The Effect of Foreign Direct Investment on Economic Growth in Sierra Leone

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Abstract
Sierra Leone is one of the poorest economies in Africa that relies heavily on foreign direct investment (FDI) inflow for growth. This study examines the impact of FDI on economic growth in Sierra Leone between 1990 and 2020 using time series data from the World Development Indicators (WDI). The analysis uses cointegration and error correction models. The findings from the result showed that FDI has a significant positive effect on the economic growth of Sierra Leone in both the short and long run. The findings recommend, among other things, that policies aimed at increasing the productivity and growth be implemented. Furthermore, since FDI of the economy is also significant, government should make further efforts to strengthen the implementation of it reform agenda which has the potential to attract more FDI into Sierra Leone. This is true because, the inflow of FDI has been on the increase because of the increase in exportation since the introduction of certain reform measures by the government which have further encouraged and boost foreign investment in various sectors of the economy.

Keywords: FDI, Economic growth, Co-integration, Error correction, Sierra Leone.

1 Introduction
Although not always, FDI is anticipated to have an effect on a country's economic growth, and this influence is anticipated to be favorable and large (Okeke et al., 2014). Despite having enormous amounts of resources including iron ore, rutile, diamonds, and fertile terrain for agriculture, Sierra Leone is a developing nation that needs on international aid and foreign direct investment to fund its economic operations. According to Duramany-Lakkoh (2020), FDI influx strengthens financial institutions and increases capital flow inside a nation by opening up chances for employment and exports of products and services from the host nation. In poor and developing nations like Sierra Leone with a large mineral deposit, the role of FDI in the growth of multinational and domestic or local industries improvement for export promotion and employment creation cannot be overemphasized. FDI is an important source of capital and resource inflow, especially for nations where advanced production techniques and knowledge transfer are needed to help local companies develop and increase productivity (Duramany-Lakkoh, 2020). Despite having a large mineral deposit and fertile terrain for agriculture, Sierra Leone has recently relied on foreign aid to sustain its economic operations and national budget deficits (Duramany-Lakkoh, 2021).

The administration has made a commitment to re-establishing the conditions that would allow the nation to thrive economically and socially since the end of the war in 2002. The nation's limited domestic market, undiversified economic structure, subpar infrastructure, and unskilled labor population, however, continue to stand in stark contrast to its abundant natural resources and advantageous maritime location. The only area of the economy that has seen a significant amount of foreign direct investment (FDI) to yet is the export of minerals. In this situation, the Government of Sierra Leone faces a significant task in implementing measures to maintain the rapid economic growth seen in the immediate post-war period. Numerous measures have been launched in this direction, and FDI has been acknowledged as a crucial component of the country's growth prospects. To date, however, the country has neither implemented a comprehensive FDI policy or made coordinated measures to enable FDI entry (UNCTAN, 2010).

Investment flows would be affected by the global economic recession, making the situation even more difficult for Sierra Leone. There is a severe competition for foreign direct investment (FDI) in many developing nations as a result of continuous processes of global economic integration and liberalization. Selective policies geared at FDI inflows, such as financial and non-financial incentives, are gradually taking the role of controls and limits on the admission and operations of foreign companies in these nations. The deliberate policies aim to increase foreign investment in the nation while also enhancing the economy's foundations.
Nevertheless, the recession in the global economy will have an influence on investment flows, making it much harder for Sierra Leone to boost FDI inflows in the near future. Although this immediate effect cannot be avoided, Sierra Leone should keep up its reform initiatives. This would help the nation retain its present levels of FDI and put it in a better position for the era of economic recovery. Despite the fact that significant legal reforms started in 2000, it was challenging to sequence and implement the suggested actions in an adequate and efficient manner (UNCTAD, 2010).

Below is an illustration showing foreign direct investment inflows to Sierra Leone, the figure in percentage of gross domestic product (GDP). This graph actually depicts relatively stable but low level (1990-2008) and increases sharply between (2008-2012). However FDI inflows to Sierra Leone in recent years has been fluctuating (2014-2020). It is because of this reason that the researchers want to conduct a research that would explore the potential impacts of FDI on economic growth and bring them to the limelight.

![Figure 1. Trend in FDI inflows in Sierra Leone](image)

2 Literature Review

The study of the connection between FDI and economic growth is gaining popularity on a global scale. The ever-growing body of literature in this area of study varies among nations and industries. Here is a summary of some findings from various nations, businesses, and sectors.

