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An Empirical Investigation and Analysis of Foreign Aid-Economic Growth Nexus in Sierra Leone (1980-2023)

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Abstract

Sierra Leone, being a small and poor developing country, colossally relies on foreign aid, cardinally as a result of infinitesimal Gross Domestic Product (GDP) and improper resource management. The study elects to investigate and analyse foreign aid-economic growth nexus in Sierra Leone for the period 1980-2023. The study uses time series secondary data obtained from various sources such as the International Financial Statistics (IFS), Central Bank of Sierra Leone (CBSL), Ministry of Finance (MoF), World Development Indicators (WDI) and Sierra Leone Central Statistics Office (SLCSO). Various macroeconomic variables including investment to GDP ratio, exchange rate, terms of trade, inflation and public debt were specified in the model used in this study. A time series growth model was estimated using ordinary least squares (OLS) and Newey-West estimation techniques. The Hendry's general-to-specific method was used to arrive at the estimated model. Stationarity test, using Augmented Dickey-Fullah Generalised Least Squares (ADF-GLS) and the Perron Vogelsang tests for unit root, was carried out for all variables in the model to avoid spurious regression results which are common with time series analysis of macroeconomic data using OLS technique. The study empirically reveals a positive and significant impact on economic growth in Sierra Leone for the period being investigated. The study, therefore, provides key recommendations consistent with the findings, among which, is the need for policymakers to exercise tremendous efforts to further attract foreign aid to Sierra Leone in order to boost output and economic growth, ensuring that such resources are well managed.

Keywords

Gross Domestic Product (GDP), Interest Rate, Inflation, Exchange Rate

1. Introduction

Developing countries' growth process is exceedingly characterised by the role of foreign aid. The role foreign aid plays in the economic growth and development of developing countries is so immense to the extent that a strong debate has arisen to investigate and analyse the impact it creates in these countries.

Three arguments on the impact of foreign aid on economic growth in developing countries have emerged in support of the debate. The first argument is that there is a positive impact of foreign aid on economic growth in developing countries. The argument holds that foreign aid complements domestic resources while it supplements domestic savings. Proponents of this argument include Kargbo [15], Karras [14], Easterly [6], Boone [2], and Griffin [10]. The second argument is that for-

eign aid has a negative impact on economic growth. Proponents of this argument, including Dalgaard et al. [5], Burnside and Dollar [3], and Hansen and Tarp [11], are of the view that developing countries fully consume foreign aid and that foreign aid does not complement domestic resources. The third argument is that there is no correlation between foreign aid and economic growth. Strong proponents of this argument include, Jensen and Paldam [13].

The distinction in the well-being among countries of the world is astonishingly staggering, with more countries in the West been able to provide better services for the well-being of their citizens than almost all of those in Africa, and most in Asia and Latin America: these countries are classified as 'Underdeveloped Countries', though there has been growing concerns in the international community that this nomenclature is derogatory and must be changed. Thus, recently that nomenclature was changed to 'Developing Countries' to reflect the fact that they are all striving to become developed nations as well.

Nafziger [19] opines that there is a wide disparity between the living standards of wealthy or moderately wealthy people (in developed countries) and poor people (mostly in developing countries). This emanates mainly from the wide gap between the per capita income of citizens of affluent nations (like America and Canada) and those of poorer nations (like Sierra Leone and Liberia). The question that comes to mind is "why such a gap in the per capita incomes of these nations?"

One key reason for this is that developed nations normally have sufficient capital to stair up and maintain sustained economic growth, while on the contrary, developing countries, are generally characterised by lack of capital necessary to undertake activities that will lead to sustained economic growth. Therefore, developing countries are always on the search for external capital to fill this gap. Foreign aid, therefore, becomes one potential external capital that is expected to significantly boost economic growth and development in these countries.

Indeed, foreign aid has been flowing into developing countries in different forms for decades. However, the real impact that it has created in terms of economic growth and development in these countries has remained questionable. Hence, ascertaining the impact of foreign aid on economic growth in Sierra Leone forms the basis of this study.

2. The Problem Statement

Several developing countries including Sierra Leone have encountered continuous gross domestic product (GDP) growth rates fluctuation as well as other major macroeconomic variables such as export growth and private investment.

Sierra Leone's GDP growth rate has enormously been fluctuating since independence without achieving any growth spell for a moment despite the rising foreign aid trend the country has witnessed for decades. The country's GDP has, therefore, been quite insufficient to run the economy, hence the quest for foreign aid. The low levels of export growth and private investment have largely weakened the ability of the state to generate the required foreign exchange to finance relevant development projects.

Sierra Leone is among the developing countries in the world that has been, and is still receiving higher quantum of foreign aid, of different forms, for over three decades. Regardless of this, poverty is still wide spread, with over 65% of the population still living below the poverty line of USD ($) 2 per day. The country continues to be rated at the bottom of the United Nations Human Development Index (UNHDI).

Considering these reported circumstances, questions about the effective and efficient utilisation of foreign aid will continue to exist. The essence of directing a high level of attention to these circumstances need not be overstated, taking into account the persistent socio-economic challenges the world is currently experiencing, among which are the prevalent effects of the Russia-Ukraine War.

