The Impact of Electricity on the Growth of Small and Medium Enterprises (SMEs) in Nigeria

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Abstract: *The study undertakes an empirical research to analyze the effects of electricity on the growth of SMEs in Nigeria between 1990 and 2013. Ordinary Least Square (OLS) multiple regression method was adopted to examine these effects. Unit root test and co integration was carried out on the variables. The study found that erratic power supply or fluctuations in electricity supply led to decline in SMEs growth. There were poor execution of the independent power projects (IPP) by Government and increased generator usage by the SMEs. Electricity supply and electricity consumption were also found to be statistically insignificant at ensuring effective SMEs growth. Amongst the recommendations were that Government should increase investment in power infrastructures and improve on the implementation of power distribution privatization.*

Keywords: *Electricity Supply, Electricity Consumption, Power Investment, Small and Medium scale Enterprises Growth*

1.0 Introduction

The worldview of Small and Medium Scale Enterprises (SMEs) as an index of technological backwardness or as a sign of industrial backwardness is changing tremendously with time *(Udechukwu, 2003).* Indeed, in many developed and developing nations of the world, SMEs are now appreciated as necessary complements to the industrial structure of any modern economy. One of the reasons for the attention on SMEs borders on the perceived wisdom that they could leapfrog the industrial development process. Many developing countries have recorded success from the use of SMEs in the past two or three decades. In many countries, the dynamic role of SMEs as engine through which the growth and development objectives of developing countries including Nigeria can be achieved has long been recognized as observed in the works of Gibb and Richie (2002); Kayanula and Quatrtey (2005); and Egelen and Stail (1997) cited in Adaramola (2012). It is estimated that SMEs employ 22 percent of the adult population in a developing country like Nigeria (Adaramola (2012). In view of the importance and place of SMEs in an economy, it is imperative that they should be given all the needed priority they deserve.

However, the contribution of SMEs to the Nigerian economy is still very small and negligible when compared with countries such as the Asian tigers (Owualah, 1987 cited in Adaramola, 2012). The SMEs in Nigeria still face a lot of problems ranging from electricity supply to financing that threaten their survival. The government has made a lot of efforts to ensure that the SMEs are given a helping hand to leap- frog their growth so as to complement the modern day industrial structure like other developing nations of the world. Over the years, there have been serious divergent opinions as to what should be an appropriate policy to develop the Nigerian SMEs. In recent times, the government merged the Nigerian Industrial Development Bank (NIDB), Nigerian Bank for Commerce and Industry (NBCI) and Nigerian Economic Reconstruction Fund (NERFUND) to form the Bank of Industry (BOI); all in the effort to assist SMEs in Nigeria. The government also established the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) as a coordinating and regulatory agency for the SMEs. The government again went ahead to establish the National Guarantee Scheme for SMEs collateral so as to reduce the risk of financing Adaramola (2012). In 2001, the Small and Medium Enterprises Industry Scheme (SMEs) was set up by the Bankers Committee which was a response to government demand that banks device ways of funding SMEs in Nigeria. Now government has converted all the Community Banks in the country into Micro Finance Banks and strengthened their capital base so as to be able to lend helping hands to the development of SMEs.

In 2012, the federal Government approved the sum of N200 billion for operation of the Small and Medium Enterprises Credit Guarantee Scheme (SMECGS) fund. To be operational, the eligibility conditions for

applying institutions were formulated by the Central Bank of Nigeria (CBN) together with relevant agencies of government Uko, (2012). While the SMECGS and the Micro finance Development Fund (MDF), which are required to support micro, small and medium enterprise, were established simultaneously, interested SMEs may only benefit from these funds if they are viable and satisfy the expected eligibility conditions.

In spite of these development policies, the result from this sector of the economy has not been encouraging. Some scholars are of the view that efforts of the Nigerian Government are unidirectional. Apart from financial support, little is being done by government about other environmental supports such as infrastructure and technology. No doubt that in Nigeria and indeed as in many other developing countries, poverty level is still very high. Some scholars have maintained that high rate of poverty can be linked to the investment environments which have not been friendly to the survival and development of SMEs.

One major problem that hinders the development of small scale businesses in Nigeria is the lack of stable electricity. Electricity is a necessary requirement for businesses ranging from the design, manufacturing, to the preservation and distribution of goods and services. According to Ayodele (2004), aside from serving as a pillar of wealth creation in Nigeria, electricity is the nucleus of operations and subsequently the engine of growth for all sectors of the economy. Statistics have shown that, Nigeria has all the available natural resources to provide adequate electricity supply to its domestic demands and even export some.

1.1 Objectives of the Study

1. The objectives of this study are to:
2. Examine whether the supply of electricity, government expenditures on electricity and consumption of electricity impact positively on SMEs growth in Nigeria.
3. Analyze whether the impacts of electricity supply, government expenditures on electricity and consumption of electricity on SMEs in Nigeria are significant
4. Determine whether supply of electricity, government expenditures on electricity and consumption of electricity can sustain Nigeria's SMEs growth in the long run.