Gui-Diby (2014) used panel data analyses for 50 countries covering the years 1980 to 2009 to examine how FDI affected economic growth in Africa. His findings suggest that throughout the whole period, FDI inflows significantly impacted the region's economic growth. He discovered that the lack of human resources had not reduced the effects of FDI on economic growth, but that there had been a negative impact from 1980 to 1994 and a positive one from 1995 to 2009 when he looked at the period as a whole.

When Khaliq and Noy (2007) examined 12 economic sectors in Indonesia, they examined the effectiveness of FDI. They found that FDI had a beneficial influence on the economy as a whole. By breaking down their findings by industry, they noted that the mining and extractive sectors had a detrimental effect.

Adewumi S. (2006) examined the effects of FDI in 11 emerging African nations between 1970 and 2003. He discovered that FDI is beneficial in nations like Benin, Botswana, Burkina Faso, the Central African Republic, Egypt, Mali, and Nigeria using regression analysis using economic growth as the dependent variable. Only in Angola did FDI contribute to considerable and beneficial economic growth. However, Cote d'Ivoire, South Africa, and Tunisia all demonstrated a detrimental effect of FDI on economic growth.
FDI has a statistically minor impact on economic growth, according to Akinlo’s (2004) analysis of the impact of FDI on Nigerian economic growth from 1970 to 2001 using ECM. The argument that the majority of foreign direct investment (FDI) in the country was focused in the extractive sector (oil), which is not very growth-enhancing when compared to other areas like the industrial sector, etc., was a big factor in this.

Chabe L. (2015) examined the effect of FDI on Cameroon’s economic growth over the years 1977 to 2010. He came to the conclusion that FDI had a beneficial influence on growth overall, but when he looked at each sector separately, he discovered that it had a negative impact on the manufacturing industry while having a positive impact on the service industry.

In order to better understand the connections between Sri Lanka’s gross domestic product growth rate, foreign direct investment, and electricity consumption between 1970 and 2017, Maheswaranathan (2020) did a research study. The empirical findings demonstrated that foreign direct investment and economic growth have a long-term favorable relationship. Foreign direct investment and economic growth have a positive and significant long-term and short-term link, according to a study by Reza et al. (2018). Given the above literature, this present paper will look at the effects of FDI on economic growth in Sierra Leone.

2 Methodology
2.1 Empirical Model Specification

There are numerous hypotheses put out on economic growth. Classical growth theory and endogenous growth theory are two of these ideas, among others. For this analysis, we used the formula $Y=AK$, where $Y$ stands for output, $A$ for technological advancement, and $K$ for capital. This formula presupposes a non-diminishing return on capital, which has been questioned by several authors. The Solow-Swan production function, a neoclassical economic model of long-run economic growth, served as the foundation for the creation of the economic growth model employed in this study. This model looks at labor, capital accumulation, and technology advancement to explain long-term economic growth. Solow-Swan demonstrates to be a useful starting point for many extensions due to its particularly appealing mathematical properties. The following neoclassical production function will be utilized because Sierra Leone’s economy is labor-intensive and the study did not concentrate on the non-economic factors of the classical growth theory:

$$ \text{Y} = f(L, K) $$

This production function is expanded by adding FDI and Control for trade as follows:

$$ \text{Y}_t = f(L_t, K_t, \text{FDI}_t, \text{TRADE}_t) $$

Where $Y_t$ is the annual gross domestic product, $L_t$ is the total labor force, $K_t$ is the gross domestic fixed capital formation, FDI$_t$ is foreign direct investment inflow in Sierra Leone, TRADE$_t$ is trade in percentage of GDP.

