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The Nexus between Energy Policies and Supply: A Descriptive Evaluation of Nigeria and UK Energy Sectors

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Abstract

Nigeria has targeted to become one of the twenty strongest economies in the world by 2020 tagged as vision 20:2020; however, the country has failed to achieve its target as at end of 2020. The country's per capita electricity consumption is one of the lowest in the world; therefore, considering the strong linkage between energy consumption and economic growth, low energy supply may have contributed to Nigeria's failure to achieve its target. The country had its first electricity installations just 15 years apart from installed electricity facility in the United Kingdom. While the United Kingdom energy consumption per capita was 32,950.19 kWh in 2018, Nigeria's per capita consumption was 2,725.678 in 2018. Provision of this quantum of energy in the UK was arguably achieved through implementing appropriately designed energy policies, footsteps of which Nigeria should have followed on the basis of *mutatis-mutandis*. Thus, the main aim of this study is to descriptively evaluate the efficiency of policies designed by governments in Nigeria and the UK on energy supply. To achieve this aim, secondary data on energy supply policy acts and energy consumption per capita denoting energy supply are collected from 1971 – 2018. Descriptive statistics are employed to present and analyze collected data while the policy analysis framework underpinned the study. Results from the study indicated that past Nigeria's energy policies were not effective in solving Nigeria's energy supply needs. The policy implications of obtained results are the need for policymakers in Nigeria to establish enabling policies that will tackle the country's energy crises simultaneously. Similarly, the policies should ensure the utilization of all sources of energy to have an efficient energy mix.

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1. Introduction

Nigeria is a country blessed with oil and gas resources with proven oil reserves of 36.90 billion barrels and 193.30 trillion cubic feet of proven natural gas reserves as at end of December 2020 [1]. Similarly, the country has the potential of generating over 11,000 megawatts of electricity from small and large hydro while its annual solar energy availability is about 27 times that of the country's total fossil fuel resource, and it is over 115,000 times generated electrical power. Arguably, the availability of enormous reserves of oil, gas and renewable energy resources should be utilized to ensure an adequate energy supply of electrical energy in the country. Conversely, the country is facing an acute shortage of energy to such an extent that the estimated National demand of 40,000 Megawatts is more than ten times the current national output [2].

Nigeria's population is over 200 million as at end of 2019 and is projected to grow to over 401 million as of 2050[3]. The country's increasing population in addition to its economic growth are identified as responsible for increasing energy which is consistent with empirical evidence from other parts of the world that found positive relationships between population growth, energy consumption, and economic growth [4][5]. Therefore, it is pertinent that Nigeria should ensure sufficient and sustainable energy supply in the country to one; meet the energy demand of its growing population; two, achieve economic growth which will ensure prosperity for all citizens, peace and stability in the country. However, achieving this requires effective energy supply and security policies and being a former colony of the United Kingdom (UK), Nigeria should arguably be following the good legacies bequeathed by the UK including formulation and implementation of policies, especially in the energy sector. Therefore, the main aim of this paper is to evaluate past energy policies on available sources of energy that are providing energy for Nigeria and the UK. This is section one of the paper; a literature review is section two; the methodology of the research is in section three; results from the study and its discussions are in section four, while conclusions and policy implications of the study are in section five.

2. Literature Review and Background

This section reviews literature relevant to this study, section 2.1 is a theoretical review while sections 2.2.1 to 2.2.3 are empirical findings on relationships between energy consumption and economic growth and between energy consumption and population growth.

2.1. Energy

Energy is most commonly and simply defined as the ability to do work or produce heat. Mankind is using energy in almost

every facet of life and the energy is coming from different sources depending on the stage of human civilization. In early human history, man relied on human muscle power, energy from animals, solar, water and air. However, with the discovery of fire making process, men began to utilize biomass as a source of energy. Energy coming from solar, wind, biomass, hydropower and geothermal are referred to as renewable energy being naturally restocking over a short period of time. As human civilization progresses, coal was discovered which significantly replaces biomass, especially in industrialized countries. The discovery of oil and gas significantly replaces coal, particularly in industrialized economies. Coal, uranium, oil and gas are referred to as non-renewable energy, being exhaustible and taking a very long time to form [6]. There is empirical evidence on the relationships between energy consumption and population growth and energy consumption and economic growth.

2.1.1. Energy Consumption and Population Growth

Empirical studies that investigated whether growth in population results in increasing demand for energy has been carried out.

[4] investigated the causal relationship between road energy consumption and population growth in Egypt over the period 1980-2011. To conduct the study, data was collected on the variables of road energy consumption per capita, annual percentages of population growth and real GDP per capita from World Bank indicators. Johansen cointegration approach, vector error correction model (VECM), generalized impulse response functions and variance decomposition techniques were used to analyze collected data. Results from the study indicated the existence of a long-run relationship between the variables of population growth and energy consumption. [7] investigated how population growth contribute to rising energy consumption in America from 1947 to 1991 using data collected on the variables of total energy consumed and total population from the United States Bureau of the Census and Department of energy. Descriptive statistical tools of graphs and charts were used to analyze collected data. Results from the study revealed that increasing population growth leads to an increase in energy consumption in the United States over the period of study from 1947 to 1991. Perhaps increasing energy consumption by a growing population means enhanced productivity leading to economic growth on which there are studies on the relationship between energy consumption and economic growth.

2.1.2. Energy Consumption and Economic Growth

[8] employed multispatial convergent cross-mapping (CCM) to investigate the relationship between energy consumption and economic growth in China, India and the G7 countries from 1965 to 2017. To achieve the aim of the study, two datasets aggregate and per capita data on energy consumption (EC) in million tons of oil equivalent and real GDP in constant 2010 prices are obtained from the BP Statistical Review of World Energy and World Development Indicators (WDI) respectively. Collected data was subjected to multispatial convergent cross mapping (CCM) analysis while results indicate a positive relationship between energy consumption and economic growth in the United States of America (USA), Japan, Italy and Canada, China and India. Conversely, a study by [9] from a developing country of Nigeria was carried out to find out the relationship between energy consumption and economic growth from 1999 to 2016. Data for the study was on collected on quarterly observations from the first quarter of 1999 to the fourth quarter of 2016 on real GDP at constant

2010 prices and energy consumption measured as electricity consumption in megawatts per hour from the National Bureau of Statistics and the Central Bank of Nigeria respectively. A nonlinear Autoregressive Distributed Lag (ARDL) model and an ARDL-ECM specification while results revealed that the role of energy consumption as a driver of growth is negligible.

