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THE POWER SECTOR AND ITS IMPACTS ON INDUSTRIALIZATION OF BUSINESSES IN NIGERIA

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ABSTRACT

The study investigates the link between power supply and business industrial development by examining the influence of government policies on power supply and industrial development in Nigeria. The Johansen Co-Integration technique was adopted to determine the long run relationship among some macroeconomic variables that includes the industrial component of Real Gross Domestic Product, explicitly chosen using explanatory variables. The independent variables includes electricity consumption, electricity production (Kwh), growth rate of labour force, real gross fixed capital formation and telephone lines per hundred population and their impact on industrial component of real GDP. Annual time series data on these variables from 1981 to 2010 were collected from the Central Bank of Nigeria Statistical Bulletin, the World Bank and United Nations Statistics. Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) tests are employed to test the order of integration of the variables. The study also performed a Vector Error Correction Model-VECM to correct possible disequilibrium caused in the short-run relationships. The study concluded that electricity condition which is a result of existing government policies exerts a negative impact on industrial output in the long run affects the business viability.

Key Words: *Power Supply, Industrial Development, SME Growth, Electricity Consumption.*

1.0 Introduction

Industrialization has been seen as a veritable channel of attaining the lofty and desirable conception and goals of improved quality of life for the populace (Adeoye, 2004). This is because; industrial development involves extensive technology-based development of the productive or manufacturing sector of the economy. In other words, it includes a sustained application and combination of suitable technology, management techniques and other resources to improve the economy from the traditional low level of production to a more automated and efficient system of mass production of goods and services (Ayodele and Falokun, 2003).

Based on this background, industrialization is proven to be central to a nation's economic growth and development. This therefore explains the reason why successive governments in developing countries such as Nigeria emphasize industrialization as a way of transforming their economies. In the past five decades, Nigeria has pursued industrialization with the hope of transforming the economy from a monolithic, inefficient and import-dependent economy to a more dynamic and export-oriented economy, especially exports of industrial goods. These aspirations as contained in the successive development plans (particularly, first and second development plans) of the Federal Government were further reinforced by the windfall gains from crude oil boom of the 1972/73 and 1979/80. However, despite series of deregulation policies by successive governments to facilitate industrialization process in an economically conducive manufacturing environment, the performance of the industrial sector remains undesirable. In the last two decades, Nigeria recorded an unremarkable or abysmal performance especially in manufacturing industry in the areas of production and international trade. Although, its poor macroeconomic management might have largely contributed to such unfavourable performance of the industrial (manufacturing) sector.

The role of constant power supply in the development of society or an economy cannot be overemphasized. Power is a physical infrastructure necessary for economic growth and development. However, statistics have shown that Nigeria continued to perform poorly in its national electricity supply. For instance, comparative investigation reveals that electricity production in Nigeria was 19.78 billion KWh while South Africa was 246.8 billion KWh, Singapore was 41.8 billion KWh and in the advanced countries, USA was 4,165.4 billion KWh and the UK was 372 billion KWh. In the same period, Nigeria was supplied at 15.85 billion KWh indicating a 3.93 billion KWh loss in transmission and distribution (CIA World Factbook, 2012).

The issue of power supply has been a major setback to industrial development in Nigeria. Electricity in Nigeria is yet to improve significantly despite the government involvement in reinstating the sector. With an increased population coupled with government efforts to diversify economic activities in the country, energy demand is rising but electricity supply has remained relatively stagnant. It is therefore obvious that electricity demand far exceeds its supply. The inefficiency as well as inadequacy of facilities to boost electricity supply has been a major cause of the increasing gap between demand and supply of electricity. The inefficiency of the power sector can be attributed to low investment in the sector and lack of preventive and routine maintenance of national power generation facilities which results in huge energy losses, frequent major breakdowns arising from the use of outdated and heavily overloaded equipment, inadequate generation due to operational/technical problems arising from machine breakdown. There is also the incidence of disruption of gas supply pipelines, fluctuation in gas pressure and water levels powering the hydro plants, poor funding, inadequate budgetary provision and undue delay in release of funds, inefficient billing and collection system, vandalism and pilfering of power generation equipment, among others as concluded by Odularu (2009), Okonkwo (2009), Nwulu (2011) and Agboola (2011). There are general assumptions that many of these inefficiencies persisted because selfish interest of government officials who have vested interests in the importation of domestic power generators. The existence of these bottlenecks in the power sector has greatly impaired the rapid development of the industrial sector Okafor (2008).

