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The Impact of Foreign Direct Investment on Total Factor Productivity growth in Sierra Leone

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Abstract

The broader objective of this study is to examine the impact of Foreign Direct Investment (FDI) on Total Factor Productivity Growth in Sierra Leone. Considering these observations, this study measures the impact of FDI on Sierra Leone's Total Factor Productivity (TFP) Growth and consequently on economic growth. This study covers the sample period 1990- 2020 employing time-series data. To achieve this end, the study brought together the dependent variables as well as FDI and other explanatory variables as a pioneer in economic analysis in the context of Sierra Leone as a least developed nation. As such, to understand the impact of FDI and other explanatory variables on Sierra Leone's TFP growth, this study employed the latest econometric techniques to achieve the stated objectives using Sierra Leone's data. In this respect, first cointegration analysis was introduced to capture long-run relationships among variables. Second, to capture short-run relationship among variables a systems simultaneous equation was developed. Following this approach, employing Vector Error Correction Mechanism (VECM) procedure the simultaneous equation was simulated. The empirical findings indicate that FDI contributes to Sierra Leone's TFP growth. However, though FDI contributes to economic growth, the marginal effect was small. This is partly attributed to Total Factor Productivity (TFP), as explained by the Solow Swan Model and the absorption capacity of Sierra Leone being a least-developed country. The result also reveals that unlike physical capital, the effect of human capital development on growth was very small. Going by the findings and conclusions drawn from this study, recommends among other things were made-improving the nation's absorptive capacity so as to promote future foreign direct investment.

Keywords: Foreign Direct Investment, Total Factor Productivity, Economic Growth, Human capital, Sierra Leone.

1. Introduction

The existing macro literature on Foreign Direct Investment-Growth nexus has identified the potential gains of FDI to recipient countries. The impact of Foreign Direct Investment (FDI) on growth has largely been explored empirically, both at -macro and -micro levels. The impacts of FDI on growth is expected to be twofold. First through capital accumulation in the recipient economy .FDI is expected to be growth enhancing ,the incorporation of new inputs and foreign technology in the production function of the recipient economy. Second, through knowledge and

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transfer, FDI is expected to augment the existing stock of knowledge in the recipient economy through labour training and skill acquisition. Studies on FDI and growth have been inspired by theories of technological spillovers that Multinational Corporations (MNCs) could bring into host countries. Several spillover channels of imitation of the technological production process of multinationals by the local firms have been identified (Das, 1987; Wang & Blomstrom, 1992); skills acquisition which relates to hiring of workers of FDI-firms by the local ones which can bring new knowledge, advanced managerial skills (Fosfuri, Motta, & Røndee, 2001). FDI can smooth the progress of technology transfer, create employment, promote exports, encourage domestic investment and generate economic growth. However, in the 1990s, there was a significant increase in TNCs' investment in developing countries. While many countries were beginning a process of international economic integration and implementing policies to attract FDI, Sierra Leone was consumed by war. Foreign investors, with the exception of few mining companies, largely bypassed Sierra Leone when considering investment opportunities in Africa .Since the end of the war, the government has committed to re-establishing the conditions that would enable the economic and social development of the country. However, the country's small domestic market, undiversified economic structure, poor infrastructure and unskilled labour force continue to contrast with its rich natural endowments and privileged maritime geographical position. So far, the economy relies essentially on exports of minerals, the only sector that has witnessed a limited foreign direct investment (FDI) presence. In this context, a major challenge for the Government of Sierra Leone is to adopt policies to sustain the high economic growth experienced in the immediate post-war period. In this regard, many initiatives have been undertaken and FDI has been recognized as a key element of the country's growth prospect (UNCTAD,2010). The global economic slowdown will impact investment flows, making it even more challenging for Sierra Leone to increase FDI inflows in the near term. While this temporary impact is unavoidable, Sierra Leone should continue with its reform agenda. This would enable the country to be better positioned for the period of economic recovery and would also be useful in maintaining current levels of FDI. Even though major legal reforms began in 2000, the limited institutional capacity made it difficult to adequately and effectively sequence and implement the proposed measures. It is against this background that the Government of Sierra Leone requested UNCTAD to undertake an Investment Policy Review (IPR) and to come up with concrete policy recommendations to attract and benefit from FDI (UNCTAD,2010).

