

THE RELATIONSHIP BETWEEN ELECTRICITY POWER AND UNEMPLOYMENT RATES IN NIGERIA

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ABSTRACT

The high level of unemployment and poor power supply to the industrial sector are the major problems facing the Nigerian economy. For the past two decades, successive governments in Nigeria have made futile attempts to address the issues of unemployment. Several scholarly studies have been conducted to establish relationships between unemployment and microeconomic variables without any serious attention on the relationship between unemployment and electricity power supply. The study addresses the question of the impact of electricity power on unemployment rates in Nigeria. This study using an ordinary least square regression model examined the influence of electricity power outputs, supply and consumption in addressing the high rate of unemployment in Nigeria. The study which covers the period of 1970 to 2005 discovers that power supply to the industrial sector was lower than the supply for residential consumption. The study also establishes that the major cause of unemployment in Nigeria can be traced to inadequate and unstable power supply to the industrial sector. The study advises the government and the policy makers to invest more in electricity power generation and ensures that the industrial sector is given a higher priority in the supply of electricity if the high unemployment rate is to be abated.

Keywords: *Unemployment, electricity, industrial sector, consumption, influence*

INTRODUCTION

Through gainful employment, the working class attracts wealth to themselves, their dependants and to their nation. The issue of unemployment has become a world-wide phenomenon (Ayinde, Ayinde, Memudu and Ojehomon, 2007) demanding for increased attention, though the impact is more astounding in developing economies (Wamukonya, 2003). For August, 2011, the rate of unemployment in Nigeria stands at 19.7per cent (National Bureau of Statistics, 2011), 9.1 per cent for USA (United State Department of Labour, 2011), 7.9 per cent for Britain (Office for National Statistics, 2011) and 25.7per cent for South Africa (Statistics South Africa, 2011). In fact, Feridun and Akindele (2006) identified unemployment as one of the major challenges confronting the Nigeria economy. The social impacts of unemployment are less prevalent in economies that are able to support unemployed class with subsidies and social security allowances. Carlyle (n.d.) once argue that a man willing to work and unable to find work, is perhaps the saddest sight that fortune's inequality exhibits under the sun, which could be an explanation for the high incidences of robberies, kidnappings, prostitutions and other vices among employable youths in the developing economies. In the words of Awogbenle and Iwuamadi, (2010), problems of unemployment "have become pathetic in many developing economies" especially the sub-Saharan Africa (Bello, 2003) and it is regarded as a pressing problem in Nigeria (USAID, 2008).

Several attempts have been made to curtail unemployment rate in Nigeria which include the introduction of Operation Feed the Nation programme by Obasanjo's regime in the mid 1970s, MAMSER and DFFRI programmes by the Babangida's administration in the 1980s. None of the interventions achieved significant results in curtailing the monster of unemployment in Nigeria.

Subair and Oke (2008) recognised that electricity as a source of energy is vital to the growth and development of any economy but the study did not mention any specific impact on unemployment. Nigerians are resilience and hardly give up in the face of challenges that affect their welfare and aspirations and this could explain the self-help provisions of infrastructures (electricity from privately or corporately owned generators and boreholes and wells to provide water supply) by many in spite of high costs that may not be good for competitive businesses. Erratic and inadequate power supply has been the major reason cited by many of the multinationals (Michelin,

