EFFECT OF ELECTRICITY INFRASTRUCTURE ON FOREIGN DIRECT INVESTMENT AMONG ECOWAS MEMBER COUNTRIES

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Abstract
The study examined the impact of electricity infrastructure on foreign direct investment among ECOWAS member countries using an annual panel data over the period 1999-2024. The variables used in the analysis include electricity infrastructure, foreign direct investment, exchange rate, interest rate, money supply, inflation, and trade openness. The method used was dynamic analysis. The result of the Kao Cointegration test showed a long-run relationship between the variables. The result of the Error Correction Model of the Pooled Mean Group dynamic analysis showed a short-run convergence between the variables in the model. The result of the long run estimates shows that electricity infrastructure is positive and significant enhances foreign direct investment. In the short run, the results of the Pooled Mean Group (PMG) indicates that electricity infrastructure is negative and significant with foreign direct investment. The Granger causality test result shows that electricity infrastructure can predict changes in foreign direct investment and not vice-versa. Based on the findings, it is recommended that policy action should focus on offering tax breaks or concessional financing for firms adopting energy-efficient equipment or renewable power sources.

Keywords: Electricity Infrastructure, Foreign direct investment, ECOWAS.

1.1 Introduction

Electricity infrastructure is a driver to foreign direct investment and development in Economic Community of West African States (ECOWAS) member countries. It enables businesses to operate efficiently, powers industrial processes, and facilitates economic growth. Governments, international organizations, and private sector actors are increasingly investing in electricity infrastructure development, including generation, transmission, and distribution projects. In the year 2013, at the 43rd Ordinary Session of the ECOWAS Conference of Heads of State and Government, countries committed themselves to universal access to clean, affordable, and sustainable energy services for all ECOWAS populations by 2030 (ECOWAS, 2013). Despite the vast energy resources available in the ECOWAS region, almost 180 million people have problems of access to electricity, that is, about 60% of the population (ECOWAS, 2021). The ECOWAS Member States are challenged with threatening factors of energy security such as poor system reliability, limited infrastructure, fuel import dependence, heavy reliance on fossil fuels, hydropower, and traditional biomass resources.

Electricity bottlenecks continue to impede economic activities in west Africa; however, a developed electricity sector is vital for the attraction of foreign direct investment in bridging the resource gap for economic growth. Thus, infrastructure developed countries present an opportunity for attracting foreign investment and the realization of economic development (see Member et al. 2024; Nguea 2021). This is plausible due to increased industrialization resulting from higher electricity consumption (Iyabo & Segun, 2022, p. 7). However, the opportunity to attract investment could be limited if the macroeconomic environment and policy uncertainty pose a great challenge. Similarly, electricity infrastructure deficit may have also affected the inflow of foreign direct investment in ECOWAS member countries, as most investors will always flood to countries where there are abundant infrastructural facilities and a stable power supply. As a result, many firms had relocated out of the region. For example, Nigeria's frequent power outages and inadequate infrastructure led to a decline in FDI from $8.9 billion in 2011 to $1.2 billion in 2018, and the Liberia's power shortages resulted in limited FDI, with investments declining from $342 million in 2014 to $174 million in 2020 (African Development Bank, 2022).

Foreign direct investment (FDI) in the region was 2.3% of GDP in 2019, with adequate electricity infrastructure estimated to be 7-10%, and estimated 20-30% increase in GDP per capita with universal electricity access. In the year 2022, foreign direct investment inflows to the ECOWAS region were significant with major recipients including Nigeria $4.8 billion, $2.6 billion FDI inflows to Ghana, $1.4 billion for Senegal, and Cote d'Ivoire for $1.4 billion. These four countries accounted for 80% of total FDI inflows to the ECOWAS region. (World Bank, 2024).

Despite enormous capital expenditures budgeted and spent in the sector, very few of the population (urban and rural) have access to quality electricity in the region. In this context, African LICs are four (4) times worse-off compared to LICs from elsewhere in terms of electricity access, while African MICs are less than twice as worse-off relative to their peers in other regions. In Low-Income Countries (LICs), 12% of population have access to electricity with 34% of households having electricity connection while in Middle-Income Countries (MICs), 45% of population have access to electricity with 63% of households having electricity connection (United State Agency for International Development, 2022).