2. FDI in Sierra Leone

The government of Sierra Leone continues to open its doors to both local and foreign investors. The establishment of the SLIEPA in 2007 and the review of several investment policies in recent times have clearly shown government commitment to encourage investment. The mining sector has attracted the largest investment in recent times especially in its rapid growth in iron ore production. Sierra Leone is the sixth largest iron ore deposits in the world. Other sectors that are also open to investments are the Energy, Marine and Fisheries, Agriculture, Tourism, Transport, Manufacturing and Infrastructure. A number of reforms have also been instituted such as streamlining the business registration processes from 14 steps to 6 steps and from an average duration of 32 days to 3 days, eliminating the issuance and the need

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for annual renewal of business license and also avoiding the need for payment of taxes in advance as a precondition for registering a business (SLICS,2015).

Sierra Leone is a country in transition from post-conflict stabilization to economic rehabilitation and growth. Following 11 years of civil war (1991–2002), which devastated Sierra Leone's social, economic and institutional conditions, political stability has been re-established as reflected in three successful presidential and district-level elections, which included a peaceful transfer of power. During this transformative period, the government has prioritized infrastructure development, reforms to domestic revenue collection and reforms supporting the development of the private sector. To support these priorities, national goals focus on increasing investment, including FDI, in the areas of energy, transport, mining and agriculture. Sierra Leone has a potentially large revenue base. The country is endowed with minerals–diamonds, gold, rutile, bauxite, and iron marine and agricultural resources. Resource abundance suggests a key role for the state collecting the rents in efficient domestic resource mobilization.

In this context, a major challenge for the Government of Sierra Leone is to adopt policies to sustain the high economic growth experienced in the immediate post-war period. In this regard, many initiatives have been undertaken and FDI has been recognized as a key element of the country's growth prospect. Until now however, there has been no overall FDI strategy or concerted efforts in place to facilitate FDI entry into the country (UNCTAN,2010).

3. Data and Methodology

In this paper, we collected consistent and reliable secondary dataset for the period 1980-2020 from the world Development Indicators (WDI) database on the World Bank. Data were collected on the main variables that have the potential to influence TFP growth which was based largely on the literatures and the characteristics of the economy involved in the present study. The research will be a practical mean, not only for academic purpose. Its findings, if implemented will cause for sure a real improvement in TFP growth in Sierra Leone.

Methodology

The ordinary least square (OLS) estimation is used in this research. The choice of this model is based on the fact that OLS is best suited for testing specific hypothesis about the nature of economic relationship (Guajarati 2003). The time series properties of the variables were examined in the process. The methodology involves estimating an econometric model where the foreign direct investment and TFP in Sierra Leone were investigated. The study also employs a multiple linear regression model to estimate the relationship between TFP and its potential predictors.

Following endogenous growth theories, the study uses growth accounting and estimates TFP as "Solow residual" as a measure of technical change. Growth accounting is useful because it breaks growth into components that can be attributed to the growth o factor accumulation and TFP. As Solow (1956) notes, this "residual" measures not only technological change but also the ignorance of both measurable and non-measurable factors with expected positive effects on production. Most empirical studies have used only two factor inputs: labour and capital to estimate TFP (e.g., Gollop & Jorgenson; 1980; Christensen, Cummings & Jorgenson; 1980; Hall & Jones, 1999; Limam & Miller, 2004). As a result, it is very likely that the Solow residual estimated from a production function with only two inputs would underestimate the rate of

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technical change, hence creating a measurement bias. To minimize the measurement bias in TFP due to inclusion of only two factor inputs, this present study utilizes the theoretical insights from the Solow (1956) growth model and its extension by Mankiw et al. (1992) by adding the input "human capital" in the production function. Particularly, the study adopts a Hicks-neutral Cobb-Douglas production function with three factor inputs given by:

$$Y(t) = A(t)[K(t)]^{\alpha}\,[H(t)]^{\beta}\,[L(t)]^{1-\alpha-\beta}\;;\; 0 < \alpha + \beta < 1 \qquad (1)$$

The model in Equation (1) exhibits constant returns to scale in its three factors: physical capital (K), human capital (H) and labor (L), such that: $\alpha, \beta \in [0, 1]$, and t denotes time. The parameter "A" is a measure of "technology" or "efficiency" and is often called a "multi-factor productivity". $A(t)$ measures the effects of technical changes or efficiency change on the shifts of aggregate production function over time and is known as TFP. As a matter of fact, changes in the index "A" indicate shifts in the relation between measured aggregate inputs and outputs and in this aggregate model these changes are assumed to be caused by changes in technology (or changes in efficiency and/or in the scale of operations of firms). The model in Equation (1) assumes that all markets (both input and output markets) are perfectly competitive. All firms are assumed to be identical. The economy can then be described by a representative agent.

