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# The Nuex Between Foreign Aid and Economic Growth in Sierra Leeone (1994 -2024)

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## Abstract

This study investigated the relationship between foreign aid and economic growth in Sierra Leone using annual data from 1994 to 2024. Specifically, the study first, estimated the impact of foreign aid on economic growth; and second, the study investigated the direction of causality between foreign aid and economic growth in Sierra Leone. The ordinary least square estimation technique was used for analysis. The empirical findings suggest that foreign aid inflow into Sierra Leone is imperative for economic growth in Sierra Leone. The study further found that gross capital formation and labour force impact significantly on economic growth whereas, foreign direct investment impacts negatively and insignificantly on economic growth. The study further found that there is no causality between foreign aid and economic growth in Sierra Leone within the period under review. Based on the findings from this study, it is recommended that vigorous effort should be made by government to create a stable economic and political environment and effective competitive policies. This work has tried to emphasize that aid programmes should be broadly consistent with a strategy aimed at developing human capital. In the absence of foreign aid, there is no doubt that the height of development in human capital in Sierra Leone would be even lesser than that prevailing. This work recommends that foreign aid could be better prioritized in the following ways; In order to lessen the extreme disparity that exists in Sierra Leone, foreign aid must be directed more specifically at individuals living in the poorest areas of the nation. The rate of school dropouts will decrease with less disparity, notably in Sierra Leone. Additionally, recent studies show that nations with less inequality have a higher likelihood of improving their literacy rates as a result of foreign help. Therefore, there should be more foreign aid programs launched in each of Sierra Leone four geopolitical zones.

## Keywords

Foreign Aid, Official Development Assistants, Economic Growth, Sierra Leone

## 1. Introduction

Sierra Leone is one the developing countries that is blessed abundantly with natural resource endowment. Despite being blessed with a vast supply of natural resources and getting a lot of foreign aid, the country has been unsuccessful beyond all possibilities. According to [2]; the country Sierra Leone performed very poorly in comparison to some of her African neighbors as indicators of social well-being were below average.

Since the early stages of global development, economies have come to understand the need of aid from more industri-

alized and developed nations to emerging countries in achieving national objectives and aspirations for the welfare of their whole populace as well as for nation-building. Although several empirical studies on the impacts of foreign help on the economy of recipient countries have been conducted, it is crucial to take into account each country's endowments when determining whether it is necessary to receive foreign aid assistance. It is significant to note from a historical viewpoint that the beginning of foreign help may be dated to the 1940s, following the massive destruction brought on by the Second World War. After the war, foreign aid was introduced to help the majority of the affected countries with their efforts at reconstruction and rehabilitation. This was done in response to the collapse of the global economic system, which was characterized by the complete lack of funding necessary for such endeavors [3].
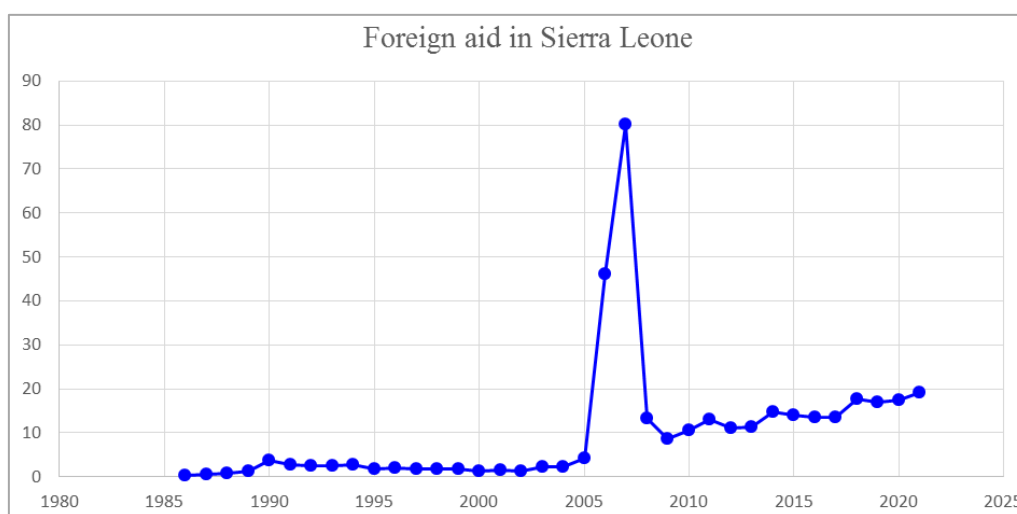
In most of Sub-Saharan Africa (SSA) countries, including Sierra Leone, foreign aid is a significant source of external financing. Aid could also boost spending on technology, human and physical capital, and the ability to purchase capital goods. According to some analysts, a significant amount of the foreign aid that rich countries sent to poor countries may have been wasted, increasing merely the wasteful public consumption.

According to research done in Sierra Leone, official assistance flows, which are usually in the form of foreign aid, represent a major addition to domestic finance for economic growth [8] Foreign aid may also play a significant role in improving the business climate for the private sector and actually accelerating economic growth and human capital development. He also pointed out that foreign aid is a crucial tool for advancing food security, agriculture, and rural development, as well as education, health, and public infrastructure development [8].

## 1.1. Statement of the Problem

In economics literature, the advantages and disadvantages of foreign aid have been extensively addressed. The relationship between foreign aid and other macroeconomic factors that directly affect economic growth, such as government spending on health and education, trade openness, and foreign direct investment, is one of the most hotly debated topics in this context.



Source: Researchers' Computation with data from BSL 2023.

*Figure 1. Trends on foreign aid in Sierra Leone from 1994 to 2024.*

Foreign aid has clearly failed in Sierra Leone and several other African countries, and this is completely supported by current statistics. Sierra Leone has not advanced to a major degree of development despite receiving several types of foreign help, most notably the overseas development assistance (ODA).

