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Research Article

Assessing the Relationship Between Economic Growth and Foreign Direct Investment: Evidence from Sierra Leone

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Abstract

Sierra Leone is one of the countries in Africa that relies heavily on Foreign Direct Investment (FDI) inflow for growth. This study examines the impact of Foreign Direct Investment (FDI) on economic growth, in which the Gross Domestic Product as main indicator of the country's using time series ranging between 1990 and 2023 using time series data from the World Development Indicators (WDI). The analysis uses descriptive statistics, Correlation, Augmented Dickey fuller test for Stationarity, as well as Regression model in order to test effect of Foreign Direct Investment (FDI) towards the country economic growth. The findings shows that Foreign Direct Investment, FDI has a significant positive effect on the economic growth of Sierra Leone. In other words, a unit increase in the FDI will definitely leads to increase in the economic grow of the country. Likewise other variables, labor, exports, imports have significant contributions towards the economic growth. It also signifies that government needs to encourage investors to the country which will play greater role to the country's economy. The findings recommend, among other things, that policies aimed at increasing the productivity and growth be implemented in order to attract investors.

Keywords

Foreign Direct Investment, Economic Growth, Stationarity, Cointegration, Sierra Leone

1. Introduction

Sierra Leone is not an exception when it comes to developing nations current issue, which is a lack of funds to finance their investments. Due to numerous resources, it therefore constantly turns to the developed as well as growing countries like China for increased investment. FDI has been a hot topic of conversation for a variety of reasons. The remarkable increase in the annual global stream from roughly $60 billion to $315 billion between 1985 and 1995, as reported by the United Nations in 1996, is what led to the subsequent rise in the country's general prominence as a foundation for venture assets for many nations. In addition to the essentially stable. Furthermore, in response to pressure from

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the World Bank and a few developed countries to liberalize trade, Sierra Leone has shifted its focus in recent decades toward opening its economies by fostering an atmosphere that attracts foreign investment. Funds going to underdeveloped countries increased by 2% but stayed constant. The proportion of emerging nations in global FDI rose to 54% as a result of the spike and therefore the unusual decline in FDI in developed nations. Still, SSA and Sierra Leone have received the least amount of foreign direct investment (FDI) worldwide. In contrast to Asia, which accounted for 3.9% of global FDI inflows in 2019, the region only reported 10.9 percent of FDI inflows, or 3.5% of overall FDI inflows worldwide.

Since it has been demonstrated that, under certain circumstances, Foreign Direct Investment can produce positive externalities, the potential of FDI in Africa is particularly significant [22]. Commerce openness, according to Krogstrup and Matar, is the extent to which an economy permits or facilitates commerce with other countries [24]. Trade restrictions like tariffs, quotas, and other barriers are usually eliminated or reduced as part of this process. Because trade openness makes it possible to access bigger markets, promotes innovation through competition, and attracts foreign investment, it is frequently associated with better economic performance.

The rise in FDI inflows into Africa, both in terms of volume and share, encourages an empirical examination of FDI's impact on development. First of all, it makes it easier to evaluate the effectiveness, durability, and efficiency of the incentives that African governments provide to multinational firms. Second, given the growing discussions among African policymakers about the necessity of the continent's industrialization, it is critical to elucidate the developmental function of foreign direct investment (FDI) in order to assist evidence-based policy design.

As previously said, foreign direct investment is thought to have been crucial in hastening the development of emerging countries, including Sierra Leone. World savings as a percentage of global income has decreased in recent years. The worldwide inflation rate has risen as a result of the real interest rate falling due to saving. In contrast to this approach, emerging nations that are dealing with declining domestic investment and rising international borrowing costs have found foreign direct investment (FDI) to be more alluring.

Therefore, in an effort to boost foreign investment and raise the rate of economic growth, the Sierra Leonean government has been offering incentives to draw in multinational firms. The empirical literature provides conflicting evidence about the reality of FDI's positive spillover effects on a host nation. However, orthodox economics assumes that FDI would have favorable direct and spillover effects. The majority of FDI surveys have focused on ways to draw in FDI rather than the effects of FDI.

Positive externalities have continued to be boosted by international financial organizations, FDI has remained the support of the development strategies of the majority of emerging nations in Africa and Asia, and the benefit of FDI is thought to be established by actual progress that ignores equivocal academic literature [25]. Indeed, in order to draw in Chinese foreign direct investment, Sierra Leone has been and continues to use a variety of subsidies, such as tax breaks, changes to the legal system, or even direct financial aid to multinational corporations, which they have used to replace the reprehensible asset sales that occurred during the period of rapid, frequently subjectively and politically motivated privatizations, during which the family silver in the majority of these countries was sold. In addition to providing African countries with much-needed funds for domestic investment, foreign direct investment (FDI) creates jobs and facilitates the transfer of technology and managerial expertise, all of which support economic growth. Every government in Sub-Saharan Africa, including Sierra Leone, wants to draw in Chinese foreign direct investment (FDI) since it may significantly boost economic growth. The global market for such ventures is, in fact, extremely competitive, and Sub-Saharan Africa in particular is looking for such funding to accelerate her advancement projects. With liberal approach system getting commonplace and losing some of their conventional capacity to draw FDI, Sierra Leone pays more recognition to the measures that actively promote it.

Because of this progress, the question emerges with respect to whether FDI engagement has contributed to the economic growth of Sierra Leone as it is the main objective of this paper. Several factors have contributed to Sierra Leone's better growth performance, including a marked improvement in institutions and structure and a decline in hostilities and macroeconomic perplexity [30], each of them will be controlled for in an empirical investigation.

Numerous studies have focused on how portfolio investment and foreign direct investment (FDI) affect growth in Africa overall, and they have shown how crucial these investments are to boosting the continent's economy. It is essential to raise awareness of additional avenues that offer chances for development and progress [31]. Additionally, when FDI’s flow inward toward a host economy, they share their knowledge and creativity. While it is true that the writing highlights the role of Foreign Direct Investment (FDI) in promoting innovation, precise evidence about FDI's effect on the development is mixed.

