

Macroeconomic Determinants of Economic Growth in Developing-8 Countries: Panel Cross-Sectionally Augmented ARDL

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ABSTRACT

Research Originality: This research is original in its examination of the impact of macroeconomic determinants on economic growth in Developing-8 countries, which accounts for cross-sectional dependence and country heterogeneity.

Research Objectives: The study aims to analyze the short-run and long-run effects of external debt, exchange rates, foreign direct investment, inflation, and balance of trade on economic growth in selected Developing-8 countries over the period 1997–2024.

Research Methods: The study employs a Cross-Sectionally Augmented ARDL model combined with the Error Correction Model, using secondary panel data from six Developing-8 countries to capture dynamic relationships and long-run equilibrium, supported by unit root, cross-sectional dependence, and robustness tests.

Empirical Results: The findings indicate that external debt and exchange rates have positive short-run effects on growth, while inflation and the trade balance have negative immediate effects. Foreign domestic investment shows no significant short-run effect but becomes positive in the long run, and the error correction term confirms a stable long-run relationship.

Implications: The results suggest that policymakers should ensure sustainable external debt management, maintain exchange rate stability, enhance the effectiveness of foreign domestic investment, and control inflation to support long-term economic growth in Developing-8 countries.

Keywords:

gross domestic product growth; external debt; exchange rates; inflation; balance of trade

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INTRODUCTION

The Developing-8, comprising Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Türkiye, was established to strengthen economic cooperation and development. However, economic growth performance has varied considerably among members. Bangladesh recorded relatively stable growth, while Türkiye experienced greater volatility. Egypt and Indonesia showed moderate yet resilient growth, whereas Nigeria and Pakistan experienced recurrent economic fluctuations (Ibrahim et al., 2022; Otieno Jabuya et al., 2023). Economic growth remains a key policy objective in Developing-8 countries, as sustainable growth is essential for addressing structural challenges and enhancing economic resilience (Muhsin et al., 2024; Sajid et al., 2025). These challenges became more apparent during periods of financial instability, commodity price fluctuations, and the COVID-19 pandemic, highlighting differences in economic resilience across member countries (Zhu et al., 2025).

Numerous recent studies have sought to identify the macroeconomic factors driving economic growth in developing economies. Some studies emphasize the importance of foreign direct investment (FDI) as a source of capital accumulation, technology transfer, and productivity enhancement (Ayenew, 2022; Ullah et al., 2022; Vo & Ho, 2025). Other studies highlight the role of trade performance in promoting economic growth by increasing market access and enhancing allocative efficiency (Abendin & Duan, 2021; Kinfack & Bonga-Bonga, 2023; Jabuya et al., 2023). At the same time, macroeconomic stability indicators such as inflation and exchange rates have been found to significantly influence investment decisions, resource allocation, and overall economic performance (Chen et al., 2025; Ibrahim et al., 2022; Iqbal et al., 2024; Yeboah, 2025). In addition, external debt remains an important source of development financing for many developing countries, although excessive accumulation of debt may hinder growth by increasing fiscal burdens and macroeconomic vulnerability (Ayana et al., 2023; Dawood et al., 2021; Gaies & Nabi, 2021; Luu et al., 2024).

Previous studies provide mixed evidence on the determinants of economic growth. FDI has been found to promote economic growth through capital accumulation and productivity enhancement (Ayenew, 2022), while external financial inflows contribute positively to inclusive economic development (Afolabi Ibikunle et al., 2023). Conversely, excessive external debt may hinder economic growth by increasing fiscal burdens and debt-servicing obligations (Ayana et al., 2023; Mohamed & Bile Mohamud, 2025). Inflation has also been shown to adversely affect economic growth beyond certain threshold levels by increasing uncertainty and reducing investment incentives (Ibrahim et al., 2022; Khan, 2022). Likewise, exchange rate volatility can undermine economic performance by discouraging trade and investment activities (Buthelezi, 2023; Yilmazkuday, 2025). Although these studies provide valuable insights, their findings remain mixed and highly dependent on regional, institutional, and macroeconomic conditions.