This paper has prompted critical questions both in the academic and professional circles regarding the foreign aid-growth relationship in Sierra Leone as follows:

1) How would foreign aid impact economic growth and development?
2) Under what circumstances foreign aid utilisation can or cannot be effective?

These are the broad questions this study intends to investigate and address, among others.

3. Literature Review

3.1. Theoretical Literature

This section focuses on the review of the theoretical literature that underpins the relationship between foreign aid and economic growth.

3.1.1. Foreign Aid and Economic Growth Theories

Foreign aid is considered a major source of financing capital formation in any economy. Developing countries are generally characterised by insufficient domestic capital formation as a result of the combination of such factors as low income, low productivity level and low level of savings (Adepoju et al.) [1]. Countries of this nature, therefore, require financial support from western countries or international financial institutions.

So, developing countries that wish to mobilise capital resources in the bid to boost economic growth and development may resort to foreign aid as a way of supplementing domestic savings, consistent with certain theories of growth.

Certain growth theories/ models support the use of foreign aid as a source of capital. Two such theories are discussed in this study,

First, Harrod-Dormar model: Harrod-Dormar model, which is based on a production function with no substitution between factor inputs (capital and labour), assumes investment to be equal to net savings and that net savings is a constant function of output. The model says that full employment of capital requires growth of output at a rate equal to the ratio of savings rate to capital-output ratio. This ratio, called the "warranted" rate of growth of full employment of capital stock, is believed to be the ratio expected to bring out the actualisation of the expectations of investors.

Harrod-Dormar model stresses that the two determinants of economic growth and development are the rate of savings (and therefore, investment) and capital-output ratio. The model is specified as, Gr =S/T, where Gr = GDP growth rate, S = domestic savings rate and T = capital-output ratio. The theory says that savings provides the necessary funds to finance investment and this investment creates further growth. According to the model, what is essential for economic growth is capital accumulation in the form of savings.

Developing countries usually have inadequate savings to facilitate investment necessary for growth. The lack of adequate savings necessitates the use of foreign aid which will serve as capital helping to fill the financing gap in developing countries to promote growth.

The model also stipulates that output growth equals growth of the labour force if full utilisation of labour is maintained. The condition might remain unchanged if effective labour force is considered. This condition is appropriately called the natural growth rate of effective labour force.

The dominant belief of the Harrod-Dormar model is that for full utilisation of both capital and labour while the economy grows, the "warranted" growth rate equals the natural growth rate which is referred to as the Harrod- Dormar (equilibrium) condition.

If the Harrod-Dormar condition does not hold, the economy will be in a state called the 'knife-edge' as it will stop moving on its equilibrium.

Second, Neo-classical growth model: This is another model of economic growth that supports the use of savings to finance investment to permit economic growth. This model outlines how steady economic growth rate can be achieved with the employment of three factors, namely, capital, labour and technology. In this model, the assumption of the employment of a production function in Harrod-Dormar model with no substitution between capital and labour (called Leontiff type production function) is relaxed. This implies the neo-classical growth model allows substitution of factors.

The simplest and most popular version of the neo-classical growth model is the Solow-Swan growth model. The central tenet of the Solow-Swan model (also called the Solow model) is that growth rate of the population and growth rate of investment determine the per capita income.

According to the Solow model, economic growth can be attained by an increase in the level of investment. The model postulates that countries will achieve economic growth if

they increase their savings and investments. Least developing countries, therefore, need to implement domestic policies that support greater savings and investment if they are to grow economically. The saving ability of developing countries is usually very low. This often requires flow of foreign resources in the form of foreign aid or foreign debt.

3.1.2. Foreign Aid and Resource-Gap Models

The idea behind resource-gap models (simply called the gap models) is that investment is the key engine of growth through the Incremental Capital-Output Ratio (ICOR (δ)) and that investment is constrained by certain factors. These models are used to determine the factors that constrain investment.

The investment equation is given as, $I = \delta\Delta Y$, where I = investment, δ = ICOR, ΔY = expected growth of output. The models identify three factors that constrain investment which are as follows: savings gap, foreign exchange gap and finance gap.

Savings gap: Savings gap is one factor that affects investment. Savings is needed for financing capital investment necessary to promote economic growth. In many developing countries, the savings obtained domestically is usually quite insufficient to promote growth. Actual savings is less than the required savings that can permit growth. This difference creates a gap called savings gap. This gap needs to be financed. Financing this gap requires foreign flow of resources. The financing of savings gap justifies the use of foreign aid as a source of capital, consistent with the Harrod-Damar model.

Foreign exchange gap: This gap occurs when the foreign exchange required for growth exceeds that available to import capital goods. This is perhaps the country's exports are not diversified. When this gap occurs, the country is in problem of foreign exchange constraint. This gap needs to be financed and in financing the gap, foreign finance is required. This calls for foreign aid availability.

A combination of savings gap and foreign exchange gap is called the two-gap model.

Finance gap: Finance gap is the gap that arises when government revenue is less than government expenditure. This is otherwise called government budget deficit. In developing countries, deficit is high because there is low revenue and government expenditure is high. Whatever that is obtained from investment is therefore used to finance the deficit. After financing the deficit, nothing will be left to finance projects that can yield high returns. Financing this gap requires foreign flow of resources.

A combination of savings gap, foreign exchange gap and finance gap gives what is called the three-gap model.