The functional form of the production function in Equation (1) can be expressed as:

$$Y_t = f(K_t, H_t, L_t, t) \qquad (2)$$

If there is technical progress, the function f shifts upwards and a technical retreat cause f to shift downwards. The production function in Equation (1) is expressed in per worker variables or intensive form as:

$$y(t) = Ak(t)^{\alpha}\, h(t)^{\beta} \qquad (3)$$

Where $y = \frac{Y}{L}, k = \frac{K}{L}$ and $h = \frac{H}{L}$. Making parameter "A" in Equation (3) the subject of the formula we have:

$$A = \frac{y}{k^{\alpha}\, h^{\beta}} \qquad (4)$$

Where $\beta = 1-\alpha$ under constant returns to scale; y is output per work and h is human capital per worker. Consequently, Equation (4) gives a measure of multifactor productivity per worker in the context of the augmented Solow growth model, which is taken as a measure of technical change. In this present study, total GDP is used to measure output; Gross capital formation is used as a proxy of physical capital, productive labor is assessed by total working population, ages 15+ and human capital is captured by total secondary school enrolment rate.

Since the main objective of this study is to verify the impact of FDI on TFP growth, our empirical model specification for estimating the influence of FDI on TFP growth specifies FDI and other key predictors of TFP growth as commonly suggested in the growth literature and the enclosure of control variables. Thus, in deriving our empirical model for estimating this relationship for Sierra Leone, we speculate that:

$$\text{TFP Growth} = f(FDI, K, H, L, TOP, Macroeconomic\ stability, War\ dummy) \qquad (5)$$

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Where TFP denotes the growth rate of total factor productivity, FDI denotes foreign direct investment, TOP denotes trade openness which is a measure of (import + export)/GDP, Macroeconomic stability is a proxy of inflation (INF) and War is a dummy variable that captures the period of war (1991-2001 = 1 and 0 otherwise).

The econometric form of equation (5) can be written thus:

$$TFPg_t = \alpha_0 + \beta_1 FDI_t + \beta_2 K_t + \beta_3 H_t + \beta_4 L_t + \beta_5 TOP_t + \beta_6 INF_t + \beta_7 War_t + \varepsilon_t \quad (6)$$

Natural logarithm has been taken for each variable to estimate the elasticity (degree of responsiveness) of TFP growth with respect to FDI, physical capital, human capital, labour, trade openness, inflation and war dummy:

$$\ln TFPg_t = \alpha_0 + \beta_1 \ln FDI_t + \beta_2 \ln K_t + \beta_3 \ln H_t + \beta_4 \ln L_t + \beta_5 \ln TOP_t + \beta_6 \ln INF_t + \beta_7 War_t + \varepsilon_t \quad (7)$$

Where α_0 is a Constant and β_1- β_6 are coefficients to be estimated. The A priori expectation signs of the coefficients are that β_1, β_2, β_3, β_4 and $\beta_5 > 0$ and β_6, and $\beta_7 < 0$ and $\boldsymbol{\varepsilon_t}$ is the stochastic error term. The E-views 10 software is used to estimate the model.

We estimated for both the short-run and long-run. Engel and Granger (1987) have shown that any co integrated series has an error correction representation that covers both long run equilibrium and short run adjustment process. This underscores an important correspondence existing between co-integration and error correction mechanism. Error correction mechanism represents a systematic disequilibrium adjustment process through which X and Y are prevented from "drifting too far apart". The error correction model (ECM) can be presented thus:

$$\Delta \ln TFPg_t = \beta_0 + \sum_{i=1}^{q} \beta_1 \Delta \ln FDI_{t-1} + \sum_{i=1}^{q} \beta_2 \Delta \ln K_{t-1} + \sum_{i=1}^{q} \beta_3 \Delta \ln H_{t-1} + \sum_{i=1}^{q} \beta_4 \Delta \ln L_{t-1} + \sum_{i=1}^{q} \beta_5 \Delta \ln TOP_{t-1} + \sum_{i=1}^{q} \beta_6 \Delta \ln INF_{t-1} + \sum_{i=1}^{q} \beta_7 War_{t-1} + \lambda ECM_{t-1} + \varepsilon_t \quad (8)$$

Where Δ is the first difference operator, q is the lag length, $\boldsymbol{\lambda}$ is the speed of adjustment and ECM_{t-1} is the lagged error term and all other variables are as previously defined.

4. Results and Discussion

Prior to computing the specified growth equation, the summary statistics is presented in the first instance to give a fair description of the link between foreign direct investment (FDI), physical capita (PK), human capital (HK), labour (L) trade openness (TOP), inflation (INF), and total factor productivity growth (TFP) for the data set collected from the World Development Indicators (WDI) for Sierra Leone over the period 1980-2020. The summary statistics for the entire sample is presented in table 1. From the summary statistics reported in table 1, TFP growth for the entire sample averaged around 21.5 % and foreign direct investment averaged around 12.6%. It can be seen that investment in physical capital PK averaged around 22.8% and investment in human capital HK and labour L averaged around 16.3% and 28.9% respectively.

