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Abstract

Purpose: The importance of electricity infrastructure has encouraged countries to improve its access and enhance its consumption. Ghana has made a lot of improvement in expanding electricity infrastructure to its people. Yet, the actual effect of increasing electricity access on electricity consumption in Ghana is unknown. The main thrust of this paper was to estimate the effect of electricity access on the consumption of electricity in Ghana from 1990 to 2020.

Methodology: This study employed a Vector Error Correction model to estimate the effect of electricity access on electricity consumption using data from 1990 to 2020.

Findings: Results show that a one percent increase in access rate of electricity increases its consumption by 10.46 kwh per capita and 61.02 kwh per capita in the short-run and in the long-run respectively. Factors such as national income, population and the country's human development index (HDI) were also found to be significant determinants of electricity consumption in Ghana.

Unique Contribution to Theory, Practice and Policy: It is also recommended that policies that encourage education among women must be enhanced to reduce their child bearing years, reduce population growth and reduce pressure on electricity infrastructure.

Keywords: *Ghana, Electricity Access, Electricity Consumption*

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INTRODUCTION

The consumption of energy such as electricity has been cited as a driving force that powers the growth of an economy. Kraft and Kraft (1978) documented a positive relationship between energy consumption and growth of national income in the United States of America. Although, Kraft and Kraft found unidirectional causality running from national income to energy consumption, subsequent studies have found evidence of how the consumption of energy like electricity drives productive activities and influence economic growth. Yoo (2006) found positive effects of electricity consumption on growth in Singapore and Malaysia, Aytac and Guran (2011) found it in

Turkey and Wolde-Rufael (2004) found same in seventeen African countries.

The essence of electricity consumption to growth have led to various state-sponsored policies and programs to expand electricity to as many Ghanaians as possible. National Electrification Program and the Self-Help Electrification projects are major projects that have been rolled out to meet

Ghana's goal of achieving universal access to electricity by the year 2020. Consequently, access rate to electricity increased from 30.6 percent in 1993 to 60.5 percent in 2008 and further to 82.39 percent in 2020 (Ghana Energy Commission, 2020). The rate of access to electricity in Ghana saw 169% increase for the past 27 years which is considered remarkable for a developing country like ours. Although Ghana still have a long way to go with regards to achieving universal access rate, majority of Ghanaians have been brought to the light and presented with an opportunity to better their lives.

However, the consumption of electricity per capita in Ghana reduced from 336.07 kwh per capita in 1993 to 261.29 kwh per capita in 2008 but bounced back to 358.53 kwh per capita in 2020 (World Bank Development Indicators, 2020). Essentially, the consumption of electricity only grew by 6.6% which is significantly low compared to the growth in electricity access over the same period. Factors such as erratic power outages experienced in Ghana from 2010 to 2015 have been cited as reasons for this low consumption of electricity (Mensah, 2016). Of course, power outages cannot wholly explain why the massive improvement in electricity access have not reflected on the consumption of electricity in Ghana and demands an empirical study to actually estimate the effect of electricity access on electricity consumption in Ghana. Perhaps, the needed and expected increase in electricity consumption despite massive electrification have not been seen due to an improvement in efficiency of power use in Ghana (Bhattacharyya, 2011).

From extensive search of literature, this is the first study to empirically examine the influence of electricity access on electricity consumption in Ghana as extant studies such as Twerefo et al. (2008), Ackah et al. (2015) and Sarkodie (2017) only concentrated on the growth-electricity consumption nexus. Access to electricity is considered essential because it is the first step to the consumption of electricity which further leads to growth. As a matter of fact, consumption of electricity will be limited if its access is inadequate. It is therefore imperative to examine the link between electricity access and electricity consumption in Ghana. The objective of this paper is twofold: it first estimates the effect of electricity access on electricity consumption in Ghana for the last thirty years and also estimate the other factors that influence electricity consumption in Ghana for the same period.