Dunlop Plc, Volkswagen Plc, PZ, Unilever) that either closed down or wound up their operations in Nigeria which further worsened the level of unemployment (National Technical Working Group on Employment, 2009). For instance, the exit of Michelin from Nigeria costs the economy 1,300 direct jobs. Similarly, in the study of youth unemployment in Nigeria, Kakwagh and Ikwuba (2010) identified increasing population, high degree of geographical mobility, lack of employable skills, non-involvement of youth in decision making processes as major causes of youth unemployment. The study fails to recognise the level of infrastructure especially as it pertains to provision of electricity as one of the causes of unemployment in Nigeria. Manufacturing, metal, electronic repair and hair salon industries depend largely on electricity power to operate. In a more recent study of the Nigeria's power sector, Barros, Ibiwoye and Managi (2011) posit that the Nigerian economy is characterized by a large informal sector which rely heavily on electricity power to operate. This results from the failure of the national power source to provide stable and adequate power supply, hence alternative though expensive private arrangements had to be made to remain in production for those that could avoid them. Entrepreneurs who could not cope with the expensive alternatives had no other choice than to seek alternative means of livelihood. The results are rising unemployment rates. The position of Barros, Ibiwoye and Managi (2011) is logical and reflects the reality in the Nigeria but the findings were not empirically supported, this study would bridge the gaps.

The research question to be addressed therefore is what impact has the quantity of electricity generation had on unemployment in Nigeria. The objective of this study is to provide empirical evidence of the influence of electricity power generation and supply on the level of unemployment in the Nigerian economy. The study contributes to knowledge in an effort to finding enduring solutions to problems of unemployment in Nigeria and emerging economies and it would also be of significance to policymakers in the power sector who would be interested in reducing unemployment in the economy.

LITERATURE REVIEW

Unemployment and inflation are two major economic problems confronting virtually all economies (Kooros, Sussan and Semetesy, 2006). While the impact of inflation could be considered more serious on the economy, it has no direct negative socio-political effects unlike unemployment that leads to compounded social vices especially in Nigeria (Chukuezi, 2009; Amuseghan and Tayo-Olajubutu, 2009; Okafor, 2011). The issue of unemployment in Nigeria has attracted so much attention from scholars (Ayinde, Ayinde, Memudu and Ojehomon, 2007; Akpan, 2008; Ingwe, Ushie, Ojong and Okeme, 2009; Awogbenle and Iwuamadi, 2010). Many of the studies focused their efforts on finding solutions to the high unemployment rate through development of agriculture (Ayinde, Ayinde, Memudu and Ojehomon, 2007; Ingwe, Ushie, Ojong and Okeme, 2009), entrepreneurial development among the youth (Awogbenle and Iwuamadi, 2010) and development of the informal sector.

Some scholars have argued that unemployment and power supply for industrial development are two common challenges confronting most economies. For instance, Ayodele (2001) argues that the development of Nigerian economy as an emerging market is technically a function of adequate provision and supply of electricity power. Similarly, Okafor (2008) argues that poor power generation represents a major setback for the Nigeria's industrial development. Asaolu and Oladele (2006) argue that infrastructural decay is the major problem confronting Nigeria and that electricity generation is one of the instances of the infrastructural decay in Nigeria. In the same vein, Rabi (2009) posits that 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. The study did not support its argument empirically, the gap which this study would address.

In the study of the effect of rural electrification on unemployment in South Africa, Dinkelma (2008) discovers that electrification reduces unemployment among the rural dwellers especially among women who engaged in home made goods and services. In Pakistan, Khan and Khan (2010) discovered that power shut down to textile industries worsened unemployment while earlier study by Aqeel and Butt (2001) argued that a proper energy (electricity and gas) growth consumption policy in Pakistan would stimulate economic growth resulting in expanded employment opportunities in the country.

Statistics have shown that small and medium-sized enterprises (SMEs) including macro-businesses are the highest employers of labour in Nigeria (Barros, Ibiwoye and Managi, 2011). One of the major challenges of SMEs in Nigeria is the high cost of electricity generation from private electricity power generators (Onugu, 2005, Aremu and Adeyemi, 2011) as a result of the inadequate and erratic supply from the Government source. The SMEs and macro-businesses (barbing and hair salons, electronic repairs, business centres, welding,

vulcanizing, etc) cannot 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 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.

CONCEPTUAL FRAMEWORK

The conceptual framework for this study provides a frame of reference for the integration of the statement of problem and objectives of the study. The conceptual framework depicted in Figure (1) below provides linkages between electricity power generation and consumption, and the employment market in addressing issues of unemployment in Nigeria.