Thus, it could be contended that the provision of adequate energy is essential for economic growth which perhaps translates to an improvement in the quality of the standard of living for an ever-growing population. However, achieving an adequate energy supply as seen in developed countries is associated with formulating and implementing the right energy policies. Policies formulated and implemented by governments are referred to as public policies denoting laws, regulations, procedures and administrative actions of governments and institutions that affect members of the public. Thus, it could be contended that decisions and actions from policies implemented by governments and institutions determine the quality of the air we breathe, the water we drink, the food we eat, the kind of environment we live etc. Indeed, to address the pressing global challenges of the 21st century such as poverty, food insecurity, lack of access to essential healthcare for many, and even peace requires access to energy for all [10].

Nigeria is a former colony of the United Kingdom (UK); therefore, Nigeria should arguably be following the good legacies bequeathed by the UK especially in such an important sector as the energy sector. However, Nigeria is facing an acute shortage of energy as the Transmission Company of Nigeria (TCN) reported National peak demand is almost ten times the available energy. Conversely, the UK is one of the leading countries in energy consumption as it consumed 68 quadrillions of Btu of energy in 2020. Arguably, the ability of the UK energy sector to provide this quantum of energy is consequent to established and implemented policies to ensure energy sufficiency and efficiency [11]. Therefore, next is an outline of the evolution of formulated policies in the UK energy sector.

2.2.1. Evolution of UK Energy Policies

The discovery of significant reserves of oil and gas in the North Sea in the 1960s launched the UK into the rank of oil and gas resource-rich countries. This discovery enabled the UK to become energy self-sufficient for some decades before becoming a net importer again in 2004. The country is also endowed with renewable energy resources mainly from Onshore and Offshore winds; ground source heat pumps, air source heat pumps, biomass electricity and biomass heat. The country is known to have the largest resource of offshore wind, wave and tidal power within Europe with the potential of producing 531GW or 2,131TWh which is capable of making the country to become a net electricity exporter if properly harnessed (Soares 2012, OVG 2010). In the 1700s, Great Britain as it is known then, invested in its inland waterway network to promote coal transport which soon brought down freight rates for coal by 50% which make coal available and affordable to citizens. This is the beginning of formulating policies in the present-day UK, and the emphases by governments on energy policy remained focused on the provision of sufficient and efficient energy [12].

The first street lighting in UK was in 1881 which heralded many private Bills into the Parliament by local authorities and companies to generate and transmit supplies resulting in the enactment of the Electric Lighting Act in 1882 as the first legislative policy on energy. Since then energy policies are being formulated to achieve government goals and objectives

in the sector. Consequently, this study looked into developments of energy policies in the UK into four periods; first, 1870 – 1949 referred to as the era of energy generation; second, 1950 – 1979 energy efficiency period; third, 1980 – 1999 as the energy market liberalization era; and fourth, 2000 – 2020 as the era of conflicting interest between energy demand and environmental concerns [13].

First Period 1870 – 1949 (Energy Generation Era)

The electric lighting act of 1882 was legislated to facilitate and regulate the procedures for the establishment of the electricity generating and supply industry in the Great Britain and Ireland applicable to every local authority, company or person authorized to supply electricity within any area. The Board of Trade established under the act was empowered to grant either a Licence for seven years, with the consent of the local authority, or a Provisional Order without consent of local authority subject to confirmation by Parliament. The Act allowed both public authorities and private companies to lay underground cables and erect overhead cables, subject to local authority consent. As a safeguard for public interests, the local authority had the option to purchase private undertakings after 21 years of operation, and then at seven-year intervals thereafter, at an agreed value.

However, the 21-year purchase option period was not sufficient to provide a satisfactory return to investors which negatively affected capital investments and the supply of electricity. Similarly, it is argued that the act is embedded with a patchwork of monopolies serving a small area, maximum pricing and compulsory right of purchase by local councils after a twenty-one-year period. Therefore, to facilitate adequate investments and supply of electricity, the 1888 electric lighting act was enacted amending the 1882 act. The 1888 act increased the purchase period option of local authorities from 21 to 42 years to enable investors to get satisfactory returns to ensure an adequate supply of electricity. The 1888 act also mandated the grant of licenses to multiple persons or companies for the supply of electricity to an area to ensure a stable and efficient supply [14].

However, Parliament re-examined happenings in the industry and the 1882 act most especially the compulsory purchase clause due to its enormous effect on investments and supplies. Despite this, the problems of patchwork market structure and pricing observed in the 1882 act remained major problems in the electricity industry and to overcome them, the 1909 electric lighting act was enacted. The act focuses on allowing any local authority, company or person authorized to generate and supply electricity rights to acquire land for building generating stations to enhance supply. To reconstruct the UK after the First World War, nationalization of the electricity industry was recommended, but the patchwork market structure and lack of effective price regulation traceable to the 1882 act are observed as the major problems of the industry [14].

Consequently, the Electricity Supply Act (ESA) 1922 was enacted which provided for the establishment of a five-member Electricity Commission (EC) that oversaw the UK electricity industry up to nationalization in 1947. The commission considered standardization of supply, regulations of overhead lines, efficiency in gas, and electricity utilization to ensure adequate supply. However, to give the EC the needed financial power to discharge its responsibility, the Electricity Supply Act of 1926 was enacted. The act provided for the establishment of the Central Electricity Board (CEB) mandated to

standardize the supply of electricity in the UK (ESA 1926). The board succeeded in establishing the UK's first synchronized AC grid and the first UK national grid facilitating the linkage of the UK's most efficient power stations with consumers. Subsequently, the Electricity Supply Act 1935 was enacted authorizing CEB to make arrangements with authorized electricity undertakers for the purpose of ensuring adequate supply. The act also gave powers to CEB to sell electricity to railway companies for certain purposes [14].