Despite the extensive literature on the determinants of economic growth, empirical evidence for the Developing-8 countries remains limited. Most previous studies focus

on specific regions such as Sub-Saharan Africa, ASEAN, or Latin America, while studies on Developing-8 economies are relatively scarce. Furthermore, existing research often examines external debt, foreign direct investment, inflation, exchange rates, and trade separately rather than within an integrated framework. In addition, many studies rely on conventional panel estimation techniques that do not adequately address cross-sectional dependence and heterogeneity across countries. These limitations create a research gap in understanding the short-run and long-run effects of key macroeconomic determinants on economic growth in the Developing-8 countries.

Despite the extensive literature on the determinants of economic growth, several gaps remain. First, previous studies have produced inconsistent findings regarding the effects of external debt, foreign direct investment, inflation, exchange rates, and trade performance on economic growth, suggesting that these relationships are highly context-specific and sensitive to differences in institutional and macroeconomic environments. Second, most existing studies focus on individual countries or broader regional groupings. In contrast, empirical evidence on Developing-8 (D-8) countries remains limited despite their growing economic significance and increasing integration within the global economy. Third, many previous studies rely on conventional panel estimation techniques that assume cross-sectional independence and parameter homogeneity, which can lead to biased and inconsistent estimates when countries are exposed to common external shocks and exhibit heterogeneous economic structures. To address these gaps, this study examines the effects of external debt, foreign direct investment, inflation, exchange rates, and balance of trade on economic growth in Developing-8 countries over the period 1997–2024. Specifically, the study investigates both the short-run and long-run relationships among these variables while accounting for country-specific heterogeneity and cross-country interdependence.

The novelty of this research lies in the application of a panel Cross-Sectionally Augmented Autoregressive Distributed Lag (ARDL) model, integrated with an Error Correction Model (ECM), to analyze the determinants of economic growth in the Developing-8 countries. Unlike previous studies, this approach simultaneously addresses cross-sectional dependence, heterogeneous country dynamics, and mixed orders of integration while estimating both short-run and long-run effects within a unified framework. By focusing on the relatively underexplored D-8 economies and employing a more robust econometric methodology, this study provides more comprehensive evidence on the macroeconomic determinants of economic growth. It offers policy-relevant insights for promoting sustainable economic development.

METHODS

This study employs secondary quantitative data obtained from the World Bank's World Development Indicators database. The population of this study comprises all member countries of the Developing-8 organization. However, the final sample comprises six countries: Bangladesh, Egypt, Indonesia, Nigeria, Pakistan, and Türkiye. Two Developing-8 member countries were excluded due to incomplete observations on

one or more variables during the study period, which could lead to an unbalanced panel and reduce the reliability of the estimated results. The analysis uses annual data from 1997 to 2024. Table 1 presents the operational definitions and measurement indicators for all variables used in this research.

Table 1. Operational Variables

Variables	Definitions	Measurements	References
Economic Growth (EG)	The increase in the value of goods and services produced within an economy	annual GDP growth (%)	(Gómez & Irewole, 2024; Srivastava et al., 2025; Yeboah, 2025)
External Debt (ED)	the total outstanding debt owed to foreign creditors, including public and private borrowing, IMF credit, and short-term debt	total external debt stocks (US\$)	(Ayana et al., 2023; Dawood et al., 2021; Mohamed & Bile Mohamud, 2025)
Exchange Rate (ER)	The average value of the local currency compared to the US\$	ratio (local currency per US\$)	(Bhat et al., 2024; Ramos-Herrera, 2024; Yilmazkuday, 2025)
Foreign Direct Investment (FDI)	cross-border investment that grants investors significant influence or control over enterprises in another country	net foreign direct investment (US\$)	(Ayenew, 2022; Choi & Kim, 2024; Mejia, 2023)
Inflation (INF)	The annual rate of change in the overall price level of an economy	annual GDP deflator (%)	(Chu, 2022; Ibrahim et al., 2022; Khan, 2022)
Balance of Trade (BOT)	The difference between the value of exports and imports of goods and services	net trade (US\$)	(Abendin & Duan, 2021; Kinfaek & Bonga-Bonga, 2023; Jabuya et al., 2023)