Low level of educational funding besides poor funding of health care are rudimentary problems facing the Sierra Leonean economy. The issue of aid effectiveness and its impact on economic growth has been controversially debated among economists. There are different motives varying from economic to social and even to a large extent, political factors that have been proffered as the reasons why foreign aid has failed to

remedy the Sierra Leonean economy. The main reasons alluded to has been among others poor institutional quality, poor regulatory frameworks and bad governance cum leadership. In fact, to show the importance of the role of institutions, it has been noted that good governance in the per capita income and real GDP growth in Sierra Leone. According to his research, aid is expected to work best and on an optimal with high institutions presumably as a part of a capable development state [6]. He had stated that institutional quality and a society's underlying determinants may both be important factors in how successful help [5].

## 1.2. Objectives of the Study

Therefore, it would seem that institutions are crucial to the administration of aid for sub-Saharan African economic progress. To put it another way, having strong, functional institutions should result in a well-ordered society, which would then allow for the successful utilization of foreign aid, which would unquestionably boost economic growth. By examining how assistance programs have met Sierra Leone fundamental requirements, it is possible to analyze how foreign aid affects economic growth. The study classified the basic needs into six major areas namely: nutrition, infrastructure, basic education; health; sanitation; water supply; housing related infrastructure. It is worthy to note that these basic needs are essential in human capital development [9]. There are a number of policy strategies to address basic needs. This would in return result in economic growth and economic development, as well as improve the economic situation of the country.

## 2. Literature Review

### 2.1. Theoretical Literature

The quality of the labor force, resources (natural and financial), capital, technology, and the institutional context of economic activity are only a few of the numerous variables that affect economic development. In addition to the areas of health and education that were previously covered. Early economic growth theories held that capital formation in achieving economic growth indirectly through human capital was the fundamental issue facing developing countries in the 1960s [10]. As a result, these theories held that development assistance was required for the developing countries to close the finance and technology gap. The trade and savings gap was the common name for these discrepancies.

Relevant foreign aid theories are reviewed below.

### 2.2. Theoretical Model

#### 2.2.1. The Two Gap Model

The growth of the Harrod-Domar model is in some ways related to the second gap, which is the trade or foreign exchange gap. According to this economic theory of foreign help, supplemental domestic capital production speeds up economic expansion through government development assistance. Through the use of the two-gap concept, this is possible. The two-gap model's central claim is that the majority of developing nations either have insufficient domestic savings to match investment possibilities or insufficient access to foreign cash to pay for imports of capital and intermediate goods. In less developed nations, the savings gap and the foreign exchange gap are two distinct and independent obstacles to achieving a specified rate of growth (LDCs).

According to this gap, foreign aid bridges the difference between necessary import expenditures and actual export revenues. Additionally, it is presumable that there is a desired level of income and that imports and exports are both linearly related to income. Even if the saving-investment deficit would be small, a larger trade difference would hinder productive investment since fewer capital goods would be imported. The trade and foreign exchange gaps, both of which are seen to be troublesome in developing countries, are supposed to be helped by foreign aid. These gaps can only be closed if there are clear incentives for investing. If there are little or no incentives for investment and if there is any doubt regarding the productivity of such investments, foreign aid would not boost investment since the flows would be focused on consumption rather than investment (a case of Sierra Leone). In addition to the two-gap model already mentioned, claimed that there are other factors that limit growth in aid-dependent countries, such as low levels of technology, education, and infrastructure, as well as rising population growth, interest payments on debts, and political instability that is visible in some developing countries. The argument that issues in emerging countries are caused by inadequate trade and foreign exchange policies rather than a lack of domestic savings or a foreign exchange deficit has been made against this idea.

Note:

$$I - S = F \qquad (1)$$

$$M - X = F \qquad (2)$$

Equations (1) and (2) shows the gap in each of savings gap and foreign exchange gap is equal to foreign aid.

$$Ne - Y = I - S = M - X = F \qquad (3)$$

In the above equation (2), and (3), Ne stands for national spending, Y for national income, I for investment, S for saving, M for imports, X for exports, and F for foreign aid. If total spending, E, exceeds total production, Y, then the economy needs foreign capital inflow or assistance, F, to make up the difference in revenue.

#### 2.2.2. Three Gap Model

The trade gap, the fiscal gap, and the saving-investment gap are all included in the three gap model. A difference between government revenues and expenditures is referred to as the fiscal gap (although the fiscal gap is a subset of the saving gap). When government resources for investment and imports are among other things a result of debt service, governmental efforts to boost private investment may be fruitless as a result of this fiscal gap. There is sufficient evidence to conclude that, despite various measures, the cost of servicing foreign debt has reduced government spending in Sub-Saharan African nations, particularly Sierra Leone. Therefore, foreign funds aimed at the government budget, which could take the form of official help, may facilitate narrowing this fiscal imbalance.

The macroeconomic performance of the economy, savings, foreign exchange, and fiscal deficits might all suffer long-term consequences if help takes the form of a loan rather than a grant, on the other hand. For instance, the repayment of debt places additional demands on the total government's revenue as well as foreign money. In addition, debt service "can result in the reduction of the economy's import capacity, reducing government investment, especially in infrastructure, education, and health facilities (human capital development), a factor that is likely to have a detrimental effect on private investments," However, foreign aid would often not boost overall savings and would instead diminish domestic savings, as pointed out.

### 2.2.3. The Dependence Theory

This theory originated from two papers written by [5]. The paper was published in 1949. Marxists observed that terms of trade had deteriorated over time between the developed and underdeveloped countries. Developed countries were exchanging large quantity of raw material exports for fewer and fewer manufactured goods. The theory came up due to the fact that resources both capital and labour transfers from the poor or underdeveloped countries to the developed countries, thereby improving the development processes of these wealthy countries at the expense of the underdeveloped countries [15]. This capital been transported to these wealthy countries are developed through educations, acquisition of skills and training so as to be very useful in these wealthy countries. This causes these poorer countries to be impoverished and the wealthy countries enriched in all sectors. Some factors contribute to economic growth in the developing world such as state fiscal strength, degrees and regime centralization, external political integration, capital accumulation. Others might be division of labour-skilled labour, capital accumulation and population - this can be fully utilized to improve the growth of different sectors in the economy [14].