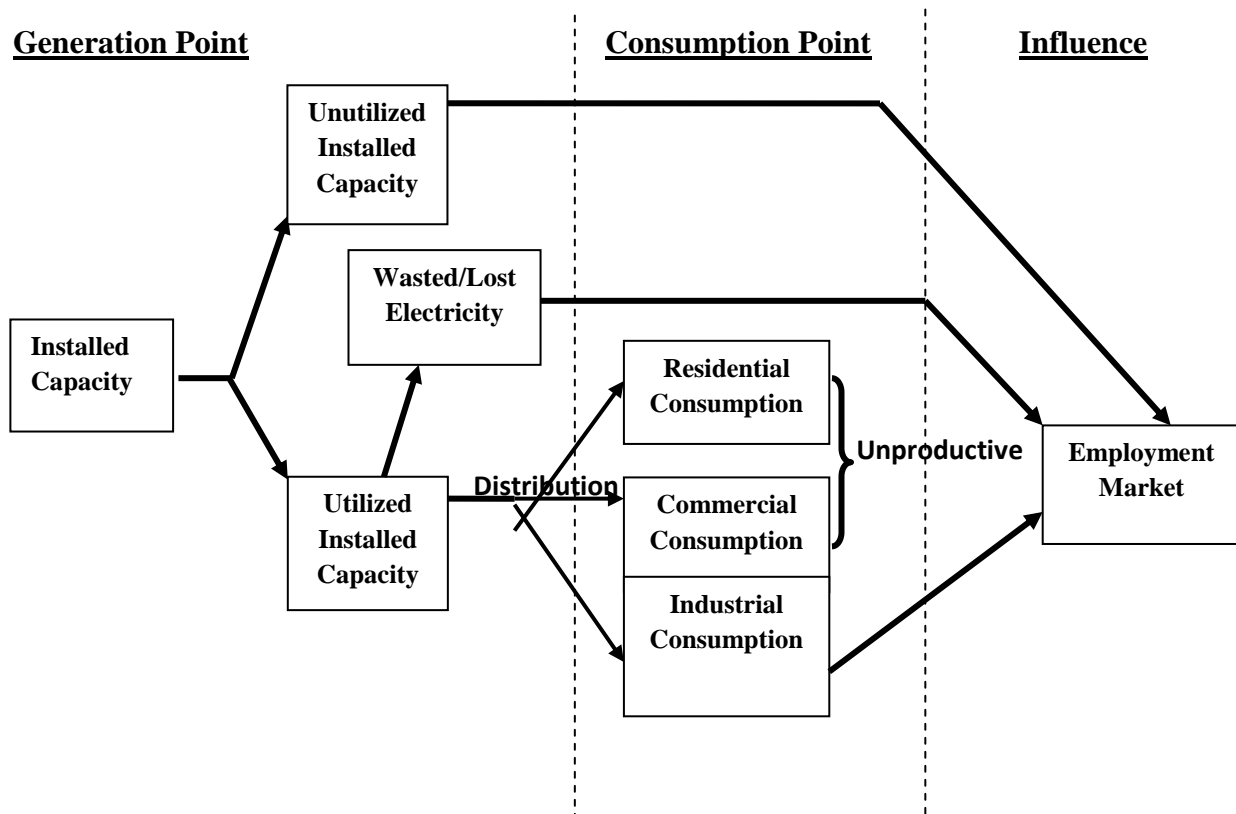


Figure 1: A Conceptual Framework of the influence of Electricity Power Generation and Consumption on Employment market in Nigeria.

Source: These Authors

Power consumption by residential (households) and commercials are excluded from the analysis of the effects of power consumption on the employment market on the assumption that the industrial sector drives employment generation and other economic indices of growing economies of the industrialized world.