To further strengthen the UK electricity industry, the Electricity Act was enacted in 1947 which nationalized 505 separate electricity generation and supply organizations in the Great Britain and brought them under 12 Area Boards. The act also provided for the establishment of the British Electricity Authority (BEA) or Central Electricity Authority (CEA) and Area Electricity Boards (AEB). The Board is saddled with the tasks of developing and maintaining an efficient, coordinated and economical system of electricity supply for all parts of Great Britain except the North of Scotland District. It is also the responsibility of the BEA to generate or acquire electricity supplies, provide bulk supplies to the AEB, coordinate the distribution of electricity by the AEB and exercise control over them. Thus, the 1947 electricity act represents the major parliamentary instrument that nationalized the UK electricity industry and is followed by the 1957 Electricity Act [14]. Therefore, in this period eight acts were enacted in the UK energy sector to address issues of energy supply and other related issues.

Second Period 1950 – 1979 (Energy Efficiency Period)

The 1957 electricity act provided for the dissolution of the CEA and the establishment of a Central Electricity Generating Board (CEGB) and an Electricity Council (EC). CEGB retains all the powers and functions of CEA; the act also provided for the establishment of 12 Electricity Consultative Councils (ECCs) that represented the interests of consumers in their area. Likewise, the Electricity Consumers' Council (ECC) which represented the interests of consumers at the national level was established. As further efforts to ensure adequate energy supply in the UK, the world's first civil nuclear power station was commissioned at Calder Hall Windscale, England, in 1956. To enhance the financial capacities of Electricity Councils, Electricity Boards, the Gas Council and the Gas Area Boards to discharge their stated responsibility of developing and maintaining an efficient, coordinated and economical system of electricity supply for all parts of Great Britain, the Electricity and Gas Act 1963 was enacted increasing the borrowing limits of EC. Then, the Gas and Electricity Act 1968 was enacted allowing the Electricity Councils, Electricity Boards, the Gas Council and the Gas Area Boards to borrow any approved sum of foreign currency by issuing stocks, bonds, or other securities specified in the act [14].

Following the Arab-Israel conflict and oil embargo of 1973, to ensure energy sufficiency and security the UK parliament enacted the Fuel and Electricity control Act 1973 making provisions for controlling the production, supply, acquisition and use of certain substances and of electricity. The Energy Act 1976 was enacted essentially providing powers for regulating or prohibiting the production, supply, acquisition or use of crude liquid petroleum, natural gas and petroleum products. As a buildup measure on energy supply, the UK parliament enacted the Nuclear Safeguards and Electricity (Finance) Act 1978, giving effect to an International Agreement for the application of Safeguards on nuclear sites consistent with the Treaty on the Non-Proliferation of Nuclear Weapons [14]. Hence, five energy acts were put in place in the UK energy sector and in addition, ten statutory instruments were also put in place to enhance energy supply and efficiency from 1950

- 1979.

Third Period 1980 to 1999 (Energy Market Liberalization Era)

The government enacted the Energy Act of 1983, which liberalized the energy market by facilitating the generation and supply of electricity by persons other than Electricity Boards, and for certain other purposes all aiming at ensuring energy supply sufficiency. To further enhance energy supply, security and liberalization of the sector, an act that put the finances of the United Kingdom Atomic Energy Authority (UK AEA) on a trading fund basis referred to as the Atomic Energy Authority Act 1986 was enacted. Perhaps, consolidating the gains of liberalization achieved under the 1983 and 1986 acts; the Electricity Act 1989 was enacted. The 1989 Electricity Act provided for the privatization of electricity in the UK by making provisions for the appointment and functions of a Director General of Electricity Supply and of consumers' committees for the electricity supply industry [14]. Therefore, three acts were enacted in this period in the UK energy sector dwelling on liberalizing the sector for enhanced supply. In addition to the acts, forty policy instruments were also put in place.

Fourth Period 2000 to 2020 (Era of Conflicting Interest between Energy Demand and Environmental Concerns)

The Electricity (Miscellaneous provision) Act 2003 further broadened the privatization drive of the UK energy industry by providing financial assistance to, or the acquisition of any securities of or any part of the undertaking or assets of, British Energy Plc. or any of its subsidiaries. This is followed by the Energy Act 2004 providing for activities relating to the civil nuclear industry for electricity generation and provisions connected to the regulation of the gas and electricity industries among others. This is followed by the Energy Act 2006 purposely meant to enhance the United Kingdom's contribution to combating climate change. Subsequent legislation was the energy act 2008 making provisions among others on matters relating to gas importation and storage; electricity generation from renewable sources; electricity transmission; third-party access to oil and gas infrastructure, modifications of pipelines and duties of the Gas and Electricity Markets Authority. To perhaps respond to global concerns about the environmental effect of oil, gas and nuclear sources of energy, the Energy Act of 2010, emphasizing modern technologies of carbon capture and storage, was enacted. The Act made provisions on matters relating to the decarbonization of electricity generation and development and use of carbon capture and storage technology; provisions about functions of the Gas and Electricity Markets Authority (GEMA) and persons authorized to supply gas or electricity [14].

Apparently, having achieved stabilization in the liberation and supply of energy in the UK energy market, the parliament enacted the 2011 Energy Act focusing on energy efficiencies, security of supplies, and generation of electricity from renewable sources among others. Subsequently, the 2013 energy Act was enacted making provisions for reforming the electricity market to encourage low-carbon electricity generation; domestic supplies of gas and electricity; and for extending categories of activities for which energy licenses are required among others. The Energy Act 2016 meant to further deregulate the UK oil and gas industry as a major source of energy created the Oil and Gas Authority (OGA) and its functions. This is a quasi-autonomous non-governmental organization, in which a government has devolved power but is still partly controlled and/or financed by government bodies. The Act makes provisions about rights to use upstream

petroleum infrastructure; abandonment of offshore installations, submarine pipelines and upstream petroleum infrastructure; disclosure of information for the purposes of international agreements etc. This is followed by the Domestic Gas and Electricity (Tariff Cap) Act 2018 making provision for the imposition of a cap on rates charged to domestic customers for the supply of gas and electricity; and for connected purposes. Consequently, six acts were put in place in the UK energy sector from 2000 – 2018; in addition to these acts, forty-three policy instruments were also put in place [14]. Having reviewed the evolution of policies in the UK energy sector, it is imperative to also review the evolution of energy policies in Nigeria.