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However, the extent of trade openness TOP averaged around 34.4%. For the overall sample, even though the level of TFP growth average around 21.5%, but foreign direct investment stood only around 12.6%. This obviously revealed low level of foreign direct investment inflows to Sierra Leone. Human capital development, measured as secondary school enrolment rate averaged around 16.3%, which is considered weak in Sierra Leone compared to other developing economies.

The pair wise correlation matrix as reported in the lower segment of table 5-1 indicate positive relationship of all the independent variables with TFP growth except for inflation rate and the War dummy, with physical capital (PK) measured as the gross fixed capital formation stood at (0.396), fairly strong. There is no presence of multicollnearity as the correlation among the explanatory variable are fairly low.

Table 1 Descriptive Statistics

Variables	TFP	FDI	PK	HK	L	TOP	INF	War
Mean	21.5	12.6	22.8	16.3	28.9	34.4	31.7	0.7
Maximum	49.9	42.6	59.3	33.2	69.1	86.2	55.3	1.0
Minimum	-17.1	1.6	-5.1	0.2	-4.1	-12.6	-1.6	0.0
Std. Dev	13.3	13.8	6.0	14.7	33.2	28.5	0.6	0.2
Correlation Matrix								
TFP	1.000							
FDI	0.215	1.000						
PK	0.396	0.231	1.000					
HK	0.137	0.073	0.226	1.000				
L	0.326	0.208	0.152	0.027	1.000			
TOP	0.223	0.487	0.031	0.251	0.349	1.000		
INF	-0.296	-0.131	-0.096	-0.086	0.383	-0.022	1.000	
War	-0.438	0.012	-0.231	0.012	-0.092	0.265	-0.015	1.000

Source: Author's Computation using E-Views 10

In an attempt to detect the problem of multicollinearity in the model, a correlation matrix was done to determine the degree of correlation among the variables under investigation. Correlation explains the changes that occur in one variable due to change in other variable. If a high correlation is found between the explanatory variables, it can lead to multicollinearity. The lower panel in table 1 shows the result from the matrix. The rule of thumb is that if multicollinearity among two variables is 70% and above, then it is a cause of concern. However, the current study does not show any severe case of multicollinearity between the set of explanatory variables as the highest value of correlation is 48.7% between trade openness and foreign direct investment. This confirms the absence of multicollinearity among the explanatory variables in the model.

4.1 Unit Root Test Results

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The time-series properties of the variables of interest for the TFP growth equation (see table 2) are also analyzed. The augmented Dickey-Fuller (ADF) test is used to determine the order of integration of data compiled for each variable. A unit root test can be applied to determine whether or not the variables of interest are stationary and this test is also necessary here, as the regression estimation is based on the assumption that the time-series data are free from unit root.

Table 2 Result of the Augmented Dickey Fuller (ADF) Unit Root Test

Variable		Constant	Constant and Trend	Conclusion
ln TFP	level	-2.783530	-3.975549	I(1)
	first difference	-8.528265**	-8.465620**	
lnFDI	level	-2.445839	-2.113429	I(1)
	first difference	-5.155255**	-6.337865**	
lnPK	level	-0.887271	-1.058828	I(1)
	first difference	-5.889944**	-6.873239**	
lnHK	level	-3.5615865	-3.534759	I(1)
	first difference	-7.916620**	-8.460341**	
lnL	level	-4.544354	-4.734123	I(1)
	first difference	-5.250599**	-4.789106**	
lnTOP	level	-1.612433	-1.463089	I(1)
	first difference	-11.26923**	-11.24401**	
lnINF	level	-0.969294	-1.976895	I(1)
	first difference	-5.867742**	-6.153552**	

(**) denotes 5% significance level, and I (1) means order of integration. Each variable is tested using the Schwarz Information Criteria (SIC). For all series, the presence of a unit root cannot be rejected at 0.05 level of significance indicating that all the series are integrated of order one I(1).

4.2 Co-integration Test Analysis

Having found the series to confirm the existence of unit root and are stationary at first difference I(1), the next logical thing to do is to test for long-run equilibrium relationship between the dependent variable and the explanatory variables using the Co-integration. The stationary linear combination is known as the co-integrating equation and may be interpreted as a long run equilibrium relationship between variables. The common objective is to determine the most stationary linear combination of the time series variables under consideration. Consequently, Johansen and Juselius (1988, 1990) co-integration technique has been employed for the investigation of stable long run relationships between TFP growth, foreign direct investment, physical capital(PK), human capital (HK), labour (L), trade openness (TOP), inflation rate (INF) and war dummy in Sierra Leone by using both the Trace and Maximum-Eigen tests statistics. The results are presented in table 3 and 4.