### 2.3. Empirical Literature

Results from previous studies on the determinant of foreign aid on in Sierra Leone economy over the years have different voices although little attention have been given to the determinant of foreign aid in Sierra Leone at the world or regional level. Some researchers have reported that foreign aid has a positive effect in Sierra Leone, while some researchers doubt this point. This relates that the relationship between foreign aid Sierra Leone economies remains provocative.

He examined foreign aid and economic growth: Do factors like energy use, trade access, and $CO_2$ emissions matter? African commercial blocs provide a DSUR of varied evidence. With the exception of the Southern African Development Community, which revealed a non-significant estimate, the analysis demonstrates that a percentage increase in foreign aid correlates to various significant weights in all panel groupings. While trade openness had a substantial impact on economic development across all panel groupings.

Using the two stage least square method, examined data for Nigeria from 1981 to 2016. (2SLS). A favorable and meaningful, if slight, association between aid and growth is revealed by the results [4]. This implies that, although being important for economic growth in Nigeria, foreign aid is not the main factor driving the economy's expansion. The impact of foreign aid that the country receives might be improved with better macroeconomic policies and the improvement of pertinent institutional frameworks.

He investigated the effects of external borrowing and foreign financial aid (foreign grant) in the form of official development assistance (ODA) on the development of the Nigerian economy during a 34-year period, from 1980 to 2013. Foreign aid was shown to be positively correlated with GDP in their analysis using the Ordinary Least Squares (OLS) method, however this correlation was statistically insignificant.

He examines and contrasts the factors that influence how much foreign aid is given to Africa by China and Japan. According to the study, China and Japan's foreign aid giving was mostly motivated by their own self-interest. A significant factor in deciding how much help China and Japan would give to a recipient nation was also its population size. The results also reveal that Japan tended to focus more on the requirements of assistance recipients as well as the standard of institutions and governance in these nations. In a similar he examined how Korea, an emerging donor in the OECD DAC, differs from Greece in terms of how aid is distributed. Researchers discovered that the patterns of assistance distribution in Greece and Korea are comparable. They favor recipients with higher income level, with larger population, closer trade ties, better social development, protection of freedom and human rights, and nearby located neighbors [16].

In a research work published in 2011, shown how foreign aid to African countries increases growth while reducing poverty. The MDGs' primary objective, which is to decrease the percentage of people living in extreme poverty to half the 1990 level by 2015, is undermined by poverty's continued increase, which is especially noticeable in sub-Saharan African countries, the author further underlines. For his econometric research, he analyzes empirical time-series data from 1980 to 2010. The paper concludes that the amount of aid any nation receives depends on its particular policy regimes, including inflation and trade openness.

The effects of assistance on economic disparity in Pakistan from 1972 to 2007 were examined by. The outcome supported the theory that government aid will eventually have an increasing influence on economic disparity in Pakistan. It is clear that the money given in the form of foreign help has not gone toward growth; instead, it may have been diverted to useless endeavors. Therefore, the influx of aid could not contribute to the expansion of the Pakistani economy and the creation of jobs, but rather aggravated economic income disparity [12].

Using Mozambique as a case study, Arndt et al. (2007) demonstrate the effects of foreign aid across a variety of

drivers and growth, starting with a long-run growth of accounting estimates and concluding that aid plays a significant role in infrastructure development as well as enhancing access to education and health.

He divided foreign capital for the first time into three groups: foreign investment, foreign aid, and other foreign inflows. The growth rate was the study's dependent variable, while the independent variables were domestic savings, foreign aid, foreign investment, and other foreign inflows. The findings show that compared to other factors, foreign aid had a far greater effect on economic development.

The study used a sample of 95 developing nations to investigate if foreign aid helped or hindered economic progress. In this case, the control variables additionally include population (POP) and foreign direct investment (FDI). The findings from the panel data show that there is a U-shaped association between foreign aid and economic development. The findings firmly support the idea that FDI and POP are more significant factors in determining GDP, suggesting that GDP is less likely to be dependent on ODA.

# 3. Methodology

## 3.1. Theoretical Framework

The theoretical hypothesis proposed a framework serves as the foundation for the model used in this investigation [17]. Foreign aid is presumptively depicted as an exogenous transfer of revenue or capital that comes from other nations and goes to recipient countries. As per Barro's theoretical foundations, it is presumptive that productive investments can be either private or governmental investments, all of which eventually have favorable impacts on production expansion and economic growth. Below, in equation 1, this is expressed more clearly:

$$y = f(k,g)$$

$$(k,g) = \phi k^{\alpha} g^{1-\alpha} \tag{4}$$

### 3.2.1. Model One for Research Objective One

where $k$ stands for private capital and $g$ is a composite function that includes all of the domestic economy's productive public spending. This public expense is paid for by taxes collected by the government and a portion of foreign aid. Thus, g may be stated in this approach;

$$g = (k,g) + d \tag{5}$$

where $d$ represents the amount of foreign aid as a percentage of national income, which is thought to be set exogenously, and represents a non-negative tax rate that represents the percentage of money that is funneled to the government in the form of tax collection.

## 3.2 Model Setup

Examining foreign aid and economic growth in Sierra Leone subject to an ideal fiscal policy framework is the main goal of this study. The study also aims to look at other elements that impact both growth and the flow of international aid.

Although policy and aid both have a direct influence on production growth at various time trajectories, emphasized that they matter in very nonlinear ways and are interconnected [5, 9]. As a result, it is possible to think of a reduced form long-term production growth as being a function of foreign aid d, private investment k, policies p, and several other factors, m so that the expression as in equation (6) may be written as follows:

$$y = (d,k,p,m) \tag{6}$$

Equation 3 is only a hybridization of the specification in equation 1 that updates to include common macroeconomic policies and control components as is customary in empirical growth equations. By converting Equation 3 to a log-linear version, all the variables are written as logarithms, and their parameters are designated as elasticities with respect to the regresand. This allows Equation 3 to be approximated.