The contrary outcomes in the literature possibly subscribe to several factors, such as negligence to account for endogeneity and the abortive magnitude of the hosting nations. International experience shows that human capital is of significant in motivating Foreign Direct Investment (FDI) and maximizing its benefits. Sierra Leone used to play an essential role in education both at the country level and within the region. However, the repercussion of the war, as it is estimated that 30 percent of educated nationals flown out of the country during that period have seriously eroded the capacity to continue to executing their responsibilities. Based on these

problems, which are in line with empirical findings, this paper aim at improving the understanding of foreign direct investment and its contributions towards the economy growth of the country.

2. Literature Review

2.1. Foreign Direct Investment and Economic Growth

Over the years, many scholars have debated for and against the benefits of FDI on economic growth. Those for identified transmission of technology and knowledge, bettering exports, capital investment, fill the resource gap in many emerging nations, and improved physical infrastructure [41]. In contrast, those contrary to identified repatriate enormous profits to the parent nation (capital flight), swarming out public venture, making a syndication, expand the host nation's imports, and mechanism for exploiting and controlling developing nations by western industrialized nations [4].

Foreign Direct Investment (FDI) has been grasped as one of the equipment's that ignite economic growth in modern years in developing countries, as it promotes host country economic growth measures such as; labor training, market development, financial inflow, technology transfer, and skills [16]. Its capacity to reduce the shortages of financial resources and technology as these critical resources can contribute to human skill development that would lead to economic growth. It can influence the host economy through a variety of channels. Principally, it helps by adding to the resources available for investment and capital development. The transfer of technology, skills, innovative capacity, organizational, and managerial applies between countries is also enhanced through the activities of foreign direct investors [18, 40].

Policymakers of late, especially in developing nations, have inferred that foreign direct investment (FDI) is highly in need in order to maximize the country's economy growth. It is claimed that Foreign Direct Investment (FDI) can help in the area of employment, improve in developing technology in the host nation, and help in revamping the economic status of the nation [37]. For emerging nations, foreign direct investment (FDI) is regarded to be a way to transfer technology and capital from other emerging and especially developed nations. When FDI comes to a domestic nation, that corporation receives a competitive advantage due to the regulation of new knowledge, experience, ways of production, and management. The current successful economic growth of developing nations is described by the "catch-up effect" in technological development with developed nations [28].

Several studies have articulated theoretically and empirically about foreign direct investment in a nation, but very few studies exist on foreign direct investment in Sierra Leone's economy. Additionally, most theoretical studies in the literature of FDI location solely focused on this issue in advanced nations like the United States and nations from the European Union (EU) as well as countries in Asia. According to survey the result of foreign direct investment (FDI) on economic development in nine West African nations, namely; Burkina Faso, Ivory Coast, Ghana, Guinea Bissau, Liberia, Niger, Nigeria, Senegal, and Sierra Leone. Employing panel data econometrics for the interval 2000-2016, they establish empirical proof that recommends that the effect of FDI on economic growth is unfavorable and statistically important [43]. The findings illustrate that neither is foreign direct investment not a Primary Sector of the Economy (PSE) of this region not a satisfactory mechanism to stimulate economic development in West African nations. Nonetheless, the secondary and tertiary sector of the economy for this region has a positive effect and is statistically important to explain the growth.

According to Sunde [42], economic expansion as a function of foreign direct investment and exports in South Africa, implementing the autoregressive distributed lag model, includes to as the ARDL bounds testing approach to cointegration for the long-run correlation between economic growth, foreign direct investment, and exports. The error correction model was used to study the short-run dynamics, and the VECM, Granger causality approach was utilized to survey the direction of causality. It established cointegration between economic development, foreign direct investment, and exports; it also shows that both foreign direct investment and exports trigger economic growth, contrary to some surveys, which established that FDI does not create economic growth. The VECM Granger causality examinations builds up unidirectional causality between economic growth and foreign direct investment administering from foreign direct investment to economic boom, unidirectional causality linking foreign direct investment, and exports coordinating through foreign direct investment to exports and bidirectional causality between economic upturn and exports. The outcomes thereof confirm the FDI-led growth assumption for South Africa.

Several theories are progressive on the beneficial outcome of foreign direct investment (FDI) on economic extension and development [20]. Nonetheless, mixed empirical outcomes have resulted during a long-standing debate. They explore the global FDI–growth correlation through an 'informed' econometric analysis forecasted on considerable recommendations acquired from comprehensive research of 880 estimates reported in 108 published surveys. With model ambiguity alleviated and therefore the core specification benchmarked against the evaluation above, our econometric analysis, operating a global sample of 140 nations within the interval 1970 to 2009, decisively documents that FDI positively affects economic development. Additionally, they find that this association holds globally as strongly as within the emerging world and also it is regional variation instead of

within-nation variation, and coexistent FDI instead of past FDI, which matters for growth. At last, appropriate absorptive capacity signs for positive development are recognized to be trade openness and financial development instead of tutoring.

Another research by [11] went to show that it is often affirmed with belief that foreign direct investment (FDI) is good for economic development in the host economy. Empirical evidences have been mixed, and there remain holes in the literature. The main part of FDI has been aimed at developed nations. Single-nation studies are required, due to the heterogeneous connection among FDI and development, and in light of the fact that the impact of FDI on development is supposed to be biggest in open, progressed developed nations with a skilled workforce and developed financial markets (although research has engrossed on developing nations). The effect of foreign direct investment (FDI) on economic growth in 19 Latin American nations was study using panel data econometrics, they found robust empirical indication that recommends that the effect of FDI on economic growth is not statistically valuable in accumulated form [6]. This result diverges when they incorporate the levels of development reached by the nations in the region. FDI has a productive and considerable influence on products in high-income nations, while in upper-middle-income nations, the outcome is uneven and not important. Eventually, the effect in lower-middle-income nations is negative and measurably important. Their results show that FDI is not a adequate system to quicken economic development in Latin America, except for high-income nations.

Afzalur [3, 5] research the impact of Foreign Direct Investment (FDI) on the economic development of Bangladesh. Time series data during the period between 1999-2013 were evaluate using a multiple regression model to observe the relationships between the independent variable (FDI) and the dependent variables (macroeconomic indicators). To attain his aim, he conducted statistical analyses of the relationships between FDI and its effect on selected macroeconomic measures; Inflation rate, Gross Domestic Product, and Balance of Trade. The findings attained suggest that there is a negative correlation between FDI and economic expansion in Bangladesh. Earlier research showed that the economic achievement of Pakistan is negatively affected by Foreign Direct Investment while its national investment has benefitted the economy [29]. Sarumi [4] research the contribution of foreign direct investment to economic development in Africa employing graphical and regression analysis; Data for the whole continent and data for eleven nations within the continent were used for the empirical analysis [37]. Eleven nations were selected based on the following criteria: growth rate, solid currency rate, population, and Geographical spread. Angola, Botswana, Burkina Faso, Central African Republic, Cote d' Ivoire, Egypt, Mali, Nigeria, South Africa, Tunisia, and the Republic of Benin were the eleven countries selected. The time-series data is between 1970-2003, except for Botswana (1975-2003) were obtained and analyzed. It was discovered that the influence of FDI to economic growth is estimated to be positive in most of the nations but not substantial.