2.2.2. Evolution of Legislation in Nigeria's Energy Sector

The first generating plant built in Nigeria with a capacity of 60KW was in Marina, Lagos in 1898 by the colonial government managed by the Public Works Department (PWD). Thus, while public electricity was first enjoyed in the UK in 1881, Nigeria started enjoying it barely 17 years later in 1898. When the Southern and Northern protectorates of the British colony were amalgamated in 1914, cities such as Port Harcourt, Kaduna, Calabar, Enugu, Maiduguri, Warri, Zaria, and Yola started developing their electricity potentials individually. To uniformly manage the supply of electricity, the Nigerian Electricity Supply Company (NESCO) was established in 1929, which is thirty-one years after the coming of public electricity. However, government and native authorities continued to maintain their separate electricity utilities until 1946 when the Nigerian Government Electricity Undertaking (NGEU) was established as an arm of the Public Works Department to take over the assets and liabilities of electricity supply in Lagos [15].

The Native and Municipal Authorities, later in 1950, agreed on matters of electricity; thus, the Federal government established the Electricity Corporation of Nigeria (ECN) through the instrument of Ordinance No. 15 of 1950. The ECN took over the assets of NESCO and was vested with the responsibility of running electricity generating stations. Based on favorable results of a study on the benefits of hydroelectricity Dams, an Act of the parliament establishing the Niger Dam Authority (NDA) was enacted in 1962. The NDA is a statutory organization saddled with the responsibility of constructing and maintaining hydroelectricity Dams in the country that have discovered the innumerable benefits that would accrue from this source of electricity. Under this authority, the construction of the Kainji Dam which started in 1962 was completed in 1968 with generated power being sold to ECN. It is through the collaborative efforts of NDA and ECN that electricity supply was interconnected through the national grid such that the entire existing thirty states and Federal Capital Territory (FCT) of Abuja are today connected to the national grid [15].

In 1972, an act establishing the National Electric Power Authority (NEPA) was enacted bringing the duties and responsibilities of ECN and NDA under this Authority. NEPA is saddled with the responsibility of developing and maintaining an efficient, coordinated and economical system of electricity supply for all parts of the Federation or as the Authority may direct. For this purpose, the Authority has the power to generate or acquire a supply of electricity; provide a bulk supply of electricity for distribution within or outside Nigeria; and provide a supply of electricity for consumers in Nigeria and as may, from time to time, be authorized by the Authority. Nigeria committed itself to have sufficient energy in the energy policy statement of vision 20:2020. Similarly, the country launched the Renewable Energy Master Plan in 2005 aimed at achieving a 10% renewable energy contribution to the national energy supply. Concerned about the problem of

power supply in Nigeria, the government established the National Integrated Power Projects (NIPP) designed to establish seven medium-sized gas-fired power stations in the gas-producing states in 2005 [16].

As an effort towards privatizing the monopolistic nature of NEPA on electricity supply in Nigeria, the Electric Power Sector Reform Act 2005 created the Power Holding Company of Nigeria (PHCN). The essence is to give the new body an intended name for privatization meant to transfer the assets and liabilities of NEPA to PHCN. Further efforts towards privatization aimed at enhancing electricity supply in the country saw the unbundling of PHCN into 18 different companies composed of 6 Generating Companies (GENCOs), 11 Distribution Companies (DISCOs) and 1 transmission company referred to Transmission Company of Nigeria. On completion of the privatization process in 2013 PHCN ceased to exist and is replaced by the Nigerian Electricity Regulatory Commission (NERC) whose functions were already set out in the 2005 power sector reform act.

The functions of NERC include creating, promoting, and preserving an efficient electricity industry and market structures; ensuring optimal utilization of resources for the provision of electricity services; ensuring that consumers in both urban and rural areas are getting an adequate supply of electricity; ensuring that prices charged by operators are fair to consumers and at the same time sufficient to ensure reasonable returns in order to ensure efficiency in operations [16]. Having had an outline of the evolutions of legislations on energy sectors of both UK and Nigeria, the next section is the methodology of conducting the study.

2. Methodology

Positivism and interpretivism are identified as the two extreme ends of research paradigms; although other paradigms exist between them. The positivism paradigm has its roots in an objective philosophy, known as realism, while the interpretivism paradigm has its roots in idealism, which is subjective. Ontology is dealing with the nature of reality; thus, if reality is seen as objective, then the research is ontologically objective following the positivist research paradigm. However, if reality is seen as subjective; then the research is ontologically subjective following the interpretivism paradigm. Epistemology is about what constitutes valid knowledge; therefore, while in positivism only observable and measurable phenomena constitute valid knowledge, interpretivism is encouraging the participation of the researcher in the inquiry. The methodological assumption is simply concerned with the actual processes involved in conducting research. This study is ontologically subjective; its epistemology is participatory while its strategy is that of drawing reasoning from particular to general [17].

3.1. Theoretical Framework

Public policy is about laws, regulations, procedures and administrative actions of governments and institutions that affect members of the public. Arguably, decisions and actions taken sequel to policies implemented by governments and institutions have impacts on the quality of the air we breathe, the water we drink, the food we eat, the kind of environment we are living and all other facets of human life. Consequently, good or bad policies produced by governments and

institutions normally affect the public; hence analysis of the policies of government and institutions referred to as public policy analysis is appropriate in establishing whether such policies are good or bad. Public policy analysis could be traced to the United States of America, in the Flood Control Act of 1933. The Act provides that the government will undertake public works on rivers and harbours after evaluating and finding out that the benefits of doing so outweigh the costs and if the lives and social security of people would otherwise be adversely affected [10].

Evaluation could take one of four forms namely; one: formative evaluation, undertaken to ensure that a programme or programme activity is viable, suitable and adequate before it is fully implemented. Two: process evaluation, which entails determining whether the implemented programme activities are as intended. Three: outcome evaluation, measuring the effects of a programme on a target population by assessing progress in the outcome objectives that the programme was designed to achieve. Four: impact evaluation, assessing the effectiveness of a programme in achieving its ultimate goals [10]. Drawing from the fourth category of evaluation, this study descriptively evaluates the impact of Nigerian and UK governments' policies in their energy sectors towards ensuring adequate energy supply. Therefore, the public policy analysis framework underpins the conduct of this study.