In order to estimate the impact of foreign aid on economic growth in Nigeria, a linear natural logarithm equation is specified.

$$GRPCt = f (ODA, \ FDI, \ GFCF, \ LBFP) \tag{7}$$

Equation (7) above can be transformed into a regression function as shown below:

$$\ln GRPC_t = \beta_0 + \beta_1 \ ODA_t + \beta_2 \ FDI_t + \beta_3 \ GFCF + \beta_4 \ LBFP + u \tag{8}$$

The Mathematical Form of the Model:

$$\Delta \ln GRPC_t = \alpha_0 + \alpha_1 \Delta \sum_{n=i}^{n} ODA_t + \alpha_2 \Delta \sum_{n=i}^{n} FDI_t + \alpha_3 \Delta \sum_{n=i}^{n} GCF_t + \alpha_4 \Delta \sum_{n=i}^{n} LBFP_t \tag{9}$$

The Econometric Form of the Model:

$$\Delta \ln GRPC_t = \alpha_0 + \alpha_1 \Delta \sum\nolimits_{n=i}^{n} ODA_t + \alpha_2 \Delta \sum\nolimits_{n=i}^{n} GCF_t + \alpha_3 \Delta \sum\nolimits_{n=i}^{n} LBFP_t + \alpha_4 \Delta \sum\nolimits_{n=i}^{n} FDI_t + \pounds_t \qquad (10)$$

### 3.2.2. Model 2 for Objective 2

The second objective is to determine the causal relationship between foreign assistance and Sierra Leone's economic expansion. In order to determine if there is a causal link between foreign aid and economic growth, this study will conduct a causality test. We are also interested in determining whether there is a bidirectional relationship between the two variables. The Granger-causality test will be used to the variables to ascertain this. The fundamental tenet of this test is that if a variable can anticipate the second variable by taking into account information from the first, it is said to be "casual" to that second variable.

The overseas development assistance (ODA) that causes GRPC (ODA→GRPC), where the arrow points to the direction of causality. The Granger causality test assumes that the information relevant to the prediction of the respective variables, GRPC and ODA, is contained solely in the time series data on these variables. The test involves estimating the following pair of regressions:

$$GRPC_t = \sum\nolimits_{i=1}^{n} \alpha_i\, ODA_{t-i} + \sum\nolimits_{j=1}^{n} \beta_j\, ODA_{t-j} + \mu_{1t} \qquad (11)$$

$$ODA_t = \sum\nolimits_{i=1}^{n} \lambda_i\, ODA_{t-i} + \sum\nolimits_{j=1}^{n} \beta_j\, GRPC_{t-j} + \mu_{2t} \qquad (12)$$

NOTE: The above equation will used to test the null hypothesis that there is no causal relationship among foreign aid and gross capital formation per capita.

When it is presumed that u1t and u2t disturbances are uncorrelated. In passing, take notice that we are dealing with bilateral causation because there are two variables. We shall expand this to multivariate causation using the vector autoregression approach in the chapters on time series econometrics (VAR).

Unidirectional causality from ODA to GRPC is indicated if the estimated coefficients on the lagged M in equation (11) are statistically different from zero. GRPC in equation (12) is not statistically different from zero. Conversely, unidirectional causality from GRPC to ODA exists if the set of lagged ODA coefficients in equation (10) is not statistically different from zero (i. e., $\alpha i = 0$) and the set of the lagged GRPC coefficients in (4f) is statistically different from zero and vice versa.

*Unit Root Test*

The unit root test is conducted for this study to determine if the variables in the model are stationary, that is to ascertain whether the mean, variance and covariance of each of the variables used in the model are constant over time, since we are dealing with time series variables, which are generated through a stochastic process. The Augmented Dickey Fuller (ADF) test of unit root is employed. A variable is stationary if the absolute ADF value is greater than any of the absolute Mckinnon tau critical values.

Ho: $\delta = 0$(unit root; the time series under consideration is not stationary).

$H_1$: $\delta < 0$(the time series under consideration is stationary).

Level of significance ($\alpha$) = 5%

Decision rule: Reject $H_0$ of the absolute value of ADF statistics is greater than any of the Mckinnon critical values in absolute terms. We do not reject, if otherwise.

*Cointegration Test*

Once the integration order has been established, the following step is to determine whether there is a long-term link between the variables. The co-integration test is used to assess whether or not a collection of non-stationary series is co-integrated. Therefore, a prerequisite for the existence of a stable linear steady-state connection is the manifestation of unit roots I (1) and I (0) by the variables of interest. Non-stationary time series are considered to be co-integrated if a linear combination of those series is present [7] The co-integrating equation, which is a stationary linear combination, may be seen as a long-term equilibrium connection between the variables; the following hypothesis should be applied:

$H_0$: There is no long-run relationship.

$H_1$: There is a long-run relationship.

This is evaluated at 5% significant level.

Decision rule: Reject $H_0$ if the ADF-Statistics is greater than the critical values at 5% level of significance and accept if otherwise.

According to this test, co-integration cannot exist unless the residual is stable at level.

$$\Delta Y = \beta 0 + \Delta \beta 2t + \beta 3 \sum\nolimits_{i=1}^{n} \Delta Yt - 1 + E_t$$

$$\Delta \mu = \beta 0 + \Delta \beta 2t + \beta 3 \sum\nolimits_{i=1}^{n} \Delta \mu t - 1 + E_t$$

where:

$\mu$ = error term

$\Delta$ = change

E = model residual term

Decision rule: there is long-run relationship if the error term $\mu$ is co-integrated at level form only using Augmented Dickey Fuller.

