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Foreign Aid and Economic Growth in Sri Lanka: Implications for Developing Countries

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Abstract

This study investigates the role of foreign aid in shaping Sri Lanka's economic growth from 1980 to 2023, using Official Development Assistance (ODA) as the primary measure of external inflows. Drawing on annual time-series data from reliable international sources, the research employs a comprehensive econometric framework to analyze both short-run and long-run interactions between foreign aid and economic performance. Stationarity is verified through Augmented Dickey-Fuller (ADF) tests, while long-run relationships are examined using the Johansen cointegration approach. Fully Modified Ordinary Least Squares (FMOLS) provides unbiased long-run estimates, accounting for endogeneity and serial correlation, and a Vector Error Correction Model (VECM) captures short-run adjustments and convergence toward long-run equilibrium. Granger causality tests further identify the directionality of relationships between aid and growth. Diagnostic checks, including Breusch–Godfrey, White, Jarque-Bera, and VIF, confirm model robustness and reliability. Findings reveal that foreign aid significantly enhances short-term economic performance, particularly during post-conflict recovery, disaster response, and periods of macroeconomic instability, while its long-term effectiveness depends critically on governance quality, institutional capacity, and efficient allocation. These results highlight the importance of sound aid management and policy coherence in leveraging foreign assistance to achieve sustainable and inclusive growth, offering lessons relevant to other developing countries facing similar challenges.

Keywords

Foreign Aid; Economic Growth; Official Development Assistance; Sri Lanka

1. Introduction

Foreign aid has long been recognized as a critical instrument for promoting economic development, particularly in low- and middle-income countries that face persistent structural and macroeconomic challenges. Sri Lanka offers a compelling case to examine the nexus between foreign aid and economic growth, given its historical reliance on external assistance and its complex development trajectory. Over the past four decades, the country has experienced multiple shocks—including a 26-year civil conflict (1983-2009), the 2004 tsunami, political instability, the COVID-19 pandemic, and the 2022 sovereign debt crisis—which have intensified the need for concessional financing and humanitarian support (Hussain, 2016; Panday, 2020). According to OECD (2022) data, Sri Lanka received approximately USD 795 million in net Official Development Assistance (ODA) in 2021, while World Bank (2023) statistics indicate that ODA accounted for nearly 5% of national income, highlighting its ongoing relevance to the country's

development planning. Despite these inflows, macroeconomic vulnerabilities such as high external debt—exceeding 128% of GDP in 2023—persistent fiscal deficits, low growth, and recurring balance-of-payments crises continue to challenge sustainable development (IMF, 2023; World Bank, 2023). This paradox raises questions about the long-term effectiveness of foreign aid in fostering economic growth.

Given this backdrop, understanding whether foreign aid contributes meaningfully to Sri Lanka's economic growth is therefore both timely and critical. Foreign aid has historically supported infrastructure development, social services, poverty alleviation, and post-conflict reconstruction (Gunawardana, 2013; Sachs, 2005). However, challenges such as inefficient allocation, weak governance, donor-driven priorities, and the risk of dependency persist (Moss, 2006; Svensson, 2000; Easterly, 2006). International evidence on the aid–growth relationship remains mixed (Boone, 1996; Burnside & Dollar, 2000; Rajan & Subramanian, 2008), emphasizing the need for country-specific empirical studies that reflect institutional and macroeconomic realities.

Although Sri Lanka has received significant aid inflows—averaging USD 686 million annually between 1990 and 2021 (World Bank, 2023)—empirical assessments of their impact on economic growth remain limited or outdated. Most prior studies are descriptive or lack rigorous econometric techniques capable of capturing both short-run fluctuations and long-run relationships. Advanced methodologies such as Johansen cointegration, Vector Error Correction Models (VECM), and Fully Modified OLS (FMOLS) have been underutilized, despite their relevance for analyzing aid effectiveness in volatile macroeconomic contexts. Furthermore, few studies explore how domestic factors - such as political stability, investment, inflation, trade openness, and labor force participation - interact with aid to influence growth. This study addresses these gaps by applying modern econometric techniques to updated data spanning 1992-2023, providing a comprehensive and robust evaluation of the foreign aid–growth nexus in Sri Lanka.

The central research question guiding this study is whether foreign aid has a measurable and significant impact on Sri Lanka's economic growth. Supporting this overarching question, the research explores several sub-questions: (i) whether foreign aid exhibits statistically significant short-run and long-run effects on economic growth; (ii) how key macroeconomic variables, including domestic investment, inflation, trade openness, labor-force participation, and political stability, mediate the aid–growth relationship; and (iii) what policy strategies can enhance aid effectiveness, ensuring that external assistance contributes to inclusive and sustainable development.

The primary objective of this study is to empirically assess the short-term and long-term effects of foreign aid on Sri Lanka's economic growth. Specific objectives include: (i) identifying long-run and short-run relationships between foreign aid and economic performance using advanced time-series econometrics; (ii) evaluating how macroeconomic conditions interact with foreign aid to influence growth outcomes; and (iii) providing evidence-based policy recommendations for optimizing the allocation and utilization of aid.

The significance of this study is twofold. For policymakers, it offers insights into designing effective development strategies that account for the interplay between foreign aid and domestic macroeconomic conditions, particularly in light of recent crises, including the 2022 economic collapse. For international development partners, the study highlights how aid can be better targeted to maximize developmental outcomes within Sri Lanka's institutional context. Academically, it contributes to the global discourse on aid effectiveness by providing a methodologically rigorous, country-specific analysis that incorporates political stability, investment, inflation, and trade dynamics - factors often overlooked in traditional aid–growth models.

The remainder of the paper is organized as follows: Section 2 reviews the theoretical and empirical literature on foreign aid and economic growth, with an emphasis on developing countries. Section 3 outlines the research methodology, detailing the research approach, operationalization of variables, analytical framework, and the methods of data analysis employed in the study. Section 4 discusses the empirical findings from descriptive statistics, multicollinearity tests, stationarity tests, cointegration analysis, FMOLS estimation, VECM modelling, causality tests, and diagnostic tests. Section 5 concludes with key policy recommendations for enhancing the effectiveness of foreign aid in promoting sustainable and inclusive economic growth in Sri Lanka.