This study examines how electricity infrastructure affects foreign direct investment among ECOWAS countries between 1999-2024. Its investigate whether the effects are shaped by macroeconomic conditions through interaction terms capturing electricity access, exchange rate, and inflation. Using pooled mean group (PMG) model, the analysis considers both short and long-run relationships. The study advances existing work by introducing interaction terms that account for conditional effects of macroeconomic variables, updating panel data that covers 1999-2024, reflecting regional dynamics and recent global shocks. The findings inform electricity infrastructure and foreign direct investment policy design in ECOWAS.

2.1 Review of Relevant Literature

Empirical literature review on the impact of electricity infrastructure on foreign direct investment vary in their time coverage of study, variables used in analysis, methodology and findings. This section reviews studies on infrastructure and foreign direct investment. Tsaurai (2025) studied the impact of infrastructural development on foreign direct investment (FDI) in BRICS countries (1991-2021), suggesting that internet penetration and fixed telephone subscriptions had a significant effect on FDI, while renewable energy infrastructure's effect was found to be minimal and non-significant. In the fixed-effects model, the interaction term produced results showing that financial development enabled infrastructural development and significantly enhanced FDI inflows. Ali et al. (2025) studied the effect of infrastructure development on the relationship between FDI, domestic investment, and economic growth in Nigeria (1993-2023). Using ARDL technique, findings indicate that infrastructure development and foreign direct investment positively influence economic growth in the short run, while in the long run, foreign direct investment and infrastructure development continue to have a positive impact. Memberr et al. (2024) studied the impact of power sector development on foreign direct investment growth in Nigeria (1986-2023), showing that power sector capital expenditure is significant and enhances foreign direct investment. While, power sector recurrent expenditure is significant but does not enhance foreign direct investment. Also, the estimated impact of power sector generation on foreign direct investment growth is negative and insignificant in the long run. Tsaurai (2023) investigated the dynamics of foreign direct investment (FDI) inflows into Central and Eastern European countries (CEECs) (1994–2020), revealing that infrastructural development, economic growth and domestic investment had a positive influence on foreign direct investment.

Rehman et al. (2022) investigated the impact of infrastructure on spurring inward foreign direct investment (FDI) in Belt and Road Initiative (BRI) countries. Indicating that aggregate and disaggregate infrastructure indices, e.g. transport, telecommunications, financial and energy infrastructures, are the driving forces in attracting foreign direct investment (FDI). In addition, control variables (i.e. institutional quality, human capital, trade, domestic investment, foreign aid and GDP per capita) play an essential role in spurring FDI inflows. Iyabo and Segun (2022) studied the dynamic relationship among energy consumption, foreign direct investment, and economic growth in Sub-Sahara Africa (1991-2018), showing that an increase in energy consumption enhances FDI. Also, energy consumption can predict future changes in foreign direct investment. Nguea (2021) investigated the effects of communication, energy and transport infrastructures development on foreign direct investment (FDI) in Cameroon (1984-2014), revealing a negative impact of energy infrastructure in attracting FDI in the long run and in the short run.

Despite extensive analysis, most studies rely on static methods, which may not capture the short and long-run effects. To address these gaps, this study examines the short and long-run effects of electricity infrastructure on foreign direct investment (1999-2024) by employing PMG estimator and integrating updated from recent global crises, providing a current and policy relevant implications. Further, most of the existing literature are country-specific or on SSA (see Ali et al. 2025; Memberr et al., 2024; Iyabo and Segun 2022; Nguea 2021) thereby leaving a gap in terms of understanding regional-specific factors such as the state of electricity infrastructure and foreign direct investment in ECOWAS member countries.

2.2 Theoretical Framework

The Accelerator theory of investment by John (1917), was adopted for this study. The theory was later developed by other economists, including Harrod (1939) and Domar (1946). The Accelerator theory implies that changes in investment within an economy are fastened by changes in sales or output. The theory assumes capital-output ratio, constant depreciation, and no technological progress. The theory is mathematically given as follows:

$$I = \alpha X \Delta Y$$

Where I is investment, α is the accelerator coefficient (representing the responsiveness of investment to changes in output), and ΔY is change in output. The theory works by first treating the economy to be in an initial equilibrium, then a change in output due to a decrease in supply or an increase in demand, adjustments of capital stocks which leads to an increase in investment to meet the new level of output. Then finally, the accelerator effect (Increase in investment is proportionally larger than the change in output). In relation to the present study, the model highlights the importance of electricity infrastructure as a physical capital that can significantly drive foreign direct investment in ECOWAS.