To examine the dynamic relationship between macroeconomic variables and economic growth, this study applies the panel ARDL model, which is appropriate because it accommodates variables integrated of order I(0) and I(1), allows simultaneous estimation of short-run and long-run relationships, and permits heterogeneity across cross-sectional units. The general panel ARDL model can be expressed as:

$$Y_{it} = \alpha_i + \sum_{j=1}^p \phi_j Y_{i,t-j} + \sum_{j=0}^q \beta_j X_{i,t-j} + \varepsilon_{it} \quad (1)$$

where Y_{it} denotes the dependent variable for the country i at time t , α_i represents country-specific effects, and ε_{it} is the disturbance term. The inclusion of lagged dependent variables captures the dynamic adjustment process inherent in economic growth behavior.

Given the presence of cross-sectional dependence, the baseline model is extended to the Cross-Sectionally Augmented ARDL model, which incorporates cross-sectional averages of the dependent and independent variables to account for unobserved common factors and reduce estimation bias (Jabuya et al., 2023). The panel Cross-Sectionally Augmented ARDL model can be expressed as:

$$Y_{it} = \alpha_i + \sum_{j=1}^p \phi_j Y_{i,t-j} + \sum_{j=0}^q \beta_j X_{i,t-j} + \sum_{j=0}^p \delta_j \bar{Y}_{t-j} + \sum_{j=0}^q \theta_j \bar{X}_{t-j} + \varepsilon_{it} \quad (2)$$

An important advantage of the panel Cross-Sectionally Augmented ARDL model is its reparameterization into an Error Correction Model, which enables a clear separation between short-run dynamics and long-run equilibrium relationships. This formulation facilitates the identification of both adjustment processes and long-run coefficients. The ECM representation is given as:

$$\Delta Y_{it} = \alpha_i + \sum_{j=1}^{p-1} \phi'_j \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \beta'_j \Delta X_{i,t-j} + \sum_{j=0}^{p-1} \delta'_j \Delta \bar{Y}_{t-j} + \sum_{j=0}^{q-1} \gamma'_j \Delta \bar{X}_{t-j} + \lambda_i (Y_{i,t-1} - \sum_{k=0}^m \theta_k X_{i,t-k} - \rho \bar{Y}_{t-1} - \rho \bar{X}_{t-1}) + \varepsilon_{it} \quad (3)$$

where λ_i captures the speed at which deviations from the long-run equilibrium are corrected. A negative and statistically significant error correction coefficient provides evidence of a stable long-run relationship among the variables. Using the operational variables listed in Table 1, this model can be formulated as equation (4). In this specification, the different terms capture short-run dynamics, while the error correction component reflects the long-run equilibrium relationship among the variables. The coefficient λ_i represents the speed at which short-run deviations from equilibrium are corrected toward the long-run path. All statistical analyses in this study are conducted using RStudio.

$$\begin{aligned} \Delta EG_{it} = & \alpha_i + \sum_{j=1}^{p-1} \phi'_j \Delta EG_{i,t-j} + \sum_{j=0}^{q-1} \beta'_{1j} \Delta ED_{i,t-j} + \sum_{j=0}^{q-1} \beta'_{2j} \Delta ER_{i,t-j} + \\ & \sum_{j=0}^{q-1} \beta'_{3j} \Delta FDI_{i,t-j} + \sum_{j=0}^{q-1} \beta'_{4j} \Delta INF_{i,t-j} + \sum_{j=0}^{q-1} \beta'_{5j} \Delta BOT_{i,t-j} + \sum_{j=0}^{p-1} \delta'_j \Delta \bar{EG}_{t-j} + \\ & \sum_{j=0}^{q-1} \gamma'_{1j} \Delta \bar{ED}_{t-j} + \sum_{j=0}^{q-1} \gamma'_{2j} \Delta \bar{ER}_{t-j} + \sum_{j=0}^{q-1} \gamma'_{3j} \Delta \bar{FDI}_{t-j} + \sum_{j=0}^{q-1} \gamma'_{4j} \Delta \bar{INF}_{t-j} + \\ & \sum_{j=0}^{q-1} \gamma'_{5j} \Delta \bar{BOT}_{t-j} + \lambda_i (EG_{i,t-1} - \theta_0 - \theta_1 ED_{i,t-1} - \theta_2 ER_{i,t-1} - \theta_3 FDI_{i,t-1} - \\ & \theta_4 INF_{i,t-1} - \theta_5 BOT_{i,t-1} - \rho_0 \bar{EG}_{t-1} - \rho_1 \bar{ED}_{t-1} - \rho_2 \bar{ER}_{t-1} - \rho_3 \bar{FDI}_{t-1} - \rho_4 \bar{INF}_{t-1} - \\ & \rho_5 \bar{BOT}_{t-1}) + \varepsilon_{it} \end{aligned} \quad (4)$$