Table 3 Unrestricted Co-integration Rank Test Result (Trace)

Hypothesized	Eigen value	Trace Statistic	0.05 Critical	Prob.**

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No. of CE(s)			Value	
None *	0.828843	194.2884	159.5297	0.0002
At most 1 *	0.718882	132.5072	125.6154	0.0178
At most 2	0.606253	88.09280	95.75366	0.1498
At most 3	0.428800	55.47115	69.81889	0.3995
At most 4	0.356529	35.87060	47.85613	0.4029
At most 5	0.303950	20.43985	29.79707	0.3935
At most 6	0.135843	7.758169	15.49471	0.4916
At most 7	0.072870	2.648139	3.841466	0.1037
Trace test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: E-views output

Table: 4 Unrestricted Co-integration Rank Test Result (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.828843	61.78118	52.36261	0.0042
At most 1	0.718882	44.41437	46.23142	0.0774
At most 2	0.606253	32.62165	40.07757	0.2702
At most 3	0.428800	19.60054	33.87687	0.7837
At most 4	0.356529	15.43075	27.58434	0.7134
At most 5	0.303950	12.68168	21.13162	0.4820
At most 6	0.135843	5.110031	14.26460	0.7279
At most 7	0.072870	2.648139	3.841466	0.1037
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: E-views output

The results of both the trace test (table 3) and the maximum-eigen test (table 4) indicate that co-integrating equation exists at the 5% significance level. Consequently the null hypothesis of no co-integrating equation is rejected. Accordingly, it can be concluded that there is a significant long run relationship between the given variables. Since variables can either have long run or short run effects, then an error correction model (ECM) is used to disaggregate this effect. The co-integrating relationship is thus specified in the table 5 below.

Table: 5 Result of the long run TFP model

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lnTFP	lnFDI	lnPK	lnHK	lnL	lnTOP	lnINF	War
	8.680118	3.571976	6.013022	6.172557	-4.63036	-8.30032	-0.42365
	(0.88117)	(0.18001)	(0.56400)	(1.51165)	(1.80772)	(0.66797)	0.00421

Values in Parenthesis are standard errors

Source: E-views output

The result of the long-run TFP model shows that foreign direct investment, physical capital, human capital and labour have positive effects on TFP in Sierra Leone while inflation rate, trade openness and war dummy have a negative effect on TFP. The elasticities show that TFP in Sierra Leone is more positively responsive to foreign direct investment followed by labour, human capital and physical capital respectively whereas it is more negatively responsive to inflation followed by trade openness and the civil war respectively in the long run (table 5).

4.3 Result of the Error Correction Model

The result in table 6 below, shows that FDI, PK and HK have positive effect on TFP growth and are statistically significant at the 5%, while INF and War dummy are found to have a negative relationship on TFP and significant at 10% levels. This indicates that high inflation raises the cost of production and reduces returns from investment and thus impact negatively on TFP growth. Other things being equal, after adjustment for the degrees of freedom, the result suggest that about 86.4% of the variation in TFP is explained by variation in the independent variables. The coefficient of the error correction term E (-1) is -0.822830 as measure of the speed of adjustment which is negative and statistically significant, it means that during periods of negative shocks and disequilibrium errors to the system, the variables increases less rapidly than consistent and thus moving their lagged values below the long run steady-state path. Due to the negative of the coefficient of the EC_{t-i} term, the total effect is to bring back the changes of variables to their long run trajectory as determined by the system. This implies that for any drift away from the long run equilibrium in previous years, convergence to the equilibrium is corrected by 82.2%. That is approximately 82.2% of the error is corrected every year in the event of shocks in the system. The table 6 of the error correction term (ECM) suggests that it is stationary.

Table 6: Stationarity test of the residual/ECM of the variables

	t-statistics	Prob.***
Augmented Dickey-Fuller Test Statistics	-4.887821	0.0000
Test critical values 1% level	-4.467895	
5% level	-3.644963	
10% level	-3.261452	

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Phillips-Perron Test Statistics	-5.460648	0.0000
Test critical values 1% level	-4.467895	
5% level	-3.644963	
10% level	-3.261452	

Source: E-views output

The Augmented Dickey-Fuller test statistics suggest that the disequilibrium error is mostly free from unit root which follows that the variables in the TFP equation are co-integrated.