3.2. Empirical Literature

Several researchers have, over time, empirically investigated the relationship between foreign aid and economic

growth in developing countries, including Sierra Leone. Empirical findings have shown mixed results. The following empirical studies on the impact of foreign aid on economic growth in different countries have been conducted:

Kargbo [15] examines the impact of foreign aid on economic growth in Sierra Leone using a triangulation of approaches involving the Autoregressive Distributed Lag (ARDL) bounds test approach and Johansen maximum likelihood approach to cointegration for the period 1970 to 2007. The author finds that foreign aid positively and significantly impacted economic growth in Sierra Leone for the study period.

Fasanya and Anakoya [8] examine the impact of foreign aid flows on economic growth in Nigeria. The study shows a positive and significant relationship between foreign aid and economic growth in Nigeria. The authors are of the view that an increase in foreign aids will lead to an increase in domestic investments, hence, an increase in growth.

Ekanayake and Chatrna [7] analyse the impact of foreign aid on economic growth of 85 developing countries for the period 1980 to 2007 using panel data. The authors find that foreign aid has mixed effects on developing countries' economic growth.

Minoiu and Reddy [17] investigate the growth effect of official development assistance to developing nations. The study reveals that development aid has positive and significant long run growth effects on developing countries.

Mallik [16] investigates the aid-growth relationship in 6 poor African countries, namely, Sierra Leone, Mali, Malawi, Niger, Togo and Central African Republic using cointegration method of analysis. The study finds a negative long run relationship between foreign and economic growth for most of the countries. The study also reveals that with the exception of Niger, no short run relationship was found.

Karras [14] examines the relationship between foreign aid and economic growth in GDP per capita for a sample of 71 aid receiving developing countries from 1960 to 1997 using annual data. The study reveals a positive and statistically significant correlation between foreign aid and economic growth in these countries.

Gomanee et. al. [9] investigate the channels through which foreign aid affects economic growth of 25 Sub-Saharan African countries for the period 1970 to 1997. The authors conclude that foreign aid positively and significantly impacted economic growth of the said countries.

Hatemi-J and Irandoust [12] examine the correlation between foreign aid and economic growth in 6 developing countries, namely, Kenya, Ethiopia, Botswana, India, Sri Lanka and Tanzania for the period 1974 to 1996. The study employed the log of real gross national product (GNP) per capita to determine each country's economic growth and panel cointegration analysis to ascertain the long run relationship. The findings indicate a positive and significant aid-growth relationship.

Moreira [18] investigates the impact of aid on economic growth of 48 developing countries for the period 1970 to 1998 using the generalised method of moments (GMM). Author concludes that the positive impact of aid on growth was higher in the long run compared to the short run.

Collier and Hoeffler [4] conduct a cross-country analysis of the impact of foreign aid on economic growth of 27 post-conflict countries and find out that foreign aid to such countries contributed positively to economic growth.

4. Methodology

4.1. Model Specification and Description of Variables

A model of real output is estimated to determine the role of foreign aid on economic growth. Hence, a model of real output is specified. The specification follows the accelerator principle which predicts that growth is determined by change in capital, which is investment. This implies that growth is determined by investment. Thus, the real output model is given by equation (1).

$$\frac{\Delta Y}{Y} = \alpha_1 \frac{\Delta K}{K} \qquad (1)$$

This implies;

$$\Delta Y = \alpha_2 \Delta K \qquad (2)$$

Where, Y is real output and K is capital stock.

$$\Delta K = I \qquad (3)$$

Where I = Investment.
Hence, equation (2) implies;

$$\Delta Y = \alpha_2 I \qquad (4)$$

That is;

$$Y_t - Y_{(t-1)} = \alpha_2 I$$

Therefore,

$$Y_t = Y_{(t-1)} + \alpha_2 I \qquad (5)$$

By scaling investment by the level of economic activities in current prices (y), equation (5) becomes;

$$Y_t = Y_{(t-1)} + \alpha_2 \frac{I}{Y_t} \qquad (6)$$

Therefore,

$$Y = f\left[\left(Y, \frac{I}{Y}\right)\right] \qquad (7)$$

Equation (7) is, however, modified in order to account for the role of real exchange rate, openness to trade, terms of trade, inflation and public debt in economic growth. Moreover, the role of foreign aid is investigated by explicitly introducing official development aid (ODA) into the model. Thus, the model estimated is given as:

$$RGDP = f\left(\frac{INV}{GDP}, REER, OPN, TOT, INF, \frac{DEBT}{GDP}, ODA\right) \text{ (8)}$$

Where:

RGDP = Real GDP Growth

$\frac{INV}{GDP}$=Investment to GDP Ratio

REER= Real Effective Exchange Rate

OPN=Trade Openness

TOT=Terms of Trade

INF=Inflation

$\frac{DEBT}{GDP}$=Public Debt to GDP Ratio

ODA=Official Development Assistance

It is shown that while all variables have stochastic trend, RGDP and ODA have deterministic trends. Hence, the logs of these variables are taken into the model unlike the other variables.