Adeleke et al. [2], the examination broke down the effect of foreign direct investment Nigeria's economic growth throughout 1999- 2013. Secondary data was used principally for the survey sourced from diverse productions of Central Bank of Nigeria, for example, Statistical Bulletin, Annual Reports, and statement of Accounts. The regression analysis was operated in this research to decide the relationship between and affect Foreign Direct Investment on economic growth. The discoveries revealed that economic growth is directly recognized with an inflow of foreign direct investment.

Olusanya, study scrutinizes the impact of Foreign Direct investment inflow and economic growth in before and after decontrolled Nigerian economy; a Granger causality test was employed as the evaluated procedure between 1970 and 2010. Conversely, the investigation de-aggregated the economy into three periods; 1970 to 1986, 1986 to 2010, and 1970 to 2010, to test the causality among foreign direct investment inflow (FDI) and economic development (GDP). In any case, the results of the causality test demonstrate that there is a causality relationship in the pre deregulation time that is (1970-1986) from economic growth (GDP) to foreign direct investment inflow (FDI), which implies GDP causes FDI. However, there is no causality relationship in the post-deregulation period that is (1986-2010) between economic improvement (GDP), what's more, Foreign direct investment inflow (FDI), which implies GDP causes FDI. In any case, between 1970 and 2010, it demonstrates that causality relationship amid economic development (GDP) and foreign direct investment inflow (FDI) which is economic development drives foreign direct investment inflow into the nation and the other way around. Surveyed was done in order to assess the impact of foreign direct investment on economic growth in Nigeria where in time-series data were collected from secondary sources covering a period of 13 years from 2002 to 2014. The inflation rate, GDP, unemployment rate, and exchange rate were used as proxies for economic growth. The Ordinary Least Square was adopted, and the outcome reveals that FDI has a significant relationship with the economic growth in Nigeria [34, 35].

2.2. Foreign Direct Investment Determinants

Among developed and developing countries, there exists extensive empirical literature on the determinants of Foreign Direct Investment. This literature is focusing on various sectors for a different period [51]. The reviewed papers, however, focus solely on developing countries and regions in the context of these studies. The specific topics to developing countries tend to deliberate on the effect of corruption, rate of return, trade openness, and natural resources [10] with

diverse discoveries on their relationship with FDI flows. Again, most emphasis has been given on market size, education, and economic growth. For instance, Tsen (2005) attributed the positive and important effect of human capital to FDI flows to the position that foreign investment does not only pursue to minimize costs but also gain access to technology and innovative capacity [43]. Divergently, according to Oke et al., the finding was the positive and insignificant impact of human capital estimated by education enrollment on FDI flows because of a shortage of training and incorporation in the pool of human capital in their illustration [32, 33].

2.3. Infrastructure

Looking at the infrastructure variable, there are many controversies among different researchers and scholars-some found positive and significant, and others found a significant negative relationship on FDI. According to different researchers, there findings shows that there is a positive and outstanding relationship between infrastructure, which is calculated by several mobile phones per 1000 population, and FDI inflows due to the fast penetration and implementation of mobile phones in the sample of emerging nations they studied [1, 38]. Nevertheless, Wadhwa and Sudhakara used internet access as a measure of infrastructure. They found a negative relationship to FDI flows, explained by the fact that emerging nations have commenced using internet services enormously only in the previous couple of years [48]. Another econometric panel survey by Behreez and Mastafa in [32] developing nations for 1990 – 2007 showed that technology and internet services have positive influence on FDI inflows in developing nations. The research work use access to electricity as a percentage of the population, as a proxy for evaluating infrastructure [46, 41].

2.4. Government Stability and It Impact on Foreign Direct Investment

As stated by Dunning and Narula, political stability in a specific nation is highly material because it implies a long-term, sustainable, and stable environment. Political solidity is, in that way, an underlying supposition for all other determinants; meanwhile, Dunning and Narula identified that investments and trade only run efficiently in a steady and peaceful environment. They also maintained that a more stable political environment is generally reduced the uncertainty of potential investors and have the potential to grow the level of inward FDI flows. Moreover, governance measures in FDI studies have been used extensively and in particular with developing country models. For instance, political instability was found to have a critical and negative effect on FDI flows [12,13] and clarified this by increases in the uncertainty of the political environment that reinforce the risk of the policy change and thus pessimistic FDI flows. In the same manner, Woo and Heo [52] similarly found a negative relationship between FDI flows and corruption in a sample of emerging Asian nations and suggested that this was due to weak economic reforms, monopolistic power, and rent-seeking behaviors of government officials, all of which deters investors. Although it has been talk about that political instability in the host nation could disappoint the inflows of FDI, most empirical studies are backing this argument. However, some empirical evidence suggested that political factors play an inconsequential role in companies' decision to invest abroad [48].

Another FDI determinant is the exchange rate. In line with the survey of Goldberg and Klien [19], the stability of domestic currency concerning hard currencies brings more FDI than the frequent significant variations. Moreover, their study disclosed that recurring outstanding variations erode the values of foreign investor assets. A study by Dipti Ranjan also found that the exchange rate influences FDI inflows absolutely. Demirhan and Masca [16] also displayed determinants of FDI inflows in 38 developing countries from 2000 through 2004, and they found out that the positive and significant factors affecting FDI inflows include income per growth rate, main telephone lines, and degree of openness.

2.5. Inflation Rate Impact Towards Foreign Direct Investment

Akinkugbu (2003), in his empirical study of the determination of FDI inflows, found that the inflation rate is not an essential determinant of FDI flows [45]. However, in a study by Yang using the OLS model, inflation was found to be a positive and substantial determinant of FDI inflows. Additionally, other variables such as host nation GDP, exchange rate, and transport costs were not found to be important at all [50, 53]. Asiedu also examined the determinants of FDI in Africa. The study suggested that low inflation and an capable legal system foster FDI, but corruption and political uncertainty have the opposite effect [9].