Table 7 Result of the Error Correction Model (ECM), Dependent Variable: ΔlnTFP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.119738	0.357067	-0.335338	0.7460
ΔlnFDI	0.039200	0.014572	2.690173	0.0360**
ΔlnPK	0.671114	0.250445	2.679681	0.0366**
ΔlnHK	0.012202	0.003939	3.097661	0.0101**
ΔlnL	2.224718	3.923546	0.567017	0.5863
ΔlnTOP	-0.225858	0.074875	-3.016446	0.0053*
ΔlnINF	-0.506211	0.203131	-2.492038	0.0299**
War	-0.359798	0.195400	-1.841340	0.0821***
ΔlnTFP(-1)	1.865908	4.998873	0.373266	0.7120
ΔlnFDI(-1)	0.352112	0.176747	1.992183	0.0595***
ΔlnPK(-1)	0.026781	0.012557	2.132816	0.0443**
ΔlnHK(-1)	0.703419	0.137058	5.132278	0.0001*
dlnL(-1)	-0.667186	1.553625	-0.429438	0.6730
ΔlnTOP(-1)	0.852227	0.235661	3.616321	0.0021*
ΔlnINF(-1)	-0.354647	0.159850	-2.218624	0.0683***
War(-1)	0.324729	0.222193	1.461417	0.1621
E(-1)	-0.822830	0.212583	-3.870638	0.0008*

Note: (*); (**) and (***) denote 1 %; 5% and 10% significance level respectively. R-squared= 0.864970; Adjusted R-squared= 0.711790 DW: 2.082407; Prob. (F-statistic) = 0.002375

4.4 Discussion

The coefficient of foreign direct investment 0.039200 has a positive and statistically significant impact on TFP growth. There is a direct relationship between Foreign Direct Investment and total factor productivity growth. This implies that a 1% increase in the foreign direct investment leads to approximately 3.9% increase in TFP growth in Sierra Leone. This outcome is in line with theories and previous studies that foreign direct investment can serve as a lubricant to speed up growth in an economy (see: Kunle, A. M., 2014; Olokoyo, F.O., 2012; Saibu, O. & Keke, N. A., 2014).

Similarly, the coefficient of physical capital 0.671114 has a positive and statistically significant impact on the TFP growth of Sierra Leone. There is a direct relationship between physical capital and TFP growth. This implies that a 1% increase in physical capital can lead to approximately 67.1% increase in TFP growth. This finding is also in conformity with theories

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and findings from previous studies that there exist a positive relationship between physical capital and growth (see: Ayanwale, A.B. & Bamire, A.S., 2001; Njeru, B. N. (2013).

The coefficient of the variable representing human capital (HK), though significant in the model for Sierra Leone, but the value is very small (0.012202). There is a direct positive relationship between human capital and total factor productivity growth. This implies that a 1% increase in the human capital leads to approximately 1.2% increase in TFP growth in Sierra Leone. This means that much more human capital development is required in the country to enhance growth via TFP. This result is not surprising because, the quality of human capital in Sierra Leone is still very low owing to the limited access to quality education in the country. Because the quality of education is very low in Sierra Leone, any marginal improvement in the quality of human capital through higher education and training can have significant impact on growth. This is because, there is a large stock of unexploited growth related technologies in the country such that any marginal increase in the use of appropriate technology through higher educational attainment and training can result in increasing the average productivity of workers. Thus, by increasing the supply of quality workers through additional training, human capital development may raise total productivity at a faster rate and, thereby accelerating economic growth in the country. This result is consistent with the findings by Sarkar, M., Sadeka, S., & Sikdar, M. (2012) who contend that human capital development can only impact significantly on growth if accompanied by the necessary education, training and technological advancement.

However, while both forms of capital are important for growth, our result suggests that greater attention must be paid to human capital development. Regarding trade openness, the results in table 7 clearly show that the impact of trade openness on TFP growth in the model is negatively significant at the conventional 5% level. A 1% increase in trade shares to GDP reduces TFP growth by about 22.5%, in the country. This result differ sharply with the findings by ONU, A.J.C. (2012), who found that a percentage point increase in trade openness is associated with a short-run increase in growth of about 0.5% in SSA. One possible explanation for this can be found in Santos-Paulino and Thirlwall (2004). In a more liberalized trade regime, it is possible or easier for importers in Sub-Saharan African countries to import more than for domestic producers to respond by reallocating resources to the traded goods sector and therefore be able to capture the export markets. This is because of the apparent weak export supply capacity that characterized these economies. A direct consequence is worsening of trade deficits and balance of payments position with a resulting negative impact on growth. This scenario best illustrates the experience of countries in SSA in general and Sierra Leone in particular with high import demand compared to export and further confirm the conventional skepticism about the growth effect of trade openness in the developing countries.