3.2. Data

Choosing a data collection method depends on the method considered most appropriate and suitable for achieving the research aim and objectives. This study is evaluating energy policies on energy supplies in Nigeria and UK. Within the context of this study, energy consumption per capita in Nigeria and the UK from 1971 - 2020 is the proxy of energy supply. The argument for using energy consumption per capita is that consumption can only take place if there is supply; thus, the consumption is invariably indicating supply and this could perhaps be indicating the effectiveness of formulated and implemented energy policies. The data is collected from the database of the World Bank from 1971 to 2014 and from Index Mundi 2014 to 2020. Although data are available for the UK from 1960, data on Nigeria commenced in 1971. However, for the fact that complete data for Nigeria and UK are only available from 1971 – 2020, the first-period review under UK 1870 – 1949 will be subsumed in the second period 1950 – 1979 and analyzed as 1971 – 1979.

3. Results and Discussion

This section is concerned with organizing, summarizing and presenting descriptive and analytical results of collected data on energy policies and supply in Nigeria and the UK. Thereafter, findings from the study are interpreted and discussed and linked with the main aim of the study, literature, theory and practice. Consistent with the aim of the study to descriptively evaluates energy policies and supply in Nigeria and the UK, descriptive statistics that aid in presenting large volumes of research data numerically or graphically are adopted. However, while numeric descriptive statistics enable researchers to present data by measures of central tendencies (mean, median, and mode) and measures of dispersion such as standard deviations, minimum and maximum; graphical data presentations enable the identification of patterns in the data [18]. This study employed graphical descriptive statistics in order to show a pattern of the energy supply after the introduction of successive policies. Figures 4.1 and 4.2 indicate energy consumption per capita in Nigeria and the UK

from 1971 – 1979 respectively.