RESEARCH METHODOLOGY

The main objective of this study is to provide an empirical explanation of the impact of electricity power supply on unemployment level in Nigeria. Specifically, the study examines how the matrix of the quantity of power outputs made available for industrial (ELIND), commercial (ELCOM) and residential (ELRES) usage as well as the wastage (ELWAS) in transmission and distribution and ungenerated electricity capacity (ELUNG) impact on unemployment level (UNRATE) in Nigeria. The study uses the time series data. We observed that output consumption falls into three categories, namely: industrial, commercial and street lighting and, residential. We derived from the available data the *output wastage* representing the difference between total outputs generated and total consumption by the three categories (industrial, commercial and street lighting and, residential). Lastly, we derived *ungenerated outputs* which represent the difference between installed capacity and the actual output generated.

We obtained the data for electricity generation outputs and consumption measured in *mega watts per hour* from the Central Bank of Nigeria Annual Statistical Bulletin (2009) and unemployment rate from the Nigeria's National Bureau of Statistics, Abuja. The data used in this study covers 1970 to 2005.

For data analysis, this study uses ordinary least square (OLS) regression model to examine the impact of electricity consumption (industrial, commercial and street lighting and, residential), wasted outputs and ungenerated capacity on the unemployment rate. The OLS model tested is as follows:

$$UNRATE_t = \sum \alpha_{t-1} UNRATE_{t-1} + \sum \beta_{t-1} ELCON_{t-1} + \sum \gamma_{t-1} ELWAS_{t-1} + \sum \psi_{t-1} ELUNG_{t-1} + \epsilon_i. \quad (1)$$

Where:

$UNRATE_t$ represents the dependent variable (unemployment rate)

$ELCON$ represents electricity consumption

$ELWAS$ represents the wasted output

$ELUNG$ represents the ungenerated capacity

α, β, γ and ψ are the constants

Replacing $\sum \beta_{t-1} ELCON_{t-1}$ in equation (1) above with industrial electricity power consumption

$$UNRATE_t = \sum \alpha_{t-1} UNRATE_{t-1} + \sum \beta_{et-1} ELIND_{et-1} + \sum \gamma_{t-1} ELWAS_{t-1} + \sum \psi_{t-1} ELUNG_{t-1} + \epsilon_i. \quad (2)$$

Where $ELIND_e$, represents industrial electricity power consumption and β_e is the constant.

Hypothesis Testing

One hypothesis is tested as follows:

H_0 : Electricity power generation and industrial consumption do not exert significant influence on unemployment rate in Nigeria

H_a : Electricity power generation and industrial consumption exert significant influence on unemployment rate in Nigeria

We used OLS regression model defined below to test the hypothesis

$$UNRATE_t = \beta_{e1} ELIND_{et-1} + \beta_{e2} ELIND_{et-2} + \dots + \beta_{e25} ELIND_{et-25} + \gamma_1 ELWAS_{t-1} + \gamma_2 ELWAS_{t-2} + \dots + \gamma_{25} ELWAS_{t-25} + \psi_1 ELUNG_{t-1} + \psi_2 ELUNG_{t-2} + \dots + \psi_{25} ELUNG_{t-25} + \epsilon_i. \quad (3)$$

The *a priori* expectation is that the industrial power consumption ($ELIND$) being a segment of power consumption where employments are generated is expected to be inversely related to the unemployment rates. It is expected that increase in power consumption in the segment would lead to increasing employment generation and decreasing unemployment rates, *ceteris paribus*.

Similarly, $ELWAS$ and $ELUNG$, representing portions of electricity wasted between the point of generation and consumption, and the portion of electricity ungenerated from the available output capacity are expected to be positively related (reacting in the same direction) to unemployment rates. Increase in the quantities of $ELWAS$ and $ELUNG$ would increase $UNRATE$, vice versa. It is also expected that $ELIND$, $ELWAS$ and $ELUNG$ would have significant influence on employment generation.

The null hypothesis (H_0) would be rejected if $P\text{-value} > 0.05$ at 95 per cent level of significance and $F\text{-stat}$ computed is greater than $F\text{-stat}_{(tab)} 2.000$. We therefore, expect to reject the hypothesis that electricity power generation and consumption do not impact significantly on unemployment rate in Nigeria.