Hence, equation (9) is estimated.

$$LnRGDP = f\left(\frac{INV}{GDP}, REER, OPN, TOT, INF, \frac{DEBT}{GDP}, LnODA\right) \text{ (9)}$$

To the extent that a dynamic model is preferred to a static model, given that it accounts for the impact of delayed effects, it tests for the existence of persistence and it also accounts for autocorrelation, a dynamic model of equation (9) is specified and estimated. This is given by equation (10) below:

$$LnRGDP = \alpha + bi\sum_{t=0}^{P1}\left(\frac{INV}{GDP}\right)_{t-i} + ci\sum_{t=0}^{P2}REER_{t-i} +$$
$$di\sum_{t=0}^{P3}OPN_{t-1} + ei\sum_{t=0}^{P4}TOT_{t-1} + fi\sum_{t=0}^{P5}INF_{t-1} +$$
$$gi\sum_{t=0}^{P6}\left(\frac{DEBT}{GDP}\right)_{t-1} + hi\sum_{t=0}^{P7}LnODA_{t-1} +$$
$$ji\sum_{t=0}^{P}RGDP_{t-1} + U_t \quad \text{(10)}$$

where U is a disturbance term that is identically and independently distributed with zero mean to ensure unbiased estimates of ordinary least squares (OLS) that have minimum variance.

4.2. Expected Signs of Model Variables

Investment (INV) (+): It is expected that investment should have a positive effect on growth as investment is a component of aggregate demand. Therefore, if there is an increase in investment, it will help boost aggregate demand and hence economic growth.

Real Effective Exchange Rate (REER) (-): It is expected that the effect of an increase in the real effective exchange rate on economic growth is negative. This is because REER is the weighted average of a country's currency in relation to a basket of other major currencies. The weights are determined by comparing the relative trade balance of the country's currency against that of each country in the index. An increase is an indication that the country's exports are becoming more expensive and its imports are becoming cheaper. At this point, it is losing its trade competitiveness.

Trade Openness (OPN) (+): It is expected that an increase in trade openness has a positive effect on economic growth. According to the theory of comparative advantage, trade openness can potentially enhance economic growth. This is because if a country wants to trade with another country, the latter will produce goods in which it has a comparative advantage. It specialises in the sector for which it has better factor endowments and produces goods on a larger scale. As a result, productivity and exports of this sector will rise and this will boost the overall economic growth.

Terms of Trade (TOT) (+): Generally, an improvement in the terms of trade is expected to have a positive effect on economic growth since it is the ratio of export price to import price. So an increase in a country's export price (which may likely result in an increase in its export volume as well) leads to an improvement in the TOT, holding the import price constant.

Inflation (INF) (-): Generally, an increase in inflation leads to a decrease or slowing down of economic growth. This is because, inflation, which is the continuous increase in the general price level, reduces the purchasing power of incomes, thus forcing consumers to spend more money to maintain the same level of consumption. This encourages consumption and reduces savings. It can also lead to increase in interest rates. Both actions lead to reduction in investment.

Public Debt (DEBT) (-): Generally, increase in public debt tends to reduce economic growth. This is because government tends to divert needed resources for growth opportunities to interest payments or debt repayment. In the long run, if debts continue to grow, government may tend to increase taxes to raise more revenues to finance debt servicing. This tax increase is passed on to consumers by the private sector.

Official Development Assistance (ODA) (+): ODA comes in various forms. However, in whatever form it comes, it represents a form of support to the government. Therefore, it is generally expected to lead to economic growth.

4.3. Estimation Procedure

When model variables are not stationary, the application of ordinary least squares to the specified model of real output, given in equation (9), can lead to misleading conclusion. This is because the standard errors are underestimated, leading to large t-values. With large t-values, there is tendency to conclude that the variables are significant, even when they are not, or are only so because of the existence of common trend between the dependent variable and the independent variables. In this regard, all model variables will be tested for stationarity.

In the test for stationarity, we will apply the Dickey Fuller Generalised Least Squares (GLS) test since it performs the original Augmented Dickey Fuller test for stationarity. However, because some variables may not be stationary due to the existence of structural break, which is a false representation of the stationarity status, tests for stationarity that take structural breaks into consideration are also applied. The Perron-Vogelsang test, which tests for one endogenous break, is applied.

4.4. Data Sources

The data sets on key macroeconomic variables including real GDP growth, investment to GDP ratio, real effective exchange rate, inflation, terms of trade this study used in carrying out the analysis for the period 1980-2023 were collected from various sources: International Financial Statistics (IFS), Central Bank of Sierra Leone, Ministry of Finance, World Development Indicators (WDI) and Sierra Leone Central Statistics Office.

5. Presentation and Analysis of Empirical Results

This section presents the empirical results and their discussions, including descriptive statistics, graphs of the variables used in the model, variable stationarity test results,

model estimation and post-estimation test results.

5.1. Descriptive Statistics and Correlation Matrix of Variables

Table 1 shows the descriptive statistics of all variables used in the model. Forty observations were included for each variable. It was found that Log of Real GDP (LnRGDP) has a mean of 29.31 with a minimum value of 28.88 and a maximum value of 29.10. Terms of Trade (TOT) has a mean of 52.53 with a minimum value of 15.63 and a maximum value of 100. Trade Openness (OPN) has a mean of 37.39 with a minimum value of 10.31 and a maximum value of 82.84. Real Effective Exchange Rate (REER) has a mean of 168.77 with a minimum value of 91.36 and a maximum value of 562.70. Investment to GDP Ratio (INV/GDP) has a mean of 12.12 with a minimum value of -2.42 and a maximum value of 41.54. Inflation (INF) has a mean of 31.75 with a minimum value of -3.29 and a maximum value of 178.7. Public Debt to GDP Ratio (DEBT/GDP) has a mean of 124.98 with a minimum value of 29.5 and maximum value of 257.75. Log of Official Development Assistance (LnODA) has a mean of 19.45 with a minimum value of 18.23 and maximum value of 20.64.