RESULTS AND DISCUSSION

Table 2 presents the descriptive statistics of the variables used in this study. Economic growth (EG) has a mean of 4.60, a median of 5.02, and a standard deviation of 3.02, with values ranging from -13.13 to 15.33. External debt (ED) records an average of 128.29 and a median of 71.50, with a high standard deviation of 130.89. The exchange rate (ER) has a mean of 1.83 and a median of 0.14, and a standard deviation of 6.39. Foreign direct investment (FDI) has a mean of -4.60 and a median of -2.17, with values ranging from -46.07 to 4.55. Inflation (INF) records an average of 13.56 and a median of 8.18. Besides, the balance of trade (BOT) has a mean of -7.52 and a median of -6.02, with values ranging from -68.87 to 42.72, demonstrating considerable variation in trade performance.

Table 3 presents the Variance Inflation Factor (VIF) results for the independent variables. The VIF values range from 1.0113 to 1.5687, with all values well below the commonly accepted threshold of 10. This indicates the absence of multicollinearity among

external debt (ED), exchange rate (ER), foreign direct investment (FDI), inflation (INF), and balance of trade (BOT). Therefore, the estimated regression coefficients are considered reliable and free from multicollinearity concerns.

Table 2. Descriptive Statistics

Variables	Mean	Median	Std. Dev.	Min.	Max.
EG	4.60	5.02	3.02	-13.13	15.33
ED	128.29	71.50	130.89	14.26	514.99
ER	1.83	0.14	6.39	0.00	65.85
FDI	-4.60	-2.17	5.99	-46.07	4.55
INF	13.56	8.18	18.00	-0.40	143.64
BOT	-7.52	-6.02	17.66	-68.87	42.72

Table 4 presents the results of the cross-sectional dependence (CSD) tests. The Pesaran CD test yields a statistic of 2.8958 with a p-value of 0.003782, which is significant at the 1% level. Likewise, the Breusch–Pagan LM test and the Scaled LM test yield p-values of 0.02377 and 0.02077, respectively, both significant at the 5% level. Since all p-values are below 0.05, the results indicate cross-sectional dependence among the countries in the panel. This result is consistent with existing literature, which documents cross-sectional dependence across various economic integrations and trading blocs. For example, studies focusing on the African region (Gómez & Irewole, 2024) and the Asian region (Dawood et al., 2021) report similar findings. Previous research has also identified cross-sectional dependence among Developing-8 member countries (Sajid et al., 2025). Consequently, second-generation panel data techniques that account for cross-sectional dependence are more appropriate for the subsequent empirical analysis.

Table 3. Variance Inflation Factor

Variables	Variance Inflation Factor
ED	1.556127
ER	1.499075
FDI	1.536375
INF	1.568728
BOT	1.011344

Table 4. Cross-Sectional Dependence (CSD) Tests Results

Tests	Statistic	p-value
Pesaran CD	2.8958 (z)	0.00378 ***
Breusch–Pagan LM	27.664 (χ^2)	0.02377 **
Scaled LM	2.3122 (z)	0.02077 **

Note: *** significant at 1%, ** significant at 5%

The Cross-Sectionally Augmented IPS (CIPS) unit root test on Table 5 was employed to examine the stationarity properties of the variables while accounting for cross-sectional dependence. The results indicate that EG, ER, INF, and BOT are stationary at their levels, as their CIPS statistics are below the critical value at the 5% significance level (approximately -2.33). In contrast, ED and FDI are non-stationary in levels but become stationary after first differencing, indicating that they are integrated of order 1 ($I(1)$). Overall, the findings reveal a mixture of $I(0)$ and $I(1)$ variables, with no variable integrated of order two, $I(2)$. This satisfies the necessary condition for applying the panel ARDL model.