2. Literature Review

2.1 Theoretical Literature

The relationship between foreign aid and economic growth has been examined through multiple theoretical lenses, each offering distinct explanations of how aid influences development outcomes. Classical growth theories emphasize capital accumulation, while modern frameworks highlight productivity, institutions, and structural

transformation. Together, these theories provide a comprehensive basis for understanding the heterogeneous impact of foreign aid in developing economies such as Sri Lanka.

2.1.1 Harrod–Domar Growth Model and the Financing Gap

The Harrod–Domar growth model conceptualizes economic growth as a function of capital accumulation and savings, emphasizing that insufficient domestic savings constrain investment and output growth (Harrod, 1939; Domar, 1946). Foreign aid, particularly capital grants and concessional development loans, is theorized to fill the *savings–investment gap* and accelerate growth by financing infrastructure, industrial capacity, and public investment. This logic aligns closely with the Two-Gap Model, which extends Harrod–Domar by identifying both savings gaps and foreign exchange gaps as major obstacles to development (Chenery & Strout, 1966).

For Sri Lanka, foreign aid has historically played a role in financing large-scale infrastructure, energy projects, and post-conflict reconstruction, helping to relax capital constraints. However, critics argue that the model's mechanical link between investment and growth ignores institutional quality, absorptive capacity, and efficiency of public spending, which can weaken the growth impact of aid-financed investment (Easterly, 2001).

2.1.2 Solow–Swan Neoclassical Growth Theory

The Solow–Swan neoclassical growth model introduces diminishing returns to capital and highlights exogenous technological progress as the key driver of long-run growth (Solow, 1956; Swan, 1956). Within this framework, foreign aid, especially project-based aid and infrastructure funding, can raise growth temporarily by increasing the capital stock, but its long-run impact is limited unless aid contributes to productivity improvements.

Empirical applications suggest that aid-financed infrastructure and physical capital accumulation can boost short-run output in developing countries, including Sri Lanka, but without sustained improvements in technology, skills, and labor productivity, growth effects may dissipate over time (Minoiu & Reddy, 2010). This framework implies that aid effectiveness depends on complementary domestic policies that support innovation, labor force participation, and capital efficiency.

2.1.3 Endogenous Growth Theory

Endogenous growth theory addresses the limitations of neoclassical models by internalizing technological progress and emphasizing human capital, innovation, and institutional quality as drivers of sustained growth (Romer, 1986; Lucas, 1988). From this perspective, foreign aid targeted toward education funding, health-sector aid, technical assistance, and institutional reform programs can generate permanent growth effects by enhancing domestic productive capacity.

Aid that supports human capital formation, research and development, and governance reforms is particularly relevant for countries undergoing structural and social transformation. In Sri Lanka, aid directed toward education, healthcare, disaster recovery, and public sector reform has contributed to improvements in human development indicators, supporting long-term growth potential. Empirical evidence supports this view, indicating that aid has a positive growth impact when allocated to productivity-enhancing sectors and supported by sound institutions (Hansen & Tarp, 2001).

2.1.4 Big Push Theory and Coordination Failures

The Big Push theory emphasizes the need for large-scale, coordinated investment to overcome structural bottlenecks and low-level equilibrium traps in developing economies (Rosenstein-Rodan, 1943; Murphy, Shleifer & Vishny, 1989). Foreign aid—particularly large multilateral funding programs and sector-wide approaches (SWAps), can play a catalytic role by financing complementary investments across infrastructure, industry, and social sectors.

In the Sri Lankan context, coordinated aid flows supporting transport networks, energy systems, and regional development initiatives illustrate how foreign assistance can address coordination failures and stimulate broader economic activity.

2.1.5 Institutional and Governance-Based Theories

New institutional economics emphasizes the role of governance, policy credibility, and institutional quality in determining economic performance (North, 1990). Within this framework, foreign aid influences growth indirectly through its impact on public financial management, regulatory capacity, and institutional reforms. Aid conditionality, technical assistance, and budget support can strengthen institutions when aligned with domestic reform priorities.

However, weak governance can lead to aid misallocation, rent-seeking, and reduced effectiveness. Burnside and

Dollar (2000) argue that aid promotes growth primarily in countries with sound macroeconomic policies, highlighting the conditional nature of aid effectiveness—an insight highly relevant to Sri Lanka's evolving institutional landscape.

2.1.6 Dependency Theory and Aid Skepticism

In contrast to pro-aid frameworks, dependency theory views foreign aid as a mechanism that may reinforce structural dependency, distort domestic incentives, and perpetuate underdevelopment (Prebisch, 1950). According to this perspective, prolonged reliance on donor-driven aid, tied aid, and politically conditioned assistance can weaken domestic institutions, reduce fiscal discipline, and delay structural transformation.

Empirical critiques suggest that excessive aid dependence may undermine accountability and state capacity, particularly when aid substitutes for domestic revenue mobilization (Moss & van de Walle, 2006). This theory underscores the risks of unproductive aid use and emphasizes the importance of recipient ownership and strategic alignment.

Taken together, these theoretical frameworks suggest that foreign aid can promote economic growth through multiple channels: capital accumulation, productivity enhancement, human capital development, institutional strengthening, and structural transformation. At the same time, the growth impact of aid is highly conditional on governance quality, absorptive capacity, policy coherence, and the type of aid funds employed—including grants, concessional loans, project aid, program aid, and sector-specific funding. For Sri Lanka, these theories collectively imply that while foreign aid has played a crucial role in addressing investment gaps, supporting post-conflict recovery, and financing social development, maximizing its long-term growth impact requires effective targeting, institutional strengthening, and integration with national development strategies. An integrative theoretical approach that acknowledges both the enabling and constraining dimensions of foreign aid is therefore essential for understanding its complex role in shaping Sri Lanka's economic growth trajectory.

2.2 Empirical Literature

Empirical studies on the relationship between foreign aid and economic growth reveal mixed and context-dependent outcomes, shaped by country-specific characteristics, aid composition, institutional quality, and econometric methodology. The literature can be broadly categorized into country-specific studies (particularly Sri Lanka), cross-country evidence from developing economies, and insights drawn from developed-country and donor-side analyses.