## 4. Empirical Results and Findings

### 4.1. Descriptive Statistics

The summary statistics of the data is shown below. The mean value of log of real gross domestic product is 11.15%, while the mean value of official development assistance is 9.757%. Foreign direct investment has the mean value of 1.69%. The mean value of gross fixed capital formation is 5.6%. Finally, the mean value of labor force is 4.3%. The table below summarizes the descriptive statistics.

|  | LNGRPC | ODA | FDI | GFC | LBFP |
|---|---|---|---|---|---|
| Mean | 11.16940 | 9.964267 | 1.663333 | 5.70E+10 | 44322236 |
| Median | 11.19031 | 3.257864 | 1.450000 | 5.43E+10 | 43919993 |
| Maximum | 11.75473 | 80.20272 | 5.800000 | 9.47E+10 | 65842262 |
| Minimum | 10.44330 | 0.379475 | 0.400000 | 3.75E+10 | 27515422 |
| Std. Dev. | 0.446148 | 14.96508 | 1.219728 | 1.26E+10 | 10640347 |
| Skewness | -0.073512 | 3.328648 | 1.767195 | 1.048355 | 0.142700 |
| Kurtosis | 1.322776 | 15.31941 | 6.059921 | 4.142692 | 1.959162 |
| Jarque-Bera | 4.252046 | 294.1310 | 32.78255 | 8.552908 | 1.747194 |
| Probability | 0.119311 | 0.000000 | 0.000000 | 0.013892 | 0.417447 |
| Sum | 402.0983 | 358.7136 | 59.88000 | 2.05E+12 | 1.60E+09 |
| Sum Sq. Dev. | 6.966671 | 7838.373 | 52.07080 | 5.52E+21 | 3.96E+15 |
| Observations | 36 | 36 | 36 | 36 | 36 |

Source: Author's conceptualization using E-views 13.0.

The table shows the values for the variables' means, medians, standard deviations, skewness, and kurtosis. The variables' descriptive statistics indicate that there were 36 observations total. Gross fixed capital formation (GCF), foreign direct investment (FDI), labor force, and official development aid (ODA) all have positive skewed distributions. As opposed to real gross domestic product (LNGRPC) data, which is negatively skewed and shows less extreme values, this suggests that they have more extreme big values.

## 4.2. Pre-estimation Tests

### 4.2.1. Unit-root Tests on Variables

The Augmented Dickey-Fuller (ADF) test was conducted. For these tests, the null hypothesis of a unit root cannot be rejected if the P value is greater than 0.05. The results are presented in Table 2 below.

*Table 2. Results of unit root tests.*

| | Augmented Dickey-Fuller (ADF) | | |
|---|---|---|---|
| Variables | Level | First difference | Inference |
| LNGDP | -0.526122 | -4.773999** | I (1) |
| OAD | -3.505102** | - | I (0) |
| FDI | -4.008807** | - | I (0) |
| GCF | 1.317223 | -7.206589** | I (1) |
| LBFP | 1.186373 | -3.337331** | I (1) |

Source: Authors' computation using E-views 13.0.
Notes: ** Indicates a significance level of 5% for the values provided as t-statistics values. In both the Augmented Dickey-Fuller and the test, it was assumed that there would be an intercept and no trend (ADF).

The results of the unit root test suggest that model variables are a mix of stationary and nonstationary variables of order "1." That is, the results suggest a mix of I (0) and I (1) series.

The tests show consistent results on official development assistants and foreign direct investment that is they are I (0) variables, while gross domestic product, gross capital for-

mation and labor force are I (1) variables.

### 4.2.2. Co-integration Test Results

Co-integration is the second pre estimation test carried out to ascertain whether the variable have a long run relationship. Johansen co-integration test is used in the analysis.

The hypothesis is stated as follows:

H0: no long run relationship.

H1: there is long run relationship.

Decision rule: reject $H_0$ if at least one of the p-value is less than 0.05 and do not if otherwise.

*Table 3. Johansen Co-Integration Test.*

| No. of Co-Integrating Equations | Trace Statistic | 0.05 Critical Value | P-Value |
| --- | --- | --- | --- |
| None* | 72.23646 | 69.81889 | 0.0317 |
| At most 1 | 39.47318 | 47.85613 | 0.2419 |
| At most 2 | 21.33474 | 29.79707 | 0.3371 |
| At most 3 | 7.628662 | 15.49471 | 0.5059 |
| At most 4 | 1.402127 | 3.841466 | 0.2364 |

Source: Researchers' Computation from Eviews 13.0.

Conclusion: From the Table 3 above, at (None), the value of the trace statistic is 72.23646 and result of the critical value is 69.81889 then we conclude by not rejecting the null hypothesis and say that there is no co-integration in the model.

Conclusively, there is no co-integrating relationship among variables that is, there is no long run relationship between the dependent and independent variables. Consequently, further specification of the short-run equation is not necessary.

## 4.3. Presentation and Analysis of Ordinary Least Square (OLS) Regression Results for the Model

*Dependent variable: LOGGRPC*

*Table 4. Ordinary Least Square (OLS) regression results for the model.*

| VARIABLE | COEFFICIENT | STD ERROR | t-STATISTIC | PROB |
| --- | --- | --- | --- | --- |
| ODA | 0.004009 | 0.001544 | 2.596001 | 0.0143 |
| FDI | -0.010612 | 0.017952 | -0.591096 | 0.5587 |
| GFC | -1.43E-11 | 3.34E-12 | -4.273408 | 0.0002 |
| LABF | 5.12E-08 | 4.03E-09 | 12.70321 | 0.0000 |
| C | 9.691928 | 0.118522 | 81.77327 | 0.0000 |
| R – SQUARED | 0.933183 | F-STATISTIC | 108.2380 | |
| ADJ. R – SQUARED | 0.924561 | | | |
| DURBIN-WATSON | 0.986239 | PROB F-STATISTIC | 0.000000 | |

Source: Researcher's Computation from E-view 13.0.