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LITERATURE REVIEW

This study is underpinned by the theory of demand which states that the demand and consumption of any particular good is determined by the good's own price and other factors such as income of the consumer, consumer's tastes and preferences and changes in the prices of its substitutes and compliments (Sloman and Wride, 2009). Central to the theory of demand is the law of demand which postulates an inverse relationship between the price of a commodity and the quantity demanded of that commodity. Essentially, an increase in the price of the commodity reduces its quantity demanded whiles a fall in the price of the good increases the quantity demanded of that commodity, all other things being equal. The demand for electricity is a derived one which means electricity is not demanded for its own sake but for the benefits it gives.

Demand for electricity consists of two parts. The part that is satisfied which is the amount of electricity consumed and the unfulfilled part known as the unmet demand which is largely due to inadequate access. Essentially, unmet demand represents the number of individuals who would want to consume electricity for their various needs but unable to do so because the energy resource is not readily available to them (Bhattacharyya, 2011). In the end, it is the fulfilled part of electricity demand which is the total amount of electricity consumed over a given period that is measured. Electricity price is crucial as far as the consumption of electricity is concerned. Apart from the fact that electricity price influences the consumption of electricity, it permeates throughout the economy to influence the prices of other goods and services. This largely stems from the fact electricity enters into the production function of almost all goods and services and it follows that changes in its price are bound to affect the demand and supply of such goods and services (Aytac and Guran, 2011).

Sami (2011) investigated the relationship among electricity consumption, exports and national income per capita in Japan. Sami employed data on exports, income per capita and electricity consumption from 1960 to 2007. The Bounds test to cointegration was used to test the long run relationship among the variables and a Vector Error Correction Model was used to determine causality between the variables. The study reports that causality runs from exports and income per capita to electricity consumption in the long run. This means policies to encourage domestic production which increases income and improves exports will ultimately leads to an improvement in the consumption of electricity in Japan.

Among empirical studies on electricity consumption in Ghana is Ackah et al. (2014) which explored how exogenous and endogenous factors influence the demand for electricity. They quantified the effect of these factors through the technique of Structural Timeseries model. The study found increases in the level of education of consumers reduces their consumption of electricity in the short run and the long run. Essentially, education improves efficiency which helps reduce electricity consumption. It also reported of an improvement in the efficiency of electricity consumption in Ghana. Electricity consumption also noted to be less responsive to changes in the price of electricity. Ackah et al. (2014) concludes public education on conservation of energy such as electricity will help improve efficiency in the use of the commodity.

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Sarkodie (2017) forecast the consumption of electricity in Ghana by the year 2030. The focus was to enable the country prepare to meet the growing demand for electricity by actually predicting the total amount of electricity that will be consumed by 2030. The study employed Autoregressive Integrated Moving Average (ARIMA) model and an annual data from 1980 to 2013. The results of the forecast revealed Ghana's consumption of electricity will grow from 8.52 billion kwh in 2012 to 9.56 billion kwh by 2030. As part of measures to meet this demand, the government is entreated to explore renewable sources of energy and enhance the management of demand-side policies. There must be massive investment in energy infrastructure to prevent the situation of demand exceeding supply by the year 2030.

Twerefou and Abeney (2020) investigated the efficiency of electricity consumption for households in Ghana. They also identified factors that influence inefficiency in electricity consumption. Employing data from the 2016/2017 round of Ghana living standard survey (GLSS) datasets and the energy demand frontier model, income was found to be inelastic to electricity demand whiles education and power outages was noted to reduce efficiency. This finding was contrary to conclusion of Ackah et al. (2014) who found education to improve efficiency of electricity use. Other factors such as appliance use, location, load and regional zones were found to influence electricity demand in Ghana. Their study recommended certain standards in appliance use and public education to improve efficiency in the consumption of electricity.

Forgoing review of empirical literature reveals limited studies that link electricity access to the consumption of electricity especially in Ghana. It is essential to establish the effect of electricity access on electricity consumption because the benefits of electricity will not be manifested without adequate access to the energy resource in the first place. This study builds on by finding out how access rate to electricity influence its consumption especially considering the aim of the Ghanaian government to achieve universal access to electricity. Will increasing electricity access necessarily promote its consumption? This is the main question this study sought to answer.