Last but not least, equation three is obtained from equations one and two by applying a natural logarithm to both sides of equation 2, eliminating any discrepancies in the units of measurement for the variables, and reducing the distance between independent variables and dependent variables. The effect of FDI on economic growth in Sierra Leone from 1990 to 2020 is then examined using this data.

$$ \Delta \text{ln}(Y_t) = a_0 + \beta_1 \Delta \text{ln}(L_t) + \beta_2 \Delta \text{ln}(K_t) + \beta_3 \Delta \text{ln}(\text{FDI}_t) + \beta_4 \Delta \text{ln}(\text{TRADE}_t) + \epsilon_t $$

Where: $\text{ln}Y_t$ is a natural logarithm of gross domestic product, $\text{ln}L_t$ is the natural logarithm of the labor force, $\text{ln}K_t$ is the natural logarithm of gross domestic fixed capital formation, $\text{ln}\text{FDI}_t$ is the natural logarithm of FDI, $\text{ln}\text{TRADE}_t$ is the natural logarithm of trade, and $\epsilon_t$ is error term $a_0$ is the constant term and $\beta_1$, $\beta_2$, $\beta_3$, and $\beta_4$ are the parameters of independent variables to be estimated. It is hypothesized that $\beta_1$, $\beta_2$, $\beta_3$, and $\beta_4 > 0$. 

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2.2 Data Source

This study uses five variables to examine the short- and long-term effects of FDI on economic growth: (i) GDP (constant US$), (ii) foreign direct investment inflow as a percentage of GDP, (iii) Fixed Formation Capital (constant US$), (iv) labor force participation rate, and (v) trade as a percentage of GDP. In order to avoid the heteroskedasticity problem, secondary data for Sierra Leone's 1990–2020 era were gathered from WDI (2023) and converted into logarithms designated by "ln" in each variable (Shawa and Shen, 2013).

2.3 Estimation Procedure

The time-series features of the variables were initially looked at using an econometric technique. A few remarks about cointegration and error correction models are necessary because the study calls for their usage. Every useful study that uses an econometric technique stresses the significance of looking into the method used to generate the data that underlies the variables before estimating the parameters and performing various types of hypothesis testing. This process aims to prevent the issue of false regression results. First, unit root testing—which involves differencing each series until stationary is attained—was used to ascertain the orders of integration for each variable under consideration. Second, we used the Johansen approach to execute the cointegration test. Third, we used variables with the same order of integration to estimate regressions using the Ordinary Least Squares (OLS) approach. Fourth, we estimated the error-correction model, and finally, we used the Brown et al. (1975) approach of Cumulative Sum (CUSUM) and the Cumulative Sum of Squares (CUSUMQ) test to determine the stability of the estimated model. The requirement is that the coefficient estimates must remain under a 5% significance level on the plot of CUSUM and CUSUMQ (shown by two lines).

3 Empirical Analyses

3.1 Test for unit roots

Because the statistical inference from a time series is typically based on the assumption of stationarity, the unit root tests should be carried out before moving on to the cointegration tests. The Augmented Dickey-Fuller (ADF) test is used in this investigation. The alternative hypothesis of stationarity is compared against the null hypothesis of non-stationarity, and all variables are examined. The Unit Root Tests using the ADF test are shown in Table 1.

Table 1 Unit Root Tests using the ADF test

<table>
<thead>
<tr>
<th>Level</th>
<th>Variable</th>
<th>Specification through DSR procedure</th>
<th>ADF 5% Critical Value</th>
<th>ADF Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>lnGDP</td>
<td>Trend and Constant</td>
<td>-3.574244</td>
<td>-2.451127</td>
</tr>
<tr>
<td></td>
<td>lnL</td>
<td>Trend and Constant</td>
<td>-3.568379</td>
<td>-1.027599</td>
</tr>
<tr>
<td></td>
<td>lnK</td>
<td>Trend and Constant</td>
<td>-3.595026</td>
<td>-7.690834</td>
</tr>
<tr>
<td></td>
<td>lnFDI</td>
<td>Trend and Constant</td>
<td>-3.595026</td>
<td>-3.464271</td>
</tr>
<tr>
<td></td>
<td>lnTRADE</td>
<td>Trend and Constant</td>
<td>-3.568379</td>
<td>-2.569872</td>
</tr>
<tr>
<td>∆Level</td>
<td>lnGDP</td>
<td>Trend and Constant</td>
<td>-3.574244</td>
<td>-4.188858</td>
</tr>
<tr>
<td></td>
<td>lnL</td>
<td>Trend and Constant</td>
<td>-3.574244</td>
<td>-3.758087</td>
</tr>
<tr>
<td></td>
<td>lnK</td>
<td>Trend and Constant</td>
<td>-3.791172</td>
<td>-4.322955</td>
</tr>
<tr>
<td></td>
<td>lnFDI</td>
<td>Trend and Constant</td>
<td>-3.632896</td>
<td>-5.767453</td>
</tr>
<tr>
<td></td>
<td>lnTRADE</td>
<td>Trend and Constant</td>
<td>-3.574244</td>
<td>-6.786849</td>
</tr>
</tbody>
</table>