The table presents the values of the estimated long run coefficients- The dependent variable is log of gross domestic product. The results suggest the following:

1) *Official development assistants (ODA)*: From the results, it can be observed that the coefficient of Official development assistants (ODA) is 0.004009. It has the unexpected positive sign and is statistically significant at 5%. Holding other variables constant, a unit increase in real official development assistants will lead to 0.004009 unit increase in gross domestic product in the long-run.

This conforms to a 'prior expectation.

2) *Foreign direct investment (FDI)*: The coefficient of foreign direct investment is -0.010612 which is negative and not significant, the result of the regression shows that FDI makes the highest contribution to GRPC. Thus, holding all other variables constant, a unit change in foreign direct investment leads to a 0.01% unit decrease in gross domestic product this implies that a rise in FDI inflows will cause GRPC to rise. Thus, the Sierra Leone economy will benefit a lot from increased foreign direct investment.

3) *Gross capital formation (GCF)*: The coefficient gross capital formation is -1.43E-11, which suggests a negative relationship between gross capital formation and log of growth rate per capita. The observed effect of gross capital formation is statistically significant at 5% level of significance. Thus, all else held constant, a unit increase in gross capital formation, will lead to -1.43E-11 decrease in log growth rate per capita in the long-run.

4) *Labor force (LBFP)*: The coefficient of labor force is 5.12E-08, which implies that in the long run, growth rate per capita is positively related to labor force. It further explains that all other variables held constant, a unit increase in labor force leads to a 5.05E-08 unit increase in growth rate per capita, and the relationship is highly significant at the 5% level. It was observed that the positive relationship does not conform to a 'prior expectation.

### 4.3.1. Expected and Obtained a Priori Signs

*Table 5. Expected and obtained a priori sign.*

| VARIABLE | EXPECTED SIGN | OBTAINED SIGN | REMARKS |
|----------|---------------|---------------|---------|
| ODA | + | + | CONFORMS |
| FDI | + | + | CONFORMS |
| GCF | - | - | CONFORMS |
| LBFP | _ | + | DOES NOT CONFORMS |

Source: Researcher's Computation from E-view 13.0.

### 4.3.2. Evaluation Based on Statistical Criteria (First Order Test)

The coefficient of the determination ($R^2$) measures the proportion of variation in the dependent variable (LOG-GRPC) which has been explained by the explanatory variables ODA, FDI, GCF, and LABF. These evaluations are made with considerations on the t-statistic, the F-statistic and the $R^2$ figures.

### 4.3.3. The T-Test

T-Test: T-test is a statistical test used to ascertain the significance impact of an individual regressor on a regressand in a model.

Here, the significance of the parameters under study is determined by comparing the values of the calculated t-statistics and the critical t-values at a specific level of significance. For the purpose of this work, the level of significance to be used is 5%. The hypothesis is stated as follows:

$H_0$: $\beta_1 = 0$ (no significant impact of regressor on the regressand).

$H_1$: $\beta_1 \neq 0$ (significant impact of regressor on the regressand).

At $\alpha = 5\%$ (that is, at 5% level of significance).

Decision Rule: Reject $H_0$ if p-value < 0.05 If otherwise, do not reject.

*Table 6. The results of the t-test (using probability value).*

| Variable | Prob-value | Decision | Conclusion |
|----------|------------|----------|------------|
| ODA | 0.0143 | Reject $H_0$ | Statistically Significant |
| FDI | 0.5587 | Do not Reject $H_O$ | Statistically Insignificant |
| GFC | 0.0002 | Reject $H_0$ | Statistically Significant |

| Variable | Prob-value | Decision | Conclusion |
|---|---|---|---|
| LABF | 0.0000 | Reject $H_O$ | Statistically Significant |
| C | 0.0000 | Reject $H_O$ | Statistically Significant |

Source: Researcher Computation from E-view 13.0.

The regression results in Table 6 above shows that the coefficient terms of foreign direct investment is not statistically significant at 5% level of significance and as such it have no impact on gross domestic product. On the contrary, official development assistants, gross capital formation and labor force are statistically significant and have an impact on log of gross domestic product.

## 4.4. The F-test

The test is used to determine the joint significance of the variables used in the model. It uses the ANOVA (Analysis of Variance). This is a test used to measure the overall significance of the variable in the model. The F-value provides a test of the null hypothesis that the true slope coefficients are simultaneously zero.

The underlying hypothesis for the F-test is stated thus:

$H_0$ : $\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=0$ (overall model is insignificant).

$H_1$ : $\beta_1\neq\beta_2\neq\beta_3\neq\beta_4\neq\beta_5\neq0$ (overall model is significant).

Decision Rule: Reject $H_0$ if p-value $< 0.05$ and do not reject if otherwise.

*Table 7. F – Test.*

| F-STATISTC | PROB F-STATISTIC | CRITICAL LEVEL | DECISION RULE | CONCLUSION |
|---|---|---|---|---|
| 108.2380 | 0.000000 | 0.05 | Reject | Statistically significant |

Source: Researcher Computation from E-view 13.0.

From the above table, given that $0.000000 < 0.05$, we reject the null hypothesis and conclude that the variables are jointly statistically significant.

$R^2$ is a non-decreasing function of the number of explanatory variables or regressors present in the model which measures the proportion of the total variation in official development assistants, foreign direct investment, gross capital formation and labor force. From the regression result, $R^2$ is 0.933183 or 93%. This implies that 93% of the total variation in growth rate per capita is as a result of the joint variation of all independent variables. Also, since the Durbin – Watson statistics (0.986239) is greater than the $R^2$ (0.933183). It further shows that the entire regression model is statistically significant. This signifies that the model is a good fit.

## 4.5. Evaluation of Table 4 Based on Econometric Criteria (Second Order Test)

This second order test was carried out to determine whether the model met the fundamental requirements of the OLS, including normality, heteroscedasticity, multicollinearity, and the autocorrelation test.