Consequently, it is of paramount interest for the purpose of economic and social policies to investigate the long-run linkage between power supply and industrial development in the Nigerian economy. This is with a view to establish the magnitude of response of the industrial sector to the power sector.

1.2 Industrialization and power sector issues in Nigeria

The prevailing issue of the power sector in Nigeria, as highlighted above, has been attributed to a number of factors such as lack of preventive and routine maintenance of national power generation facilities, the use of outdated and heavily overloaded equipment, operational or technical problems arising from machine breakdown. These have resulted in frequent major breakdowns, huge energy losses, inadequate power generation amongst others which act as the major setback to the pace of industrial development in Nigeria. Industrial development involve a change of system of production from the traditional low level of production to a more automated and efficient system, of mass production of goods and services, therefore, availability constant power supply is therefore indispensable.

World economies are heavily reliant on energy and Nigeria is not an exception. As Alam (2006) puts it, energy is the indispensable force driving all economic activities. In other words, the greater the energy production and consumption, the more the economic activity in the nation and as a result a greater economy emerges.

Small and Medium Scale Enterprises (SMEs) are believed to be the engine room for the development of any economy because they form the bulk of business activities in a growing economy like that of Nigeria and they contribute to GDP and employment generation capacity. A major problem of SMEs in Nigeria is inadequate and inefficient utilities such as power supply which tend to escalate costs of operation as SMEs are forced to resort to private provisioning of such utilities. Studies have shown that Nigeria's abysmally poor supply of electricity adds 40 percent to the costs of goods produced in the country (Adenikinju, 2005). These high costs of production have compelled many industries for example Dunlop tyres and other industrial corporations to either shut down or relocate to neighboring countries thereby deterring domestic and international investment. Also, apart from its direct fiscal effects, the power sector is strategic for increasing the competitiveness of the Nigerian economy by reducing overall energy costs and to facilitate the modernization of the technology used by economic agents and businesses. It is therefore important to investigate how efficient power supply has been in ensuring effective industrial development in Nigeria.

2.0 Review of Literature

Many studies have established the existence of links between power as a form of energy and economic outcomes such as productivity, industrial development, the growth of SMEs, unemployment, economic growth and development amongst others (see, e.g., Agil and Butt, 2001; Alam, 2006; Breshin, 2004). Some scholars have argued that power supply for industrial development is a common challenge confronting most economies. Okafor (2008) argued that poor power generation represents a major setback for the Nigeria's industrial development. George and Oseni (2012) observed that the less and non-productive residential sector of Nigeria's economy attracts about four times of electricity supply than the industrial and commercial sector in an economy which they considered inappropriate for the growth of the industrial sector. According to Emovon, *et al* (2010) a sustained power supply system is effective and indispensable machinery for the rapid industrial and economic growth of any nation. Ayodele and Falokun (2003) examined the structure of the Nigerian industrial sector with emphasis on the manufacturing subsector. In their analysis, it was observed that, industrialization is central to economic growth and development. This is because the excess labour resources in the country can be absorbed by the desired positive developments in the process of industrialization.

Infrastructure in general has been seen to contribute tremendously to economic development. Asaolu and Oladele (2006) argue that infrastructural decay is the major problem confronting Nigeria and that poor electricity generation is one of the instances of the infrastructural decay in Nigeria. For three decades, inadequate quantity, quality and access to electricity service remain a big challenge to the Nigerian economy and the resolution of the challenge would boost the economy, reduce unemployment and the resultant social vices (Rabiu, 2009).

Power supply as an infrastructure is necessary for the effective operation of SMEs. Statistics have shown that small and medium-sized enterprises (SMEs) including macro-businesses are the highest employers of labour in Nigeria (Barros, *et al,* 2011). Adenikinju (2005) analyzed the economic cost of power outages in Nigeria. Using the revealed preference approach on business survey data (Bental and Ravid 1982; Caves, Herriges, and Windle 1992; Beenstock, Goldin, and Haitovsky 1997), Adenikinju estimated the marginal cost of power outages to be in the range of $0.94 to $3.13 per kWh of lost electricity. Given the poor state of electricity supply in Nigeria, Adenikinju (2005) concluded that power outages imposed significant costs on business. Small-scale operators were found to be most heavily affected by the infrastructure failures.