Marcelo and Mario using panel data analysis for developing nations for the period of 1975 – 2000, the main determinants of FDI inflows in emerging economies [15]. Factors as scope and pace of growth of economic activity, the level of labor requirement, friendly strategies towards foreign capital, country risk, and stock market performance are the main factors of FDI identified [27, 28]. The coefficient of an economy's degree of sincerity was included as a proxy to disclose the willingness of a nation to accept foreign investment and proved to be important in attracting capital, considering that said variable presented the expected sign and was highly significant. Also, a causality test, in the particular context of panel data, has shown that FDI does not cause economic growth. On the opposite, economic growth causes FDI. In the same issue of market size as one of the notable determinants of FDI, Anyanwu

[8], in the study of the economic determinants of FDI in Nigeria, confirmed the decisive role of the domestic market size in establishing FDI inflow into the nation. The survey also noted that the repudiation of the indigenization policy in 1995 notably revitalized the flow of FDI into the nation and that more effort is essential in constructing the nation's economic growth to attract more FDI.[7]

FDI has both cost and benefits. Based on this notion, Shatz and Venables [39] suggested two main reasons why a firm would want to become a multinational. According to them, the first reason is to serve the local market better, and the other is to get lower-cost inputs. For FDI to serve local markets, it is often being referred to as "horizontal" or "market-seeking." This is FDI, which involves duplicate building plants in a foreign location to supply the market there. The intention behind this is to minimize the cost involved in supplying the market or to become further competitive in other ways like proximity to the market and also being able to respond to changing local circumstances and preferences. In this case, FDI tends to restore exports if the expenses of market access through exports are higher than the expenses of setting up a local plant and doing business in a foreign environment. The second reason is that FDI getting lower-cost inputs is being referred to as vertical or production cost-minimizing FDI. This vertical or production cost-minimizing FDI involves the slicing of the vertical chain of production and consequent relocation of part of this chain in a low-cost location. Vertical FDI is also being referred to as what is called "raw material seeking" FDI since the inexpensive inputs that could be primary commodities are in a specific location. However, both horizontal and vertical FDI may tend to cluster in specific locations because of linkage among projects, creating an incentive to locate closer to other firms.

3. Research Methods

This section of the research work presents the various methodology and techniques that will be used in the anlysis of the data.

3.1. Methodology

Quantitative research techniques or approach has been employed to examine the proposed relationship between Growth and FDI. Owing to the nature of the research, the data is in time-series form, and therefore time series data econometric techniques using Descriptive, stationarity, cointegration, Vector Error Correction Model and the Ordinary Least Square (OLS) were used.

3.2. Data Sources

Data for this investigation were obtained from the World Development Indicators (WDI) database on the World Bank and the Statistics of Sierra Leone. Annual time series data were collected on total Gross domestic Products, foreign direct investment, interest rate, exchange rate, imports, exports and inflation for the period 1990-2023.

3.3. Description of Variables

In line with the discussions in the literature, and based on the availability of data for Sierra Leone over the 1990–2023 period, the general model of the study. The survey presents an empirical investigation into the correlation between Foreign Direct Investment and the Economic growth in Sierra Leone using an econometric technique. The methodology involves regressing economic growth on its explanatory variables through the following approaches using testing for stationary properties of the variables employing the Augmented Dickey-Fuller tests, Johansen's co-integration test to check for the actuality of co-integrating and long-run relationships. Consequently, the vector error correction model (VECM) was employed to estimate the error correction term and causal relationship, respectively. Finally, stability and diagnostic test were also conducted to determine the robustness of the model adopted.

3.4. Model Specification

In order to examine the impact of Foreign Direct Investment Sierra Leone Economy.

Table 1. *Variables and Definition.*

Variable	Full form	Definition
lnGDP	Economic Growth	The total gross domestic product, which is given in logarithmic form, is a dependent variable in FDI-economic growth study. It shows the total market value of products and services generated in a particular year inside the borders of an economy. The data is in USD 2015 constants.
lnFDI	Foreign Direct Investment	According to [17, 44], Foreign direct investment represents the direct investor from the home economy who owns ten percent or more of the common stock or voting rights of the resident entity of the host economy. Included are a transfer of money, a reinvestment of earnings, a debt transaction between companies, a transfer of patents, and a transfer of technology [47, 14]. In several studies, the flow of FDI was used as a metric to assess FDI's impact on economic growth. In their analysis of its impact on economic growth, other re-

Variable	Full form	Definition
		searchers [16, 21] considered both its flow and its latency.
lnEXP	Export rate	Goods and services produced in one nation and sold to consumers in another are referred to as exports. Because they increase domestic production and bring in foreign cash, they are a vital part of global trade and a major force behind economic growth. A nation's trade performance and competitiveness in the international market are frequently evaluated by looking at its exports [23].
lnEXCH	Exchange Rate	The price of one nation's currency represented in terms of another nation's currency is known as the exchange rate. It influences the relative costs of imports and exports between nations and is a key factor in determining international trade and investment. There are two types of exchange rates: fixed, where the government sets the rate, and floating, where supply and demand in the market determine the rate [26].
lnGFCF	Gross Fixed Capital Formation	Gross Fixed Capital Formation is the net growth of tangible assets in an economy over a given time frame. It calculates the difference between the purchase and disposal of new or existing fixed assets, such as buildings, machinery, equipment, and infrastructure. As a measure of economic growth and development, GFCF is a crucial part of a country's investment. (OECD, 2023)
lnLAB	Labor Force	The labor force can be described as people that are qualify to be in the employed. Generally, it could be as well refer to those that are actively in work in any company, institution or industries, but can also seek to another geographic area. Any country's labour force has much impact towards transforming the economic growth into better level. It includes also both employed and unemployed as well.
lnIMP	Imports	Goods and services produced in one nation and acquired by citizens, corporations, or governments of another are referred to as imports. These transactions, which usually entail crossing international borders, are an essential part of international trade and support a nation's economic activity and balance of payments [24].
lnINF	Inflation rate	The steady rise in prices for goods and services over time is referred to as inflation. Because it has a direct influence on consumers' purchasing decisions and their capacity to pay for goods and services, it is an essential indication of financial well-being. Usually, inflation is shown as a percentage change in prices over a given time frame. Excessive money supply, uncontrolled exchange rates, and ongoing budget deficits are examples of poor monetary and fiscal policy management that can lead to high inflation rates. These kinds of situations frequently indicate bad economic times, weaken the value of the local currency, and discourage foreign investment.
lnTRA	Trade Openness	The degree to which a nation participates in international trade by permitting the unrestricted movement of goods and services across its borders is known as trade openness. It is frequently calculated as the ratio of a nation's gross domestic product (GDP) to the total of its imports and exports. Significant integration into the global economy is usually indicated by high trade openness, which promotes competitiveness, technological transfer, and economic expansion. Trade openness, which can have a big impact on economic performance, is a measure of a nation's readiness to lower trade barriers and encourage economic engagement with other countries, claim Rodriguez and Rodrik [36].