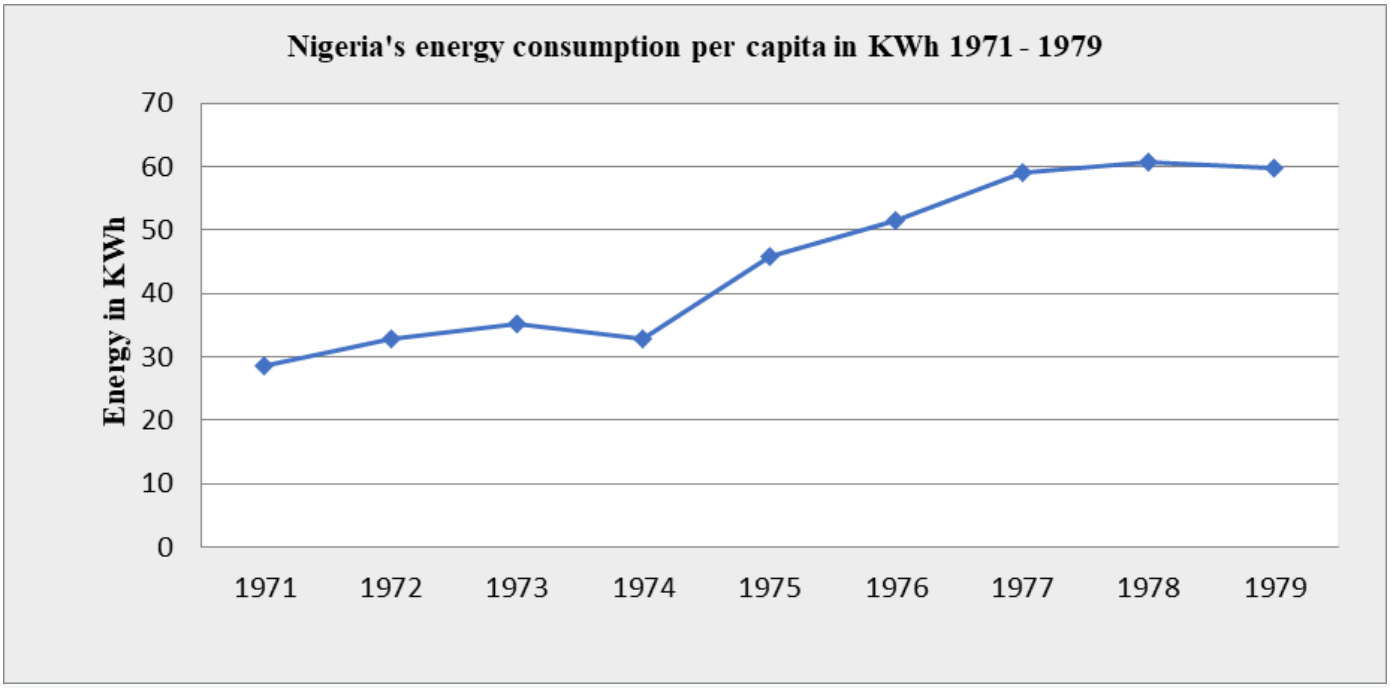

Figure 4.1. Energy Consumption per Capita (KWh) in Nigeria 1971 - 1979

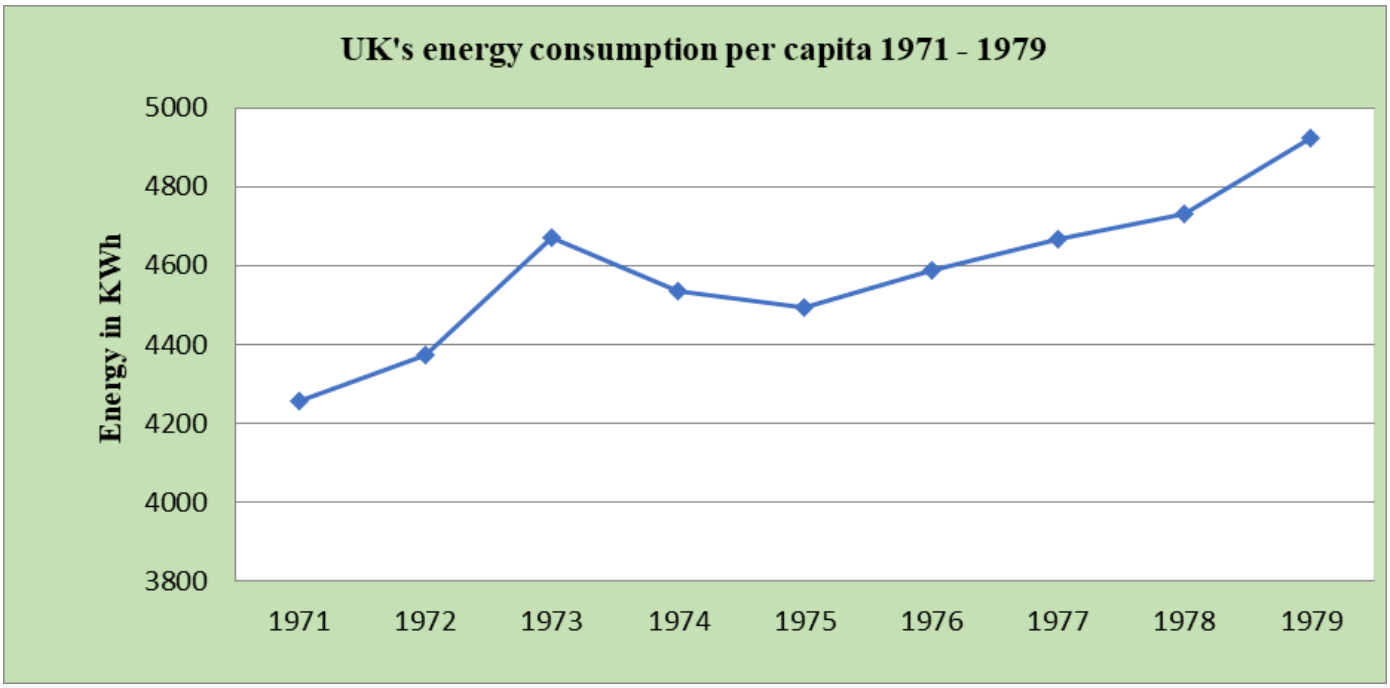

Figure 4.2. Energy Consumption per Capita (KWh) in the UK 1971 - 1979

Energy consumption per capita in Nigeria in 1971 is just 29KWh while for the corresponding period, it is 4,255KWh in the

UK. In 1971, Nigeria's population is over 57 million people while UK's population is over a 55million, although the UK was an industrialized nation per capita energy of only 29KWh in Nigeria is too meager. Energy consumption per capita in Nigeria began to rise from 29KWh in 1971 to 33KWh in 1972 and 35KWh in 1973 while for the corresponding years in the UK are 4,373KWh and 4,672KWh respectively. The sharp increases in 1973 in both countries could be attributed to increasing tensions that culminated in the late 1973 Arab-Israel conflict in the Middle East which is one of the major global sources of energy supply. Energy consumption per capita as an indicator of supply decreased in 1974 in both countries, which may be attributed to the global energy shock although supplies in Nigeria are grossly low compared to the UK at 33KWh and 4,534KWh respectively. Supplies denoted by per capita consumption then began to rise from 1975 to 1979 in both countries.

Energy consumption per capita in Nigeria was 46KWh in 1975, 52KWh in 1976, 59KWh in 1977, 61KWh in 1978 and 60KWh in 1979. Energy consumption per capita in the UK was 4,492KWh in 1975, 4,588KWh in 1976, 4,668KWh in 1977, 4,730KWh in 1978 and 4,923KWh in 1979. Despite the increasing population and economic activities in Nigeria from 1971 to 1979 which should have stimulated energy consumption [4] consumptions are very low overall. Within this time frame, only four energy policies were formulated in Nigeria and perhaps, this lack of adequate policies on energy supply from 1971 – 1979 resulted in the paltry increases in energy consumption per capita in the country. This is consistent with Nigeria's position on the global ranking of countries on energy consumption ranging from 64th to 68th over the period [19]. On the other hand, perhaps the realization of policymakers in the UK of the significant role of energy in sustaining the country's economic growth [5] and satisfying the energy needs of its increasing population[4] resulted in the formulation and implementation of thirteen energy acts from 1882 to 1979.

Similarly, ten policy instruments were put in place in the sector over this period of time. The formulation and implementation of these energy policies could contend as the main drivers of the high energy per capita supplied and consumed in the country from 1971 to 1979. This is perhaps confirmed by the UK's position among the global ranking of the top 20 energy-consuming countries. Figures 4.3 and 4.4 are on energy consumption per capita in Nigeria and the UK from 1980 to 1999.