1.2 Statement of Hypotheses (Null)

H1: *the supply of electricity, government expenditures on electricity and consumption of electricity do not impact positively on the growth of SMEs in Nigeria.*

H2: *the supply of electricity, government expenditures on electricity and consumption of electricity do not have a significant influence on SMEs growth in Nigeria?*

H3: *the supply of electricity, government expenditures on electricity and consumption of electricity cannot sustain Nigeria's SMEs growth in the long-run.*

2.0 Review of Literature

2.1 Concept of SMEs in Nigeria

Small and Medium Scale Enterprises (SMEs) development process continues to be in the forefront of policy debates in developing countries. Small and medium scale enterprises have been generally acknowledged as the bedrock of the industrial development of Nigeria and other countries (Audretsch, Verheul, Wennekers & Thurik, 2002; Stokes & Wilson, 2006 and Hulbert, Gilmore & Carson, 2013). The dynamic role of SMEs in developing countries as engines through which the growth and development objectives can be achieved has long been recognized and stated in the literature. The claimed advantages for SMEs are numerous, including the encouragement of entrepreneurship (Ayesha, 2007; Ayozie & Latinwo, 2010; Safiriyu & Njogo, (2012); the greater likelihood that SMEs will utilize labour intensive technologies Salami, 2003; Muritala et al, (2012) and thus have an immediate impact on employment generation Henriques & Klock, (1999); Udechukwu, (2003); Adenuga and Ochu (2004); Ayozie & Latinwo (2010); Ariyo, (2008); they can usually be established more rapidly and put into operation to

produce quick returns; SMEs development can encourage the process of both inter– and intra–regional decentralization Adenuga and Ochu (2004); and, they may well become a countervailing force against the economic power of larger enterprises Salami, (2003). More generally the development of SMEs is seen as accelerating the achievement of wider economic and socio-economic objectives, including poverty alleviation Udechukwu, (2003); Ayozie & Latinwo, (2010). But in Nigeria, the sub-sector is still faced with a number of constraints with inadequate financial facilities being one of the principal constraints.

According to the United Nations Industrial Development Organization UNIDO (2001), for developing countries, integration into the global economy through economic liberalization, deregulation, and democratization is seen as the paramount way to triumph over poverty and inequality. The importance of this process is the development of a vibrant private sector, in which small and medium enterprises can play a central role. Small and Medium Scale Enterprises occupy a place of pride in virtually every country or state. Because of the significant roles SMEs play in the growth and development of various economies, SMEs have aptly been referred to as "the engine of growth" and "catalysts for socio-economic transformation of any country". The small scale business sector is recognized as an integral component of economic development and a crucial element in the effort to lift countries out of poverty (Wolfenson, 2001). Small scale businesses are driving force for economic growth, job creation, and poverty reduction in developing countries .They have been the means through which accelerated economic growth and rapid industrialization have been achieved (Sauser, 2005; Harris & Gibson, 2006). Fabayo(2009) says SMEs have been recognized as a feeder service to large-scale industries. SMEs represent a veritable vehicle for the achievement of national economic objectives of employment generation and poverty reduction at low investment cost as well as the development of entrepreneurial capabilities including indigenous technology. Other intrinsic benefits of vibrant SMEs include access to the infrastructural facilities occasioned by the existence of such SMEs in their surroundings, the stimulation of economic activities such as suppliers of various items and distributive trades for items produced and or needed by the SMEs. Another benefit is the enhancement of standard of living of the employees of SMEs and their dependants stemming from rural urban migration. Small and medium scale enterprises (SMEs) have been recognized as indispensable components of national development in both developed and developing economies.

Obitayo, (2001) stated that SMEs are noted for their immense contributions to the development processes and as the engine of growth. They are promoted as a critical segment of the manufacturing sub-sector as an effective strategy for tackling unemployment, diversifying output and achieving trade and balance of payment. He further opined that successive Nigerian Governments had recognized the strategic importance of SMEs since independence. Udechukwu, (2003) argued that a major gap in Nigeria's industrial development process has been the absence of a strong and virile small and medium enterprises sub-sector. The growing concern about unemployment among the youth especially graduates of tertiary institutions and diminishing growth potentials in the economy have further drawn increased attention to the need to ensure the survival and growth of SMEs. Small scale businesses in Nigeria constitute over 80 percent of all registered companies, occupying positions in agro based and allied industries, rubber -based, leather shoes industries, chemical, electronics, and general merchandising.