Furthermore With regards to macroeconomic instability proxied by inflation rate is found to be statistically significant for the study with a negative impact on TFP growth in the country. A 1 percentage increase in inflation will lead to approximately 50.6% fall in TFP growth. This result is in line with the A priori expectation of the variable and also in conformity with previous findings by Nkechi, E. R. (2013). It is believed that high inflation rate signals a sign of weak macroeconomic performance and investors both foreign and domestic may not be willing to invest in an environment of high inflation rate and thus a negative consequence on growth.

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Finally, the correlation between TFP and political instability, proxied by a binary variable (Dummy), has a negative sign and it is statistically significant at ten percent level, similar to the results of other studies like Malefane (2007) and Sesay (2015).

4.5 Diagnostics and Stability Test Results

Diagnostic tests were performed in order to validate the parameter evaluation of the outcomes achieved by the model adopted in this research. The goodness of fit of the model was tested in five main ways, i.e. the langrage multiplier (LM) test for serial correlation, the ARCH effect on the model's error, the Breusch-Godfrey test for heteroscedasticity, Ramsey RESET test for correct specification of the model and the Jarque-Bera for normality test. These tests results are presented in table 8.

Table 8 Diagnostic test results

Test	Null Hypothesis	F-Statistics	Probability
Langrage Multiplier (LM)	No serially correlated errors	2.640162	0.2671
ARCH	ARCH effect does not portray model's errors	0.800939	0.3708
Ramsey RESET	Model is correctly specified	0.001326	0.9727
Breusch-Godfrey	No heteroscedasticity	3.751521	0.4407
Jarque-Bera (JB)	There is a normal distribution	0.304606	0.8587

Source: Author's computation using E-views 10

The results presented in table 8 suggest that there is no serial correlation, there is no ARCH effect on the model's error, there is no heteroscedasticity, the model error is normally distributed and the model is correctly specified. We therefore fail to reject the null hypothesis and conclude that the model has a very good fit and thus we can rely on its analysis.

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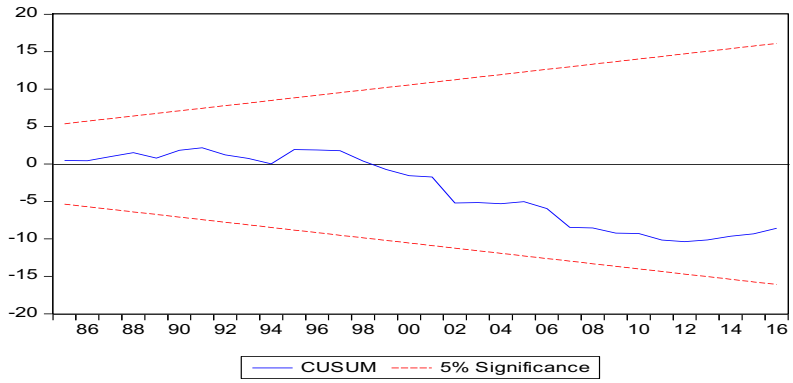

Figure 1: Plot of Cumulative Sum (CUSUM)

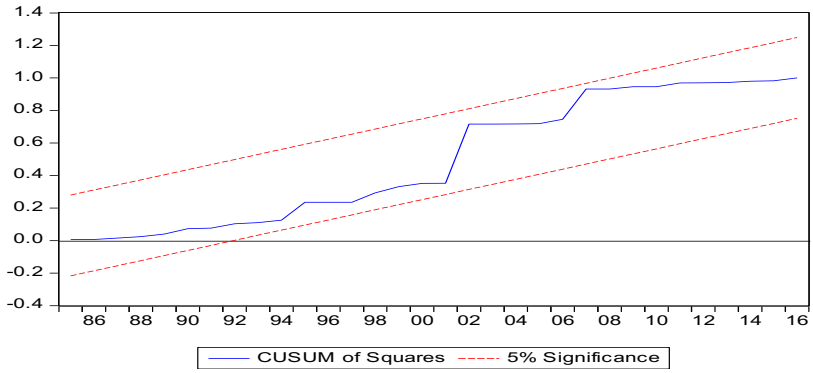

Figure 2: Plot of Cumulative Sum of Squares (CUSUMQ)

With regards stability test, the results of both the CUSUM (figure 1) and CUSUMQ (figure 2) plots lie within the 5% critical band width which confirm the stability of the coefficients over the study period and the correct specification of the model.