The cointegrating relationship captures the long-term effect of FDI and other variables on GDP and therefore the model will be as follows below:

$$Y_t = f(FDI_t, EXP_t, EXCH_t, GFCF_t, LAB_t, IMP_t, INF_t, TRA_t) \quad (1)$$

$$lnGDP = \beta_0 + \beta_1 lnFDI_t + \beta_2 lnEXP_t + \beta_3 lnEXCH_t + \beta_4 lnGFCF_t + \beta_5 lnLAB_t + \beta_6 lnIMP_t + \beta_7 lnINF_t + \beta_8 lnTRA_t + \epsilon_t \quad (2)$$

where: lnGDP = Gross Domestic Product, lnFDI = Foreign Direct Investment, lnFDI = Exports, lnEXCH = Exchange Rate, lnGFCF = Gross Fixed Capital Formation, lnIMP = Imports, lnINF = Inflation, lnLAB = Labor Force, lnTRA = Trade Openness, β_0 is the slope and β_1……., β_8 are the coefficients of the independent variables and ϵ_t represent the error term.

4. Results and Discussion

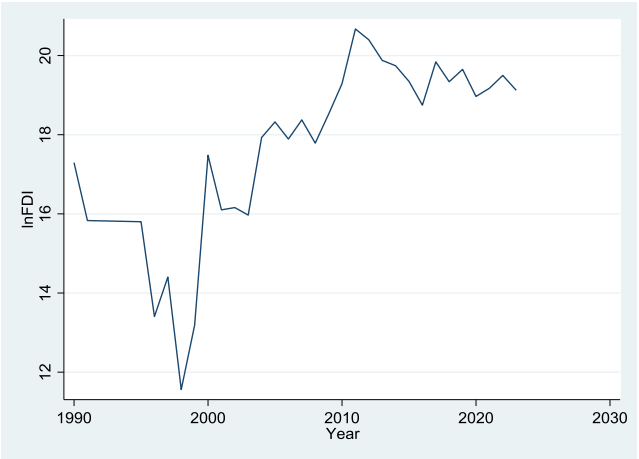
4.1. Summary Statistics of the Variables

Table 2. Summary Statistics.

	lnGDP	lnFDI	lnEXP	lnEXCH	lnGFCF	lnIMP	lnINF	lnLAB	lnTRA
Mean	6.20644	18.189	19.794	1.2823	3.1402	20.49	2.7926	14.41	41.92813
Median	6.45584	18.633	19.752	1.3002	3.0531	20.48	2.6952	14.572	43.6102
Maximum	6.7858	20.672	21.045	3.0589	7.7654	21.51	5.1243	14.846	68.69067
Minimum	4.96803	13.406	18.264	-1.8875	-0.79	19.21	1.1882	11.96	22.97334
Std. Dev.	0.60806	1.8217	0.8753	1.1755	1.9816	0.867	0.9629	0.6774	12.75392
Skewness	-0.952	-1.161	-0.096	-1.0273	0.3722	-0.128	0.7728	-3.195	0.342731
Kurtosis	2.63506	4.0277	1.8336	4.4845	3.6054	1.372	3.5523	12.197	2.333737
Jarque-Bera	2.50582	4.3026	0.9315	4.2833	0.6139	1.811	1.7959	83.608	0.609178
Probability	0.28567	0.1163	0.6277	0.1175	0.7357	0.404	0.4074	0	0.737427
Sum	99.303	291.02	316.7	20.517	50.242	327.9	44.681	230.56	670.8501
Sum Sq. Dev.	5.54605	49.776	11.491	20.727	58.901	11.27	13.909	6.8828	2439.936
Observation	16	16	16	16	16	16	16	16	16

Source: Author computational

The descriptive statistics in Table 2 shows for the variables use in this research analysis. Based on the result above, from the year 1990 to 2023, Gross Domestic Product (GDP) recorded maximum value of 6.7858 million and the lowest Gross Domestic Product (GDP) value of 4.96803 million, with a standard deviation of 0.60806 million, which shows that there is low variability values of the Gross Domestic Product (GDP) and an average value of 6.20644 million USD. Foreign Direct Investment (FDI) recorded maximum value of 20.672 million and a minimum of 13.406 million, with a standard deviation of 1.8217 million which implies that there is high variability of the Foreign Direct Investment (FDI) and a mean value of 18.189 million USD. The export rate maximum and minimum value are 21.045 and 18.264 respectively, while the standard deviation is 0.8753 which implies low disparity among the data with an average of 19.794 million USD. On the other hand, maximum and minimum import rate is not far from each other from the year 1990 to 2023. The inflation rate recorded standard deviation value of 0.9629 which below the one for GDP but it clearly shows that there is moderate variability of inflation from the year 1990 to 2023 with an average value of 2.7926 and verse difference with maximum and minimum value. The exchange rate minimum and maximum value are -1.8875 and 3.0589 respectively. This shows that there is a verse difference of the exchange rate as result other factors like inflation, decline in exports rate as well as decrease in the money value.