RESULTS AND DISCUSSIONS

A strong multicollinearity was observed between commercial and residential power consumptions (ELCOM and ELRES) and ELWAS and ELUNG. The highest correlation of 0.966 was observed between ELCOM and ELRES which could have resulted from the lack of demarcation between commercial and residential areas in the Nigerian communities. Many buildings and apartments serve both commercial and residential purposes especially in the urban areas. The two independent variables ELCOM and ELRES were therefore dropped from only the *statistical analysis* of the model but retained for *descriptive analysis*.

DESCRIPTIVE STATISTICS

In Table 1 (Appendix), we present the descriptive statistics of the various variables used to test the impact of electricity power generation and consumption on unemployment rate in Nigeria. We discovered that the average unemployment rate in Nigeria is 6.56 *per cent*, while the minimum and maximum unemployment rates were 1.9 *per cent* and 18.1 *per cent* respectively.

On the average electricity power consumption made available for residential consumption was higher than the total made available for the productive sector (industrial and commercial). This observation was further buttressed with the maximum consumption of residential been 1,194.30 *megawatt /hour* in contrast with a total of 894.60 *megawatt per hour* for both industrial and commercial consumption respectively. This implies that out of the total electricity power consumed, 57.17 *per cent* was consumed by the non-economic productive users (residential). Out of an average of 2,088.9 *megawatt per hour* consumed, only 398 *megawatt per hour* representing 19.05 *per cent* was consumed for industrial production.

An average of 578.98 *megawatt per hour* of the electricity power generated was lost in transmission (ELWAS), the least *megawatt per hour* lost in transmission was 5.10 while the maximum lost was 4,660.50 *megawatt per hour*. Lastly, we observed that an average of 2,217.25 *megawatt per hour* and a maximum of 4,490.10 of the installed capacity was left ungenerated except in 2003 when the full capacity of 6180 *megawatt per hour* was fully generated.

In Figure II (see Appendix), a steady growth was observed in the power consumption for residential (ELRES) and commercial (ELCOM) purposes between 1988 and 2005. In the same period, the power consumption for industrial (ELIND) purposes did not witness noticeable improvement rather a significant decline was observed between 2001 and 2003. The ELWAS witnessed stability between 1970 and 1973 but with effect from 1982 it leaped into a steady increase with occasional declines between 1992 and 1993, 1997 and 1998, and 1999 and 2001 until 2003 when an unprecedented rise in the unemployment rate occurred. A near-similar pattern was observed in the behaviour of both the ELWAS and ELUNG except that a sharp increase occurred much earlier in ELUNG than in ELWAS and while no redundancy was witnessed only once (2003) in the former the latter witnessed no redundancy in 1974 and 1978.

ANALYTICAL STATISTICS

Between the period of 1970 and 2005, the industrial electricity consumption (ELIND) was found in agreement to a *priori expectation* to be inversely and insignificantly correlated to the unemployment rate at coefficient of -0.0138 and $t\text{-test}_{cal}$ of -1.1901 ($t\text{-test}_{tab} = 2.037$), between 1970 and 1985 the coefficient was negative (0.0035) and insignificant at $t\text{-test}_{cal}$ of -1.2058 ($t\text{-test}_{tab} = 2.179$). In a departure from observed relationship between ELIND and UNRATE between 1970 and 2005 and 1970 and 1985, a positive relationship was established between the independent and dependent variables though the influence of ELIND on UNRATE was found to be insignificant at $t\text{-test}_{cal}$ of 1.7791 ($t\text{-test}_{tab} = 2.120$).

The observed inverse relationship between ELIND (industrial electricity power consumption) and UNRATE (unemployment rate) implies that as power supply to the industrial sector increases, the production capacity increases leading to increasing employment generation and decreasing unemployment rate though the impacts were not significant to arouse a major change in the unemployment rate. As earlier observed, there was no major significant change in the electricity power consumption by the industrial sector except in 2004 when about 100% increase in industrial consumption was observed. The increase fizzled away in 2005 when over 100% decrease was observed in electricity consumption by the industrial sector.