Table 1 findings demonstrate that while none of the variables were stationary at level, they all became stationary after being differentiated. Cointegration can therefore be used to examine the long-term relationship between variables.
3.2 Cointegration Test Analysis

The Johansen cointegration approach was utilized to create a long-term link between variables. Each variable has an established order of integration that fits the given economic growth model. Each and every integrated variable is of order one, I(1). After that, the two-step Engel and Granger process and Johansson's maximum likelihood approaches will be used to assess the long-term link between economic growth and FDI in Sierra Leone.

The trace and maximum Eigenvalue statistics may occasionally produce results that are in disagreement. Johansen (1990) advised identifying the quantity of cointegration vectors based on one of them to address this issue. However, as both of them exhibit the same number of a cointegrating vector, this study used both the trace and maximum Eigenvalue. Based on the aforementioned two statistics, Table 2 displays the results of the cointegration test for the economic growth model.

Table 2 Results of the test of cointegration

<table>
<thead>
<tr>
<th>Null hypothesis</th>
<th>Alternative H1</th>
<th>Trace statistics</th>
<th>0.05% critical value</th>
<th>Max-Eigen statistics</th>
<th>0.05% critical values</th>
</tr>
</thead>
<tbody>
<tr>
<td>R=0</td>
<td>R≤1</td>
<td>97.84007*</td>
<td>69.81889</td>
<td>47.47948*</td>
<td>33.87687</td>
</tr>
<tr>
<td>R≤1</td>
<td>R≤2</td>
<td>50.36059*</td>
<td>47.85613</td>
<td>26.06145</td>
<td>27.58434</td>
</tr>
<tr>
<td>R≤2</td>
<td>R≤3</td>
<td>24.29914</td>
<td>29.79707</td>
<td>19.66633</td>
<td>21.13162</td>
</tr>
<tr>
<td>R≤3</td>
<td>R≤4</td>
<td>4.632805</td>
<td>15.49471</td>
<td>4.088743</td>
<td>14.26460</td>
</tr>
<tr>
<td>R≤4</td>
<td>R≤5</td>
<td>0.544062</td>
<td>3.841466</td>
<td>0.544062</td>
<td>3.841466</td>
</tr>
</tbody>
</table>

The trace statistics and Max-Eigen both showed two cointegrating vectors (equation) at the 5% significance levels in Table 2, while the latter two only showed one. Thus, the null hypothesis that there is no cointegration is rejected. Therefore, the Error Correction Model (ECM) would be estimated. It should be obvious from the results of the cointegration test that there are long-term correlations between GDP and the explanatory variables of labor, capital, FDI, and trade. Table 3 below shows the outcome of the long-run GDP growth function.

3.3 Results of Long run relationship

We first give the results from the cointegration study in this subsection's table 3 and then go into more detail about the findings by contrasting them with earlier findings by other researchers in the literature.

Long-run relationship between FDI and economic growth

\[
\ln(\text{GDP}) = 49.916 - 6.709L + 0.187K + 0.119\text{FDI} - 0.376\text{TRADE} \\
(5.003) \quad (1.081)*** \quad (.079)** \quad (.049)** \quad (.294)
\]

\[n = 30, R^2 = 0.83, \bar{R}^2 = 0.803, \text{SSR} = 2.182, F = 27.5, \text{DW} = .667\]

Source: Author's calculations from E-views version 10.

Findings in the above estimated model reveal that the labor force, albeit being negative, capital, and foreign direct investment were all statistically significant at the 5% level, whereas trade was negative and not statistically significant. The corrected \(R^2\) has a value of 0.8035. This suggests that the set of independent variables' modifications have the capacity to affect the GDP growth rate by around 80.3%.

The long-term outcome demonstrated that FDI, gross domestic fixed capital formation (lnK), a proxy for capital, directly affect economic growth. The association between capital and foreign direct investment is favorable and highly statistically significant, supporting those two hypotheses. However, the hypothesis for labour (L) and trade (TRADE) were not supported based on the results and thus rejected. The overall model was statistically significant.
significant as shown by the F-Statistic of 27.5 with a probability value below 1% and thus statistically significant at the 1% level.