2.2.1 Empirical Evidence from Sri Lanka

Empirical research focusing on Sri Lanka generally finds that foreign aid has played a supportive—though conditional—role in economic growth. Early studies emphasize the importance of aid in financing public investment and alleviating foreign exchange constraints. Athukorala and Jayasuriya (1994) show that foreign aid contributed positively to capital formation and growth during Sri Lanka's liberalization period, particularly when aligned with export-oriented reforms.

Using time-series techniques, Silva and Dissanayake (2015) find a long-run positive relationship between foreign aid and GDP growth in Sri Lanka, emphasizing the role of aid-financed infrastructure and human capital investment. Rajapaksha and Ahamad (2016), employing cointegration and error-correction models, confirm that aid supports economic growth when complemented by trade openness and macroeconomic stability. Samarakoon and Weerasinghe (2017) further highlight that aid has been instrumental in strengthening agricultural productivity and rural development, particularly through concessional lending and donor-supported extension services.

Post-conflict and post-disaster contexts receive particular attention in the literature. Kelegama (2010) and Gunasinghe (2014) argue that foreign aid played a critical role in post-war reconstruction, infrastructure rehabilitation, and social sector recovery, though concerns remain regarding absorptive capacity and project efficiency. More recent studies using ARDL and VECM approaches (e.g., Perera & Wijesinghe, 2020) indicate that aid exerts a statistically significant long-run effect on growth, while short-run impacts depend on fiscal discipline and institutional effectiveness.

Overall, Sri Lankan evidence suggests that foreign aid has been growth-enhancing when directed toward productive sectors and supported by coherent policy frameworks, but less effective when associated with fiscal imbalances, project delays, or weak institutional coordination.

2.2.2 Evidence from Developing Countries

A large body of empirical literature examines the aid–growth nexus across developing countries, often producing divergent conclusions. On the positive side, Hansen and Tarp (2001), using cross-country regressions, find that aid has a robust positive effect on growth even after accounting for diminishing returns. Karras (2006) and Ghosh and

Gregoriou (2006) similarly report that aid promotes growth, particularly in low-income countries where capital scarcity is severe.

Several studies emphasize the conditional effectiveness of aid. Burnside and Dollar (2000) argue that aid enhances growth primarily in countries with sound fiscal, monetary, and trade policies - a finding that sparked extensive debate. Neanidis and Varvarigos (2009) show that productive aid (infrastructure, education, health) stimulates growth, while non-productive aid has limited or negative effects. Aid volatility also emerges as a critical concern; Ouattara (2006) demonstrates that unstable aid flows undermine fiscal planning and reduce public investment efficiency.

Regional studies provide additional nuance. Baliamoune-Lutz (2012a; 2012b) finds that institutional quality and social cohesion significantly influence aid effectiveness in African economies. Appiah-Konadu et al. (2016) report positive long-run growth effects of aid in Sub-Saharan Africa, particularly in post-conflict countries, while Southeast Asian evidence suggests that aid is most effective when integrated into broader industrial and export-oriented strategies.

However, skepticism persists. Boone (1996) and Rajan and Subramanian (2008) argue that aid largely increases government consumption rather than investment, yielding negligible growth effects. Doucouliagos and Paldam (2009), through meta-analysis, conclude that the average growth effect of aid is small and highly sensitive to model specification, data quality, and estimation techniques.

2.2.3 Evidence from Developed Countries and Donor-Side Perspectives

While developed countries are not aid recipients, donor-side studies provide important insights into aid allocation efficiency and effectiveness. Easterly (2001) critiques large-scale aid programs, arguing that donor incentives and bureaucratic inefficiencies often limit development outcomes. Kilby (2010) emphasizes the importance of disaggregating aid by type and donor motivation, noting that politically motivated aid is less effective than development-oriented assistance.

Studies focusing on aid effectiveness from an institutional and governance perspective highlight that donor conditionality and coordination matter. Clemens et al. (2012) distinguish between short-impact aid (infrastructure, budget support) and long-impact aid (education, health), showing that growth effects depend on time horizons and aid purpose. Developed-country evaluations increasingly stress results-based financing, accountability, and recipient ownership as key determinants of success.

Reviewing the empirical literature, several consistent themes emerge. First, foreign aid is not inherently growth-enhancing; its impact depends on how, where, and under what institutional and policy conditions it is deployed. Second, the composition of aid matters - productive, stable, and well-targeted assistance is more likely to foster growth than fragmented or volatile flows. Third, institutional quality, macroeconomic stability, and policy coherence play decisive roles in shaping aid effectiveness.

In the Sri Lankan context, empirical evidence generally supports a positive long-run relationship between foreign aid and economic growth, particularly in post-conflict reconstruction, infrastructure development, and social sector investment. Nonetheless, short-run effects remain sensitive to fiscal management, absorptive capacity, and governance quality. These insights justify the present study's use of advanced time-series techniques to capture both long-run equilibrium relationships and short-run dynamics, thereby contributing to the broader debate on aid effectiveness in developing economies.

3. Methodology

This section outlines the methodological framework used to examine the impact of foreign aid on economic growth in Sri Lanka. It details the data sources, variables, and hypotheses, and describes the econometric techniques employed to ensure the robustness of the analysis. This framework provides a foundation for the empirical investigation presented in subsequent chapters.

3.1 Research Approach

The analysis relies on secondary annual data spanning 1992-2023, sourced from authoritative institutions, including the Central Bank of Sri Lanka (2023), Department of Census and Statistics (DCS), Sri Lanka Bureau of Foreign Employment (SLBFE), and the World Bank.

The dependent variable is GDP per capita growth (annual %), with net official development assistance (ODA) as the primary independent variable. Control variables include gross fixed capital formation (GFCF), labour force

participation rate (LFPR), inflation, trade openness, and military expenditure, consistent with prior studies (Burnside & Dollar, 2000; Minoiu & Reddy, 2010). The longitudinal design allows for analysis of trends over three decades, capturing variations in macroeconomic and political conditions. The research design follows the 'research onion' framework (Saunders et al., 2019), providing a systematic approach from philosophical assumptions to econometric modelling.