3. Data and Methodology

3.1 Data

The study was based on secondary source of data collection. Annual panel data was used for twelve (12) ECOWAS member countries (Benin, Cabo Verde, Gambia, Ghana, Guinea, Guinea-Bissau, Cote d'Ivoire, Liberia, Nigeria, Senegal, Sierra Leone and Togo) over the period of 26 years from 1999-2024. The variables employed in the study are: electricity infrastructure (EI), foreign direct investment (FDI), exchange rate (EXG), interest rate (INTR), money supply (MS), inflation (INFL), and Trade Openness (TO). The data for all the variables were sourced from the publications of Development Indicator (WDI) (2025).

3.2 Definition and Measurement of Variables

Table 3.1: Variable Description and Measurement

Variable	Description	Measurement	Source	Apriori Sign
Electricity Infrastructure (EI)	Electricity infrastructure includes the physical systems and networks generating, transmitting, distributing, and delivering electricity to consumers.	The series is measured as electricity access (% of population) in both urban and rural	WDI (2000-2024)	+
Foreign Direct Investment (FDI)	Foreign direct investment is described as investments made by individuals, businesses, or organizations from one country into another country, with the aim of establishing a lasting interest in a business or enterprise.	The FDI inflows is measured as % of GDP.	WDI (2000-2024)	+
Exchange Rate (EXG)	This is the value of Naira exchange rate in terms of US Dollar.	Nominal effective exchange rate will be used and the series is the ratio of local currencies to a dollar ($).	WDI (2000-2024)	-
Money Supply (M2)	Money supply is described as the total amount of money circulating in an economy, including currency, deposits, and other liquid financial assets.	Measured by broad money (M2) to GDP ratio (%)	WDI (2000-2024)	+

Trade Openness (TO)	Trade openness is the degree to which a country's economy is open to international trade, characterized by low barriers to trade (tariffs, quotas), high levels of imports and exports, integration into the global economy.	It measured by Trade-to-GDP ratio (T/GDP): (exports + imports) / GDP.	WDI (2000-2024)	+
Inflation (INF)	It is usually measured as a percentage change in the Consumer Price Index (CPI) over a specific period, such as a month or a year.	The series is measured in percentage (%)	WDI (2000-2024)	-
Interest Rate (INTR)	Interest rate refers to the rate at which interest is levied on borrowed funds.	Typically expressed as a percentage (%) per annum.	WDI (2000-2024)	-

Source: Author's Computation (2025)

3.3 Model Specification

The study adapt the model in the work of Ali et al. (2025) who examined the effect of infrastructure development on the relationship between foreign direct investment, domestic investment, and economic growth in Nigeria. The adaptation is justified on four grounds. Firstly, while Ali et al. (2025) focused on Nigeria as a single case study, this study extends the model to a 12-country ECOWAS panel to examine regional dynamics under the West African Power Pool. Secondly, Ali et al. (2025) used aggregate infrastructure index and included domestic investment and growth as dependent variables, whereas this study isolates electricity infrastructure and FDI to maintain focus and address the binding energy constraint in West Africa. Thirdly, methodological extension is introduced by employing PMG instead of ARDL used by Ali et al. (2025) to account for cross-sectional dependence and slope heterogeneity across ECOWAS member countries. The model can be specified as follows:

$$EG = f(FDI, DSI, IFD, HCD) \ldots . \ldots (3.1)$$

Where EG represented economic growth (which was measured by growth rate of GDP), FDI is foreign direct investment, DSI is domestic investment, IFD is the infrastructure development, HCD is human capital development.

The model is modified in this study as follows:

$$FDI = f(EI, EXG, INTR, MS, INFL, TO) \ldots \ldots \ldots 3.2)$$

The log linear form of the model can be specified as:

$lnFDI_{it} = \beta_0 + \beta_1 \, lnEI_{it} + \beta_2 \, EXG_{it} + \beta_3 \, INTR_{it} + \beta_4 \, lnMS_{it} + \beta_5 \, INFL_{it} + \beta_6 \, lnTO_{it} + \varepsilon_{it}$ ………………………………………………………………………………………… (3.3)

Where: FDI= Foreign Direct Investment, ln= Logarithmic sign, β_0= Constant terms/ Intercept, β_1, β_2, β_3, β_4, β_5 are the coefficient of the parameters to be estimated, ε_{it} = Error term.

