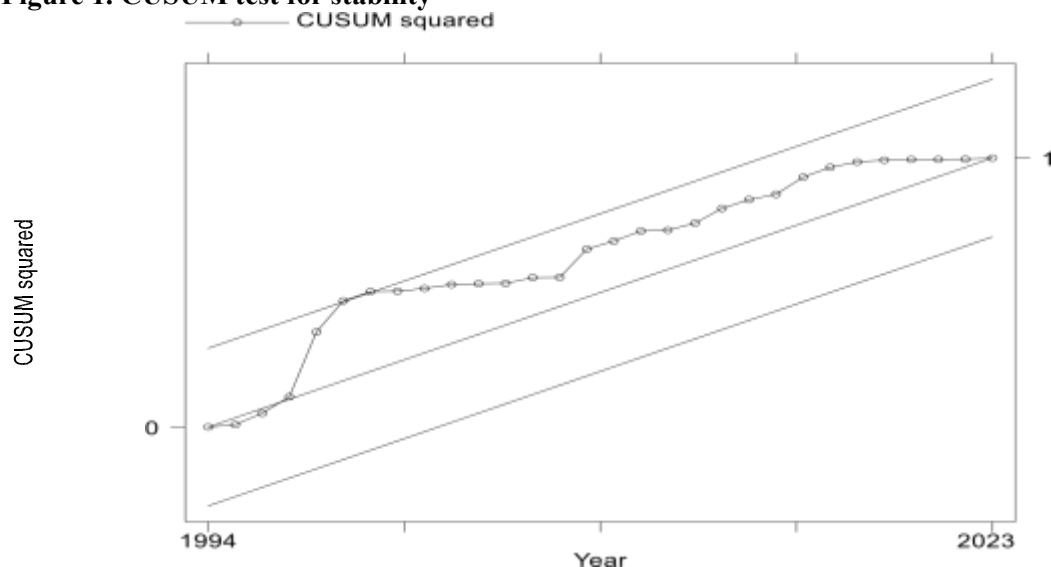
Test	chi2	df	P-value
Heteroskedasticity	15.5	20	0.7468
Skewness	3.46	5	0.6291
Kurtosis	1.24	1	0.2659
Total	20.2	26	0.7818

Model stability test

The CUSUM squared curve remains within the bounds throughout the period from 1994 to 2023, suggesting that there is no significant deviation in the residuals. This means that the variance of the residuals has remained stable, and therefore, there is no indication of a structural break.

Thus, the model appears to be stable over time, meaning the relationship between the variables has not undergone any significant shifts or changes in variance that would warrant a re-specification of the model. as shown in Figure 1 below

Figure 1. CUSUM test for stability



5. DISCUSSION

The empirical findings provide critical insights into the dynamic interplay between Foreign Direct Investment (FDI), exchange rates, and Tanzania's economic growth. The descriptive statistics show that while GDP (lnGDP) has maintained low variability over time, indicating relatively stable economic growth, FDI inflows (lnFDI) have exhibited considerable fluctuations, and the exchange rate (lnEXR) has shown sustained depreciation, particularly after 2015. These underlying trends establish an essential context for interpreting the econometric outcomes, especially the mediating role of the exchange rate.

The ARDL short-run regression results reveal that past GDP ($\ln GDP L1$) has a strong and statistically significant influence on current GDP, with a coefficient of 0.921. This outcome aligns with the Endogenous Growth Theory (Romer, 1986; Lucas, 1988), suggesting that prior economic performance, capital accumulation, and knowledge effects positively influence future growth. Furthermore, the exchange rate is found to have a statistically significant short-term impact on GDP, with a negative contemporaneous coefficient (-1.067) and a positive lagged effect (1.036). This dual effect suggests that while immediate depreciation of the Tanzanian shilling negatively affects output—likely due to inflationary pressures and import costs—its lagged effect may enhance competitiveness and stimulate trade in the medium term. These results support Hafidh and Soud (2024), who found that exchange rate depreciation can promote export-oriented investment, and align with Morina et al. (2020), who caution that volatility undermines long-run growth predictability.