3.2 Variable Operationalization

In this study, the dependent variable is Gross Domestic Product (GDP) per capita, which measures the average economic output generated by an individual in Sri Lanka. This variable is adjusted for population growth and inflation, making it a reliable indicator of economic performance and living standards over time. The primary independent variable is foreign aid, operationalized as Official Development Assistance (ODA). This variable captures financial support from donor countries and international organizations aimed at promoting Sri Lanka's development, including contributions to post-conflict reconstruction, education, health, and infrastructure development. To isolate the effect of foreign aid on economic growth, several control variables are included. Gross Fixed Capital Formation (GFCF) represents investments in physical assets such as machinery, buildings, and infrastructure, reflecting the economy's productive capacity. Labour Force Participation Rate (LFPR) indicates the proportion of the working-age population actively engaged in the labour market, capturing human capital utilization. Inflation, measured as the annual percentage change in consumer prices, accounts for the macroeconomic stability of the economy. Trade openness, defined as the sum of exports and imports as a share of GDP, reflects the extent of Sri Lanka's integration into the global economy. Finally, military expenditure is included as a proxy for political stability and resource allocation, capturing the potential economic impact of defence spending. Collectively, these variables provide a comprehensive framework for analysing the influence of foreign aid on Sri Lanka's economic growth.

3.3 Analytical Framework

This study employs a model based on the Cobb-Douglas production function framework to investigate the impact of foreign aid on economic growth in Sri Lanka. The approach is grounded in neoclassical growth theory and has been widely adopted in empirical literature examining the role of external financial flows on productivity and output (Jawaid & Raza, 2012).

The standard Cobb-Douglas production function is specified as:

$Y = (L, K, A)$

Where:

Y = Gross Domestic Product

L = Employed labour force,

K = Capital stock,

A = Total Factor Productivity, augmented by foreign aid

Foreign aid is assumed to influence productivity A by facilitating technology transfer, human capital development, institutional reform, and infrastructure investment (Hansen & Tarp, 2001; Moreira, 2005). Thus, productivity is a function of foreign aid:

$A = g(AID)$

Substituting this into the production function yields:

$Y = (L, K, AID)$

Assuming a log-linear form suitable for time series econometric analysis and converting all variables into natural logarithms to stabilize variance and interpret coefficients as elasticities, the empirical specification becomes:

$$lnGDPPC_t = \beta_0 + \beta_1 lnAID_t + \beta_2 GFCF_t + \beta_3 LFPR_t + \beta_4 INF_t + \beta_5 TO_t + \beta_6 ME_t + \mu_t$$

Where:

- $lnGDPPC_t$: Natural log of GDP per capita.
- $lnAID_t$: Natural log of net official development assistance.
- $GFCF_t$: Gross fixed capital formation.
- $LFPR_t$: Labour force participation rate.
- INF_t: Inflation.
- ME_t: Military expenditure.

- TO_t: Trade openness.
- μ_t: Error term.

3.4 Method of Analysis

To comprehensively examine the impact of foreign aid on economic growth in Sri Lanka, a suite of advanced econometric techniques is employed, each selected for its ability to address specific challenges inherent in time-series analysis. First, the descriptive statistics offer an initial overview of the key variables used in the analysis, providing insights into their distribution and trends over the study period. Second, unit root tests, particularly the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979), are applied to ensure the stationarity of the variables, as non-stationary data can produce spurious regression results and misleading inferences. Following this, cointegration analysis using the Johansen test (Johansen, 1988; Johansen & Juselius, 1990) is conducted to identify the existence of long-run equilibrium relationships among the variables, enabling an assessment of whether foreign aid exerts sustained effects on economic growth. To estimate the long-run coefficients while addressing potential issues of endogeneity and serial correlation, the Fully Modified Ordinary Least Squares (FMOLS) method is employed, which provides robust and unbiased estimates for cointegrated systems (Phillips & Hansen, 1990).

To capture both short- and long-run dynamics and the speed of adjustment toward equilibrium, a Vector Error Correction Model (VECM) is utilized, allowing for the analysis of immediate and delayed effects of foreign aid on GDP growth while accounting for interactions with other macroeconomic factors (Engle & Granger, 1987). The Granger causality test (Granger, 1969) is incorporated to determine the direction of causality between foreign aid and economic growth, providing insights into whether aid drives growth or vice versa. Additionally, comprehensive diagnostic tests are performed to check for autocorrelation (Breusch-Godfrey test), heteroskedasticity (White test), normality of residuals (Jarque-Bera test), and multicollinearity (Variance Inflation Factor), ensuring that all classical regression assumptions are satisfied. This methodological approach aligns with established practices in empirical research on aid and development economics (Burnside & Dollar, 2000; Olubiyo et al., 2020; Jawaid & Raza, 2012), ensuring the results are robust, valid, and theoretically sound.

4. Results and Findings

4.1 Descriptive statistics

The descriptive statistics presented in Table 1 offer a vivid snapshot of Sri Lanka's macroeconomic landscape over the study period, revealing both stability and significant fluctuations across key variables.

Table 1. Descriptive statistics results

	GDPG	GFCF	INF	LAID	LFPR	ME	TO
Mean	4.221	25.467	9.913	19.637	51.134	3.039	63.728
Median	5.249	25.241	7.625	19.827	50.300	2.833	65.987
Maximum	8.669	31.600	49.721	20.762	62.600	5.861	88.636
Minimum	-7.346	17.588	2.135	16.217	47.900	1.343	37.089
Std. Dev.	3.702	3.1704	8.578	0.771	2.811	1.183	15.271
Skewness	-1.573	-0.2497	3.306	-2.827	2.1521	0.718	-0.142
Kurtosis	5.085	2.997	15.711	13.564	9.571	2.745	1.517
Jarque-Bera	18.999	0.332	273.766	185.485	82.287	2.838	3.039
Probability	0.000	0.846	0.000	0.000	0.000	0.241	0.218
Sum	135.100	814.945	317.217	608.763	1636.300	97.252	2039.322
Sum Sq. Dev.	424.896	311.603	2281.302	17.874	245.072	43.400	7229.544
Observations	32	32	32	31	32	32	32

Source: World Bank. (2023).