The positive relationship between ELIND and UNRATE contrary to expectation was because of the inadequate power supply to the industrial sector and the high costs of generating alternative power supply. The industrial sector that is charged with employment generation had an average of 19.05 *per cent* of the electricity power for its consumption while the bulk (80.95) was consumed by the non-industrial (largely non-productive sector) who

find it easier to operate with alternative power supply than the industrial sector. Many of the manufacturing companies abandoned production for commercial activities by either importing similar products for repackaging in Nigeria. Some others relocated their production lines to other countries where power supplies were considered stable and cheaper. The resultant effects were that production staff, suppliers of production inputs and support services became redundant thereby making electricity power consumption by the industrial sector not achieving the expected reduction in unemployment rates. Ordinarily, UNRATE declines as ELIND increases.

Expectedly, the coefficients of ELWAS and ELUNG representing wasted electricity power between the point of generation and distribution and the ungenerated electricity power respectively were found to be positively and significantly related to UNRATE between 1970 and 2005. The two independent variables are unproductive in their states and the higher they are, the higher the effects on unemployment rates.

We observed that ELWAS was negatively (coefficient of -0.0004) but insignificantly ($t\text{-test}_{cal} = -0.2474$, $t\text{-test}_{tab} = 2.179$) related to UNRATE between 1970 and 1985 while ELUNG was also negatively but significantly related to UNRATE between the same period. We cannot find any explanation for the inverse relationship observed between the two independent variables and UNRATE except that the total of the quantity of electricity power wasted and ungenerated crowded out the effects of those engaged by the industrial sector. In effect, between 1970 and 1985 the independent variables (ELWAS and ELUNG) and dependent variable (UNRATE) move in opposite direction, i.e. decreased ELWAS and/ or ELUNG caused increased UNRATE. Electricity power supply to the industrial sector was stable during the period of 1970 to 1985 than the post periods. Also, during the period of 1970 to 1985, reliable alternative power generation (coal) for production and manufacturing activities existed that made the effects of inadequate and unstable power supply resulting from wasted energy from national grid on unemployment rate insignificant. Also, many of the production activities post 1970 – 1985 era such as printing activities that require electricity inputs were manually or mechanically done in the 1970 – 1985 period. The Nigerian economy was vibrant during this period (1970 -1985) as a US dollar exchanged for less than NGN1 of Nigeria currency and a greater percentage of working class of the populace resided in the rural areas engaging in farming, the era in which the national governments gave greater attention to growing of cocoa and rubber plantations in the South and groundnut pyramid in the North.

As expected, both ELWAS and ELUNG were found to be positively and significantly related to UNRATE between 1986 and 2005 the period that witnessed unprecedented down trend of the Nigerian economy. The levels of significance of ELWAS and ELUNG between 1986 and 2005 were higher than the earlier periods, which suggests, increasing dependence on electricity power for production activities. The Nigerian industrial sector has become sophisticated compared with the earlier era of 1970 to 1985. Most industrial production activities are automated requiring stable and adequate power supply to function and the absence of which would declare the plants and the production staff redundant. The significant impact of ELWAS and ELUNG on employment rate as observed was indeed not unexpected.

ADJUSTED R-Square

With the exception of the period of 1970 – 2005, when the adjusted R-square was 0.3030 and $F\text{-test}_{cal}$ was 6.0729 ($F\text{-test}_{tab} = 2.90$), implying that 30.30% of the unemployment in Nigeria (UNRATE) was caused by the electricity power generation and supply, the adjusted R-square for periods of 1970 – 1985 and 1986 – 2005 were much higher. The adjusted R-square of 0.3030 is very low and this also suggests that there are some other important causes of unemployment in Nigeria between 1970 and 2005 that are not related to power supply and generation as the supply of power was even found to be stable during this period.