2.2 Electricity Demand in Nigeria

Development of the electricity sector has a key role to play in Nigeria's economic-development process. It has the capacity to serve either as a catalyst or a fetter on the wheels of economic development. A careful study of the pattern of electricity consumption vis-à-vis economic growth across different countries shows an oscillation around an initial cluster characterized by low energy consumption, economic stagnation and poor energy infrastructure. By way of comparison South Africa has 40,000mw for a population of 50million people; Brazil has 100,000mw for a population of 192 million people; USA has 700,000mw for a population of 308 million while Nigeria with a population of over 150 million people only generates 2443mw at peak periods (Ibitoye & Adenikinju, 2007). This translates to very disappointing levels of electricity consumption per capital, thereby leaving our industries to perform at epileptic levels, goods and services to be sold at prices that automatically adjust due to power outages, to account for the expensive cost of production via generating sets and a populace that is unable to take advantage of the latest advances in technology and appliances (Darling et. al. 2008).

For over twenty years prior to 1999, the power sector did not witness substantial investment in infrastructural development. During that period, new plants were not constructed and the existing ones were not properly maintained, bringing the power sector to a deplorable state. In 2001, generation went down from the installed capacity of about 5,600MW to an average of about 1,750MW, as compared to a load demand of 6,000MW. Also, only nineteen out of the seventy nine installed generating units were in operation (Sambo, 2008). As a result of this, less than 45% of the Nigerian population had access to electric power in 2003.

As at 2008 electricity generation ranged from 2500MW to 3500MW out of an installed capacity of 5963MW even with the inclusion of 3 gas powered independent power projects in the Niger delta region (Bolaji, 2008). As at September 2009, Nigeria's power demand was estimated at 15,000mw but peak generation by PHCN was 2,443mw which was less than 17% of the electricity need (Nasir, 2009). In 2010 the power holding company of Nigeria could only supply 4,320mw of electricity while demand was 10,500mw, leaving an excess demand of 6180mw (Odiaka, 2006). Demand for electricity has grown at a rate of 8.2% per annum since 1984 against GDP growth of about 3.5% and per-capita generation relative to other countries is extremely low (Garba, 2002). It was estimated that an additional 10,000MW in capacity is required to meet the current demand. The country has not been able to meet the current demand for electricity because the nation's electricity demand continues to grow in response to increasing population, urbanization, improved standard of living and economic development (Sambo, 2008). There is no doubt that expensive and unreliable power remains a major concern to Nigeria's industrial sector and household consumers. Multiple and unpredictable power cuts which have become a daily occurrence in Nigeria often result in equipment malfunctioning of all the sectors of the economy and make it difficult to produce goods and provide services efficiently. Despite the attempts by some firms to supplement power supply by PHCN, electricity demand by consumers, particularly domestic users, has continued to increase.

2.3 Empirical Studies on Electricity Supply and its Impact on SMEs Growth

Power supply is the most important commodity for national development. With electricity energy the SMEs are empowered to create employment in the large –scale and manufacturing complexes. Various researches have been done in the area of examining how electricity supply influences small business operations in an economy. Hossain (2012) in his work empirically examined the dynamic causal relationship between SMEs growth, electricity consumption, export values and remittance for the panel of three South Asian Association for Regional Cooperation (SAARC) countries i.e. Bangladesh, India and Pakistan using the time series data for the period 1976- 2009. Using four different panel unit root tests, adopting the Johansen Fisher panel co-integration and Kao tests, Husain's (2012) study interestingly found that all the panel variables are co integrated. The panel Granger F test results support the fact that there is only a bidirectional short-run causal relationship between economic growth and export values but there is no evidence of long-run causal relationship. It was found that the long-run elasticity of economic growth with respect to electricity consumption and remittance are higher than short run elasticity. Thus, this means that over time higher electricity consumption and higher remittance from manpower supply in the panel of SAARC countries give rise to more economic growth.

The empirical evidence showed that there was a long-run relationship between electricity consumption/supply per capita and SMEs growth for only 9 countries (Benin, Cameroon, Morocco, Zambia, Congo Republic, Gabon, Nigeria, South Africa and Zimbabwe) and Granger causality for only 12 countries. For 6 countries (Cameroon, Ghana, Nigeria, Senegal, Zambia and Zimbabwe) there was a positive uni-directional causality running from real GDP per capita to electricity consumption per capita; an opposite causality for 3 countries (Benin, the Democratic Republic of Congo and Tunisia)and bi-directional causality for the remaining 3 countries (Egypt, Gabon and Morocco). What the evidence may suggest is that there may be a number of factors at work that differ significantly across countries that account for the different directions of causality detected in this study. Detecting some of these factors might help in understanding and defining the relationship between electricity consumption and economic growth. The result is subject to varied interpretation as to determining if there is a strong relationship between the variables, especially as electricity consumption accounts for less than 4% of total energy consumption in Africa and only grid-supplied electricity was taken into consideration.