### 4.5.1. Normality Test

This test is carried out to see if the error terms are normally distributed. In this study, the Jacque Berra (JB) test is employed. The JB test for normality is a large-sample test that uses a chi-square distribution with two (2) degrees of freedom. This indicates that as the sample size grows, the residuals move toward a normal distribution.
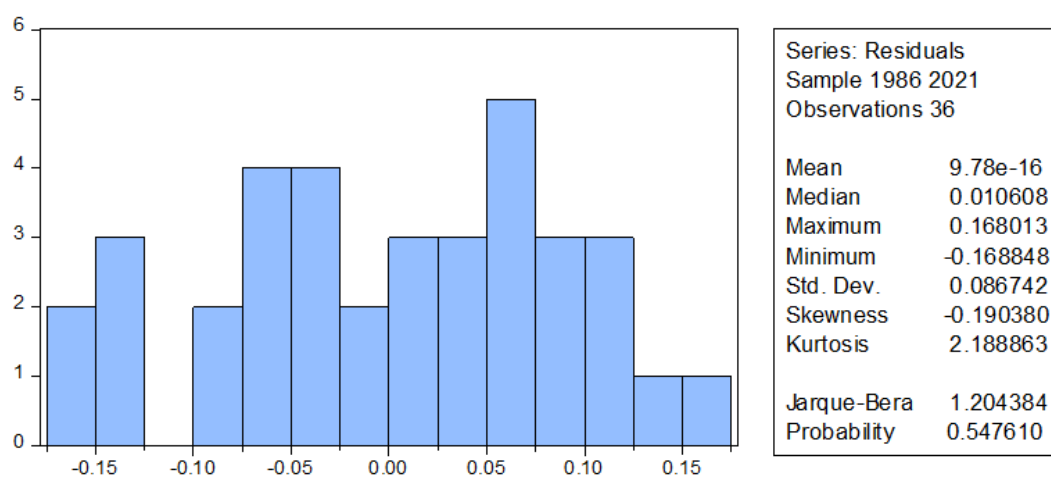
Jacque- Berra hypotheses:

$H_0$: Error term is normally distributed.

$H_1$: Error term is not normally distributed.

At $\alpha = 5\%$ level of significance.

Decision Rule: Reject $H_0$ if the probability value of the JB test is less than 0.05, if otherwise do not reject.

*Normality result*

Source: Researcher's Computation from E-view 13.0.

*Figure 1. Histogram of Residual result.*

From the graph, the p-value of the Jarque-Bera Test is 0.547610 which is greater than 0.05. Therefore, we do not reject the null hypothesis and conclude that the error terms of the model are normally distributed.

### 4.5.2. Multicollinearity Test

This test will show whether the independent variables have a perfect linear association. To achieve this, we'll make use of the correlation matrix. The correlation coefficient between any two regressors must be more than 0.8, according to Gujarati (2009), for there to be multicollinearity between the two variables.

*Table 8. Test on Multicollinearity dependent variable: (LNGDP).*

|  | LNGDP | ODA | FDI | GFC | LABF |
|---|---|---|---|---|---|
| LNGDP | 1.000000 | 0.504647 | -0.239189 | 0.729693 | 0.945012 |
| ODA | 0.504647 | 1.000000 | -0.015121 | 0.394200 | 0.430701 |
| FDI | -0.239189 | -0.015121 | 1.000000 | -0.259742 | -0.251843 |
| GFC | 0.729693 | 0.394200 | -0.259742 | 1.000000 | 0.856923 |
| LABF | 0.945012 | 0.430701 | -0.251843 | 0.856923 | 1.000000 |

Source: Researcher's Computation from E-view 13.0.

From the correlation matrix result obtained above, there's is no multicollinearity in the model.

Additionally, this is not an issue because none of the correlation coefficients are greater than 1, indicating that the variables do not perfectly exhibit multicollinearity. Additionally, multicollinearity does not cause the BLUE (Best, Linear, Unbiased, and Efficient) characteristic of the OLS regressors to be violated. Dropping any of the essential variables will result in specification bias since they are associated with one another. The inaction is one of the multicollinearity repair techniques, [12, 1]. Doing nothing is the philosophy used in this investigation.

### 4.5.3. Heteroskedasticity Test

The purpose of this test is to establish the consistency of the error variance for each observation. Results that come from an estimated model with non-constant variance might be biased. At a 5% level of significance, White's general heteroskedasticity test would be applied to this test [13]. Here are some of the possibilities:

$H_0$ = Residuals are Homoskedastic.

$H_1$ = Residuals are not Homoskedastic.

Decision rule: Reject $H_0$ if the p-value of chi-square is less than 0.05, we do not reject if otherwise.

*Table 9. Heteroskedasticity test result.*

| Heteroskedasticity Test: Breusch-Pagan-Godfrey | | | |
|---|---|---|---|
| F-statistic | 1.962198 | Prob. F (4, 31) | 0.1250 |
| Obs*R-squared | 7.273237 | Prob. Chi-Square (4) | 0.1221 |
| Scaled explained SS | 3.205884 | Prob. Chi-Square (4) | 0.5240 |

Source: Researcher's Computation from E-view 13.0.

Conclusion: From the table, the p-value of chi-square is 0.5240 of which is greater than 0.05 level of significance. Therefore we do not reject the null hypothesis and conclude that the model is Homoskedastic.

### 4.5.4. Autocorrelation Test

Autocorrelation occurs when the regression estimate's error components are serially correlated. If the mistakes corresponding to several observations are serially con-nected, this test will show it. It is preferable for errors to have no association. The Breusch-Godfrey (B-G) serial correlation test will be used to ascertain whether autocor-relation occurs.

Hypotheses are as follows:

$H_0$: No autocorrelation.

$H_1$: Autocorrelation.

Decision rule: Reject $H_0$ if the observed chi-square proba-bility value is less than 0.05, if otherwise do not reject.