Economic growth averaged 4.22%, but its wide fluctuations—from deep contractions to strong expansions—and its non-normal distribution underscore the economy's vulnerability to shocks. Inflation displayed similar instability,

with a high mean of 9.91% and extreme spikes, reflected in its pronounced right-skewness and excess kurtosis, capturing repeated inflationary pressures. In contrast, gross fixed capital formation remained relatively stable and normally distributed, suggesting consistent investment activity. Foreign aid inflows, while steady on average, showed a sharply left-skewed and peaked distribution, indicating occasional abrupt declines. Labour force participation demonstrated moderate variability but notable deviations from normality due to sporadic increases. Military expenditure and trade openness showed more balanced and near-normal distributions, highlighting predictable defence spending patterns and a generally open trade regime. Collectively, these patterns reveal a mixed macroeconomic landscape, where certain indicators exhibit stability while others reflect structural fragility. The presence of significant skewness and kurtosis in several variables reinforces the need for robust econometric methods capable of handling non-normal time-series data to ensure reliable empirical inferences.

4.2 Multicollinearity test

Multicollinearity assessment is a crucial diagnostic step in regression analysis because excessive correlation among explanatory variables can inflate standard errors and weaken the reliability of coefficient estimates. When multicollinearity is high, it becomes difficult to isolate the individual effect of each variable, ultimately undermining the model's predictive accuracy and policy relevance. By ensuring that Variance Inflation Factor (VIF) values remain below the conventional threshold of 10, the model demonstrates statistical stability and supports precise, unbiased interpretation of the estimated relationships. This is particularly important in a study examining how foreign aid, investment, labour participation, inflation, military expenditure, and trade openness jointly influence economic growth. Table 4.2 reports the multicollinearity diagnostics using centered VIF values, which provide the standard measure for detecting collinearity among predictors.

Table 2. Multicollinearity Test Results

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
AID	0.613	1375.692	2.053
GFCF	0.024	90.698	1.275
LFPR	0.035	532.848	1.604
INF	0.005	5.304	2.171
ME	0.438	27.594	3.420
TO	0.003	78.244	4.082
C	393.582	2284.093	NA

Source: World Bank. (2023).

The results indicate that all independent variables fall well within acceptable limits, confirming the absence of serious multicollinearity in the model. Foreign aid (AID) shows a centered VIF of 2.053, suggesting mild correlation with other variables but not at a level that threatens estimation accuracy. Gross fixed capital formation (GFCF) and labour force participation (LFPR) also display low VIF values of 1.275 and 1.604, respectively, indicating that these variables contribute unique explanatory power to the model. Inflation (INF) records a moderate VIF of 2.171, which remains far below the critical threshold. Military expenditure (ME) and trade openness (TO) show slightly higher VIF values—3.420 and 4.082—but these still fall comfortably within the acceptable range, implying manageable levels of correlation that do not distort the regression estimates. Overall, the multicollinearity test confirms that the regression model is robust, and the included variables do not exhibit problematic intercorrelations. This enhances confidence in the reliability of the coefficient estimates and ensures that subsequent interpretations and policy recommendations based on the model are statistically credible.

4.3 Unit Root Test

Assessing the stationarity of time-series variables is a fundamental step in empirical analysis, as non-stationary data can produce spurious regression results and unreliable inferences. Stationarity implies that a series maintains constant statistical properties—such as mean, variance, and autocorrelation—over time. To determine the order of integration

of each variable, the Augmented Dickey-Fuller (ADF) test was conducted at both the level and first difference. Table 3 presents the ADF statistics and corresponding p-values for all variables included in the model.

Table 3. Unit root test

Variables	Level		First Difference		I(d)
	t-statistics	p-value	t-statistics	p-value	
GDPG	-0.674	0.838	-10.480	0.000	I(1)
LAID	-3.421	0.068	-8.196	0.000	I(1)
LGFCF	-2.066	0.258	-3.011	0.045	I(1)
LFPR	-3.350	0.076	-3.972	0.020	I(1)
INF	-0.472	0.502	-8.618	0.000	I(1)
ME	-3.508	0.056	-5.365	0.000	I(1)
TO	-3.331	0.080	-5.638	0.000	I(1)

Source: World Bank. (2023).

The ADF test results clearly show that none of the variables—GDP growth (GDPG), log of aid (LAID), log of gross fixed capital formation (LGFCF), labour force participation rate (LFPR), inflation (INF), military expenditure (ME), and trade openness (TO)—are stationary at their levels. Although a few variables, such as LAID (-3.421), LFPR (-3.350), and ME (-3.508), approach the 10% significance threshold at levels, none satisfy the more robust 5% significance requirement. This indicates the presence of unit roots and confirms that the variables are non-stationary in level form. However, once first differenced, all variables exhibit strong stationarity, with highly significant t-statistics and p-values below 0.05. Thus, each variable becomes stationary only after differencing, implying that they are integrated of order one, I(1).

Establishing that all variables share the same order of integration is essential for conducting cointegration analysis. This finding provides a solid econometric basis for applying the Johansen cointegration technique and subsequently estimating a Vector Error Correction Model (VECM). These methods allow for identifying long-run equilibrium relationships and short-run dynamic adjustments among the variables, forming the foundation for deeper empirical investigation in the following sections.

4.4 Cointegration

The Johansen cointegration analysis was conducted to determine whether long-run equilibrium relationships exist among foreign aid, economic growth, and the selected macroeconomic control variables. Since all series were confirmed to be integrated of order one, I(1), the Johansen approach is appropriate.

Table 4. Unrestricted Cointegration Rank Test (Trace) Results

No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.890	182.801	125.615	0.000
At most 1 *	0.826	122.968	95.753	0.000
At most 2 *	0.655	75.656	69.818	0.015
At most 3	0.571	46.887	47.856	0.061
At most 4	0.443	23.995	29.797	0.200
At most 5	0.254	8.160	15.494	0.448
At most 6	0.008	0.234	3.841	0.6280

Source: World Bank. (2023).
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
*denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The Trace test results (Table 4) indicate strong evidence of cointegration, as the trace statistics for the first three hypotheses exceed their respective 5% critical values, leading to the rejection of the null hypotheses of no

cointegrating vectors, at most one vector, and at most two vectors. This implies the presence of three long-run cointegrating relationships, suggesting that the variables share a stable long-run association despite short-term fluctuations.