The high cost of electricity generation from private electricity power generators is one of the major challenges of SMEs in Nigeria (Onugu, 2005, Aremu and Adeyemi, 2011) as a result of the inadequate and erratic supply from the national grid. Most micro-businesses (barbing and hair salons, electronic repairs, business centres, welding, vulcanizing, etc) are unable to run profitably on power generating sets in a highly competitive and open economy like Nigeria because of the high costs of fuel and maintenance. Ordinarily, the power generating sets which have now become the primary source of electricity supply to industries and homes in Nigeria ought to serve as backups in the event of disruption from government sources (Okereke, 2010) but because of government inefficiency the backups are serving as the primary source. The aforementioned cost does not include costs associated with the use of private gasoline powered generators like noise and environmental pollution, risk of fire outbreak among others.

Furthermore, the relationship between energy consumption and productivity has been established. For example, Adenikinju and Alaba (2000) conducted an empirical study which evaluated the Nigerian manufacturing sector's performance with regards to the relationship between productivity, performance, and energy consumption within the manufacturing organizations. Utilizing an aggregate model, the study measured the changes in the total factor productivity of the sector relative to the change in energy consumption. The research concluded that efficiency and productivity of the Nigerian manufacturing organizations are indeed related to the energy supply and energy price. However, while the energy resources were found to play a critical role in the manufacturing sector, it was also discovered that the energy source alone cannot effectively improve the performance of the manufacturing sector in Nigeria. An important point identified in the research was that the manufacturing sector is too wedded to using old technology, and as such there is a great need for the adoption of more advanced energy-efficient technological devices and techniques. For this reason, reforms concerning the prices of energy options alone do not significantly affect the performance of the sector because it is hindered by the need for improved technology and energy supplies. Thus, the reforms in the energy sector need to happen alongside technological reforms, otherwise the manufacturing organizations cannot entirely enjoy the advantages of the energy resources.

Some studies have shown that the demand for energy leads to economic growth. Since consumption is derived from demand, whatever is consumed must have been demanded. Birol (2007) argues that demand for energy has surged and in that respect, the unrelenting increase has helped fuelled global economic growth. Yu and Choi (1985) carried out a research in the Philippines and found that there is a positive relationship between energy consumption and economic growth. They went further to define that relationship as a unidirectional one where economic growth served as the dependent variable and energy consumption was the independent variable. Asafu-Adjaye (2000) carried out a similar research on Singapore and Indonesia respectively and found out the same unidirectional causality effect of Energy consumption and Economic growth. Ukpong (1976) also established the existence of a positive relationship between electricity consumption and economic development. In addition, he submitted that the expansion of the energy sector on the demand side is an important factor in accelerating the growth of the industrial sector.

There are however other economic findings which are contrary to the Energy - GDP causality relationship. Yu and Choi (1985) carried out a verification study on the causality relationship between energy consumption and economic growth and found out that the causality ran in an opposite direction, from economic growth to energy consumption. The positive relationship between electricity and economic growth has been justified by some authors as being consistent. Many economists agree that there is a strong correlation between electricity use and economic development. Morimoto and Hope (2001) have discovered, using Pearson correlation coefficient that economic growth and energy consumption in Sri Lanka are highly correlated. Ndebbio (2006) submitted that one important indicator whether a country is industrialized or not is the megawatt of electricity consumed. He further argued that a country's consumption per capita in Kilowatt hours (*KWh*) is proportional to the state of industrialization of that country.

Breshin (2004) concluded that electricity is vital for driving growth in the energy, manufacturing and social sector. He observed that a parallel (positive) growth trend existed between electricity demand and gross domestic product (GDP). According to Simpson (1969), "it is electricity rather than steam engine, which is driving the developing industries in modern Africa". By implication, he re-emphasizes the fact that electricity drives economic growth.

Ageel and Mohammad (2001) ran a co-integration model on energy and its relationship with economic growth in Pakistan, a developing nation like Nigeria and found that increase in electricity consumption leads to economic growth. Sanchis (2007) stated that "electricity as an industry is responsible for a great deal of output". She went on to say that electricity had effects not only on factors of production but also on the impact it had on capital accumulation. Alam (2006) agrees that there is a departure from neoclassical economics which include only capital, labour and technology as factors of production to one which now includes energy as a factor of production. He went further to say that energy drives the work that converts raw materials into finished products in the manufacturing process.