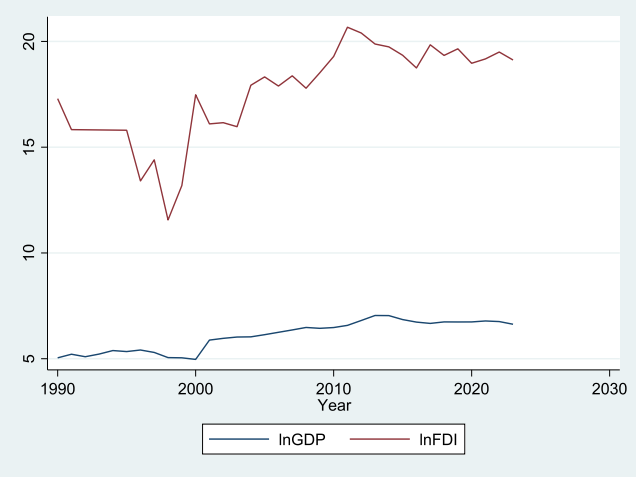


Source: Author computational

Figure 1. Sierra Leone Foreign Direct Investment (1990 – 2023).

The foreign direct investment trend over time is seen in the graph (Figure 1). The findings showed that foreign direct investment (FDI) fell precipitously in the early 1990s and

peaked about 2000. This might be a result of political or economic unrest, bad investment climates, or worldwide economic downturns at the time. After 2000, there is a sharp increase in foreign direct investment (FDI), which peaks around 2010. This implies that investor confidence has returned, most likely as a result of global conditions that encourage FDI inflows, policy changes, or enhanced macroeconomic stability. With just slight variations, FDI stabilizes after peaking about 2010, suggesting consistent but less erratic FDI inflows. After 2020, the pattern flattens out, indicating a constant level of FDI without appreciable growth. The precipitous decline and subsequent rebound underscore how vulnerable Foreign Direct Investment (FDI) was to external, political, or economic shocks during the 1990s. The sharp increase after 2000 points to either important reforms or advantageous circumstances that are attracting FDI inflows. After 2010, the leveling off can be a sign of saturation, declining returns, or difficulties luring new FDI. The stabilization and recovery of FDI may be a result of effective investment or economic policy. The post-2010 standstill in FDI inflows may indicate the need for creative approaches to draw in fresh capital. The observed oscillations were probably driven by worldwide economic patterns, such as financial crises or changes in global capital flows.



Source: Author computational

Figure 2. *Economic Growth (GDP) and Foreign Direct Investment (1990-2023).*

The graph (Figure 2) shows the patterns of two variables over time (1990 to 2023): lnFDI (log of Foreign Direct Investment) and lnGDP (log of GDP). Between 1990 and 2020, the Gross Domestic Product increased somewhat slowly, demonstrating consistent economic growth. The growth rate seems to level off after 2010, which could indicate either a plateau in economic performance or slower GDP growth. Although the steady upward trend points to favorable long-term growth, the post-2010 flattening may indicate difficulties maintaining growth due to external shocks or structural economic problems. On the other hand, Foreign Direct Investment (FDI) exhibits a more volatile trend, with noticeable fluctuations between 1990 and 2000. These might be a reflection of notable shifts in foreign investment regulations or the state of the economy. The significant increase between 2000 and 2010 suggests a spike in foreign direct investment during that period. Following 2010, there are only slight variations in the lnFDI trend, which indicates steady levels of Foreign Direct Investment inflows. Uncertainty in the investment climate or in transitional economic policies may be the cause of the first volatility. The rise and subsequent stabilization imply that FDI inflows became more consistent and predictable, either as a result of better economic policies or increased investor confidence. The fact that both indicators show a general rising trend suggests that the inflows of foreign direct investment may help spur economic growth in Sierra Leone. But compared to GDP, FDI growth is more noticeable and erratic, suggesting that factors other than FDI may influence GDP development. The post-2010 plateau in GDP contrasts with the persistently high level of FDI, which could indicate that FDI's contributions to economic growth are waning or that there are other economic constraints.

4.2. Regression Result, Diagnostic Tests, and Discussion

This section investigates the correlation analysis between the variables (Inflation, Unemployment and Gross domestic product). Correlation can be described as statistical measure that used to express the extent at which two variables are linearly related to each other. It further also shows the simple relationship without stating cause and effects among the variables. The Pearson correlation test method was used in order to know if correlation exist and the strength of the relationship between the dependent variable and the independent variables. Thus, the Pearson correlation is given by:

$$r = \frac{n\sum_{i=1}^{n} X_i Y_i - (\sum_{i=1}^{n} X_i)(\sum_{i=1}^{n} Y_i)}{\sqrt{[n\sum_{i=1}^{n} X_i^2 - (\sum_{i=1}^{n} X_i)^2][n\sum_{i=1}^{n} Y_i^2 - (\sum_{i=1}^{n} X_i)^2]}} \quad (3)$$

Where: r= Pearson correlation coefficient, X= first set of data, Y= second set of data and n = total number of the data, *i= 1, 2, 3 …. N.*

A diagnostic test must be run both before and after regression. The independent variables' correlation matrix is shown in Table 3. A multicollinearity issue is likely to arise if the correlation coefficient between two variables is higher than 0.8, or 80% (Gujarati, 2003).

Table 3. Correlation of explanatory variables.

	lnGDP	lnFDI	lnEXP	lnEXCH	lnGFCF	lnIMP	lnINF	lnLAB	lnTRA
lnGDP	1	0.80	0.910	0.800	-0.594	0.82	-0.227	0.699	-0.33
lnFDI	0.801	1	0.721	0.6185	-0.303	0.759	-0.35	0.332	0.047
lnEXP	0.910	0.721	1	0.746	-0.464	0.736	-0.293	0.412	0.232
lnEXCH	0.800	0.619	0.746	1	-0.392	0.716	-0.373	0.672	-0.21
lnGFCF	-0.594	-0.30	-0.46	-0.392	1	-0.44	0.07	-0.29	0.345
lnIMP	0.82	0.759	0.736	0.716	-0.444	1	-0.314	0.608	0.049
lnINF	-0.227	-0.35	-0.29	-0.373	0.07	-0.31	1	-0.42	-0.05
lnLAB	0.699	0.332	0.412	0.672	-0.293	0.608	-0.425	1	-0.5
lnTRA	-0.328	0.047	0.232	-0.211	0.345	0.049	-0.049	-0.5	1

Source: Author computational

Table 3 correlation matrix explain on the connections between the explanatory factors. A trade-dependent economy is probably reflected in the above finding, which indicates a large positive correlation between GDP and imports (0.82). This connection implies that imports increase significantly with GDP. The close relationship between exports and GDP (0.910) is indicated by the strong positive correlation, underscoring the contribution of exports to economic growth. The substantial positive connection (0.800) between GDP and exchange rates suggests that currency stability is influenced by economic growth. The correlation (0.736) between imports and exports is typical with economies in which trade activities are interconnected. A possible trade-off between GDP growth and gross fixed capital creation could be indicated by a moderately negative correlation. Furthermore, a moderately negative correlation (-0.5) may indicate that labor supply and trade openness have an inverse relationship in this situation. There are variables with correlation coefficients higher than 0.8, according to Table 3, suggesting that multicollinearity is an issue. In order to solve this problem, Principal of component Analysis will be applied.