For the period of 1970 – 1985, the adjusted R-square of 0.7336 and $F\text{-test}_{cal}$ 14.7667 ($F\text{-test}_{tab} = 3.49$) were observed. This suggests that 73.36 per cent of unemployment rate in Nigeria between the period of 1970 and 1985 was caused by poor and inadequate power supply and generation to the industrial sector. For the period of 1986 to 2005, the observed adjusted R-square and $F\text{-test}_{cal}$ were 0.7897 and 24.7777 ($F\text{-test}_{tab} = 3.24$) respectively. The observed adjusted R-square of 0.7897 indicates that 78.97 per cent of the unemployment rate in Nigeria between 1986 and 2005 can be attributed to poor and inadequate power supply and generation to the industrial sector.

The adjusted R-squares were above 0.70 with the exception of the period of 1970 - 2005 when the adjusted R-square was 0.3030. Also, the computed $F\text{-test}_{cal}$ were greater than the $F\text{-test}_{tab}$ in all the three scenarios. The *p-values* were also found to be less than 0.05. All the observed statistics have therefore shown that the hypothesis that electricity power generation and consumption do not impact significantly on unemployment rate in Nigeria be rejected.

CONCLUSION

The structure of unemployment in Nigeria is dynamic and changing with respect to circumstances of the environment but electricity power remains a major driver of industrial activities in any upward looking economy. In Nigeria, electricity power generation and supply remain a big challenge especially where installed capacities are yet to be fully utilized in the midst of wastages between points of generation and distribution.

The industrial sector is a core sector for the generation of national wealth and employments. It is therefore absurd that less and non-productive sectors of the economy would attract about four times of electricity supply than the industrial sector in an economy that is aspiring to be listed among the 20 most industrialized economies in the world by year 2020. In the same vein, it is difficult to understand that while the installed capacity of electricity generation and the high level of wastages would remain unabated, the industrial sector kept searching for alternative though expensive but stable and adequate electricity power supply or relocate production lines to other favourable economies.

Power supply is a critical production inputs that could be used to address unemployment in an emerging economy like Nigeria where market opportunities exist to absolve locally produced goods. The government and policy makers are therefore advised to give adequate attention to improving power generation and supply especially to the industrial sector. The installed capacity should be fully utilized while measures should be put in place to minimise the persistent high incidents of wastages between the points of power generation and distribution. The government should also ensure that the industrial sector enjoys higher proportion of the power supply compared with the totality of the other sectors especially the non-productive (leisure) sector of the economy to reduce drastically the unemployment rate in the country.