Sanchis (2007) added that increase in the electricity production will avoid the paralysis of the industrial production and increased industrial production will eventually lead to increase output. Thus, this implies that electricity production should become an economic policy high-priority objective which should be urgently responded to. Energy efficiency which is also called 'efficient energy use' is not just about reducing utility bills of energy. It also involves boosting revenue through greater productivity. Energy efficiency is an indispensable component of any effort to improve electricity productivity. Ultimately, energy efficiency contributes to enhanced resource productivity and wealth creation.

According to Oviemuno (2006), energy efficiency provides another option for meeting air quality goals in that combustion volumes are reduced proportionately with fossil fuel consumption. Energy Efficiency refers to the improvement of products and practices that result in a reduction in the amount of energy necessary to provide energy services such as lighting, cooking, heating, cooling, transportation and manufacturing (Amaewhule, 2000). Although Classical economists did not recognize energy as a factor of production in the production process and neither did the neo-classicals, today, economists like Alam (2006) found out in his work on 'Economic Growth with Energy' that not only does energy serve as a factor of production on its own it also acts as a booster to growth of a nation.

3.0 Methodology

In order to examine the relationship between the power sector development and industrialization, we considered the usage of secondary data by specification of the relationship between the dependent variable and independent variables. The study employed annual time series data for Nigeria from 1981 to 2010 as deduced from the Central Bank of Nigeria Statistical Bulletin of various editions and considering the world development indicators (WDI) and annual reports from the United Nations Statistics Division.

3.1 Model Specification

The model adopted for the research is stated as: $\boldsymbol{ICGDP_t = \beta_0 + \beta_1 ELC_t + \beta_2 ELP_t + \beta_3 LFGRW_t + \beta_4 RGFCF_t + \beta_5 TLPH_t + \varrho_t}$*.......... (1)*

Where *ICGDP* denotes Industrial Component of real GDP; ELC denotes electricity consumption; ELP represents electricity production; LFGRW represents growth rate of labour Force (proxy for labour); RGFCF represents real gross fixed capital formation (proxy for capital); TLPH denotes telephone fixed lines per one hundred Populations. β_0 indicates the intercept parameter while β_1 to β_5 are the slope coefficients and ϱ_t the Stochastic error term.

A priori expectation is that a positive relationship exists between the explanatory variables and the dependent variable. In mathematical terms, we expect β_1, β 2, β 3, β 4 and $\beta_5 > 0$. That is, the respective coefficient should have a positive sign which means that as these variables increase, industrial output should increase as well.

3.2 Estimation Technique

The estimation technique used for this study is the Johansen Co-Integration technique which is employed to establish the long run relationships existing among the variables. The estimation was conducted in three stages:

The first stage is the Unit root test which follow the assumptions from empirical research that most macroeconomic variables are non – stationary and that regression analysis using the levels of these variables is spurious that may result in high error value terms hence the need to test for stationarity of the variables. The Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root test is used to test for stationarity.

The second stage is the Johansen Co-integration test that is required when all variables are ascertained to be stationary or of the unit root. Co-integration is a means for correctly testing hypothesis concerning the relationship between two variables having unit roots (integrated of at least order one). Johansen co-integration test determines whether the long-term relationship occurs in variables or not.

The final stage is error correction test which serve as the dynamic system that reconciles the static long – run equilibrium relationship of co-integrated time series with its short - run dynamics. The E-views 5 software is used to carry out the tests.

3.3 Hypotheses of the study

Two of the research hypotheses are presented in their null forms as follows:

Hypothesis One

H_{01}: there is no significant relationship between electricity consumption and industrial development in Nigeria

Hypothesis Two

H_{02}: there is no significant relationship between electricity production and industrial development in Nigeria

4.0 Data Analysis and Findings

We present the econometric estimations which include the unit root test, Johansen co-integration and Vector Error Correction Mechanism. These were performed in order to ensure that the estimated results are reliable for meaningful inferences.

4.1 Unit root test

Table 1 reveals the result of the stationary test. The Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) tests are employed in order to test the order of integration of the variables. This is necessary as it helps in determining the properties of the process that generate the time series variables used in this study. Results of this test suggest that all variables employed in this study are stationary at first difference (at 5% significance level). Therefore, evidence suggests that first differencing is sufficient for modelling the time series considered in this study and it can be inferred that the variables are integrated of order I(1) and by this, non-spurious estimations can be expected which can be predictable and relied upon for forecast.