Table 1. Descriptive Statistics.

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
LnRGDP	43	29.31	0.34	28.88	29.10
TOT	43	52.53	26.10	15.63	100
OPN	43	37.39	15.64	10.31	82.84
REER	43	168.77	115.55	91.36	562.70
INV/GDP	43	12.12	7.64	-2.42	41.54
INF	43	31.75	37.19	-3.29	178.70
DEBT/GDP	43	124.98	72.58	29.50	257.75
LnODA	43	19.45	0.61	18.23	20.64

Table 2 presents the Pairwise Correlation result. It shows that Terms of Trade has a positive correlation with GDP but it is not significant. Trade Openness has a significant positive correlation with GDP. Real Effective Exchange Rate has a negative correlation with GDP but it is not significant. Public Investment to GDP Ratio has a significant positive correlation with GDP. Inflation has a negative correlation with GDP
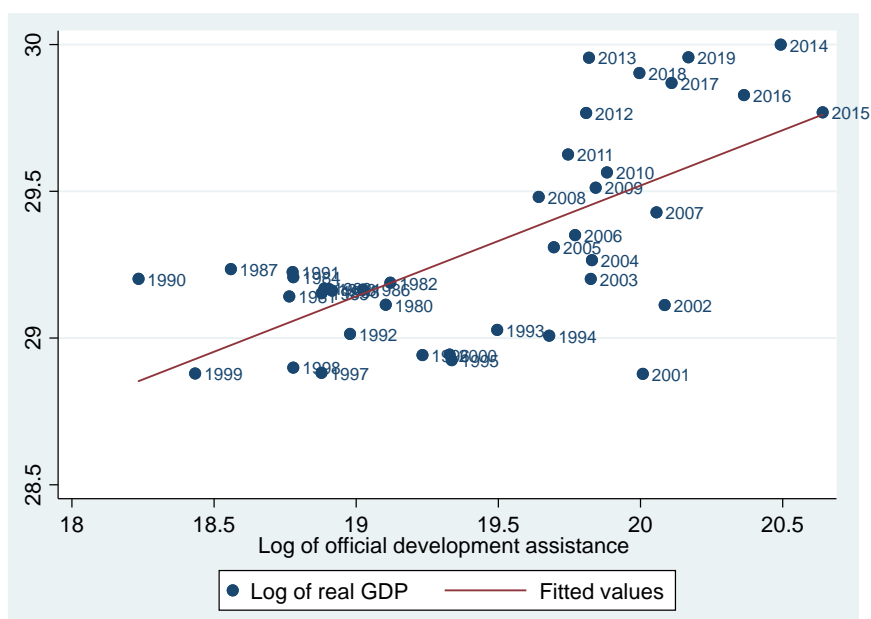
but it is not significant. Public Debt to GDP Ratio has a significant negative correlation with GDP. Official Development Assistance has a significant positive correlation with GDP. The significant positive relationship between Official Development Assistance and GDP suggests that foreign aid may have a positive effect on economic growth, though it is only a stylised fact.

Table 2. Pairwise Correlation of Model Variables.

	LnRGDP	TOT	OPN	REER	INV/GDP	INF	DEBT/GDP
TOT	0.1155 (0.4778)						
OPN	0.6915* (0.0000)	-0.1374 (0.3978)					
REER	-0.2193 (0.1739)	-0.5736* (0.0001)	-0.1402 (0.3883)				
INV/GDP	0.5754* (0.0001)	0.0217 (0.8941)	0.7890* (0.0000)	-0.0451 (0.7822)			
INF	-0.2620 (0.1024)	-0.5819* (0.0001)	-0.0611 (0.7081)	0.3315* (0.0367)	-0.1267 (0.4361)		
DEBT/GDP	-0.7954* (0.0000)	-0.1246 (0.4435)	-0.5232* (0.0005)	-0.0059 (0.9711)	-0.6065* (0.0000)	0.3750 (0.0171)	
LnODA	0.6660* (0.0000)	0.4891* 0.0014)	0.3524* (0.0257)	-0.4256* (0.0062)	0.3747* (0.0172)	-0.6932* (0.0000)	-0.5912* (0.0001)

Note: * means coefficient is significant.