METHODOLOGY

Model Specification

The purpose of this paper is to estimate the effect of electricity access on the consumption of electricity in Ghana using data from 1990 to 2020. The study acknowledges the importance of electricity consumption to economic growth as suggested by Kraft and Kraft (1978). The consumption of electricity is however hampered without adequate access. Consequently, the study regresses consumption of electricity on the rate of its access plus other significant factors such as price, income and population. The functional form of the model is specified as follows;

$$EC_t = f(EA_t, POP_t, GDP_t, HDI_t, CPI_t) \quad \ldots (1)$$

The econometric form of equation 1 can be written as;

$$EC_t = \beta_0 + \beta_1 EA_t + \beta_2 lnPOP_t + \beta_3 lnGDP_t + \beta_4 HDI_t + \beta_5 lnCPI_t + \mu_t \quad \ldots (2)$$

where EC_t is defined as electricity consumption, EA_t as access rate measured as a percentage of the population, GDP_t as gross domestic product, POP_t as total population, HDI_t as Ghana's human development

index and CPI_t as consumer price index which is the proxy for electricity price. β_0 is the intercept, μ_t as the stochastic error term and β_1 to β_5 as coefficients of the independent variables.

Type and Source of Data

The study used annual data from the World Bank Development Indicators (WDI) datasets from 1990 to 2020. The choice of variables stems from the theory of demand which states the demand and consumption of any particular good is influenced by its price, income of the consumer among other factors (Slowman and Wride, 2009). Electricity consumption is measured in kilowatt per hour (Kwh) per capita. Electricity access is measured as the percentage of the population with access to electric power. An increase in electricity access is expected to increase the number of individuals connected to the national grid and hence increases the consumption of electricity. The study hence expects electricity access to have a positive effect on electricity consumption, holding all other factors constant. Also, the price of any commodity is postulated to have an inverse relationship with that commodity and it is therefore expected that consumer price index which is a proxy for electricity prices will have a negative effect on its consumption. Consumer price index is used as a proxy for electricity price due to limited data.

Again, income is measured as yearly gross domestic product for Ghana. Income is expected to have a positive effect on electricity consumption because evidence from Kraft and Kraft (1978) suggests higher levels of income are accompanied by higher levels of electricity consumption. Increases in population increases the total demand and consumption of electricity which informs the study to expect a positive relationship between them. Human development index (HDI) measures the level of development of a country taking into consideration their educational, health and income aspects. As a development indicator, it is expected that increases in it signal development of a country and suggest a fall in the use of energy such as electricity as indicated by the Kuznets curve. Essentially, a country shift from the use of less efficient productive technology and equipment to more efficient ones as they experience structural and technological development (Zhao et al., 2017). The efficiency of modern technology reduces the intensity of electricity use and it is therefore expected that a negative relationship exists between HDI and the consumption of electricity.

Estimation Strategy

As a rule, stationarity property of the variables is tested to ensure their stability. The Augmented Dickey-Fuller (ADF) and the Philips-Perron tests were used. The model selection criteria are then used to select the optimal lag length and a Johansen Cointegration test to check for a long run relationship among the variables before estimating the Vector Error Correction (VEC) model. Diagnostic tests are finally conducted to ensure that the coefficients estimated are reasonable and empirical results are valid.

The study follows Sims (1980) and use a VEC model to achieve its objectives. The VEC model implies that each variable in the system is explained by its lagged values and the lags of other variables plus the error correction term. Empirical model to be estimated with the six (6) variables is expressed as;

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$$\Delta EC_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta EC_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta EA_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta lnCPI_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta HDI_{t-g} + \sum_{f=1}^{k-1} \psi_f \Delta lnPOP_{t-f} + \phi_1 ECT_{t-1} + {}_{1t} \dots\dots\dots\dots\dots\dots (3)$$

$$\Delta EA_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta EC_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta EA_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta lnCPI_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta HDI_{t-g} + \sum_{f=1}^{k-1} \psi_f \Delta lnPOP_{t-f} + \phi_2 ECT_{t-1} + {}_{2t} \dots\dots\dots\dots\dots\dots (4)$$