Table 1. Unit Root Test

	Augmented Dickey Fuller		Phillip Perron	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
ICRGDP	0.2579	-1.5365	0.9660	-1.3482
ΔICRGDP	-6.5937	-6.9980	-6.6604	-15.4200
LELC	-1.8901	-3.5019	-1.8943	-3.6498
ΔLELC	-7.5366	-7.3116	-7.9260	-7.6885
LELP	-1.7285	-3.6811	-1.7918	-2.3886
ΔLELP	-3.6892	-6.3077	-6.1322	-6.3007
LFGRW	-1.7326	-1.0641	-1.6903	-0.5837
ΔLFGRW	-3.9814	-4.1175	-3.7761	-3.3469
LRGFCF	-1.6608	-3.2082	-2.7797	-3.5978
ΔLRGFCF	-4.4191	-5.2763	-4.5949	-5.2927
TLPH	-4.4675	-5.4524	-1.1779	-2.1110
ΔTLPH	-2.9299	-3.1188	-4.2836	-4.1121
Critical Value_Level	*-3.5806*	*-3.5806*	*-2.9678*	*-3.5742*
Critical Value 1st_Diff	*-2.9763*	*-3.5875*	*-2.9719*	*-3.5806*

Note: first row are variables at levels while second row are the first differences, The critical values were at 5 percent level of significance.
Source: Authors' Computation

4.2 Johansen Co-Integration

This study performed the Johansen co-integration test to establish the long run relationships existing among the variables. The result from the Johansen co-integration test was presented in Table 2. The Trace Statistics and the Maximum Eigen value as well as their Critical Values were displayed in the Table. From the Table, it can be observed that there exist at least one co-integrating relationships among the variables. This implies that long-run relationships exist among the variables. This result was evidenced with the values of the Trace statistics and Maximum Eigen value being greater than the critical values.

Table 2. Johansen Co-integration Test Results

Hypothesized No. of CE(s)	Eigen Value	Trace Statistic	Critical Value	Prob. value	Max-Eigen Statistic	Critical Value	Prob. Value
None *	0.9932	198.8270	103.8473	0.0000	124.7087	40.9568	0.0000
At most 1	0.7387	74.1183	76.9728	0.0809	33.5487	34.8059	0.0701
At most 2	0.5570	40.5697	54.0790	0.4421	20.3569	28.5881	0.3853
At most 3	0.2852	20.2128	35.1928	0.7133	8.3943	22.2996	0.9359
At most 4	0.2472	11.8185	20.2618	0.4652	7.0997	15.8921	0.6574
At most 5	0.1720	4.7188	9.1645	0.3157	4.7188	9.1645	0.3157

Log Likelihood = 397.8236

DICRGDP = 0.6726DLELC – 0.7968DLELP + 3.8494DLFGRW + 0.0506DLRGFCF – 0.6189DTL01 + 0.0090C

(0.0232) (0.0276) (1.3969) (0.0081) (0.0341) (0.0014)

Note: * Reject H_0 at 5 percent significant level as tabulated in Eviews 5.0.
The Values in Parenthesis are the standard errors.
Source: Authors' Computation

Further investigation of the normalized co-integrating equation reveals that in the long-run, electricity consumption *(ELC)*, the growth rate of labour force *(FGRW)* and real gross fixed capital formation *(RGFCF)* have a positive impact on industrial component of real GDP. From Table 2, a percentage change in electricity consumption will lead to a 0.0067 unit change in industrial component of real Gross Domestic Product and a percentage change in electricity production will lead to a 0.0079 unit change in the industrial component of real Gross Domestic Product. Also, a unit change in the growth rate of labour force will lead to a 3.85 unit change in the industrial component of real Gross Domestic Product; a percentage change in real gross fixed capital formation will lead to a 0.0001 unit change in industrial component of real Gross Domestic Product. Finally, a unit change in technology- telephone lines per hundred of the population will lead to a 0.62 unit change in the industrial component of real Gross Domestic Product. This implies that labour force growth and electricity consumption are higher influencers of industrial output in the long-run.