5. Conclusion and Recommendation

This final section summarizes the major findings and provides policy implications from the empirical analysis in the previous section. As mentioned in the introductory section, this study sought to explore the impact of FDI on TFP in Sierra Leone, including the measures undertaken by the government to facilitate the attraction of foreign investment inflows into the country. With a view to achieve this goal, the study employs an annual time series data over the 1980-2016 periods. Furthermore, and in line with econometric theory, prior to estimating the model, the time series properties of the underlying variables (excluding the War dummy) were examined by employing the Augmented Dickey Fuller and Philipps-Perron unit root tests to check the stationary of the variables. As the probability values of each of the series tend to be significant, when both tests were conducted under first difference, we conclude that there is no unit root in first differences. Hence, each of the series are integrated of order one, denoted as I(1).

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Following the unit root tests, and based on its outcome, the study employs the Johansen's test of co-integration in order to examine the long run and short run relationships between TFP and the explanatory variables, because, it is the appropriate method when the variables are integrated of the same order I(1). By employing this technique for the empirical analysis, the existence of a long run relationship was observed and, in addition, this relationship was further confirmed by the expected negative and significant effect of the error correction term with TFP.

The existence of a co-integrating relationship necessitated the estimation of the short run dynamic model. The results of the error correction model indicate that the error correction term has the expected negative sign and is statistically significant, which further confirmed the existence of a long run relationship. The regression results showed that foreign direct investment, physical capital and human capital influence TFP growth positively, whereas trade openness, inflation rate and political instability exert a negative relationship with TFP in Sierra Leone, which called for the policy recommendations below.

To ascertain the goodness of fit of the model, diagnostic test statistics were conducted involving normality, serial correlation, heteroscedasticity, ARCH effect and functional form misspecification tests. The results suggest a good fit of the model. Almost all the variables were found to be statistically significant. The results therefore failed to reject the hypothesis of the study.

Policy Recommendations

Given the positive and statistically significant effect of FDI on TFP, the study recommends that private sector development be a priority for the Sierra Leonean government. Consequently, with the purpose of improving the country's investment climate, several strategies have been adopted such as reviewing and updating the related laws or establishing incentives and guarantees for potential investors as explained in chapter three. The results of our study support most of the empirical studies that were carried out, particularly the FDI literature on developing countries. Likewise, foreign investment activities in Sierra Leone are vertical in nature, or resource-seeking FDI. In what follows, and based on the results achieved, we present the main conclusions and respective policy implications which, if addressed, will also stimulate domestic investment in the short term, since the investors' decisions are to a large extent motivated by similar factors.

At the same time, the positive and significant effect of FDI and TFP highlights the relationship between the potential investors' knowledge of foreign market and the amount of resources they would be willing to invest there. Likewise, it suggests that foreign investors would be motivated to invest in a country in which there is a tradition of foreign investment activities, due to the limited information available about the location advantages of the host country. Therefore, the presence of foreign investment in Sierra Leone nowadays has a tendency of attracting further investment in the future. In this regard, the government should not only formulate and implement policies that would aim at attracting foreign investors, but the measures should also seek to retain the existing investors in the country. As most of these investors are engaged in trading across borders, and accordingly to the international doing business rankings the positioning of Sierra Leone in this context is not positive, the measures adopted should also aimed at improving the country's performance on this area, which would eventually have a positive effect on the existing investors that are engaged in trading across borders.

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We also concluded in this study that there is a negative and significant relationship between TFP and the inflation rate. Considering that an increase is this last variable is associated with an inverse relationship with TFP growth which is not desirable, the monetary authorities should implement measures aimed to combat high inflation given that high level of it tends to reduce aggregate demand and investment spending. In addition, the lending rate should be reduced in order to encourage inward FDI, because high level of it may increase the costs of borrowing and production, thereby reducing investment demand and thus have a negative consequence on growth.

In turn, the evidence of a negative and statistically significant coefficient of the war dummy suggests that the civil war in Sierra Leone, between 1991 and 2002, had decreased the country's investment activities and growth prospects. So, the government should be committed to solving the root causes of the civil conflict, more specifically addressing issues such as bad governance, corruption, economic deprivation and exclusion. Considering that it was one of the causes of the war and the country's position on international rankings since 2010, we should point that scarce progresses have been made to fighting corruption. In this context, the government should focus on ensuring that the recommendations of the study's report are implemented, particularly the introduction of competition economics into the university curricula at the undergraduate and graduate levels. At the same time, to ensure a fair game for business activities in the country, it should be considered the setting up of a Competition Policy Authority, as this institution has a key role in fighting corruption. In addition, corruptive practices could be minimized if there is a collaboration or memorandum of understanding between the National Public Procurement Authority and Anti-Corruption Commission, especially with regards to policies in relation to designing of public contracts. As the Sierra Leone government is in the process of modernizing its investment-related laws and regulations, it is quite important to ensure that afterwards they are applied equally to all so as to avoid further political instability that will hinder growth.

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