Table 5. Cross-Sectionally Augmented IPS (CIPS) Root Test Results

Variables	CIPS Value at Level/ $I(0)$	CIPS Value at First Difference/ $I(1)$	Order
EG	-3.5094	-7.4384	$I(0)$
ED	-1.1424	-2.7633	$I(1)$
ER	-5.9834	-9.7521	$I(0)$
FDI	-1.3873	-5.6502	$I(1)$
INF	-3.4742	-7.3544	$I(0)$
BOT	-2.9861	-4.7039	$I(0)$

Table 6 presents the results of the optimal lag length selection. Based on the information criteria, the optimal lag length is the one selected by the model with the lowest criterion value. The Akaike Information Criterion (AIC) reaches its minimum value of 25.12685 at lag 2, while the Hannan–Quinn Criterion (HQ) and Schwarz Criterion (SC) attain their lowest values of 25.75132 and 26.22099, respectively, at lag 1. Since AIC is generally preferred in panel ARDL studies for capturing more dynamic relationships by selecting a less restrictive lag structure, lag 2 is chosen as the optimal lag length for the subsequent analysis. This lag specification is expected to adequately capture both the short-run and long-run dynamics among the variables included in the model.

Table 6. Optimal Lag Length Selection

Lag	AIC	HQ	SC
1	25.43039	25.75132	26.22099
2	25.12685	25.72287	26.59511
3	25.25996	26.13107	27.40589

Table 7 presents the Cross-Sectionally Augmented ARDL estimation results for the immediate effects of the explanatory variables on economic growth. The results indicate that external debt (ED) has a positive effect on economic growth. Similarly, the exchange

rate (ER) exerts a positive impact on economic growth. In contrast, inflation (INF) and balance of trade (BOT) have negative effects on economic growth. This result implies that increases in inflation and deterioration in the trade balance are associated with lower economic growth. Foreign direct investment (FDI), however, has a negative coefficient of -0.019036 but is not statistically significant ($p = 0.6968$), indicating no immediate effect on economic growth. The coefficient of the cross-sectional average of economic growth is positive, suggesting the presence of common factors affecting economic growth across countries. Meanwhile, the cross-sectional averages of the explanatory variables are statistically insignificant, indicating that their common cross-sectional components do not exert a significant immediate influence on economic growth.

Table 7. Cross-Sectional Augmented ARDL Estimation Results (Immediate Effect)

Variables	Coefficient	Std. Error	t-Statistic	p-value
ED	0.021424	0.009433	2.2713	0.0248 **
ER	0.139726	0.047105	2.9663	0.0036 **
FDI	-0.019036	0.048737	-0.3906	0.6968
INF	-0.047372	0.017816	-2.6590	0.0089 **
BOT	-0.062618	0.018135	-3.4529	0.0008 ***
EG	1.004310	0.309432	3.2457	0.0015 **
ED	-0.021457	0.049239	-0.4358	0.6638
ER	-0.158691	0.933806	-0.1699	0.8653
FDI	0.021278	0.181427	0.1173	0.9068
INF	0.046340	0.104018	0.4455	0.6567
BOT	0.061994	0.104808	0.5915	0.5553

Note: *** significant at 1%, ** significant at 5%

Table 8 presents the Cross-Sectionally Augmented ARDL estimation results incorporating the delayed effects of external debt, exchange rate, foreign direct investment (FDI), inflation, and balance of trade on economic growth. For the first lag, economic growth (EG_lag1) has a positive effect on current economic growth, indicating persistence over time. External debt (ED_lag1) has a significant negative effect at the 10% level, implying that higher external debt in the previous period may slightly reduce economic growth in the current period. Balance of trade (BOT_lag1) has a positive impact on economic growth, indicating that improvements in the balance of trade contribute to higher economic growth. Meanwhile, exchange rate (ER_lag1), foreign direct investment (FDI_lag1), and inflation (INF_lag1) do not show statistically significant effects at the first lag.