4.3. Principal Component Analysis

Table 4. Eigenvalues.

Eigenvalues: (Sum = 9, Average = 1)					
Number	**Value**	**Difference**	**Proportion**	**Cumulative Value**	**Cumulative Proportion**
1	5.110808	3.566110	0.5679	5.110808	0.5679
2	1.544698	0.487809	0.1716	6.655506	0.7395
3	1.056889	0.409575	0.1174	7.712395	0.8569
4	0.647314	0.205448	0.0719	8.359708	0.9289
5	0.441865	0.303374	0.0491	8.801573	0.9780
6	0.138491	0.096145	0.0154	8.940064	0.9933
7	0.042346	0.025433	0.0047	8.982411	0.9980
8	0.016913	0.016237	0.0019	8.999324	0.9999
9	0.000676	---	0.0001	9.000000	1.0000

Source: Author's Computation

From the result above (Table 4), first principal component (PC1) explains about 0.5679 (56.79%) of the total variance in the dataset. The second principal component (PC2) explains an additional of 0.1716 (17.16%), bringing the cumulative variance explained to 73.95%. The first three components together account for 85.69% of the variance, which means they capture most of the variability in the dataset. The Components 4 to 9 contribute little individually (eigenvalues < 1) and cumulatively explain the remaining 14.31%.

Table 5. Eigenvectors (loadings).

Variable	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9
lnGDP	0.422	-0.101	0.175	0.091	0.087	-0.47	0.205	-0.059	0.709
lnFDI	0.339	0.265	0.045	-0.06	0.794	0.382	0.049	0.171	-0.01
lnEXP	0.384	0.327	0.181	0.004	-0.2	-0.3	-0.61	0.428	-0.19
lnEXCH	0.411	-0.074	-0.15	0.274	-0.19	0.448	-0.41	-0.553	0.136
lnGFCF	-0.25	0.242	-0.49	0.672	0.267	-0.32	-0.11	-0.013	0.009
lnIMP	0.42	0.185	0.089	0.151	-0.08	-0.25	0.483	-0.337	-0.59
lnINF	-0.19	-0.118	0.725	0.609	3E-04	0.201	0.032	0.116	-0.03
lnLAB	0.334	-0.358	-0.37	0.259	-0.25	0.252	0.293	0.588	-0.03
lnTRA	-0.08	0.757	-0.01	0.024	-0.38	0.288	0.295	0.076	0.313

Source: Author's Computation

Each component is a linear combination of the original variables, with the loadings indicating the contribution of each variable to the component. Base on the results Table 5, Principal Component 1 (PC1) shows high positive loadings with GDP (0.422), imports (0.42), and exchange rate (0.4111), Furthermore, PC1 represents an economic growth dimension, as variables like GDP, imports, exchange rate, and exports are strongly correlated and contribute positively. For Principal Component 2 (PC2), there is high positive on trade (0.7566), moderate contributions from exports (0.3269) and foreign direct investment (0.2655). PC2 is associated with trade activity, emphasizing the proportion of trade to GDP. Principal Component 3 (PC3) is dominated by LNINF (0.725) with moderate contributions from Gross Fixed Capital Formation (-0.4936) and Labor force (-0.3688). In order words, PC3 captures an inflation-related dimension, where inflation is inversely associated with factors like gross fixed capital formation. PC4 to PC9 have smaller contributions and explain niche variations or noise in the dataset.

Table 6. Ordinary correlations.

	lnGDP	lnFDI	lnEXP	lnEXCH	lnGFCF	lnIMP	lnINF	lnLAB	lnTRA
lnGDP	1								
lnFDI	0.7009	1							
lnEXP	0.8162	0.721	1						
lnEXCH	0.8483	0.619	0.746	1					
lnGFCF	-0.594	-0.303	-0.46	-0.39	1				
lnIMP	0.9196	0.759	0.936	0.86	-0.44	1			
lnINF	-0.227	-0.35	-0.29	-0.37	0.07	-0.31	1		
lnLAB	0.6992	0.332	0.412	0.872	-0.29	0.608	-0.425	1	

	lnGDP	lnFDI	lnEXP	lnEXCH	lnGFCF	lnIMP	lnINF	lnLAB	lnTRA
lnTRA	-0.328	0.047	0.232	-0.21	0.345	0.049	-0.049	-0.495	1

Source: Author's computation

The correlation matrix (table 6) confirms relationships between the variables shows that GDP is strongly positively correlated with imports (0.92) and the exchange rate (0.848) but negatively correlated with LNGFCF (-0.594). On the other hand, trade has low correlation with most variables, suggesting it represents an independent dimension.

Table 7. *Augmented Dickfuller test for Stationarity.*

Variable	Specification through DSR procedure	ADF 5% critical value	Test Statistic	p-value
lnGDP	Contant and trends	-3.572	-1.698	0.7518
lnFDI	Contant and trends	-1.945	-1.945	0.6312
lnInf	Contant and trends	-3.072	-3.072	0.1131
lnExch	Contant and trends	-2.153	-3.572	0.5161
lnInt	Contant and trends	-3.600	-2.990	0.1349
lnLab	Contant and trends	-3.572	-3.513	0.0381
lnTrade	Contant and trends	-3.572	-1.909	0.6500
lnGFCF	Contant and trends	-3.600	-0.949	0.9506
lnExp	Contant and trends	-3.572	-2.329	0.4181
lnImp	Contant and trends	-3.572	-2.005	0.5989

Source: Author's computation

Since statistical inference from a time series is typically based on the assumption of stationarity, the unit root tests should be conducted before the cointegration tests. The Augmented Dickey-Fuller (ADF) test is used in this investigation. The null hypothesis of non-stationarity is compared with the alternative hypothesis of stationarity for each variable. The Unit Root Tests using the ADF test are shown in Table 7.