Aliero and Ibrahim (2012) investigated the causal relationship between power sector and SMEs growth in Nigeria using time series data of energy consumption; including coal, petroleum, gas and electricity from the period 1970-2009. Employing the Augmented Dickey Fuller unit root tests and Johansen co integration tests, the study revealed that petroleum, coal and electricity consumption lead to SMEs growth, but without feedback. These studies imply that electricity supply acts as an engine of SMEs growth for various countries, including Nigeria. Thus, it is very important that this sector be given more relevance as a step towards harnessing the inherent potentials as much as possible to encourage economic growth and development.

Some researchers concentrate on the impact of electricity on the growth of the economy as a whole (Hossain, 2012). Those that consider the impact of electricity on SMEs dwell on the consumption (Alieru and Ibrahim, 2012). Others examine the impact of the entire business environment, electricity being a key variable, and the performance of the manufacturing sector (Iarrossi and Clarke, 2011). None of the studies combined the impact of Government expenditure, electricity supply and electricity consumption on the growth of SMEs in Nigeria. This study addresses this gap.

2.4 Theoretical Framework

The following are the various theories that link the development of infrastructure i.e. electricity to the performance of SMEs and the economy at large. The subsequent analysis of empirical data is to show the practical import of the theories and also possibly build on them.

2.4.1 The Big Push Theory

The "big push" theory deals with the large comprehensive program needed in the form of high minimum amount of investment to overcome the obstacles to development in an underdeveloped economy and to launch economic development. Rosenstein-Rodan (1943) who propounded this theory linked about three (3) indivisibilities which are pre-requisite for lunching economic development successfully. Among them is the indivisibility in the production function. He added that indivisibilities of input, output will lead to increasing returns. He regards social overhead capital as the most important instance of indivisibility. The services of social overhead capital comprises of infrastructure such as electricity supply, water supply, road network among others. These services are directly productive and have long gestation period.

2.4.2 The Gerschenksron's Great Spurt Theory

Gerschenkron (1962) theory states that the great spurt industrialization could take place if 5 pre- requisites are fulfilled. Among which he emphasized that there should be provision for material social overhead capitals. Gerchenkron (1962) categorized countries into three groups on the basis of the degree of economic backwardness: the advance, the moderately backward, and the very backward. For a great spurt of industrialization, he noted that the advanced nations start their first stage of development with the factory (or private firm) while the extreme backward start with governments. But it should not be inferred from this that industrialization is dependent upon the creation of these preconditions. In fact, one precondition can be substituted by another precondition; further preconditions can always be created even during the course of industrialization. Gerschenkron, (1962) supported his view by citing the example of England where capital was a supplement to the early factories in England from previously accumulated wealth or from gradually investing back of profits. Extremely backward countries which could not have these preconditions for industrialization were compensated by the actions of banks and governments.

For a great spur in industrialization, Gerschenkron (1962) emphasized the adoption of capital intensive techniques. According to him, in an extremely backward country, there would be a very big technological gap between its techniques of production and those of developed countries. It can, therefore, be industrialized by adopting the most advanced capital-intensive techniques of other countries for two reasons: first, such techniques help the establishment of import substitution industries, thereby reducing foreign competition. Secondly, backward economies have shortage of skilled labour; they use capital intensive and labour saving techniques. The more backward an economy is, the greater is the degree of capital intensiveness of industrialization. Gerschenkron (1962) considered the introduction of capital intensive techniques essential for economic development from historical, borrowed technology as one of the primary factors assuring that high speed development in a backward country enables it to enter the stage of industrialization.

2.4.3 The Theory of Unbalanced Growth

This theory as popularized by Hirschman (1958) says that consistent investment should be made in selected sectors rather than simultaneously in all sectors of the economy. No underdeveloped country possesses capital and other resources in such quantities as to invest simultaneously in all sectors. Therefore, investment should be made in a few selected sectors of industries for the rapid development of other sectors. Thus the economy gradually moves through the path of unbalanced growth to that of balanced growth. Economists like have expressed their views in favor of unbalanced growth. It is the contention of Hirschman (1958) that deliberately unbalancing the economy according to pre-designed strategies is the best way to achieve economic growth in an underdeveloped country. Investments in strategically selected industries or sectors of the economy will lead to new economic investment opportunities and so pave the way to further economic development.

Hirschman (1958) tried to explain growth and development of nation or economy with social overhead capital which included investment in education, public health, communications, transportations and conventional public utilities like electricity, water, irrigation and drainage schemes among others. He stipulated that a large investment in overhead capital will encourage private investment, and later direct productive activities (DPA) i.e. industrialization. For example, cheap and frequent supply of electricity power will encourage the establishment of small industries. Unless social investment provides cheaper and improved services, private investment in direct productive activities (DPA) will not be encouraged.

As Hirschman puts it, investment in social overhead capital (SOC) is advocated not because of its direct effect on final output, but it permits and in fact invites Direct Productive Activities (DPA).The study thus adopts the big push theory which aims at examining the indivisibility of inputs (Electricity) which will lead to increasing returns of SMEs.