At the second lag, several explanatory variables become significant. Economic growth (EG_lag2) remains positively associated with current growth, further confirming

the persistence of growth dynamics. Exchange rate (ER_lag2) has a negative effect on economic growth, suggesting that exchange rate fluctuations may adversely affect economic performance after two periods. In contrast, foreign direct investment (FDI_lag2) positively influences economic growth, suggesting that FDI benefits are realized over time rather than immediately. Similarly, inflation (INF_lag2) has a positive effect, while balance of trade (BOT_lag2) continues to exhibit a positive effect. However, external debt (ED_lag2) does not significantly affect economic growth. The coefficients of the cross-sectional averages of economic growth, external debt, exchange rate, foreign direct investment, inflation, and balance of trade are statistically insignificant at both lags. This suggests that the common factors captured by these cross-sectional averages do not directly affect economic growth in the sample.

Table 8. Cross-Sectional Augmented ARDL Estimation Results (Delayed Effect)

Variables	Coefficient	Std. Error	t-Statistic	p-value
EG_lag1	0.172903	0.078220	2.2105	0.0289 **
ED_lag1	-0.017558	0.010095	-1.7393	0.0844 *
ER_lag1	0.026807	0.052882	0.5069	0.6131
FDI_lag1	-0.060358	0.053771	-1.1225	0.2638
INF_lag1	0.007209	0.018625	0.3871	0.6994
BOT_lag1	0.053100	0.020983	2.5307	0.0126 **
EG_lag1	-0.171647	0.312566	-0.5492	0.5839
ED_lag1	0.016964	0.056083	0.3025	0.7628
ER_lag1	0.020454	0.928925	0.0220	0.9825
FDI_lag1	0.059070	0.297219	0.1987	0.8428
INF_lag1	-0.006853	0.070633	-0.0970	0.9229
BOT_lag1	-0.051888	0.111919	-0.4636	0.6437
EG_lag2	0.141455	0.076073	1.8595	0.0653 *
ED_lag2	0.008070	0.007497	1.0764	0.2838
ER_lag2	-0.189314	0.052369	-3.6150	0.0004 ***
FDI_lag2	0.206656	0.052680	3.9229	0.0001 ***
INF_lag2	0.042492	0.016445	2.5839	0.0109 **
BOT_lag2	0.032254	0.019033	1.6946	0.0926 *
EG_lag2	-0.140856	0.229535	-0.6137	0.5406
ED_lag2	-0.007169	0.055171	-0.1299	0.8968
ER_lag2	0.170218	0.688388	0.2473	0.8051
FDI_lag2	-0.207525	0.247111	-0.8398	0.4026
INF_lag2	-0.041772	0.058025	-0.7199	0.4729
BOT_lag2	-0.032483	0.106187	-0.3059	0.7602

Note: *** significant at 1%, ** significant at 5%, * significant at 1%

Table 9. ECM Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	p-value
ΔED	0.048720	0.022970	2.1211	0.0359 **
ΔER	2.958486	0.564698	5.2391	0.0000 ***
ΔFDI	-0.077997	0.051417	-1.5170	0.1318
ΔINF	0.020930	0.019022	1.1003	0.2733
ΔBOT	-0.002836	0.021243	-0.1335	0.8940
ΔEG_lag1	-0.172697	0.088039	-1.9616	0.0520 *
ΔED_lag1	-0.017677	0.021926	-0.8062	0.4216
ΔER_lag1	-1.957646	0.570824	-3.4295	0.0008 ***
ΔFDI_lag1	0.238584	0.077022	3.0976	0.0024 ***
ΔINF_lag1	-0.035576	0.019292	-1.8441	0.0675 *
ΔBOT_lag1	-0.005024	0.021282	-0.2361	0.8138
ΔEG_lag2	-0.051869	0.072440	-0.7160	0.4753
ΔED_lag2	-0.031903	0.020876	-1.5282	0.1290
ΔER_lag2	0.108324	0.324482	0.3338	0.7391
ΔFDI_lag2	0.095216	0.083190	1.1446	0.2546
ΔINF_lag2	-0.001628	0.015695	-0.1037	0.9175
ΔBOT_lag2	0.070975	0.021615	3.2837	0.0013 ***
$ECT_{(t-1)}$	-0.346587	0.108393	-3.1975	0.0018 ***