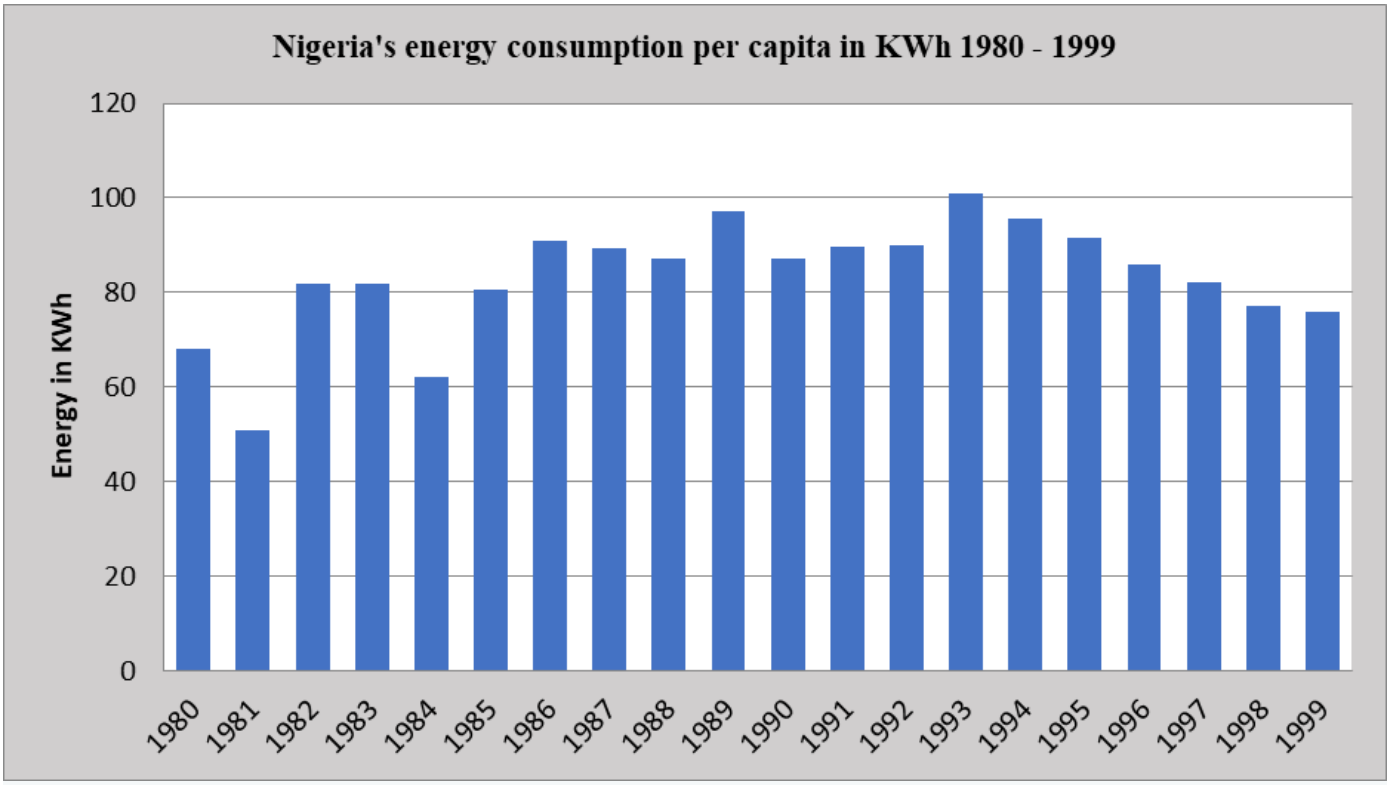

Figure 4.3. Energy Consumption per capita (KWh) in Nigeria 1980 - 1999

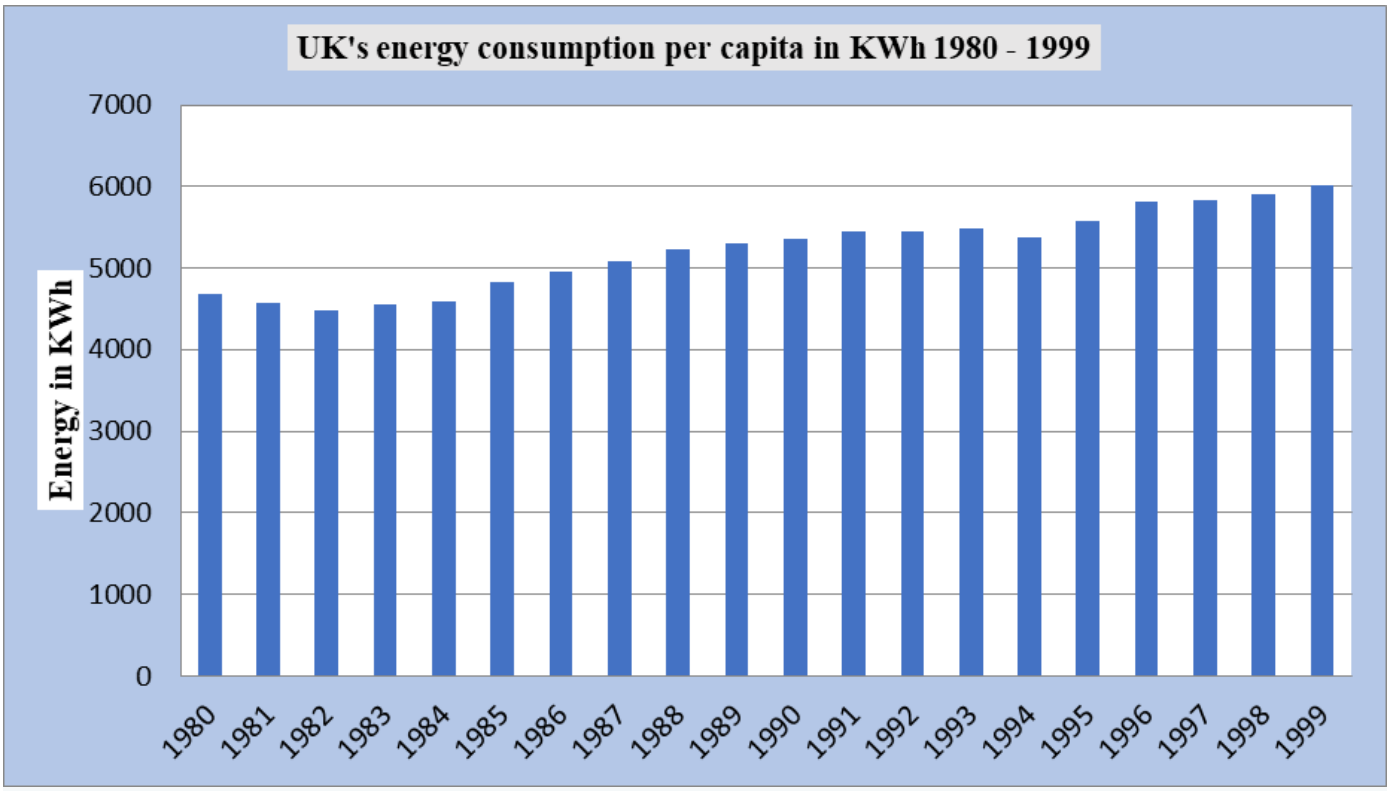

Figure 4.4. Energy Consumption per Capita (KWh) in the UK 1980 - 1999

Energy consumption per capita in Nigeria as shown in Figure 5.3 was on fluctuating trends from 1980 to 1999, despite the increase in population and economic activities which should have translated to more energy consumption [9]. It was 68KWh in 1980, 51KWh in 1981, 82KWh in 1982, and 82KWh again in 1983, then falling down to 62KWh in 1984. Consumption per capita then rose to 80KWh in 1985, then to 91KWh in 1986, falling down to 89KWh in 1987, further falling to 87KWh in 1988 and rising to 97KWh in 1989. Supplies of energy measured by per capita consumption sharply dropped to 87KWh in 1990, increasing to 90KWh in 1991 and 1992, and then increased to 101KWh in 1993 and dropping down to 96KWH in 1994. Consumed energy per capita in Nigeria continued to decrease in 1995 to 91KWh, 86KWh in 1996, 82KWh in 1997, 77KWh in 1998 and 76KWh in 1999. From 1980 to 1999 no single act was formulated in the Nigerian energy sector with a view to addressing the acute energy supply shortage in the country.