Equation 3.2 is going to be estimated using the Pooled Mean Group model (PMG) to estimate short-run of the model can be specified as: both short run and long run effect of electricity infrastructure on foreign direct investment. Thee PMG estimation technique was developed by Parman and Smith, (1995) which has unrestricted specification for the models. The technique examines the effect of lagged variables on the current value of the independent variable and it is used to investigate whether there exist a short-run and long-run relationship between variables. The PMG method combines the advantages of the random effects and fixed effects by allowing for individual-specific effects and assumes homogenous slope coefficients across units.

$$\Delta lnFDI_{i,t} = \beta_0 + \sum_{i,t=1}^{k} \beta_1 \Delta lnFDI_{i,t-1} + \sum_{i,t=1}^{k} \beta_2 \Delta lnEI_{i,t-1} + \sum_{i,t=1}^{k} \beta_3 \Delta EXG_{i,t-1} + \sum_{i,t=1}^{k} \beta_4 \Delta INTR_{i,t-1} + \sum_{i,t=1}^{k} \beta_5 \Delta lnMS_{i,t-1} + \sum_{i,t=1}^{k} \beta_6 \Delta INFL_{i,t-1} + \sum_{i,t=1}^{k} \beta_7 \Delta lnTO_{i,t-1} + \delta ECT_{i,t-1} + \varepsilon_{i,t} \quad \ldots\ldots\ldots (3.4)$$

The MG long-run equation for Objective 3 can be specified as:

$$\Delta lnFDI_{i,t} = \beta_0 + \sum_{i,t=1}^{k} \beta_1 \Delta lnFDI_{i,t-1} + \sum_{i,t=1}^{k} \beta_2 \Delta lnEI_{i,t-1} + \sum_{i,t=1}^{k} \beta_3 \Delta EXG_{i,t-1} + \sum_{i,t=1}^{k} \beta_4 \Delta INTR_{i,t-i} + \sum_{i,t=1}^{k} \beta_5 lnMS_{i,t-1} + \sum_{i,t=1}^{k} \beta_6 \Delta INFL_{i,t-1} + \sum_{i,t=1}^{k} \beta_6 \Delta lnTO_{i,t-1} + {}_{y1} lnFDI_{i,t-1} + {}_{y2} lnEI_{i,t-1} + {}_{y3} EXG_{i,t-1} + {}_{y4} INTR_{i,t-1} + {}_{y5} lnMS_{i,t-1} + {}_{y6} INFL_{i,t-1} + {}_{y7} lnTO_{i,t-1} + \varepsilon_{i,t} \quad \ldots\ldots\ldots (3.5)$$

Where $lnFDI$ is log of foreign direct investment, α is the intercept, $lnEI$ is log of electricity infrastructure, EXG is exchange rate, $INTR$ is interest rate, $lnMS$ is log of money supply, $INFL$ is inflation rate, $lnTO$ is log of trade openness, ε is the error term, the indexes i and t represents the countries and periods, respectively. The Dumitrescu and Hurlin (2012) Granger non-Causality test is used to estimate the causality relationships between electricity infrastructure and foreign direct investment. The test is specifically based on the individual W-statistics and Z-statistics of Granger causality averaged across the cross-section units.

4. Results and Discussions

4.1 Result of Descriptive Statistics

Table 4.1 Result of the Descriptive Statistics of the Variables (1999-2024)

	LFDI	LEI	EXG	INTR	LMS	INFL	LTO
Mean	4.99	3.45	0.39	6.09	2.98	7.75	58.24
Median	2.34	3.72	0.38	5.37	3.21	5.85	54.14
Maximum	103.33	4.57	0.65	29.58	4.76	47.6	223.86
Minimum	-2.57	0.09	0.16	-53.64	-4.23	-3.50	16.51
Std. Dev.	10.91	0.91	0.08	7.86	1.37	8.74	22.35
Skewness	6.22	-1.72	0.28	-1.19	-4.13	2.14	1.85
Kurtosis	46.86	5.88	3.13	15.88	21.9	8.40	12.05
Jarque B.	26151.54	247.5	4.2	2094.9	5213.6	580.5	1238.55
Prob.	0.00	0.00	0.00	0.13	0.00	0.00	0.00

Source: Author's Computation using Eviews 10 (2025)