Table 5. Unrestricted Cointegration Rank Test (Maximum Eigenvalue) Results

No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.890	59.833	46.231	0.001
At most 1 *	0.826	47.311	40.077	0.006
At most 2	0.655	28.769	33.876	0.180
At most 3	0.571	22.891	27.584	0.178
At most 4	0.443	15.835	21.131	0.234
At most 5	0.254	7.925	14.264	0.386
At most 6	0.008	0.234	3.841	0.628

Source: World Bank. (2023).
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

In contrast, the Maximum Eigenvalue test (Table 5) provides a more conservative outcome, identifying two statistically significant cointegrating equations, where the null hypotheses of no cointegration and at most one cointegrating vector are rejected at the 5% level. However, subsequent hypotheses fail to show statistical significance, indicating no additional long-run relationships based on this criterion. Taken together, both tests confirm the existence of multiple long-run equilibrium relationships among foreign aid, GDP growth, and the macroeconomic indicators included in the model. The slight difference between the number of cointegrating vectors identified by the two tests is common in empirical work, as the Trace test tends to be more inclusive while the Max-Eigen test is more restrictive. Overall, the evidence strongly supports the presence of cointegration, validating the application of the Vector Error Correction Model (VECM) to capture both short-run dynamics and long-run adjustments among the variables in the Sri Lankan context.

4.5 FMOLS test

The Fully Modified Ordinary Least Squares (FMOLS) estimates presented in Table 6 provide a clear picture of the long-run determinants of economic growth in Sri Lanka. The results indicate that foreign aid (LAID) is a highly influential driver of long-term growth, exhibiting a strong positive and statistically significant coefficient of 3.610 ($p = 0.000$). This implies that a 1% rise in foreign aid inflows leads to approximately a 3.61% increase in GDP growth, underscoring the critical role of development assistance in supporting Sri Lanka's macroeconomic stability and reconstruction efforts. Gross fixed capital formation (GFCF) also emerges as a major contributor to long-run growth. Its coefficient of 0.407 ($p = 0.000$) reflects the growth-enhancing impact of physical capital investments such as infrastructure, machinery, and productive assets, which expand the economy's capacity over time.

Trade openness (TO) similarly exhibits a positive and statistically significant long-run effect, with a coefficient of 0.102 ($p = 0.003$). This suggests that Sri Lanka's integration into international markets—through exports, imports, and global value chains—supports economic expansion by promoting technological spillovers, competitive efficiency, and access to broader markets. Together, these three variables—foreign aid, investment, and trade—constitute the core long-run pillars of economic growth according to the FMOLS evidence.

Conversely, inflation (INF), labour force participation rate (LFPR), and military expenditure (ME) are found to be statistically insignificant determinants of long-run growth. Although inflation (-0.040) and military spending (- 0.471) carry negative signs, their large p-values (0.354 and 0.230, respectively) indicate that their long-run influence on GDP growth is weak or inconclusive. Labour force participation, despite its theoretical importance for productivity, also shows no significant long-run relationship ($p = 0.622$), suggesting that labour quantity alone may not drive growth without complementary improvements in skills and technology.

Table 6. FMOLS test results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LGFCF	0.407	0.088	4.601	0.000
INF	-0.040	0.042	-0.946	0.354
LAID	3.610	0.464	7.773	0.000
LFPR	0.053	0.107	0.498	0.622
ME	-0.471	0.382	-1.234	0.230
TO	0.102	0.031	3.224	0.003
C	-85.270	11.547	-7.384	0.000
R-squared	0.895	Mean dependent var		4.434
Adjusted R^2	0.813	S.D. dependent var		3.780
S.E. of regression	2.351	Sum squared resid		121.669
Long-run variance	1.708			

Source: World Bank. (2023).

The constant term is notably large and negative (-85.270, p = 0.000), implying that without the included explanatory variables, economic growth would be substantially lower—affirming the critical contribution of capital formation, trade, and foreign aid to Sri Lanka's long-run growth trajectory. The model exhibits an excellent fit, with an R-squared value of 0.895 and an adjusted R-squared of 0.813, indicating that more than 81% of the long-run variation in economic growth is explained by the variables in the model. The low standard error of regression (2.351) and modest long-run variance (1.708) further validate the reliability and precision of the FMOLS estimates.

4.6 Vector Error Correction Model

The Vector Error Correction Model (VECM) provides valuable insights into both the short-run dynamics and long-run equilibrium mechanisms affecting economic growth in Sri Lanka. Table 7 summarises the estimation results, where GDP growth is the dependent variable, and the first differences of the explanatory variables capture short-term fluctuations.

Table 7. VECM model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.154	0.411	-0.376	0.710
D(LGFCF)	1.001	0.202	4.946	0.000
D(INF)	-0.005	0.061	-0.081	0.935
D(LAID)	2.106	0.893	2.358	0.027
D(LFPR)	0.467	0.196	2.374	0.026
D(ME)	-0.519	0.683	-0.759	0.455
ETC	-1.134	0.213	-5.316	0.000
R-squared	0.772	Mean dependent var		-0.000
Adjusted R^2	0.709	S.D. dependent var		3.944
S.E. of regression	2.124	Akaike info criterion		4.551
Sum squared resid	99.303	Schwarz criterion		4.881
Log likelihood	-58.997	Hannan-Quinn criter.		4.654
F-statistic	12.419	Durbin-Watson stat		2.200
Prob(F-statistic)	0.000			

Source: World Bank. (2023).

The negative and highly significant error correction term (-1.134, p = 0.000) confirms the presence of a stable long-term relationship among the variables, indicating that deviations from equilibrium are corrected rapidly, with over 113% adjustment occurring within a single period. This underscores a strong tendency for the economy to revert to long-run stability after short-term shocks.

In the short run, gross fixed capital formation (D(GFCF)) emerges as the most influential driver, with a coefficient of 1.001 (p = 0.000), demonstrating that increases in investment significantly boost immediate economic output. Foreign aid (D(LAID)) also positively affects short-term GDP growth (2.106, p = 0.027), highlighting the importance of aid inflows for stimulating immediate economic activity alongside long-term development benefits. Labour force participation (D(LFPR)) contributes meaningfully to short-run growth (0.467, p = 0.026), reflecting the role of an engaged workforce in enhancing productivity. Conversely, inflation (D(INF)) and military expenditure (D(ME)) show insignificant short-term effects, suggesting limited influence on immediate growth fluctuations.