Conversely, energy consumption per capita in the UK in 1980 was 4,684KWh decreasing to 4,573KWh in 1981 and 4,480KWh in 1982; then, started increasing to 4,549KWh in 1983 and 4,598KWh in 1984. Consumption of energy per capita as an indication of adequate supply kept rising in the UK to 4.827KWh in 1985, 4,954KWh in 1986, 5,082KWh in 1987, 5,233KWh in 1988 and 5,295KWh in 1989. Similarly, from 1990 to 1994, energy consumption per capita was on the rise; 5,357KWh in 1990, 5,452KWh in 1991, remaining constant in 1992, then, increasing to 5,492KWh in 1993 and slightly decreasing to 5,380KWh in 1994. Energy consumption per capita in the UK steadily increases from 1995 to 1999; it was 5,576KWh in 1995, 5,816KWh in 1996, 5,832KWh in 1997, 5,909KWh in 1998 and 6,007KWh in 1999.

Therefore, it could be noted that energy consumption per capita in Nigeria from 1980 to 1999 does not perhaps show an encouraging supply of energy that could have resulted in increased energy consumption per capita as the country do not formulate any act on energy during the period. This is confirmed by the country's best position of 66th to the worst position of 96th in the global ranking of countries on energy consumption over this period[19]. However, energy consumption per capita kept increasing in the UK perhaps due to the enactment of three acts and forty policy instruments put in place in the country. The country maintained excellent positions from 21st to 30th among the global ranking of energy-consuming countries and it could be argued that this coming at a period when energy efficiency measures have started yielding results in the country [19]. Table 4.1 is on energy consumption per capita of Nigeria and the UK from 2000 to 2020.

Table 4.1. Nigeria and UK energy consumption per capita (KWh) 2000 - 2020

Years	Nigeria	UK
2000	74	6,115
2001	76	6,142
2002	105	6,143
2003	102	6,175
2004	124	6,139
2005	129	6,271
2006	112	6,201
2007	139	6,102
2008	127	6,016
2009	121	5,643
2010	136	5,701
2011	150	5,472
2012	157	5,449
2013	143	5,410
2014	145	5,130
2015	118	4,808
2016	124	4,732
2017	129	4,657
2018	134	4,552
2019	121	4,749
2020	115	4,701

From table 4.1, energy consumption per capita in Nigeria in 2000 was down to 74KWh from 76KWh consumed in 1999; then, moving back to 76KWh in 2001; consumption increased to 105KWh in 2002, coming down to 102KWh in 2003 and improving to 124KWh in 2004. Consumed energy per capita then increases to 129KWh in 2005, coming down to 112KWh in 2006, increasing to 139KWh in 2007, then decreasing to 127KWh in 2008, again decreasing in 2009 to 121KWh. Nigeria's energy consumption per capita showed progressive increases to 136KWh in 2010, 150KWh in 2011, and 157KWh in 2012, sliding to 143KWh in 2013, then improving to 145KWh in 2014. In 2015 Nigeria's energy consumption per capita slid to 118KWh, improving to 124KWh in 2016, 129KW in 2017 and 134KWh in 2018. Energy consumption per capita is 121KWh in 2019 declining to 115KWh in 2020.

On the other hand, over the same period, UK's energy consumption per capita was 6,115KWh in 2000, increasing to 6,142KWh in 2001, further increasing to 6,143KWh in 2002, and 6,175KWh in 2003 before sliding down to 6,139 in 2004. In 2005, UK's energy consumption per capita increased to 6,271KWh, then kept on sliding down to 6,201KWh in 2006, 6,102KWh in 2007, 6,016KWh in 2008 and 5,643KWh in 2009. Energy consumption per capita kept going down in the UK to 5,701KWh in 2010, 5,472KWh in 2011, 5,449KWh in 2012; 5,410KWh in 2013 and 5,130KWh in 2014.

Energy consumption per capita in the UK showed further slides in 2015 to 4,808KWh; then to 4,732KWh in 2016;

4,657KWh in 2017 and 4,552KWh in 2018. Total energy consumption per capita in 2019 is 4,747KWh declining to 4,701KWh in 2020. Thus, energy consumption per capita in Nigeria showed fluctuating trends from 2000 to 2020. Similarly, the energy supply in the UK has been steadily declining from 2006 to 2020 despite a steadily growing economy and increasing population over the same period. The most widely advanced reasons for UK's declining energy consumption are energy efficiency technologies in household appliances and industrial machines and declining heavy manufacturing activities [16]. This is perhaps pointing to the success of the UK's past energy policies that emphasize achieving energy efficiency.

From 2000 to 2020, only one energy policy act was enacted in Nigeria, while six energy policy acts and forty-three policy instruments were put in place in the UK. Therefore, policymakers in Nigeria have not paid attention to the formulation of policies that could have guided the country towards achieving an adequate energy supply. Thus, the country's position among the global ranking of energy-consuming countries ranges from 93rd to 105th {m/20/}. Conversely, the six energy policy acts and forty-three policy instruments enacted in the UK from 2000 to 2018 could be argued as drivers for the levels of energy consumed. This is perhaps confirmed by the country's positions of 25th to 40th among the global ranking of countries on energy consumption {m/20/}. Although the range of these positions could be indicating low energy consumption, this could be attributed to energy efficiency. Subsequent section six is the conclusion of the study and its policy implications.

1. **4.0 Conclusions and Policy Implications.**

This section draws conclusions on the study and its possible policy implications which may be found useful by policymakers in Nigeria and the UK. Energy consumption per capita in Nigeria is among the worst globally despite its huge reserves of energy resources. From 1898 to 2020 only six acts were enacted to solve the country's acute energy supply shortage. Hence, it may be concluded that the lack of adequate policies in the Nigerian energy sector is a key reason for the acute shortage of energy supply. The UK is among the top energy-consuming countries although its consumption over the last decade is declining due to energy efficiency still a total of twenty-two acts and ninety-three policy instruments on energy supply, security and efficiency are put in place from 1882 to 2020.

Therefore, it could be concluded that an adequate energy supply in the UK despite being a net energy importer was consequent to the establishment of efficient energy policies. The policy implications of this study include the need for policymakers in Nigeria to focus on formulating and conscientiously implementing policies that will ensure adequate energy supply while tackling other problems in the sector. Similarly, copying from the UK, the policies must be put in place on regular basis to be addressing observed lapses in existing policies. Likewise, policymakers should ensure that the policies to be formulated are pragmatic enough to ensure efficient utilization of all viable energy resources available in different parts of the country for a robust energy mix. The provision of an adequate energy supply will undoubtedly serve

as a catalyst for the economic growth of the country, ensure a good standard of living for its growing population and bring more peace and stability to the country.

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