The study also found out that electricity production (ELP) and technology-telephone lines per 100 persons (TL01) exerts a negative impact on industrial output in the long-run. A caveat to this result is that technology was measured using telephone usage and it cannot conclusively be asserted based on the findings of this study that technology impedes industrial output in the long-run. There exists the possibility that the usage of these telephone lines for more of unproductive i.e. non- work related calls than productive activities in the long run may lead to a negative impact of telephone usage on industrial composition of Gross Domestic Product. Also, where the costs of installation and maintenance of these telephone lines become greater than the benefits obtained from their usage, this could constitute an overall negative contribution to output. Despite the observation from the table above that electricity consumption positively influences industrial output significantly; electricity production is seen to exert a negative impact on industrial output in the long run. Electricity production is highly influenced by government policies. The result of the study therefore goes to say that existing government policies are inefficient and thus exert a negative influence on industrial output in the long run. This is also very obtainable in Nigeria because a large quantity of electricity produced is still being lost in transmission and as such does not necessarily translate into electricity consumed and thus industrial output. George and Oseni (2012) also observed that the less and non-productive residential sector of Nigeria's economy attracts about four times of electricity supply than the industrial and commercial sectors in Nigeria, thus, the increase in electricity production can be expected to exert greater impact on these non-productive sectors rather than the productive sectors.

4.3 Vector Error Correction Model-VECM

After establishing the existence of the long-run relationship among the variables, this study performed a VECM to correct the disequilibrium caused in the short-run. By this method, the intent is to find out the speed of adjustment of the disequilibrium in the long-run relationship in the short-run. The VECM is reported in Table 3. From the Table, it is evident that the disequilibrium in the long-run can be corrected with speed in the short-run therefore adjusting the value of industrial output to equilibrium. The Table reveals that about 156 percent of the disequilibrium in the long-run is corrected in the short-run. From the Table, it can be emphasized that in the short-run only electricity consumption is able to generate positive impact on the extent of industrial output. This impact was significant at 1 percent and it implies that a one percent change in *ELC* will result to 0.0012 unit change in industrial output. The other variables did not exert any significant impact on industrial output in the short-run.

Table 3: Vector Error Correction Model

Error Correction	*ICRGDP*	*LELC*	*LELP*	*LFGRW*	*LRGFCF*	*TL01*
ECM(-1)	-1.5569	3.2737	2.4735	0.1913	-5.9114	-0.2067
	[-4.4049]	[1.4676]	[1.5297]	[4.2659]	[-1.0963]	[-0.1010]
ICRGDP(-1)	0.3676	0.2165	-0.4435	-0.1239	2.4234	-1.3069
	[1.4007]	[0.1308]	[-0.3694]	[-3.7218]	[0.6053]	[-0.8602]
LELC(-1)	0.1237	-0.7542	-0.1532	-0.0159	0.2350	-0.2423
	[3.0259]	[-2.9241]	[-0.8192]	[-3.0636]	[0.3770]	[-1.0242]
LELP(-1)	-0.0681	0.8367	-0.3427	0.0072	0.2596	-0.1808
	[-1.2451]	[2.4240]	[-1.3695]	[1.0409]	[0.3111]	[-0.5709]
LFGRW(-1)	-0.7188	-17.7962	-8.1338	-0.4510	3.4747	7.6817
	[-0.5477]	[-2.1485]	[-1.3546]	[-2.7084]	[0.1735]	[1.0109]
LRGFCF(-1)	0.0122	-0.0124	-0.1476	0.0045	-0.3415	0.0006
	[0.7147]	[-0.1147]	[-1.8909]	[2.0652]	[-1.3117]	[0.0064]
TL01(-1)	0.0407	0.1828	0.3688	-0.0310	0.2033	-0.6350

	[0.7900]	[0.5617]	[1.5638]	[-4.7351]	[0.2586]	[-2.1275]
C	-0.0022	0.0112	0.0034	-0.0003	0.0217	-0.0101
	[-0.49867]	[0.41070]	[0.17452]	[-0.58360]	[0.32925]	[-0.40347]
R-squared	0.6874	0.6577	0.6228	0.7254	0.2605	0.3682
Adj. R-squared	0.5658	0.5246	0.4762	0.6186	-0.0271	0.1225
F-Statistics	5.6536	4.9405	4.2462	6.7918	0.9056	1.4985

Note: The VECM was performed using Lag 1.