Note: *** significant at 1%, ** significant at 5%, * significant at 1%

Table 9 presents the Error Correction Model (ECM) estimation results, which capture the short-run dynamics among external debt, exchange rate, foreign direct investment (FDI), inflation, trade balance, and economic growth. The results indicate that changes in external debt (ΔED) and exchange rate (ΔER) have positive effects on economic growth in the short run, with coefficients of 0.0487. In contrast, changes in FDI (ΔFDI), inflation (ΔINF), and balance of trade (ΔBOT) do not exert significant contemporaneous effects on economic growth.

Regarding lagged effects, the first lag of economic growth (ΔEG_lag1) is negative, indicating a partial adjustment process. The first lag of the exchange rate (ΔER_lag1) has a negative effect, suggesting that the initial positive impact of exchange rate changes reverses in the subsequent period. Meanwhile, the first lag of FDI (ΔFDI_lag1) positively affects economic growth, suggesting that the benefits of foreign investment are delayed. The first lag of inflation (ΔINF_lag1) has a weak negative effect that is significant at the 10% level, whereas the first lag of external debt remains insignificant. Among the second-lag variables, only the balance of trade (ΔBOT_lag2) has a positive effect on economic growth, implying that improvements in trade performance contribute to growth after a two-period delay. The remaining second-lag variables are statistically insignificant, indicating limited delayed effects beyond the first lag.

Most importantly, the Error Correction Term, $ECT(t-1)$, is negative and highly significant, confirming the existence of a stable long-run equilibrium relationship among the variables. The negative sign is consistent with the ECM theory and indicates that deviations from the long-run equilibrium are corrected over time. Specifically, approximately 34.66% of any disequilibrium is adjusted within one period, implying a moderate speed of convergence toward long-run equilibrium following short-run shocks.

The Cross-Sectionally Augmented ARDL results indicate that external debt has a positive and statistically significant immediate effect on economic growth, suggesting that external borrowing supports economic expansion by providing additional financial resources for infrastructure, public investment, and other productive activities. In developing economies with limited domestic savings, external debt can help bridge financing gaps and stimulate aggregate demand. This finding is consistent with previous studies showing that external financial resources promote economic growth by supplementing domestic capital and supporting productive investment (Abduvaliev & Bustillo, 2024; Afolabi Ibikunle et al., 2023; Ayenew, 2022; Choi & Kim, 2024; Luu et al., 2024; Musse et al., 2024). However, the finding differs from studies that documented a negative relationship between external debt and economic growth, particularly when debt accumulation becomes excessive (Ayana et al., 2023; Dawood et al., 2021; Gaies & Nabi, 2021; Luu et al., 2024; Mohamed & Bile Mohamud, 2025). A possible explanation for this difference is that most of these studies focused on the long-run consequences of debt accumulation. In contrast, the present study captures the immediate effect of external borrowing. While external debt may generate short-run growth benefits through increased investment and expenditure, excessive debt accumulation may eventually reduce growth by imposing higher debt-servicing obligations and imposing fiscal constraints, as predicted by the Debt Overhang Theory.

The results further show that the exchange rate has a positive and statistically significant immediate effect on economic growth, suggesting that exchange rate depreciation enhances export competitiveness by lowering the relative price of domestic goods, thereby increasing export demand, production, and economic activity. This finding is consistent with previous studies highlighting the importance of exchange rate movements in influencing economic performance through trade and investment channels (Gold & Tregenna, 2024; Nazamuddin et al., 2024; Oyadeyi et al., 2025; Rashed et al., 2022; Zahra et al., 2023; Zhu et al., 2025). However, the negative lagged effect identified in this study is more consistent with findings suggesting that prolonged exchange rate volatility creates uncertainty, increases import costs, raises production expenses, and discourages investment (Bhat et al., 2024; Buthelezi, 2023; Giordano, 2023; Ramos-Herrera, 2024; Sheykhi et al., 2025). The coexistence of positive short-run and negative delayed effects suggests that exchange rate depreciation may initially stimulate growth through export competitiveness. However, persistent instability can eventually undermine economic performance through inflationary pressures and increased uncertainty.