Overall, the VECM demonstrates strong explanatory power ($R^2 = 0.772$, adjusted $R^2 = 0.709$) and reliability, indicating that policy measures promoting investment, foreign aid utilization, and labour participation are essential for supporting both short-term economic expansion and long-run equilibrium in Sri Lanka.

4.7 Causality test

The Granger causality analysis provides important insights into the directional relationships among economic growth and key macroeconomic variables in Sri Lanka. The results (Table 8) reveal a bi-directional causality between foreign aid (LAID) and GDP growth, with foreign aid Granger-causing growth (F = 3.908, p = 0.035) and GDP growth, in turn, influencing future aid inflows (F = 6.554, p = 0.005). This highlights the dual role of foreign aid in both stimulating economic performance and responding to the country's economic conditions. Trade openness (TO) is also found to Granger-cause GDP growth (F = 5.584, p = 0.009), highlighting the importance of international trade in driving economic expansion. Similarly, inflation (INF) exhibits predictive power for economic growth (F = 6.728, p = 0.004), reflecting the need to monitor price stability for sustained economic performance.

Table 8. Causality test results

	GDPG	LAID	LGFCF	LFPR	INF	ME	TO
GDPG		3.908	1.733	5.236	6.728	0.438	1.666
	-	(0.035)	(0.197)	0.013	(0.004)	(0.650)	(0.209)
LAID	6.554		6.037	13.271	0.864	0.963	0.263
	(0.005)	-	(0.008)	(0.000)	(0.435)	(0.397)	(0.771)
LGFCF	4.791	1.408		0.999	0.522	1.444	1.087
	(0.017)	(0.266)	-	(0.382)	(0.599)	(0.255)	(0.352)
LFPR	0.810	0.189	3.592		2.468	0.683	0.227
	(0.455)	(0.828)	(0.042)	-	(0.105)	(0.514)	(0.798)
INF	1.222	1.517	5.144	6.195		0.805	1.263
	(0.311)	(0.241)	(0.013)	(0.001)	-	(0.458)	(0.300)
ME	2.517	0.352	1.138	2.492	0.812		2.045
	(0.101)	(0.707)	(0.337)	(0.103)	(0.455)	-	(0.150)
TO	5.584	1.559	4.642	3.347	1.151	1.939	
	(0.009)	(0.233)	(0.019)	(0.051)	(0.332)	(0.164)	-

Source: World Bank. (2023).

Conversely, gross fixed capital formation does not significantly predict GDP growth in the short run (F = 1.733, p = 0.197), though GDP growth influences investment activity (F = 4.791, p = 0.017), suggesting that economic performance encourages capital accumulation. Labour force participation (LFPR) shows a reciprocal relationship with GDP growth and capital formation, whereas military expenditure (ME) exhibits no significant causal links.

Overall, the findings highlight foreign aid, trade openness, and inflation as key drivers of economic growth, with the bi-directional relationship between aid and GDP being particularly noteworthy. These results emphasize the importance of integrated macroeconomic policies to strengthen Sri Lanka's growth trajectory.

4.8 Diagnostic Tests

To ensure the reliability and robustness of the estimated econometric model, several diagnostic tests were conducted,

including assessments of serial correlation, heteroskedasticity, and normality of residuals. These tests are crucial to verify whether the model satisfies the classical linear regression assumptions and to ensure the validity of inference.

Serial Correlation: The Breusch-Godfrey LM test results (Table 9) indicate an F-statistic of 0.796 (p = 0.463) and an R-squared value of 2.093 (p = 0.351), both exceeding the 5% significance level. Consequently, the null hypothesis of no serial correlation cannot be rejected, suggesting that the residuals are free from autocorrelation. This confirms that the model is correctly specified with respect to time dependence and that the standard errors of coefficients are reliable.

Table 9. Breusch-Godfrey Serial Correlation LM Test Results

F-statistic	0.796	Prob. F (2,22)	0.463
Obs*R-squared	2.093	Prob. Chi-Square (2)	0.351

Heteroskedasticity: The Breusch-Pagan-Godfrey test (Table 10) shows an F-statistic of 1.823 (p = 0.136), Obs*R-squared of 9.707 (p = 0.137), and scaled explained sum of squares of 7.739 (p = 0.257), all above the 5% threshold. These results indicate homoskedasticity, meaning the residual variance is stable across observations, ensuring efficient parameter estimates and valid hypothesis testing.

Table 10. Heteroskedasticity Test: Breusch-Pagan-Godfrey Results

F-statistic	1.823	Prob. F (6,24)	0.136
Obs*R-squared	9.707	Prob. Chi-Square (6)	0.137
Scaled explained SS	7.739	Prob. Chi-Square (6)	0.257

Normality: The Jarque-Bera test (Figure 1) yields a statistic of 2.976 (p = 0.225), implying residuals are approximately normally distributed. Minor deviations are observed, with a skewness of -0.646 and kurtosis of 3.890, indicating slight left skewness and marginally heavier tails, but these remain within acceptable bounds for econometric analysis.

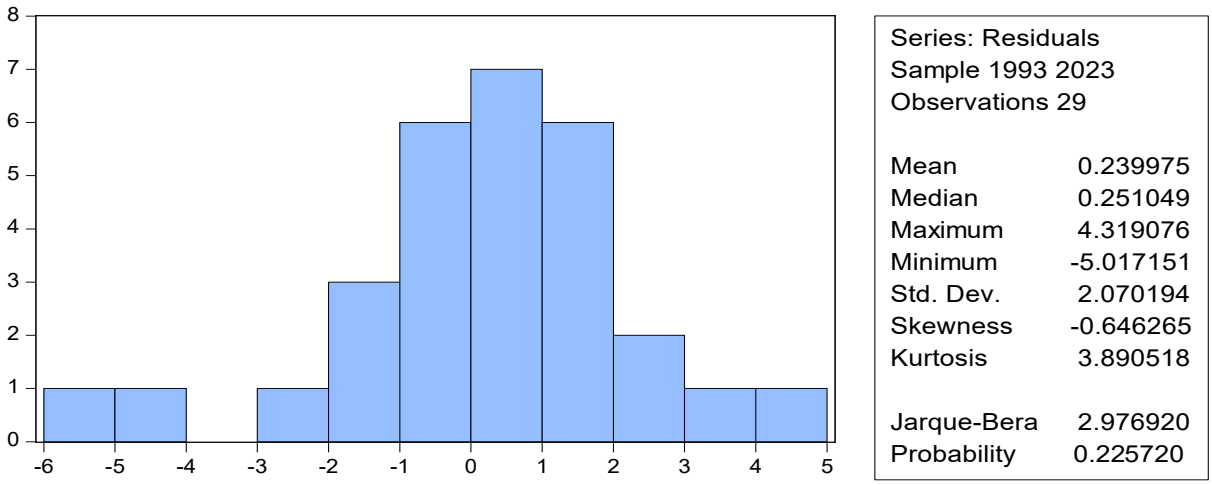

Figure 1. Normality test results.