Table 4.1 presents the result of the descriptive statistics of the variables of the study. The result indicated that electricity infrastructure has mean of 3.45 while exchange rate, money supply, inflation rate, foreign direct investment and trade openness has mean values of 0.39, 2.98, 7.75, 4.99 and 58.24 respectively. Interest rate has the highest mean among all the variables with the value of 6.09. The standard deviation of 0.91 EI indicates some variability around their mean, emphasizing the need to consider the dispersion of data points. Electricity infrastructure is negatively skewed which implies a leftward tail in the distributions while foreign direct investment shows positive skewness. The kurtosis for electricity infrastructure and foreign direct investment shows a peaked distribution (leptokurtic) relative to the normal. The result of the Jarque-Bera test for the variables shows that the values are less than 0.05 at 5% significance level. This indicates that we reject the null hypothesis of normality distribution for electricity infrastructure and foreign direct investment at 5% significance level. The result implies that

The variables does not have a normality distribution across all cross-sections.

4.2 Result of Unit Root Test

Table 4.2: Results of the Im, Pesaran, and Shin Unit Root Test

Variables	IPS t-statistics		Order of Integration
	Levels	**1st Diff**	
LEI	-4.31**	-	1(0)
EXG	-1.61	-5.24**	1(1)
INTR	-3.88**	-	1(0)
LMS	-2.93**	-	1(0)
INFL	-2.83**	-	1(0)
LFDI	0.11	-7.07	I(1)
LTO	-2.61**	-	I(0)

Note: *, **, *** represent 1%, 5%, and 10% significance levels. Source: Author's Computation using Eviews 10 (2025)

Table 4.2 presents the results of the Im, Pesaran, and Shin (IPS) panel unit root test. The result indicates that the value of the t-statistics for the variables (LEI, INTR, LMS, INFL, and LTO) is greater than their critical values at 5% significance level respectively. Therefore, we reject the null hypothesis of non-stationarity in level at 5% level of significance. This result implies that the variables are stationary in their level form. However, the result further shows that the value of the t-statistics for the variables (EXG and LFDI) is -1.61 and 0.11 respectively. The results indicates that we cannot reject the null hypothesis of non-stationarity for the variables at a 5% significance level. This implies that the variables are non-stationary and hence has a unit root in their level forms respectively. However, the result indicates that the variables (EXG and LFDI) are stationary at first difference at a 5% significance level.

4.3 Result of Panel Co-Integration Test

Table 4.3: Result of Kao Co-Integration Test

	T-statistics	***P* value**
ADF	-3.9303	0.0000**
RESID(-1)	-8.0589	0.0000**
D(RESID(-1))	1.6358	0.1034***

Note: *, **, *** represent 1%, 5%, and 10% significance levels. Source: Author's computation using Eviews 10, 2025.

Table 4.3 presents the result of the cointegration test estimation using the Kao test. This model is estimated with individual intercept and lags of 1 for both the endogenous and exogenous variables is used based on Newey-West automatic bandwidth selection and Bartlet Kernel. The result of the Kao cointegration test indicates that the probability for the Augmented Dickey-Fuller, Resid(-1) and D(Resid(-1)) are 0.00, 0.00, and 0.10 respectively. Hence, we reject the null hypothesis of no cointegration at 5% significance level. The result indicates that there is an existence of cointegration relationship between the variables. This result implies that there is a long-run relationship between the variables.

4.4 Result of the Long Run Dynamic Analysis

Table 4.4: Result of the PMG in the Long-run

Independent Variables	**Pooled Mean Group Long Run Results**
LEI	0.23 (0.17)
EXG	-0.0002 (0.14)
INTR	0.05 (0.01)**
LMS	-0.07 (0.55)
INFL	-0.04 (0.01)**
LTO	-1.12 (0.00)**

Note: *, **, *** represents statistical significance at 1%, 5%, and 10%. Probability values are in parenthesis. Source: Author's computation using Eviews 10 (2025).

Table 4.4 presents the results of Pooled Mean Group (PMG) in long-run. The result shows that electricity infrastructure has a positive and insignificant relationship with foreign direct investment. The result implies that a 1% increase in electricity infrastructure will increase foreign investment by 0.23%. The result is consistent with Iyabo and Segun (2022) that found a positive and significant relationship between energy consumption and foreign direct investment. However, the result contradicts Fan and Hao (2020) that found a negative and significant relationship between energy consumption and foreign direct investment.