3.0 Methodology

3.1 Data Measurement and Sources

Data used for this study were collected basically from secondary sources such as CBN Statistical Bulletin, National Bureau of Statistics (NBS) and Economic reports from World Bank among others for the years 1990 – 2013.In this study, data on electricity supply (ES), federal government expenditure on electricity (GEE) which comprise of capital and recurrent expenditures and electricity consumption (EC) were used for analysis.

3.2 Procedure for Data Analysis and Model Specification

For the purpose of this research, the ordinary least square (OLS) multiple regression model is used to estimate the variables. This involves estimation of the regression model in order to examine the impact of electricity supply, federal government expenditure on electricity, and electricity consumption on SMEs growth in Nigeria. The econometric regression model is used to test the impact of electricity supply (ES), government capital expenditures (GEE) and electricity consumption (EC) on SMEs growth in Nigeria. The conversion of parameters into logarithm aims at achieving unique parameter estimates that would enable us to interpret the regression coefficients in terms of elasticity and consequently give a slightly better fit. To capture both the long-run and the short-run dynamics of ES, GEE, and EC on SMEs in Nigeria, an error correction model (ECM), using multivariate co integration techniques is employed. However, before performing the co integration test, stationary test using ADF test is carried out on each of the variables to avoid spurious regression results. The estimation is conducted using the econometric computer software package, E-views version 7.0.

3.3 Model Specification

The econometric model to consider in this study takes Electricity supply (ES), Government expenditure on electricity (GEE), and Electricity consumption (EC), as the explanatory variables and small and medium scale enterprises growth (SMEG) as dependent variable respectively. These variables are used at constant prices to obtain reliable parameter estimates in the time series regression. Flowing from the propositions explored in the theoretical framework for the successful examination of the impact of ES, GEE and EC on the SMEG, the following models needed to test the set hypotheses are explicitly specified:

$$SMEG = f(ES, GEE, EC) \text{ - - - - - - - - - - - - - - - 1}$$

Specifying equation (1) in an exponential regression model, we have;

$$SMEG = a\, ES^{b_1} GEE^{b_2} EC^{b_3} e^{m_t} \text{ - - - - - - - - - - - - 2}$$

In this form, the coefficients b_1, b_2, b_3 can be directly estimated by applying log-linear regression techniques via logarithmic transformation; those coefficients are the elasticity's. Taking natural logs of both sides of the equation, we have:

$$\log SMEG = \log a + b_1 \log ES + b_2 \log GEE + b_3 \log EC + m_t \text{ - - - - - - - - - 3}$$

Suffice it to reiterate that co integration provides the theoretical underpinning for error-correction model. Specifying equation 3 in the mode of error-correction model, we have:

$$D\log SMEG_t = D\log a + \sum_{i=1}^{m} b_1 D\log ES_{t-i} + \sum_{i=1}^{n} b_2 D\log GEE_{t-i} + \sum_{i=1}^{o} b_3 D\log EC_{t-i} + d ECM_{t-i} + e_t \text{ - - - - 4}$$

Where;

a = is the autonomous parameter (or the intercept)

SMEG = Represents the small and medium scale outputs (and its contribution to GDP)

ES = Electricity supply or production is measured at the terminals of all alternator sets in a station. In addition to hydropower, coal, oil, gas, and nuclear power generation, it covers generation and distribution by geothermal, solar, wind, and tide and wave energy, as well as that from combustible renewable and waste. Production or supply includes the output of electricity plants that are designed to supply electricity only, as well as those of combined heat and power plants.

EC = Electric power consumption which measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants.

GEE = Represents federal Government (budgetary) Capital and recurrent Expenditures on the power sector.

m= represents the stochastic error term.

We then differentiate partially with respect to the log of each variable to obtain elasticity of SMEG and *apriori*sign expectation of equation (4);

$$\frac{\partial \log SMEG}{\partial \log ES_t} = \left(\frac{\partial \log SMEG}{\partial \log ES_t}\right)\left(\frac{ES_t}{SMEG_t}\right) = b_1 > 0 \text{ - - - - - - - - - - - - 5}$$

$$\frac{\partial \log SMEG}{\partial \log ES_t} = \left(\frac{\partial \log SMEG}{\partial \log ES_t}\right)\left(\frac{ES_t}{SMEG_t}\right) = b_2 > 0 \text{ - - - - - - - - - - - - 6}$$

$$\frac{\partial \log SMEG}{\partial \log EC_t} = \left(\frac{\partial \log SMEG}{\partial \log EC_t}\right)\left(\frac{EC_t}{SMEG_t}\right) = b_3 > 0 \text{ - - - - - - - - - - - - 7}$$

$$\frac{\partial \log SMEG}{\partial \log ECM_t} = \left(\frac{\partial SMEG}{\partial ECM_t}\right)\left(\frac{ECM_t}{SMEG_t}\right) = \hat{d} < 0 \text{ - - - - - - - - - - - - - - - 8}$$

4. Results and Discussions of Findings

4.1 Pre-Estimation Diagnostics Tests (Unit Root Test)

Macroeconomic time series data as presented in *Appendix I* are generally characterized by stochastic trend which can be removed by differencing. Unit root test is a test of stationarity or non-stationarity of series data used in the model. This is to find out if the relationship between economic variables is spurious or nonsensical. This test is conducted by adding the lagged values of the dependent variable so that the error term is serially uncorrelated.