$$\Delta lnGDP_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta EC_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta EA_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta lnCPI_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta HDI_{t-g} + \sum_{f=1}^{k-1} \psi_f \Delta lnPOP_{t-f} + \phi_3 ECT_{t-1} + {}_{3t} \dots\dots\dots\dots\dots\dots (5)$$

$$lnCPI_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta EC_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta EA_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta lnCPI_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta HDI_{t-g} + \sum_{f=1}^{k-1} \psi_f \Delta lnPOP_{t-f} + \phi_4 ECT_{t-1} + {}_{4t} \dots\dots\dots\dots\dots. (6)$$

$$\Delta HDI_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta EC_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta EA_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta lnCPI_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta HDI_{t-g} + \sum_{f=1}^{k-1} \psi_f \Delta lnPOP_{t-f} + \phi_5 ECT_{t-1} + {}_{5t} \dots\dots\dots (7)$$

$$\Delta lnPOP_t = \beta_0 + \sum_{i=1}^{k-1} \theta_i \Delta EC_{t-i} + \sum_{j=1}^{k-1} \alpha_j \Delta EA_{t-j} + \sum_{p=1}^{k-1} \delta_p \Delta lnGDP_{t-p} + \sum_{m=1}^{k-1} \gamma_m \Delta lnCPI_{t-m} + \sum_{g=1}^{k-1} \lambda_g \Delta HDI_{t-g} + \sum_{f=1}^{k-1} \psi_f \Delta lnPOP_{t-f} + \phi_6 ECT_{t-1} + {}_{6t} \dots\dots\dots\dots (8)$$

where β_0 is the constant term, θ, α, δ, γ, λ, ψ and ϕ are the coefficients of electricity consumption, electricity access, income, price level, HDI, population and the error correction term respectively. $_t$ is the white noise error term and all variables are as already defined.

RESULTS

Descriptive Statistics

Summary statistics grant an understanding about the variables used in the study. Specifically, the mean, standard deviation, maximum and minimum values of the study variables are presented.

Table 1 presents the descriptive statistics of variables used in the study.

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Table 1: Descriptive statistics of variables

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
Electricity consumption (kwh)	319.83	47.96	216.90	386.79	31
Electricity access (%)	54.78	18.44	25	84	31
Income (GHS mil.)	28.2	13.8	12.0	53.8	31
Price level (%)	81.51	81.65	2.16	255.1	31
Human development index	0.523	0.053	0.454	0.611	31
Population (mil.)	22.2	4.79	14.8	29.8	31

Source: Author's estimation based on data from WDI

Variables used in the study is described in Table 1. Electricity consumption per capita over the study period averaged 319.83 kwh with a standard deviation of 47.96 kwh. Overall, electricity consumption in Ghana per head of the population ranged from 216.90 kwh to 386.79 kwh. Impressive access rate to electricity in Ghana is emphasized by an average of 54.78% and standard deviation of just 18.44%. This shows access to electricity has fairly been stable. Consumer price index which is a proxy for electricity price was quite high with an average of about 81% whiles Ghana's index for HDI over the same period had a mean of 0.523 which shows the country is doing relatively well. Ghana's national income averaged 28.2 million GHS and a standard deviation of 13.8 million GHS which shows income have fairly been stable from 1990 to 2020. Population in Ghana over the study period had a mean of 22.2 million and a standard deviation of 4.79 million which means the country's population is less volatile.

Stationarity Tests

It is important that the variables employed in the study are stationary so as to provide robust and consistent results. This section therefore presents the results and explanation of the stationarity test using the Augmented Dickey-fuller (ADF) test. Philips-Perron (PP) tests for unit root was used to confirm the results of the ADF test.