3.4 Results of Short-run relationship
The short-run dynamics have been determined using the Error Correction Model (ECM). The short-run dynamic model is estimated when there is a long-term relationship between the variables. According to table 4's analysis of the short-run error correction model, the GDP in the lagged one-year period has a favorable and significant impact on Sierra Leone's economic growth for our study. Additionally, the lagged one-year period of GDP must be taken into account in any policy proposals intended to influence short-term economic growth in Sierra Leone. Within our study period, a 1% rise in GDP one year earlier will result in a short-term increase in GDP of 0.62%.

Table 4 short-run relationship between FDI and economic growth

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.014030</td>
<td>0.024645</td>
<td>-0.569271</td>
<td>0.5771</td>
</tr>
<tr>
<td>∆ln(GDPt-1)</td>
<td>0.612637</td>
<td>0.130251</td>
<td>4.703512</td>
<td>0.0002</td>
</tr>
<tr>
<td>∆ln(lnt-1)</td>
<td>-2.004867</td>
<td>1.761232</td>
<td>-1.138333</td>
<td>0.2717</td>
</tr>
<tr>
<td>∆ln(Kt-1)</td>
<td>0.039049</td>
<td>0.020871</td>
<td>1.871014</td>
<td>0.0797</td>
</tr>
<tr>
<td>∆ln(FDI,t-1)</td>
<td>0.080213</td>
<td>0.015216</td>
<td>5.271587</td>
<td>0.0001</td>
</tr>
<tr>
<td>∆ln(TRADE,t-1)</td>
<td>0.235353</td>
<td>0.092838</td>
<td>2.535103</td>
<td>0.0221</td>
</tr>
<tr>
<td>ECM,t-1</td>
<td>-0.057044</td>
<td>0.073169</td>
<td>-0.779625</td>
<td>0.4470</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.837046</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.775939</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>13.69790</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prob(F-stat)</td>
<td>0.000016</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author's calculations from E-views version 10.

The short-run dynamics have been determined using the Error Correction Model (ECM). The short-run dynamic model is estimated when there is a long-term relationship between the variables. According to table 4 analysis of the short-run error correction model, the GDP in the lagged one-year period has a favorable and significant impact on Sierra Leone's economic growth for our study. Additionally, the lagged one-year period of GDP must be taken into account in any policy proposals intended to influence short-term economic growth in Sierra Leone. Within our study period, a 1% rise in GDP one year earlier will result in a short-term increase in GDP of 0.62%.

3.4 Diagnostics Test Result
We also conducted some residual diagnostics tests for the estimated model. The Heteroskedasticity Test and normality test results show that the model was not suffering from the problem of Heteroskedasticity and non-normality. Therefore the model was homoskedastic and normally distributed. The test results are shown in the appendix.

3.5 Stability Test Result
In this study, the CUSUM and CUSUMSQ tests are used. The graphs for the CUSUM and CUSUMSQ tests are shown in Figure 1. The findings show that the plots are entirely stable within 5% of the crucial bands, demonstrating parameter stability. The test results demonstrate that all roots’ moduli are less than one and fall inside the unit circle. In light of this, we may say that our estimated model is stable.
4 Conclusions and Recommendation

Using annual data for the years 1990 to 2020, the primary goal of this study was to objectively ascertain the contribution and impact of foreign direct investment (FDI) on economic growth in Sierra Leone. The study used an econometric method to confirm the association in Sierra Leone, adhering to the framework of the Solow growth model. A number of tests were run to meet the requirements that make the OLS technique necessary for our empirical research. The key conclusion from the results is that, in both the short and long terms, foreign direct investment (FDI) has a positive and statistically significant impact on growth.

The conclusions discussed above have significant policy ramifications. First, the Gross Domestic Product (GDP) of the nation must continuously increase and grow since the lagged value of GDP has a large beneficial impact on present growth. Foreign investors will be encouraged and drawn when they are confident that the host nation will develop the necessary market for their goods. Government-created incentives or an atmosphere that facilitates production activities can help with this. Second, given the importance of trade to the economy, the government should work harder to implement its reform program, which has the potential to draw additional FDI into Sierra Leone. This is true because with the implementation of certain reform measures by the government, which have further encouraged and boosted foreign investment in many sectors of the economy, the inflow of FDI has been on the rise due to the increase in exporting.

References