Figure 1 shows the log of real GDP growth and the log of ODA while figure 2 depicts the first difference of the log of real GDP growth and the log of ODA. Both figures show that ODA has a positive impact on economic activities and economic growth respectively.
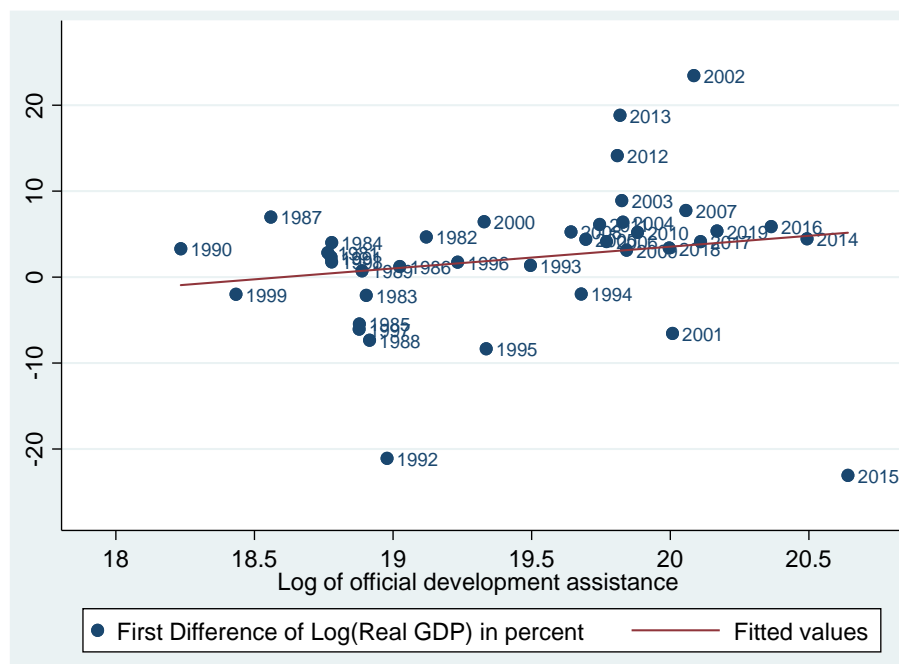

Figure 1. Log of Real GDP Growth and Log of ODA.

Figure 2. First Difference of Log of Real GDP Growth *and Log of ODA.*

Table 3. *Partial Correlation of Model Variables.*

Variable	Partial Correlation	Significance Value
TOT	0.0602	0.7354
OPN	0.5322	0.0012
REER	-0.1113	0.5310
INV/GDP	-0.3367	0.0515
INF	0.4022	0.0184
DEBT/GDP	-0.6755	0.0000
LnODA	0.4959	0.0029

Table 3 presents the Partial Correlation results. It shows that Terms of Trade has positive partial correlation with GDP but it is not significant. Trade Openness has a significant positive partial correlation with GDP. Real Effective Exchange Rate has a negative partial correlation with GDP but it is not significant. Public Investment to GDP Ratio has a significant negative partial correlation with GDP (contrary to its pairwise correlation) and it is significant. Inflation has a significant positive partial correlation with GDP (contrary to its pairwise correlation). Public Debt to GDP Ratio has a significant negative partial correlation with GDP. Official Development Assistance has a significant positive partial correlation with GDP (same as the pairwise correlation). Again, the partial correlation between Official Development Assistance and GDP may suggest that foreign aid has a significant positive impact on economic growth.

5.2. Variable Stationarity Test Results

Table 4 shows the result of Dickey-Fuller GLS Unit Root Test. The result shows that out of the eight model variables, only three are I(0), namely, Real Effective Exchange Rate (REER), Investment to GDP Ratio (INV/GDP) and Log of Official Development Assistance (LnODA). All the others are I(1).

Table 4. *Results of the Unit Root Test with Dickey-Fuller GLS (Maxlag4 @ SC).*

Variable	Stationary at	Deterministic Component	Lag	test - statistics	1% Critical value	5% Critical value	Conclusion
LnRGDP	Level	Trend	1	-1.106	-3.770	-3.273	LnRGDP is I(1)
	1st difference	Constant	1	-4.125	-3.770	-3.283	
TOT	Level	Constant	1	-1.188	-2.636	-2.346	TOT is I(1)

Variable	Stationary at	Deterministic Component	Lag	test - statistics	1% Critical value	5% Critical value	Conclusion
	1st difference	Constant	1	-3.314	-2.638	-2.355	
OPN	Level	Constant	1	-2.041	-2.636	-2.346	OPN is I(1)
	1st difference	Constant	1	-3.074	-2.638	-2.355	
REER	Level	Constant	1	-4.432	-2.636	-2.346	REER is I(0)
INV/GDP	Level	Constant	1	-2.796	-2.636	-2.346	INV/GDP is I(0)
INF	Level	Constant	1	-2.089	-2.636	-2.346	INF is I(1)
	1st difference	Constant	1	-6.454	-2.638	-2.355	
DEBT/GDP	Level	Constant	1	-1.325	-2.636	-2.346	DEBT/GDP is I(1)
	1st difference	Constant	1	-4.730	-2.638	-2.355	
LnODA	Level	Trend	1	-3.537	-3.770	-3.273	LnODA is I(0)

Table 5 shows the results of Perron-Vogelsang Unit Root Test. Using this test, it was observed that all the variables are I(0), except Trade Openness (OPN) which is I(1).

Table 5. Unit Root Test Results Using Perron-Vogelsang Break Test.