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Table 2: Results of Stationary Tests

Variable	ADF test		Philip-Perron		Order of Integration
Test					
	CONST	CONST + T	CONST	CONST + T	
Panel A: Levels					
EC	-2.175	-2.160	-2.128	-2.091	-
EA	-0.791	-3.083	-0.921	-4.149	-
GDP	0.881	-1.766	0.668	-1.797	-
CPI	1.612	-1.543	1.144	-1.603	-
HDI	0.352	-1.819	0.395	-1.800	
POP	-0.459	-1.450	-0.437	-1.784	
Panel B: F irst Differen ce					
EC	-7.251***	-7.193***	-7.472***	-7.506***	I(1)
EA	-8.567***	-8.404***	-9.146***	-8.922***	I(1)
GDP	-3.180***	-3.548***	-3.121***	-3.584***	I(1)
CPI	-2.993***	-3.584***	-2.990***	-3.608***	I(1)
HDI	-6.281***	-6.408***	-6.241***	-6.353***	I(1)
POP	-3.185***	-3.963***	-3.100***	-4.038***	I(1)

Source: STATA Estimation Based on Data from WDI

According to Table 2, all the variables were not stable at the level as can be seen in panel A for both tests. The study then proceeded with the first difference. The results showed that all variables became stationary after the first difference. Hence, all the series in the model are integrated of order one and therefore justifies estimation of the VEC model.

Selection of Optimal Lag Length

The Final Prediction Error (FPE), Akaike Information Criteria (AIC), Hannan-Quinn Criteria (HQ) and the Schwarz Criteria (SBIC) was employed to select the optimal lag length for the estimation of the VEC model.

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Table 3: Results of the selection order Criteria

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	85.072				9.2e-11	-6.08246	-5.99886	-5.79213
1	123.156	76.169	36	0.000	8.5e-11	-6.2428	-5.65757	-4.21049
2	157.765	69.217	36	0.001	1.6e-11	-6.13578	-5.04892	-2.36149
3	226.565	137.6	36	0.000	7.7e-11	-8.65884	-7.07035	-3.14257
4	2740.75	5028.4*	36	0.000	1.9e-11*	-199.288*	-197.198*	-192.03*

Endogenous: dE dEA dHDI Dpop dGDP Dlcpi

Exogenous: _cons

Table 3 shows all the criteria supported a lag length of 4. The study therefore proceeded to do the co-integration test.

Johansen Co-integration Test

The estimation of a VEC model necessitates that a long-run relationship exists among the variables. The results of the Johansen cointegration tests is tabulated by table 4.

Table 4: Results of Johansen Co-Integration Test

Maximum Rank	Parms	LL	Eigenvalue	Trace statistic	5% critical value
0	42	105.87779	.	115.5360	94.15
1	53	125.6154	0.75582	76.0607	68.52
2	62	139.57489	0.63105	48.1418	47.21
3	69	149.84822	0.51992	27.5951*	29.68
4	74	156.39922	0.37370	14.4931	15.41
5	77	162.37383	0.34738	2.5439	3.76
6	78	163.64577	0.08685		

Source: STATA Estimation Based On Data from WDI

The trace statistics showed there is at least three co-integrating equations as indicated in Table 4. This is because the trace statistics for lags 1 to 3 exceeded their 5% critical values and leads to rejection of the null hypothesis that there is no co-integration. The long-run relationship among the variables validates the use of a VEC model.

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Influence of Electricity Access on Electricity Consumption in Ghana

The short-run and long-run effect of electricity access and other relevant factors on Ghana's electricity consumption is presented. This presentation helps explain how access to electricity influence Ghana's consumption of electricity from 1990 to 2020.

Table 5: Effect of electricity access on electricity consumption in Ghana

Electricity consumption	Short run	Long run
Speed of Adjustment	-0.418***	
	(0.159)	
Electricity access	-10.46*	-61.02***
	(5.465)	(9.084)
National income (ln)	8.59**	-1.33
	(4.38)	(4.75)
Human development index	-1366.953	13.11***
	(1050.34)	(2.62)
Population (ln)	-32.50**	-5.47*
	(18.23)	(43.94)
Price level (ln)	1.74	0.824
	(1.13)	(1.20)
Constant	-0.00246	131.79
	(9.03)	

Source: Author's estimation based on data from WDI, standard error in parenthesis, ***, ** & * represents 1%, 5% & 10% significance level.

The speed of adjustment was negative, significant and less than one which confirms a long-run relationship exist among the variables and hence justifies the use of the VEC model. It must be emphasized that sign of coefficients in an error correction model are interpreted in the opposite.