4.5 Results of the Short-Run Dynamic Analysis

Table 4.5: Result of the PMG in the Short-run

Short Run Results	
COINTEQ01	-0.51 (0.00)**
D(LEI)	-0.57 (0.62)
D(EXG)	-0.03 (0.13)
D(INTR)	0.009 (0.83)
D(LMS)	-0.07 (0.84)
D(INFL)	-0.004 (0.78)
D(LTO)	1.57 (0.03)**
C	2.80 (0.00)**

Note: *, **, *** represents statistical significance at 1%, 5%, and 10% respectively. Probability values are in parenthesis. Source: Author's computation using Eviews 10 (2025).

Table 4.5 presents the results of Pooled Mean Group (PMG) in short-run. The result shows that the coefficient of the ECM which measures the speed of adjustment is -0.51 with probability value of 0.00. The result indicates that the ECM is negative and statistically significant at a 5% level of significance. This implies that there is a short-run convergence between the variables. The result shows that electricity infrastructure is negative and insignificant with foreign direct investment. The result implies that a 1% increase in electricity infrastructure will lead to a -0.57% decrease in foreign direct investment. with foreign direct investment.

4.6 Result of Granger Causality Test

Table 4.6: Result of Granger Causality Test

	W-statistics	Z-statistics	*P* value
LEI→LFDI	2.83	3.50	0.00**
LFDI→LEI	1.60	1.01	0.30

Note: *, **, *** represents statistical significance at 1%, 5%, and 10%. Source: Author's computation using Eviews 10 (2025).

Table 4.6 presents the results of the Dumitrescu & Hurlin (2012) Granger non-Causality Test. The result indicates that we reject the null hypothesis of electricity infrastructure does not Granger cause foreign direct investment but cannot reject that of foreign direct investment does not Granger cause electricity infrastructure at 5% level of significance. This implies that there exists a causality relationship running from electricity infrastructure to foreign direct investment. The result indicates that electricity infrastructure can be used to predict changes in foreign direct investment and not vice-versa. This result suggests that there is a uni-directional relationship between electricity infrastructure and foreign direct investment. This result is consistent with Iyabo and Segun (2022) who found a uni-directional relationship between energy consumption and foreign direct investment.

4.7: Discussion of Major Findings

This section discusses the results of the major findings of the study using the short-run dynamic analysis using the pooled mean group (PMG), Kao Cointegration test, long-run dynamic analysis using the pooled mean group (PMG) and the Granger causality test.

The result of the short-run dynamic analysis using PMG indicate the existence of a short-run convergence between the variables in model. This result implies that the deviations from the short-run equilibrium are corrected to form a long-run relationship. The result shows that electricity infrastructure is negative and insignificant with foreign direct investment. The implication is that, short-run inefficiencies or adjustments costs may be at play to delay the effectiveness of electricity infrastructure capable of attracting foreign direct investments due to construction delays or time-lags in implementation. However, in Ghana, Liberia and Togo, the result shows that electricity infrastructure is positive and significant in the short-run. This is because construction delays and time-lags in implementation may be absent in those countries making it possible for electricity infrastructure to attract foreign direct investments in the short run. The link between electricity infrastructure and foreign direct investment could arise since electricity infrastructure that provides high and accessible electricity supply for industrial purposes could attract foreign investments in ECOWAS member countries. This result is consistent with findings of Iyabo and Segun (2022) and Ali et al. (2025).

The result of the Kao Cointegration test shows the presence of long-run relationship between the variables at 5% level of significance. This implies that there exists long-run relationship among the variables in the model. The implication is that that there is a sustained connection between the variables over a long time. The result suggests that electricity infrastructure is directly linked to foreign direct investment in the ECOWAS countries. This could be because the state of electricity infrastructure drives foreign direct investment. This result is consistent with Bello et al. (2024) and Iyabo and Segun (2022) who found a long-run relationship between energy consumption and foreign direct investment.

The result of the long run dynamic analysis using the pooled mean group shows a positive and insignificant relationship between electricity infrastructure and foreign direct investment. An increase in electricity infrastructure capable of generating and distributing high-quality power supply would attract and encourage foreign investors for investments in ECOWAS countries. Typically, foreign direct investment stimulates human capital development, contributes to trade integration, creation of more competitive business environment and enterprises all leading to sustainable economic growth.