*Table 10. Breusch-Godfrey Serial Correlation Test.*

| F-statistic | 37.26051 | Prob. F (2, 28) | 0.0000 |
|---|---|---|---|
| Obs*R-squared | 25.91509 | Prob. Chi-Square (2) | 0.0000 |

Source: Researcher's Computation from E-view 13.0.

According to the preceding table, the chi-square distribu-tion's p-value is 0.0000, which is less than 0.05. As a result, we reject the null hypothesis and come to the conclusion that the error term exhibits auto-correlation.

## 4.6. Specification Error Test

The specification error test shows whether the model is correctly specified or not and it is done here using the Ramsey Reset Test. The hypothesis used here are:

$H_0$ = Model is well specified.

$H_1$ = Model not well specified.

Decision rule: Reject $H_0$ if the p-value of the F-statistic is less than or equal to 0.05 at 5% level of significance.

Since the p-value of the observed F-statistic in the above result 0.070372 is greater than 0.05, thus we fail to reject the null hypothesis and conclude that the model is well speci-fied.

*Table 11. Ramsey Reset Test.*

| Ramsey RESET Test | | | |
|---|---|---|---|
| Equation: UNTITLED | | | |
| Specification: LNGDP ODA FDI GFC LABF C | | | |
| Omitted Variables: Squares of fitted values | | | |
| | Value | Df | Probability |
| t-statistic | 0.265277 | 29 | 0.7927 |
| F-statistic | 0.070372 | (1, 29) | 0.7927 |
| Likelihood ratio | 0.084829 | 1 | 0.7709 |

Source: Researcher's Computation from E-view 13.0.

## 4.7. Granger Causality Test

*Table 12. Granger Causality Test Result.*

| Pairwise Granger Causality Tests<br>Date: 01/22/23 Time: 11:37<br>Sample: 1986 2021<br>Lags: 2 | | | |
|---|---|---|---|
| **Null Hypothesis:** | **Obs** | **F-statistics** | **Prob** |
| ODA does not Granger Cause LNGRPC | 34 | 0.74950 | 0.4815 |
| LNGRPC does not Granger Cause ODA | | 2.70288 | 0.0839 |

Source: Researcher's Computation from E-view 13.0.

This test helps to determine the direction of causality between domestic investment and the independent variable(s). the granger causality test basically posits that one variable or time series is causal to another if its ability to predict the second variable or time series is improved by including information about the first variable. The test is generally to determine the degree of causation of one variable on another.

According to the results of the granger causality test, ODA does not granger cause LNGRPC. We do not reject the null hypothesis that ODA does not directly cause LNGRPC since the initial p-value of 0.4815 is higher than 0.05. As a result, we draw the conclusion that foreign aid does not generally cause Economic growth per-capita income. Since the second p-value for the same view is greater than 0.05 and the LNGRPC does not granger cause ODA, we do not reject the null hypothesis and come to the conclusion that the log of growth rate per capita does not granger cause overseas development aid. Because the variables' p-values are greater than 0.05 at the 5% level of significance, it is clear that there is no causal relationship between them.

## 5. Conclusion and Policy Implications

### 5.1. Conclusion

The broad objective of this study was to ascertain the determinant of foreign aid in Sierra Leone economy from 1994 to 2024. To accomplish this objective, an econometric methodology was adopted as a tool for testing the stated hypothesis. The ordinary least square was chosen as estimation technique because of the merits it has over other techniques with respect to the phenomenon under study [18]. The study started with pre-estimation analysis in the model as a first pass at data in form of unit root test and co-integration test which depicts stationary of variables in levels forms of first difference. Post-estimation diagnostic tests were further conducted to confirm the statistical significance of basic econometric criteria.

The empirical results indicate that foreign direct investment and gross capital formation impacts negatively on gross domestic product in Sierra Leone. The results further suggest that the other macroeconomic variables impacting positively and significantly on growth rate per capita in Sierra Leone are official development assistants and labor force whereas foreign direct investment is the only macroeconomic variables that impacts insignificantly on gross domestic product.

The first and second objectives were captured using the Ordinary Least Square method with variables of the study while the casual relationship was observed using the granger causality test where we discovered that overseas development assistance does not statistically and significantly cause growth rate per capita. The study also shows that not all components of foreign aid are contributing positively to the growth rate in Sierra Leone both in the long-run and short-run.

### 5.2. Policy Implications

The policy implications of the empirical findings are essential. The empirical findings from this research points out that even though there is an impact of official development assistants and foreign direct investment on gross domestic product, official development assistants and foreign direct investment does not cause economic growth.

Based on the findings from this study, it is recommended that vigorous effort should be made by government to create a stable economic and political environment and effective competitive policies.

This work has tried to emphasize that aid programmes should be broadly consistent with a strategy aimed at developing human capital. In the absence of foreign aid, there is no doubt that the height of development in human capital in Sierra Leone would be even lesser than that prevailing. This work recommends that foreign aid could be better prioritized in the following ways:

In order to lessen the extreme disparity that exists in Sierra Leone, foreign aid must be directed more specifically at individuals living in the poorest areas of the nation. The rate of school dropouts will decrease with less disparity, notably in Sierra Leone. Additionally, recent studies show that nations with less inequality have a higher likelihood of improving their literacy rates as a result of foreign help. Therefore, there should be more foreign aid programs launched in each of Sierra Leone four geopolitical zones.

Finally, developing countries such as Sierra Leone should create a favorable environment to attract foreign aids because multinational companies and nations have a significant role in the provision of facilities that enhances human capital. However, the recipient country should also make effort to promote basically its education and Health sector.

# Abbreviations

FDI　　Foreign Direct Investment

# Author Contributions

**Moses Balla Marah:** Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

**Saidu Kallah Fofanah:** Conceptualization, Data curation, Funding acquisition, Investigation, Project administration, Resources, Supervision, Writing – original draft

**Saidu Kargbo:** Conceptualization, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft

# Conflicts of Interest

The authors declare no conflicts of interest.

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