The findings presented in Table 5 show that electricity consumption in Ghana increased by 10.46 kwh per capita and 61.02 kwh per capita respectively in the short-run and in the long-run for a percentage increase in the rate of access. This conforms to the a-priori expectation of electricity access increasing the consumption of electric power despite the low uptake of electricity power in Ghana. Blimpo et al. (2019) found that increasing electricity access alone is not enough for people to actually connect to it. They explained other economic and social factors contribute to the decision of the individual to consume electricity even if they have access. Majority of individuals have access to electricity but still cannot connect because they simply cannot afford it. Mensah

(2016) also asserted that erratic power outages makes power from electricity grid unattractive and some consumers will rather invest in self-generation for their power needs. Resolving these challenges will enhance electricity consumption and make increase in access rate more profitable in Ghana.

Table 5 also showed electricity consumption is influenced by other factors aside its access. It shows a fall of 8.59 kwh per capita in electricity consumption when national income increases in the short run but does not influence it in the long run. This result contradicts the expected sign but can be explained by the fact that higher income levels means the country is advancing with better productive technologies which improves efficiency and reduces the consumption of electricity (Bhattacharyya, 2011).

Human development index (HDI) only influenced the consumption of electricity in the long run. This is explained by the fact that development takes time to manifest and its mostly a long run phenomenon. It shows an increase in Ghana's HDI reduces the consumption of electric power by 13.1 kwh per capita. This is in confirmation of the a-priori expectation of a negative effect and might be due to the fact that Ghana's level of development is improving and industrial production has reached a level of sophistication and structural innovation needed to improve efficiency and reduce electric power consumption.

Population of Ghana had a positive effect on electricity consumption for both the short run and the long run. It shows a percentage increase in Ghana's population increases the consumption of electricity by 32.50 kwh per capita and 5.47 kwh per capita respectively for the short-run and the long-run. This is expected as increases in population increases the total demand and load of electricity. In the end, more electricity would have to be consumed with each increase in population.

Post-estimation Tests

Post estimation tests are important to establish validity of study results and repose confidence in its conclusions and policy recommendations. The results of the Jarque-Bera test of normality and the Lagrange-multiplier test for autocorrelation are presented to validate the findings of the study.

Table 6: Results of post-estimation tests

Diagnostic test	Statistic	Probability value
Autocorrelation test	27.2565	0.849
Normality test	262.509	0.000

Source: Author's estimation based on data from WDI

The null hypothesis of no autocorrelation cannot be rejected as the probability value is greater than 5 percent significance level. This means the model used to estimate the results of the study does not suffer from autocorrelation. The Jarque-Bera test which combines the tests of normality however indicates that the data is not normally distributed. This notwithstanding is due to the fact that the Ghanaian economy experienced structural break for the period studied (Dramani et al.

2012).

Conclusion

The main thrust of this paper was to estimate the effect of electricity access on the consumption of electricity in Ghana from 1990 to 2020. The Vector Error Correction model was employed to achieve this objective. This paper emphasized that the consumption of electricity to fuel economic growth will be hampered without adequate access to electricity. There was the need to find out how access rate of electricity affects consumption of electricity in Ghana and deliberate on how access rate can be strengthened with other factors to actually get people connected to power.

The findings show access rate of electricity has a positive effect on electricity consumption in Ghana for the study period. This positive nexus between electricity consumption and electricity access is persistent despite low uptake and erratic power outages in the country. National income and HDI was found to negatively influence electricity consumption whiles population has a positive effect on it. The positive effect of population on electricity consumption is essentially due to higher population growth rate which increases electricity demand in Ghana.

This study revealed that it increasing electricity access increases the consumption of electricity in Ghana but efforts must be made to eliminate other barriers that prevent Ghanaians from actually connecting to power. The energy ministry must particularly work on improving uptake by making electricity more affordable and resolving issues such as electricity outages to enhance the consumption of electricity which is essential for Ghana's growth. It is also recommended that policies that encourage education among women must be enhanced to reduce their child bearing years, reduce population growth and reduce pressure on electricity infrastructure.

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