Therefore, to examine the existence of stochastic non-stationarity in the series, the research establishes the order of integration of individual time series through the unit root tests. The tests of the stationarity of the variables adopted were Augmented Dickey Fuller (ADF) test. The variables tested are: ES, GEE, EC, and SMEG and presented in table 4.1 below:

Table 4.1: Summary of Unit Root Test Results

Variable	Order of Integration	ADF Test Statistics	Critical ADF Test Statistics
SMEG	I(1)	-4.956069	(-4.440739)*
ES	I(1)	-4.848829	(-4.440739)*
GEE	I(0)	-4.315183	(-3.690814)**
EC	I(1)	-6.344767	(-4.440739)*

Source: *Authors Computation, 2014 (Eview-7.0)*

Note: MacKinnon critical values for the rejection of hypothesis of unit root are in parenthesis in Columns 1 and 2 and the tests include intercept with trend; ** significant at 1%; ** significant at 5%;*** significant at 10; Mackinnon critical values*

From table 4.1, only one variable GEE was found stationary at level form, and is of an integrated order zero {that is I (0)}. At this order of integration, its ADF test statistics (-4.315183) is greater than the critical test statistics (-3.690814) ** at 5% significant level. However, the other three variables; SMEG, ES, and EC were found stationary at first difference, and they are integrated. At this order of integration, its ADF test statistics are greater than their critical test statistics at 1% level of significance respectively. These stationary variables were then used for the log-linear multiple regression analysis.

4.2 Co-integration Test

If two or more time series are not stationary, it is important to test whether there is a linear combination of them, which is stationary. Variables are co integrated if they have a long term or equilibrium relationship between them (Dimitrious& Stephen, 2007). It is a pretest to avoid spurious regression situations. It is possible for a combination of some series to achieve long run equilibrium although they may be individually non-stationary. This phenomenon is referred to as the test for co-integration. The evidence of co integration implies that there is a long run relationship among the variables. Asteriou and Hall (2006) argued that where there are more than two variables in a model, there is a possibility that the emerging co integrating vectors governing the joint evolution of all the series will be more than one. This logic presents the superiority of Johansen Co-integration test over the Engle Granger approach. Thus Johansen Co-integration approach was adopted in this study.

Co integration Test Result and Interpretation

Table 4.2 shows the results of the co-integration test, using the Johansen methodology. The results show that trace statistics test rejected the null hypothesis of no co-integration among the variables at the 5 percent level of significance. The trace statistics indicates 2 co integrating equations at the 5% level of significance. The co integration test results are therefore uninformative about the number of co integrating relations among the variables. Max-Eigen test indicates 2 co integration equations at the 5 percent level co-integrating equation.

The conclusion drawn from table 4.2 is that there exists a long-run relationship between our variables:

SMEG, ES, GEE and EC. The co-integration result as captured in the analysis thus rejects the third null hypothesis (**H0$_3$**), and we thus state that there is long term equilibrium relationship between the supply of electricity, government expenditures on electricity and consumption of electricity with SMEs growth in Nigeria

Table 4.2: Results of Johansen Multivariate Co integration Test

Eigen value	Trace Statistics	5 Percent Critical Value	Prob.**	Hypothesized No. of CE(s)
0.960327	103.4342	47.85613	0.0000	None *
0.879672	45.34642	29.79707	0.0001	At most 1 *
0.323416	7.230850	15.49471	0.4853	At most 2
0.010954	0.198261	3.841466	0.6561	At most 3

Source: *Authors Computation, 2014 (Eview-7)*

Max-Eigen value test indicates 2 co integration equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
** p-values