The results show that all of the variables became stationary following differentiation, even though none of them were stationary at level. Therefore, the long-term relationship between variables can be examined via cointegration.

Cointegration Test

Table 8. *Johansen Cointegration output.*

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.922332	211.0604	125.6154	0.0000
At most 1 *	0.871256	136.9562	95.75366	0.0000
At most 2 *	0.668578	77.50831	69.81889	0.0107
At most 3*	0.574907	45.48178	40.85613	0.0422

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
At most 4*	0.339321	20.67378	19.79707	0.0378
At most 5	0.193301	8.653647	15.49471	0.3984
At most 6	0.080198	2.424322	3.841466	0.1195

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

Table 8. *Continued.*

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.922332	211.0604	125.6154	0.0000
At most 1 *	0.871256	136.9562	95.75366	0.0000
At most 2 *	0.668578	77.50831	69.81889	0.0107
At most 3*	0.574907	45.48178	40.85613	0.0422
At most 4*	0.339321	20.67378	19.79707	0.0378
At most 5	0.193301	8.653647	15.49471	0.3984
At most 6	0.080198	2.424322	3.841466	0.1195

Source: Author's computation

This part of the research presents the outcome of the cointegration results to test whether there is a cointegration existing among the variables. The Johansen cointegration method was applied in which entails both the Trace statistic, eigenvalue, critical value at 5%, probability value and the Maximum Eigenvalues were recorded.

Our hypothesis is stated below:

H_0: There is no cointegration existing between the variables.

H_1: There is a cointegration existing between the variables.

We reject the null hypothesis if the t-statistic is greater than the critical value. Since the t-statistic values are greater than the critical value (table 8) at most one level, then the null hypothesis is rejected, therefore we can conclude that there is cointegration between the variables. Furthermore, the results from table shows there is two cointegration between the variables since their Eigenvalue is greater than the probability value. This further indicates that the variable was cointegrated at 5% significant level, that is they move simultaneously in the long run.

4.4. Multiple Regression Analysis

This study seeks to explore the relationships between the two variables and its effects on the economic growth of Sierra Leone, therefore with reference of equation 2, the regression model is fitted as stated below.

Table 9. Regression Model output.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFDI	0.244166	0.130260	1.874451	0.0157
LNEXP	1.080617	1.089761	0.991609	0.0305
LNEXCH	0.14642	0.045287	3.233175	0.0037
LNIMP	0.412828	0.154973	2.663869	0.0139
LNINF	-0.025537	0.036471	-0.7002	0.4908
LNLAB	-0.323963	0.086069	-3.763974	0.0021
lnTRA	-0.018644	0.003865	-4.82382	0.0001
lnGFCF	-0.025537	0.036471	-0.7002	0.4908
C	1.000709	1.591235	0.628888	0.5349
R-squared	0.946262	Mean dependent var		6.18539
Adjusted R-squared	0.932244	S.D. dependent var		0.685367
S.E. of regression	0.178402	Akaike info criterion		-0.408596
Sum squared resid	0.732024	Schwarz criterion		-0.08165
Log likelihood	13.12894	Hannan-Quinn criter.		-0.304003
Durbin-Watson stat	1.343722			

$$lnGDP = 1.000709 + 0.244166FDI_t + 1.080617EXP_t + 0.14642EXCH_t - 0.025537GFCF_t - 0.323963LAB_t + 0.412828IMP_t - 0.025537\ INF_t - 0.018644TRA_t \quad (4)$$

The results from table 9 reveal that foreign direct investment, exports, exchange rate, import rate, labor force and trade openness used in this model are statistically significant at 5% since their p-values are less than 5% (0.05). This simply implies that the results show 95% confidence that the coefficients for these independent variables (UNP and INFL) are significantly different from zero and thus have a significant influence on the dependent variable (GDP). The R-squared value for this model is 0.94626 and this implies that the independent variables account for about 94.626% of variations in the Gross domestic product (GDP). The p-value of F-statistics (0.044) indicates that the entire model is statistically significant at 5% level.

This study's main goal is to find out whether foreign direct investment (FDI) has an impact on Sierra Leone's economic growth. Given that a percentage increase in FDI in the secondary sector would raise the nation's GDP by 0.24416%, the result (table 9) demonstrates that FDI has a positive and statistically significant impact on economic growth. However, other researchers also support these conclusions as other researchers investigate the causal association between foreign direct investment inflows and economic growth in China [19]. The study discovered that FDI has a major impact on China's GDP growth through greater trade and technology transfers, demonstrating the crucial role FDI plays in changing emerging economies. It also supports the findings of Chandio et al. [14], which show that foreign direct investment (FDI) in manufacturing and technology-intensive industries greatly boosts economic growth. However, as FDI inflows do not result in growth, this conclusion contradicts other researcher's findings [5, 10].

5. Conclusion and Recommendation

The study used time series data from 1990 -2023 to investigate the impact of FDIs on Sierra Leone's economic growth. According to econometric theory, the time-series properties of the underlying variables were analyzed before the model was estimated. The Augmented Dickey-Fuller unit root tests were used to verify that the variables were stationary, and the Johansen test technique of cointegration was used to investigate the long- and short-term relationships between economic growth, foreign direct investment, and the other explanatory variables. The results indicated the presence of a cointegrate. Along with exports, exchange rates, labor, imports, and trade openness, the regression model's conclusion also demonstrates the positive and large impact of foreign direct investment to Sierra Leone's economic growth. Foreign investors, however, will be attracted and encouraged when they believe the host country would create the required market for their products. This can be aided by government-designed incentives or an environ-

ment that supports production activity. Furthermore, the government should put more effort into implementing its reform agenda, which might attract more foreign direct investment into Sierra Leone, considering the importance of trade to the economy. This is accurate since the government has been implementing reforms that have further boosted and encouraged foreign investment in many sectors of the economy, and the increase in exporting has led to an increase in FDI inflow.

Abbreviations

FDI	Foreign Direct Investment
GDP	Gross Domestic Product

Author Contributions

Matthew James Turay: Conceptualization, Data curation, Formal Analysis, Methodology, Writing – original draft

Abdul Koroma: Methodology, Validation

Issac Tamba Issa: Data curation, Supervision

Conflicts of Interest

The authors declare no conflicts of interest.

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