The findings indicate that foreign direct investment (FDI) does not have a statistically significant immediate effect on economic growth, although its impact becomes positive and highly significant over time. This suggests that the benefits of FDI are realized gradually as foreign firms establish operations, transfer technology, develop human capital, and

generate productivity spillovers. The positive lagged effect is consistent with evidence that the growth-enhancing benefits of FDI emerge primarily in the long run (Asafo-Adjei et al., 2023; Mejia, 2023; Triatmanto et al., 2023; Ullah et al., 2022). However, the insignificant immediate effect differs from studies that report a direct positive relationship between FDI and economic growth. This difference may be explained by variations in absorptive capacity, institutional quality, infrastructure development, and the time required for foreign investment projects to become operational. Therefore, the findings suggest that FDI contributes more effectively to long-run economic growth than to short-run economic expansion.

Inflation has a negative and statistically significant immediate effect on economic growth. This result indicates that rising prices reduce purchasing power, increase production costs, create uncertainty, and discourage private investment. This finding is consistent with studies showing that inflation adversely affects economic growth by weakening investment incentives and macroeconomic stability (Helmy, 2022; Ibrahim et al., 2022; Ozili, 2025; Rashed et al., 2022). However, the positive lagged effect observed in this study differs from research reporting a consistently negative relationship between inflation and growth. Instead, it supports the argument that moderate inflation may reflect stronger aggregate demand and expanding economic activity (Ibrahim et al., 2022). This finding implies that the relationship between inflation and economic growth may be nonlinear: low or moderate inflation can accompany economic expansion, whereas excessive inflation is detrimental to economic performance.

The balance of trade is found to have a negative immediate effect on economic growth but a positive lagged effect. The negative short-run impact may reflect structural trade imbalances, dependence on imported intermediate goods, and external shocks on domestic production. However, the positive lagged effect suggests that improvements in trade performance eventually promote economic growth by boosting export earnings, increasing foreign exchange accumulation, facilitating technology transfer, and driving productivity gains. This finding is consistent with evidence that trade expansion enhances economic growth by increasing market access and efficiency (Abendin & Duan, 2021; Abille & Meçik, 2023; Kinfack & Bonga-Bonga, 2023; Sajid et al., 2025; Sharmiladevi, 2023). However, the negative contemporaneous effect differs from that reported in studies that report exclusively positive trade-growth relationships. This discrepancy may arise because many previous studies focus on long-run trade performance, whereas the present study distinguishes between immediate and delayed effects. The findings therefore suggest that the growth benefits of trade require time to materialize through investment, production adjustments, and export expansion.

CONCLUSION

Economic growth in selected Developing-8 countries during 1997–2024 is influenced by external debt, exchange rates, foreign direct investment (FDI), inflation, and the trade balance through both short-run and long-run channels. The results show that external debt and the exchange rate positively affect economic growth in the short term, while inflation and the trade balance negatively affect economic growth. In contrast,

FDI does not significantly affect growth in the short run but contributes positively over the long run. The delayed-effect analysis further indicates that external debt and the exchange rate may hinder growth in subsequent periods, whereas FDI, inflation, and the trade balance exert positive lagged effects. Furthermore, the ECM results confirm a stable long-run equilibrium relationship among the variables, with approximately 34.66% of short-run disequilibrium adjusted toward equilibrium within one period.

Based on these findings, policymakers in Developing-8 countries should implement prudent fiscal policies by limiting excessive external borrowing and allocating debt-financed expenditures to productive sectors, such as infrastructure, education, and technology development. Monetary authorities should maintain a stable and predictable exchange rate while adopting a moderately contractionary monetary policy when inflationary pressures intensify to preserve price stability and macroeconomic stability. In addition, governments should pursue expansionary structural policies that attract technology-intensive, export-oriented foreign direct investment, promote export diversification, and strengthen trade competitiveness by improving trade infrastructure and the business environment.

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