Source: Authors' Computation

4.4 Wald/Block Granger Causality Test

This study examines the causality test among the variables; with a focus on the variables that granger causes industrial output. From the Table, it is evident that there is a unidirectional flow between electricity consumption and industrial output. This implies that electricity consumption granger causes industrial output. The other variables did not reveal granger causality on the value of industrial output. However, taking the variables as a block, it is evident that the variables as a group significantly cause a change in the value of industrial output.

Table 4 Granger Causality Test

Dependent variable: (ICRGDP)			
Excluded	*Chi-sq*	*df*	*Prob.*
LELC	9.1562	1	0.0025
LELP	1.5503	1	0.2131
LFGRW	0.2999	1	0.5839
LRGFCF	0.5108	1	0.4748
TL01	0.6241	1	0.4295
All	11.4182	5	0.0437

Source: Authors' Computation

5.0 Conclusion and Recommendations

5.1 Conclusion

This study investigates the links between power supply and industrial development and examines the influence of government policies on power supply on industrial development in Nigeria. The dependent variable employed for the model specified in this study is Industrial Component of Real Gross Domestic Product (ICGDP) while this study uses the following explanatory variables; Electricity Consumption (ELC), Electricity Production (ELP), Growth rate of Labour Force (LFGRW), Real Gross Fixed Capital Formation (RGFCF) and Telephone Lines per hundred population (TLPH). The Johansen Co-integration technique is used to determine the long run relationship among the variables. Some robustness and sensitivity tests were carried out as well where the robustness of the empirical results was ascertained. Econometric estimations from this study suggests a positive link between power supply and industrial development in accord with theoretical expectation; an increase in electricity consumption during a given period was shown to lead to an increase in industrial output and thus the industry contribution to real Gross Domestic Product in the long run. However, contrary to theoretical expectation, electricity production which is a result of existing government policies exerts a negative impact on industrial output in the long run. The existing government policies in Nigeria which affect electricity production have been found to have a negative impact on industrial output and thus its contribution to Gross Domestic Product. This can be attributed to inefficiency of the government policies. George and Oseni (2012) also observed that the less and non-productive residential sector of Nigeria's economy attracts about four times of electricity supply than the industrial and commercial sectors in Nigeria, thus, the increase in electricity production can be expected to exert greater impact on these non- productive sectors rather than the productive sectors.

In terms of labour contribution to the Industrial Composition of Gross Domestic Product, consistent with theory, a growth in labour force was found to have a positive impact on the industrial component of real Gross Domestic Product in Nigeria. This implies that an increase in the absorption of labour into the industrial sector will record about a four times increase in its contribution to Gross Domestic Product.

With respect to Real Gross Fixed capital formation which was used as a proxy for capital, in line with the apriori, the study showed that there exists a positive link between the stock of capital and the industrial component of Real Gross Domestic Product. This entails that an increase in the stock and quality of capital through investment in human capital will go a long way to increase the output of the industrial sector and thus its contribution to the Real Gross Domestic Product. This is consistent with economic theory.

The study also showed against apriori expectation, that there exists a negative relationship between technology - no of telephone lines per hundred of the population and industrial output. This was not consistent with apriori expectation. This finding however indicates in general that the present level of technology is inefficient.

Although the coefficients of Electricity Consumption (ELC), Growth rate of Labour force and Real Gross Fixed Capital Formation (RGFCF) revealed the expected positive signs, that is, conform to apriori specification; only Growth rate of Labour Force is individually statistically significant. However, the F-statistic shows that the overall model is statistically significant and a strong basis for reliable predictive purposes. This study found out that Electricity Consumption (ELC) and Real Gross Fixed Capital Formation (RGFCF) cannot on their own effect a significant change in the industrial growth process of an economy.

5.2 Recommendations

Investment in the Nigerian power sector is recommended and an improved budget allocation backed by effective monitoring of funding of the sector is advised. Furthermore, government policies on power presently implemented in Nigeria have been found to exert a negative impact on industry output and thus its contribution to Gross Domestic Product. It is therefore essential that more power sector-friendly policies be implemented so as to encourage industrial output. Electricity distribution should give greater priority to the more productive industrial and commercial sectors than the less productive residential sector. Finally, the government should give preference to job creation within the industrial sector so as to boost industrial and therefore economic growth. The government should establish industrial parks in respective states and regions across the country where constant supply of electricity is provided as priority to safeguard and monitor industrial progress and productivity.

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