Variable	Stationary at	Additive Outlier (Sudden Break)			Innovative Outlier (Gradual Break)			Conclusion
		Break Point	P-value at Break Point	test - Statistics	Break Point	P-value at Break Point	test - Statistics	
LnRGDP	Level	2008	0.000	-2.669	2000	0.000	-5.693	LnRGDP is I(0)
TOT	Level	1995	0.000	-2.288	1996	0.001	-6.601	TOT is I(0)
OPN	Level	2006	0.000	-2.195	2008	0.004	-3.903	OPN is I(1)
	1st difference	2009	0.661	-1.952	2010	0.166	-7.585	
REER	Level	1988	0.000	-3.300	1983	0.000	-8.331	REER is I(0)
INV/GDP	Level	2007	0.000	-3.714	2008	0.000	-5.316	INV/GDP is I(0)
INF	Level	1993	0.000	-5.590	1991	0.000	-6.627	INF is I(0)
DEBT/GDP	Level	2003	0.001	-3.720	1999	0.000	-4.053	DEBT/GDP is I(0)
LnODA	Level	1997	0.000	0.411	1998	0.000	-4.917	LnODA is I(0)

Critical Values at 5%

Additive Outlier = -3.560

Innovative Outlier = -4.270

Table 6 shows the Unit Root Test conclusions for both Dickey -Fuller GLS Test and Perron- Vogelsang Test. The result shows that all variables are I(0), except Trade Openness (OPN) which is I(1).

Table 6. Synthesis of the DF-GLS and Perron-Vogelsang test results.

Variable	DF – GLS Test	Perron – Vogelsang Test	Conclusion
LnRGDP	I(1)	I(0)	I(0)
TOT	I(1)	I(0)	I(0)
OPN	I(1)	I(1)	I(1)
REER	I(0)	I(0)	I(0)
INV/GDP	I(0)	I(0)	I(0)
INF	I(1)	I(0)	I(0)
DEBT/GDP	I(1)	I(0)	I(0)
LnODA	I(0)	I(0)	I(0)

5.3. The Estimated Model of Real GDP

To the extent that only one variable is I(1), the first difference of the variable (Trade Openness) is used. In this regard, the OLS was used to estimate the model of Real GDP. However, tests for model diagnostic shows that while the residuals are normal and there is no heteroscedasticity, there is serial correlation as shown in Table 7. As the model residuals are serially correlated, we re-estimated the model using Newey-West technique in order to correct for Serial Correlation (See Table 8).

Table 7. Residual Diagnostic Test.

Test type	Test statistics (Chi square)	p-value	Conclusion
Normality test	2.46	0.2918	Residual is normal
Serial or autocorrelation test	7.262	0.0070	There is first and second order serial correlation
	11.208	0.0037	
Heteroscedasticity test	1.71	0.1904	No heteroscedasticity

Model 1 in Table 8 shows the OLS results while Model 2 shows the Newey-West results.

Table 8. Estimated Model of Real GDP.

VARIABLES	(Model 1) OLS	(Model 2) Newey -West
TOT_Lag1	0.00627***	0.00627***
	(0.000)	(0.000)
TOT_Lag3	-0.00296***	-0.00296***
	(0.000)	(0.000)
ΔOPN_Lag2	0.00681***	0.00681***
	(0.000)	(0.000)
ΔOPN_Lag3	0.00298***	0.00298**

	(Model 1)	(Model 2)
VARIABLES	**OLS**	**Newey -West**
	(0.003)	(0.016)
REER	0.00109***	0.00109***
	(0.000)	(0.000)
REER_Lag1	-0.00118***	-0.00118***
	(0.001)	(0.000)
REER_Lag2	0.00107***	0.00107***
	(0.001)	(0.000)
REER_Lag3	0.000960***	0.000960***
	(0.000)	(0.000)
INF	0.00448***	0.00448***
	(0.000)	(0.000)
PDGDPR_Lag1	-0.00120***	-0.00120***
	(0.000)	(0.000)
PDGDPR_Lag3	0.000902***	0.000902***
	(0.003)	(0.000)
LNODA	0.189***	0.189***
	(0.000)	(0.000)
LNODA_Lag1	-0.175***	-0.175***
	(0.000)	(0.001)
LNODA_Lag2	0.205***	0.205***
	(0.000)	(0.000)
INVGDPR_Lag2	0.00421**	0.00421**
	(0.028)	(0.029)
LNRGDP_Lag2	0.389***	0.389***
	(0.001)	(0.000)
LNRGDP_Lag3	0.452***	0.452***
	(0.000)	(0.000)
Constant	0.119	0.119
	(0.958)	(0.942)
Observations	36	36
R-squared	0.996	

p-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The estimated model shows that foreign aid has a positive effect on growth in Sierra Leone. However, after a year it has a negative effect on growth. Hence, the effect of foreign aid on growth in Sierra Leone is positive but the positive effect can turn negative after a year, though it can later improve.

Investment is also found to have a significant positive effect on growth but this effect is significant after two years. Hence, in Sierra Leone increase in investment increases

growth with a lag of two years. The result also shows that both the second and third lags of GDP are significant and positive. Hence there is persistence in growth, which holds only after two and three years.

The estimated model of real GDP also shows that terms of trade is significant in raising real GDP in the current year of improvement as the coefficient is positive and significant. However, after three years it has a negative effect on GDP. This suggests that the increase in import due to reduced import price, which improves the terms of trade, outweighs the associated increase in output from imports of inputs for domestic production.

Openness has a positive and significant effect on growth. The result shows that when openness to trade increases, the positive effect is felt after two to three years. This implies that export performance improves with a lag when the economy becomes more open.