4.3 Model Estimation and Interpretation

The results indicate that the variables in the output model in equation (3) tend to move together in the long-run as predicted by theory. In the short-run, deviations from this relationship could occur due to shocks to any of the variables. In addition, the dynamics governing the short-run behavior of SME performance are different from those in the long-run. Due to this difference, the short-run interactions and the adjustments to long-run equilibrium are important because of the policy implications. According to Sauser (2005), if co-integration exists between non-stationary variables, then an error-correction representation of the type specified by equation (8) below exists for these variables. Given the fact that the variables of the SME performance equation are co-integrated, the next step is the estimation of the short-run dynamics within an error correction model (ECM) in order to capture the speed of adjustment to equilibrium in the case of any shock to any of the independent variables. The generalized specification framework of the over-parameterized Error correction model is expressed below:

$$\mathrm{D}\log SMEG_t = \mathrm{D}\log a + \sum_{i=1}^{m} b_1 \mathrm{D}\log ES_{t-i} + \sum_{i=1}^{n} b_2 \mathrm{D}\log GEE_{t-i} + \sum_{i=1}^{0} b_3 \mathrm{D}\log EC_{t-i} + d\,ECM_{t-i} + e_t \quad ----4$$

The ECM is expected to be less than one, negative and statistically significant. The negative sign of the *ECM* (-1)term indicates long-run convergence of the model to equilibrium as well as explaining the proportion and the time it takes for the disequilibrium to be corrected during each period in order to return the disturbed system to equilibrium. Thus, our parsimonious reduction process made use of a stepwise regression procedure (*through the elimination of those variables and their lags that are not significant*), before finally arriving at an interpretable model. The parsimonious error-correction model is in table 4.3.

Table 4.3: Parsimonious Error-Correction Results of SMEG

Dependent Variable: D(SMEG)
Method: Least Squares
Date: 08/14/14 Time: 15:21
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-506.5606	1100.599	-0.460259	0.6536
D(SMEG(-1))	0.297046	0.209573	1.417388	0.1818
D(ES)	-2.16E-07	4.52E-07	0.478501	0.6409
D(GEE)	-0.025484	0.011143	2.286973	0.0412
D(EC)	59.46010	94.39284	0.629922	0.5406
ECM(-1)	-0.403545	0.219954	-2.834678	0.0415

R-squared	0.579762	Mean dependent variable	1814.880
Adjusted R-squared	0.299603	S.D. dependent variance	3893.037
S.E. of regression	3258.072	Alkaike info criterion	19.31319
Sum squared residual	1.27E+08	Schwarz criterion	19.76084
Log likelihood	-193.7885	Hannan-Quinn criterion.	19.41034
F-statistic	8.069404	Durbin-Watson stat	1.788635
Probe(F-statistic)	0.023649		

Source: Authors Computation, 2014 (Eview-7.0)

4.4 Findings

By examining the overall fit of the model, it can be observed that the parsimonious model have better fit as indicated by a higher value of the *F*-statistic 8.069 and it is significant at the 5.0 per cent level. The F-statistics shows that the model is statistically significant, and as such, we reject the second null hypothesis (**$H0_2$**) and accept the alternative stating that the supply of electricity, government expenditures on electricity and consumption of electricity have a significant influence on SMEs growth in Nigeria. It can be observed from the results that the coefficient of the error correction term ECM (-1) has the expected negative sign, less than unity and it is significant at the 5.0 per cent level. The significance of the error correction mechanism (ECM) supports co-integration and suggests the existence of long-run steady-state of equilibrium with SMEG equation. The absolute value of the coefficient of the error correction term thus indicates that about 40.35 percent of the disequilibrium in the small scale enterprises model is offset by short run adjustment within a year. In this case, the full adjustment is achieved, and takes twelve months to complete the cycles. Thus, to maintain a long-run equilibrium, it is important to reduce the existing disequilibrium overtime. The R^2 of 0.5797 indicates that about 57.97 per cent of the variation in SME growth is explained by electricity supply(ES), government expenditure on electricity(GEE) and electricity consumption(EC), while the remaining 42.03 percent is captured by the white noise error term. The model also indicates that there is no autocorrelation among the variables as indicated by Durbin Watson (DW) statistic of 1.78(or 2.0 approximately). This shows that the estimates are unbiased and can be relied upon for policy decisions

4.5 Discussions of Findings

On *apriority* bases, it was expected that the electricity supply variable should have a direct relationship with SMEs growth in the economy, but based on our result, there exist an indirect relationship. It shows that due to erratic power supply or fluctuations in electricity supply, SMEs growth has been on the decline. Frequent power failures and inability of government to execute independent power projects (IPP) had all negatively influenced SME growth rates. This situation resulted in increased generator usage in the SME production processes that tend to increase the cost of overheads. More so, this slows down the pace of economic growth as a result of disruption of production activities. In other words, the production possibility frontier of the small scale businesses could not shift as far outwards as it would have been with sufficient electricity power. Secondly, social welfare diminishes because of lower output; increase in price

level emanates from higher production costs and there is reduction in consumption activities based on electricity power supply. At the microeconomic level, we have local producer losses which can be approximated by the downward shift in producers' profit level due to irregular production activities, low capacity utilization and the need for running and maintaining very expensive generators. Small scale producers however try to offset these costs through increase in product price to consumers so as to minimize losses. The function thus shows that a 1.0 percentage (1.0%) change in electricity supply, results in 2.16 percentage (2.16%) decrease in SMEs growth.