In contrast, FDI ($\ln FDI$ and its lag) exhibits no statistically significant short-run impact on GDP, indicating that foreign investment may not immediately influence output growth. This finding diverges from Magai (2021) and Mwakabungu and Kauangal (2023), who reported long-term growth effects of FDI in Tanzania. The lack of short-run impact in this study may be attributed to limited absorptive capacity, weak infrastructure, or inefficient investment allocation. Moreover, the insignificant Error Correction Term (t-statistic = -1.066) in the bounds test implies that no strong long-term cointegrating relationship exists among the variables. This result suggests that any short-term gains from exchange rate movements or FDI inflows do not translate into a stable, long-run economic trajectory. It also aligns with Tekin (2011) and Draz et al. (2019), who emphasized that the effectiveness of FDI is contingent upon macroeconomic stability, institutional quality, and policy consistency.

Collectively, the results emphasize the mediating role of the exchange rate in the FDI–growth relationship, as conceptualized in this study. Exchange rate fluctuations appear to condition the effectiveness of FDI in influencing GDP, meaning that the full benefits of foreign investment are realized only in environments where currency volatility is well-managed. This underscores the theoretical insights from the Investment Development Path (IDP) and Endogenous Growth theories, which highlight the centrality of macroeconomic stability and domestic capacity in leveraging FDI for sustained development. The absence of a long-run equilibrium relationship further points to the importance of structural reforms, exchange rate stabilization policies, and targeted investment strategies that align FDI with national development goals.

6. CONCLUSION AND RECOMMENDATIONS

This study set out to investigate the dynamic relationship between Foreign Direct Investment (FDI), exchange rates, and economic growth in Tanzania using time-series data from 1990 to 2023. Employing the Autoregressive Distributed Lag (ARDL) model, the analysis captured both short-run dynamics and potential long-run interactions. The findings reveal that while past GDP significantly influences current economic growth, indicating growth persistence, the exchange rate plays a critical short-term role. Specifically, depreciation of the Tanzanian shilling exerts an immediate negative impact on GDP, though lagged effects suggest that depreciation may enhance competitiveness over time.

Contrary to expectations and much of the existing literature, FDI does not demonstrate a statistically significant short-run effect on economic growth in Tanzania. This suggests that while foreign capital inflows are present, their immediate contribution to GDP is limited, likely due to delayed absorption, infrastructure challenges, or sectoral inefficiencies. Moreover, the ARDL bounds test does not confirm a strong long-term cointegrating relationship among FDI, exchange rates, and GDP, implying that Tanzania's economic growth path lacks a stable long-run adjustment mechanism. These findings highlight the critical role of macroeconomic conditions, especially exchange rate behavior, as a mediator in shaping the effectiveness of FDI.

In light of these conclusions, several policy recommendations are proposed. First, macroeconomic stability should remain a top priority, with particular emphasis on maintaining a predictable and well-managed exchange rate regime to enhance investor confidence and reduce volatility-related uncertainty. Second, Tanzania must improve its absorptive capacity to fully leverage FDI. This includes investments in infrastructure, skills development, and institutional reforms that can enable local firms and industries to benefit from technology and knowledge transfers. Third, there is a need to strategically align FDI inflows with national development priorities, particularly in manufacturing, agro-processing, and digital infrastructure, ensuring that foreign capital is directed toward high-impact, growth-enhancing sectors. Lastly, policymakers should consider complementary reforms in the financial and regulatory environment to foster long-term investor confidence and resilience against external shocks.

In conclusion, while FDI remains a potentially powerful tool for economic development, its effectiveness in Tanzania is shaped by the quality of macroeconomic management and the country's capacity to absorb and channel investment toward productive uses. Strengthening these foundations will be essential for translating foreign capital inflows into sustainable and inclusive economic growth.

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