Collectively, the diagnostic tests confirm that the model satisfies the key classical assumptions, free from serial correlation, heteroskedasticity, and severe non-normality. This enhances confidence in the reliability, precision, and validity of the estimated results.

The results of this study indicate that foreign aid has a positive and statistically significant long-run impact on economic growth in Sri Lanka, corroborating earlier findings by Wijeweera and Dollery (2010) and Rajan and Subramanian (2008), who emphasized the growth-enhancing role of aid in developing economies. Similarly, gross fixed capital formation and trade openness are found to significantly contribute to long-term growth, aligning with Barro

(1991) and other empirical studies highlighting investment and external trade as key drivers of economic development. In contrast, while some prior research suggested that labour force participation has a limited effect on growth (Ranasinghe, 2015), this study identifies a positive short-run impact through the VECM analysis, reflecting structural changes in the labour market and increased female participation over the period 1992-2023. The Granger causality results also reveal a bi-directional relationship between foreign aid and GDP growth, indicating that not only does aid stimulate economic performance, but stronger growth may, in turn, attract higher aid inflows - a dynamic feedback mechanism not extensively documented in earlier studies. Overall, these findings reinforce the interconnectedness of macroeconomic variables and underscore the importance of a coordinated policy approach that leverages foreign aid, investment, and trade openness to sustain Sri Lanka's economic growth.

5. Conclusion and Policy Implications

5.1 Conclusion

This study investigated the impact of foreign aid on economic growth in Sri Lanka by employing a comprehensive econometric framework, including unit root tests, Johansen cointegration, FMOLS estimation, Vector Error Correction Model (VECM), and Granger causality analysis. The study incorporated key macroeconomic variables such as gross fixed capital formation, labour force participation, inflation, military expenditure, and trade openness to capture both long-run and short-run dynamics.

Empirical results demonstrate that foreign aid has a statistically significant and positive long-run relationship with GDP growth, confirming that aid contributes to sustainable economic expansion when aligned with domestic policy and institutional capacity. Cointegration analysis indicates a stable long-run equilibrium among foreign aid, GDP growth, and other macroeconomic determinants, while the VECM results show that short-term deviations are corrected efficiently, reflecting a strong adjustment mechanism. FMOLS estimates further highlight the critical roles of gross fixed capital formation, trade openness, and foreign aid in driving long-term growth, aligning with classical Harrod-Domar predictions on investment and the Solow-Swan model's emphasis on capital accumulation and productivity.

Short-run analysis reveals that foreign aid, investment, and labour force participation significantly affect immediate growth dynamics, whereas inflation and military expenditure have a limited short-term impact. Granger causality tests indicate bi-directional causality between foreign aid and GDP growth, suggesting that not only does aid stimulate economic performance, but higher growth may also attract further aid inflows. Trade openness and inflation also exhibit significant causal links with growth, demonstrating the interconnectedness of macroeconomic factors in shaping economic outcomes.

The findings align with theoretical frameworks emphasizing the conditional nature of aid effectiveness. Endogenous growth theory underscores that human capital, institutional quality, and innovation are crucial for transforming aid into lasting growth. Dependency theory cautions that aid effectiveness depends on strategic allocation and governance quality to avoid dependency or inefficiency. Sri Lanka's experience, supported by prior empirical studies (Silva & Dissanayake, 2015; Rajapaksha & Ahamad, 2016; Samarakoon & Weerasinghe, 2017), confirms that well-targeted aid directed toward productive investments, infrastructure, social sectors, and post-conflict reconstruction can meaningfully enhance growth.

Overall, the study demonstrates that foreign aid, combined with domestic investment, labour force development, and trade integration, plays a pivotal role in fostering sustainable economic growth in Sri Lanka. Achieving long-term development objectives requires both external support and robust domestic structural reforms, coordinated through sound policy frameworks and strong institutions.

5.2 Policy Implications

Based on the findings of this study, several policy measures are recommended to maximize the developmental impact of foreign aid and promote sustainable economic growth in Sri Lanka.

First, foreign aid should be strategically targeted toward long-term productive investments, including infrastructure, education, healthcare, and tourism development, rather than short-term consumption. Well-directed aid can enhance human capital, strengthen institutions, and support post-conflict reconstruction, thereby ensuring that external assistance contributes to sustainable growth rather than creating dependency.

Second, domestic investment and labour productivity should be promoted alongside foreign aid. Policies that

encourage private sector participation, expand industrial and service sector capacities, and develop workforce skills through education and vocational training will complement aid inflows, diversify the economy, and increase resilience against external shocks.

Third, trade openness should be enhanced to integrate Sri Lanka more effectively into global markets. Reducing trade barriers, negotiating favorable trade agreements, and supporting export-oriented sectors - including tourism - can magnify the growth effects of both domestic resources and foreign aid.

Fourth, a holistic macroeconomic strategy is essential, combining foreign aid, domestic investment, labour development, trade policies, and strong institutions within a coordinated framework. Such an approach will ensure policy coherence, maximize the efficiency of resources, and sustain long-term growth.

Finally, attention to institutional quality and governance remains critical, as the effectiveness of aid is highly contingent upon transparency, accountability, absorptive capacity, and the strategic alignment of external funds with national development priorities. Collectively, these measures can enable Sri Lanka to leverage foreign aid effectively while fostering inclusive, sustainable, and resilient economic growth.

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