Real exchange rate depreciation is found to have a positive effect on growth in the year of depreciation but this effect changes to a negative one after one year. In the second and third years it becomes positive and negative respectively. Hence real exchange rate depreciation does not have a consistent growth effect, suggesting the need for policies for real exchange rate to have consistent growth effect.

Inflation rate is found to have growth effect on the economy and this is significant in the same year of inflation. However, as the real exchange rate has significant effect for up to three years, the inflationary effect on growth can be expected to be insignificant given that inflation is expected to lead to real exchange rate depreciation.

Public debt to GDP ratio has a negative contemporaneous effect on growth. However, after three years the effect is positive. This implies that as public debt increases, there is debt overhang, which reduces investment and growth. However, as the debt is used to finance investment, after about three years, growth is realised.

The model R-Squared shows that the goodness of fit is high in spite of the fact that model variables are stationary. About 99.6 % of variation in GDP is explained by model variables.

6. Summary of Main Findings

This paper has investigated and analysed the impact of foreign aid on economic growth in Sierra Leone for the period 1980 to 2023. This research will immensely contribute to the hot debate resonating around the ascertainment of foreign aid on the economic growth and development of developing countries. Although Sierra Leone has a lot of natural resources, the quest for foreign aid increases at an increasing rate. This is highly justified by the large number of reported situations such as low GDP level, reduced private sector investment, misdirection of resources, export growth decline and massive corruption, to name a few.

A number of results were obtained. These are:
1) Foreign aid has a significant positive effect on real GDP in Sierra Leone.
2) Investment has a significant positive effect on real GDP

in Sierra
3) Terms of trade is significant in raising real GDP in the current year of improvement as the coefficient is positive and significant.
4) Openness has a positive and significant effect on growth. The result shows that when openness to trade increases, the positive effect is felt after two to three years. This implies that export performance improves with a lag when the economy becomes more open.
5) Real exchange rate depreciation is found to have a positive effect on real GDP in the same year of depreciation but this effect becomes negative after one year. In the second and third years, it becomes positive and negative respectively. Hence real exchange rate depreciation does not have a consistent sign effect on output in Sierra Leone.
6) Inflation rate is found to have significant positive effect on real GDP in the same year, suggesting that policies that are used to reduce inflation are consistent with reducing real GDP, such policies include reduction in money supply.
7) Public debt to GDP ratio has a significant negative effect on real GDP in the same year of increase in public debt. However, after three years the effect is positive, suggesting that as public debt increases, there is debt overhang, which reduces real GDP but as the debt is used to finance fiscal operations, after about three years real GDP increases due to build-up of the enabling environment for economic performance.

Authors, therefore, conclude that foreign aid contributed positively to economic growth in Sierra Leone for the study period.

7. Policy Recommendations

Premised on the research findings, authors have provided the following policy recommendations to enhance the effective and efficient utilisation of foreign aid for the purpose of economic growth and development in Sierra Leone.

Since Official Development Assistance has a positive cumulative effect on growth in Sierra Leone, policymakers should put more effort to attract foreign aid to Sierra Leone in order to boost output and economic growth.

Public Debt has a negative one-period lagged effect on output and through the three years period lagged effect has positive effect, the cumulative effect is negative. Hence, policymakers around debt management should adopt strategies that can ensure that as government debt increases, its potential to increase growth is enhanced. This requires strong commitment to having strong macroeconomic fundamentals and factors that increase the efficiency of investment. These include education for building human capital to develop the labour force.

Investment has a positive effect on output, though this significant effect comes with a two- year lag. Hence, further strengthening public investment and building the enabling environment for more private sector investment should be a strong priority for policymakers.

While Real Exchange Rate has a positive cumulative ef-

fect on output, its sensitivity is low. There is need for efforts to build this sensitivity through investment in agricultural transformation for export purpose and building domestic capacity for developing import-competing goods sector, especially import of foods, which has strong inelastic demand.

Inflation has a significant positive effect on output in the same year. Hence, policymakers, when adopting inflation control strategies, should simultaneously adopt other strategies that will cushion the negative effect on output.

Openness to trade has a positive effect on output. Thus, there is need to strengthen the openness content in Sierra Leone's Trade Policy. This gives the opportunity to leverage on higher export-led growth strategy.

"Terms of Trade" has a positive cumulative effect on output, but the sensitivity is low. Hence, it is useful for Sierra Leone's domestic policy to be designed such that there can be strong participation in production of goods that have more value-addition compared to export of raw materials with little or no value addition. This can reduce Sierra Leone's vulnerability to terms of trade shocks emanating from exports.

Abbreviations

ADF-GLS	Augmented Dickey-Fullah Generalised Least Squares
BoP	Balance of Payments
CBSL	Central Bank of Sierra Leone
DBS	Direct Budget Support
GDP	Gross Domestic Product
IFS	International Financial Statistics
LDCs	Least Developed Countries
MoF	Ministry of Finance
ODA	Official Development Assistance
OLS	Ordinary Least Squares
SLCSO	Sierra Leone Central Statistics Office
UDCs	Underdeveloped Countries
UNHDI	United Nations Human Development Index
USD	United States Dollars
WDI	World Development Indicators

Conflicts of Interest

The authors declare no conflicts of interest.

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