APPENDIX

Table I: Results of Descriptive Statistical Analysis

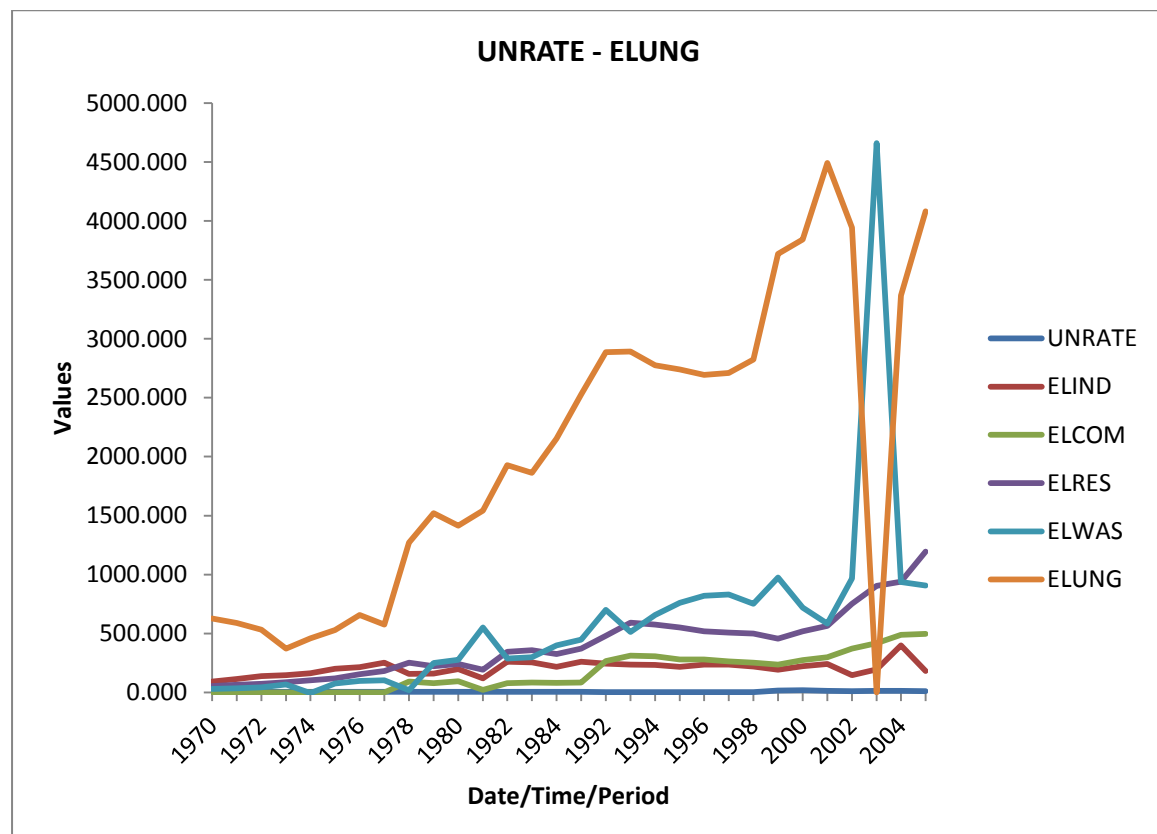
ColumnName	UNRATE	ELIND	ELCOM	ELRES	ELWAS	ELUNG
Mean	6.56	215.75	170.18	417.55	578.98	2,217.25
Median	4.80	221.35	106.35	452.95	481.40	2,701.60
Standard Dev	4.20	58.91	145.42	255.16	753.48	1,232.32
Minimum	1.90	91.40	0.00	53.90	-5.10	0.00
Maximum	18.10	398.00	496.60	1,194.30	4,660.50	4,490.10

Table II: Results of Multicollinearity between the dependent and independent variables

	UNRATE	ELIND	ELCOM	ELRES	ELWAS	ELUNG
UNRATE	1					
ELIND	0.150323	1				
ELCOM	0.502504	0.462599	1			
ELRES	0.520924	0.470465	0.966154	1		
ELWAS	0.473174	0.143403	0.604901	0.62343	1	
ELUNG	0.462212	0.426406	0.729891	0.682812	0.070909	1

Table III: Results of Model Analysis of Power Outputs and Consumptions on Unemployment Rates in Nigeria

Variables	1970 - 2005		1970 – 1985		1986 - 2005	
	Co-eff.	t- test	Co-eff.	t- test	Co-eff.	t- test
Constant	4.710	2.0814	4.2716	9.1799	-30.3028	-5.3576
ELIND	-0.0138	-1.1901	-0.0035	-1.2058	0.0216	1.7791
ELWAS	0.0026	3.2265	-0.0004	-0.2474	0.0087	8.2200
ELUNG	0.0015	2.7369	-0.0015	3.7587	0.0081	7.8029
R.Sq	0.3628		0.7869		0.8229	
Adj. Rsq	0.3030		0.7336		0.7897	
S.E	3.559		0.5218		2.5185	
F. Test	6.0729		14.7667		24.7777	
Observation	36		16		20	
t-test_{tab} @ 0.05 level of sign (2-tail test)						
Durbin Watson	0.6446		0.5452		1.3713	

Figure II: Trends of the Electricity Power Consumptions, Outputs and Capacity in relation to Unemployment rate in Nigeria

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