The coefficient estimate of government expenditure on Electricity (GEE) on power sector is statistically significant but negatively signed. This is attributed to corruption and embezzlement of funds meant for power sector development. This equally justifies the negatively signed electricity production capacity in the country. This relationship as revealed in this equation indicates that it is imperative that the federal government of Nigeria hands off the electricity sub-sector of the country by inviting private participation and concentrate on the proper regulation of activities in the power industry such that small and medium scale investors will not be exploited through high tariff and poor power supply of the commodity. The government has started by selling off the distribution companies but needs to go a step further by selling off the generation after renewing the infrastructures through heavy investment.

The positive coefficient of electricity consumption variable agrees with our apriority expectation that the usage of electricity propels the growth of SMEs. This result is in conformity with the works of Adenuga and Ochu (2013) who noted that no productivity and investment levels will take place without adequate power supply, and as the electricity consumption increases, investments are attracted to small and medium scale industries. In addition, the size of the investment program depends on the projected demand. Underestimation of demand in an environment of relatively high growth often leads to underinvestment and, consequently, an in-built disequilibrium between demand and supply. This situation has been characteristic of Nigeria's power situation. The statistical significance of the electricity consumption relationship captured in the model could have been due to the introduction of independent power project programme and the ongoing privatization of the power sector by the federal government. The function therefore shows that a 1.0 percentage change in electricity consumption, gives a marginal increase of 54.46 in SME growth which is substantial.

One of the implications of the results is that in spite of increase in government expenditure, electricity supply had negative impact on SMEs growth. This position is supported by the works of Ayodele (1998), Adenikinju (2008), Iarossi & Clarke (2011). These all show that in addition to dwindling electricity supply generally on account of deteriorating infrastructures and corruption, supply for residential use had been increasing at the expense of supply for productive industrial use. While high-browse urban centers enjoy relatively better electricity supply, less urban and rural areas where most of the SMEs are located hardly have supplies leaving them with no other option but alternative power sources which are very expensive.

Though electricity consumption has the capacity to impact positively on the growth of SMEs in Nigeria by up to 54.46% going by the results of our analysis, the limited and erratic supply has had very insignificant impact on SMEs' growth. The fact that the model, when corrected for unexplained variation, is significant means that when all the anomalies of investment not reaching its final destination, little electricity generated not getting to the SMEs and the erratic nature of the supply, amongst other anomalies that characterized the Nigerian economic system, are corrected, the SMES in Nigeria will receive a boost. Reliable electricity power supply remains a Sine qua non for the growth of the SMEs in Nigeria.

Nigeria needs to adopt the principle of unbalanced growth towards balanced growth as advocated by Hirshman (1958) by concentrating on the power sector which has the capacity of leapfrogging the growth of other sectors of the economy. Most modern technology use electricity, so for Nigeria to enjoy the advantages of modern technology, the electricity sector needs to be fixed as a matter of urgency. There is the need to plug every leakage in the system by tackling corruption which is endemic. This should then be followed up with massive investment in the power sector to replace all the over-aged infrastructures. The Private Public Partnership agreement in the power sector should be intensified with every political will and be governed by transparency and rule of law.

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Appendix I

Small and Medium Scale Enterprises output, Electricity Supply, Government Expenditure on Electricity and Electricity Consumption, 1990-2013

Year	SMEs Outputs{its contribution to total GDP(N' Million)}	Electricity Supply (kWh)	Government Expenditure on Electricity(#Billion)	Electricity Consumption per capita (kWh)
1990	7371.4	13463000000	3,919.20	85
1991	8046	14167000000	3,594.30	88
1992	7657.2	14834000000	3,267.58	88
1993	7341	14505000000	19,940.28	99
1994	7280	15531000000	28,239.79	94
1995	6880	15857000000	44,776.70	90
1996	6940	16243000000	117,988.53	84
1997	6960	16117000000	170,367.53	81
1998	6980	15110000000	201,988.80	76
1999	7330	16089000000	325,141.08	75
2000	7180	14727000000	125,738.97	74
2001	7480	15463000000	264,566.26	75
2002	7820	21544000000	221,452.02	104
2003	8109.89	20183000000	146,885.12	101
2004	8309.61	24275000000	192,276.02	123
2005	25376.25	23539000000	287,059.86	128
2006	27874.14	23110000000	294,107.30	111
2007	30529.03	22978000000	401,475.60	138
2008	33340.81	21110000000	590,786.90	127
2009	33409.81	19777000000	630,110.00	121
2010	39435.7	26121000000	697,526.34	136
2011	42718.59	29411000000	446,901.89	141
2012	46158.48	31121000000	411,300.00	148
2013	52134.43	34521000000	423,541.78	154

Sources: *World Bank (2014); CBN (2012)*