The result of the Granger causality test shows that electricity infrastructure Granger cause foreign direct investment and not vice-versa. The findings indicate a unidirectional relationship where electricity infrastructure can predict levels of foreign direct investment and not vice-versa. The connection between electricity infrastructure and foreign direct investment could arise since electricity infrastructure that can provide quality and accessible electricity supply for industrial purposes could attract foreign investments in ECOWAS member countries. The result is consistent with Iyabo and Segun (2000) but contradicts Tsaurai (2025) and Nguea (2021).

5.1 Conclusion and Recommendation

This study examined the impact of electricity infrastructure on foreign direct investment in ECOWAS member countries using a panel data covering 1999-2024. The findings showed that electricity infrastructure is positive and significant with foreign direct investment in most ECOWAS member countries. Based on the findings, there is an existence of both short-run and long-run relationships between electricity infrastructure and foreign direct investment. Also, findings showed that electricity infrastructure can predict future changes in foreign direct investment. Based on the findings, there is need for policy action to be centered on offering tax breaks or concessional financing for firms adopting energy-efficient equipment or renewable power sources. This will attract more foreign direct investment, encourage sustainable business models and reduce dependency on unreliable grid power.

References

Ali H., Adamu H. A., & Alfred G. G. (2025). Effect of infrastructure development on the relationship between foreign direct investment, domestic investment, and economic growth in Nigeria: ARDL Approach. *British Journal of Business and Psychology Research,* 1(2), 26-35.

African Development Bank. (2022). West Africa regional integration strategy paper 2021-2025. African Development Bank. https://www.afdb.org/en/documents/west-africa-regional-integration-strategy-paper-2021-2025

Bello B. T., Anifowose A., & Awotundun D. A. (2024). Effect of foreign direct investment and foreign portfolio investment on economic growth in selected African economies. *Journal of Finance, Governance and Strategic Studies,* 7(1), 54-66.

Economic Community of West African States. (2023). ECOWAS energy outlook 2023: Tracking progress toward SDG7. ECOWAS Commission. https://www.ecowas.int/publications.

Economic Community of West African States. (2021). Updated master plan for the development of power generation and transmission infrastructure in ECOWAS (Technical report). *ECOWAS Commission & WAPP*. https://www.ecowapp.org/en/resources

Economic Community of West African States. (2013). Updated master plan for the development of power generation and transmission infrastructure in ECOWAS [Technical report]. *ECOWAS Commission & WAPP*. https://www.ecowapp.org/en/resources

Fan, W., & Hao, Y. (2020). Empirical research on the relationship amongst renewable energy consumption, economic growth and foreign direct investment in China. *Renewable Energy*, 146, 598–609.

Iyabo A. O., & Segun S. A. (2022). Assessing the nexus among energy consumption, foreign direct investment and economic growth in Sub-Saharan Africa. *CBN Journal of Applied Statistics,* 13(1), 27-53.

Memberr G., David O., & Sunday O. (2024). Impact of power sector development on foreign direct investment in Nigeria. *International Journal of Operational Research in Management Social Sciences and Education*, 10(2),116-135

Nguea, M. S. (2021). The impact of infrastructure development on foreign direct investment in Cameroon. *Economics Bulletin*, 41(3), 1113-1124.

Rehman F. U., Monirul M. I., & Kazi S. (2022). Does infrastructural development allure foreign direct investment? The role of Belt and Road Initiatives. *International Journal of Emerging Markets,* 2(5), 1-23.

Stéphane M. N., & Ulrich V. E. K. (2020). Are growth effects of foreign capital significant for increasing access to electricity in Africa?. *Economic Issues,* 2(4), 1-23.

Tsaurai K. (2025). Impact of infrastructure development on foreign direct investment in BRICS countries. *Journal of Risk and Financial Management,* 18(3), 2-15.

Tsaurai K. (2023). Foreign direct investment inflow dynamics: The case of central and eastern Europe, comparative economic research. Central and Eastern Europe, ISSN 2082-6737, *Lodz University Press, Lodz*, 26(1), 45-63. https://doi.org/10.18778/1508-2008.26.03

Tang, C. F., Tan, B. W., & Ozturk, I. (2019). Energy consumption and economic growth in Vietnam. *Renewable and Sustainable Energy Reviews,* 5(4), 1506–1514.

United States Agency for International Development (2022). West Africa energy program: Electricity trade and regional integration. *U.S.*

Agency for International Development. https://www.usaid.gov/west-africa-regional

World Bank. (2024). World development indicators 2024. World Bank. https://data.worldbank.org