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DOES ENERGY PRICES TRIGGER UNEMPLOYMENT? EMPIRICAL EVIDENCE FROM NIGERIA

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Abstract

This study investigated the impact of energy prices on the unemployment rate in Nigeria from 1981 to 2021. The study obtained data on unemployment rate, hydro energy price, crude oil price, natural gas price, electricity tariffs, and electricity consumption from the World Bank and the International Energy Agency. These data were then analysed utilising the Autoregressive Distributed Lag (ARDL) approach to fulfil the study's objective. The research and conclusions indicate that: The use of hydro energy in Nigeria's economy has had a little impact on reducing unemployment in the long term, but it does not have any immediate influence on the unemployment rate in the near term. The long-term impact of crude oil price on unemployment in Nigeria is little, but in the short term it has a substantial effect on reducing the amount of unemployment. The long-term impact of the decline in natural gas prices on the unemployment rate was only somewhat favourable, but in the near term, it had a mixed effect on the level of unemployment, which was also considerable. Electricity tariffs had a long-term impact on the unemployment rate, leading to an upturn. However, in the near term, their influence on unemployment was varied and substantial. Electricity consumption had a favourable impact on

job creation in the long term, but its effects on unemployment in the near term were varied and not substantial. The findings also demonstrated a persistent nexus between energy cost and unemployment levels in Nigeria throughout the research period.
Keywords: Unemployment rate, hydro energy price, crude oil price, natural gas price, electricity tariffs, electricity consumption

INTRODUCTION

Energy is essential for the socio-economic growth, industrial advancements, healthcare, education, employment, and general well-being of the citizens of a nation. The pursuit of clean and cost-effective energy in Nigeria has persistently risen in response to energy supply deficiencies, highlighting the crucial role of energy not only in the manufacturing of goods and provision of services, but also in the realms of social welfare, employment generation, and safeguarding lives and assets. An economy requires enough supply of energy and its effective utilisation so as to fully achieve infrastructural growth. Although energy does not solve all of Nigeria's social and economic problems, it is a major hindrance to the development of the energy sector and the country's economic growth because of the high cost and unreliability of the currently available energy sources. Nigeria has a plethora of both traditional and sustainable energy resources that have the capacity to fulfil the energy requirements of its large population. Although the country currently faces a higher demand for energy than it can supply, there exist also unequal access to energy due to various factors i.e. inadequate infrastructure, inefficiencies in the energy sector, and insufficient investment. Some industry experts believe that these issues are caused by problems with energy pricing in the country. Furthermore, Nigeria is now grappling with energy insufficiency problems while having a plethora of energy resources. An effective and well-structured energy market is necessary to provide energy commodities that fuel the vital sectors of an economy, leading to upturn productivity. Hence, the inadequate level of productivity and the hindered expansion of the Nigerian industrial sector, including small and medium size firms, serve as evident indicators of an ineffective energy market burdened with supply volatility and price challenges.

As an upshot, the cost of electricity in Nigeria has become a widely discussed and important issue. The recent changes in the Nigerian energy sector, i.e. the deregulation of some parts and the price variations of energy items, have had a detrimental impact on the level of productive activities and job creation in the nation. Therefore, implementing a well-designed and productive energy pricing system will encourage investment and enhance involvement throughout the energy value chain, ultimately promoting growth and fortifying the Nigerian

energy sector. This will facilitate the optimal utilisation of both traditional and alternative energy resources, ensuring energy security and putting an end to long-standing energy poverty. Consequently, this will remove barriers to industrialization, foster wealth creation, and alleviate unemployment in the country.

The issue of unemployment has been a substantial macroeconomic challenge in Nigeria. In 2020, the unemployment rate was recorded at 33.3 percent. However, it has since declined to 5.3 percent in 2022 and further to 4.1 percent in 2023, as reported by the National Bureau of Statistics (NBS). The present rate of decline in unemployment, as reported by the National Bureau of Statistics, is being strongly disputed due to the simultaneous upturn of unemployed individuals and poverty levels in Nigeria. In light of this situation, it is crucial to analyse the influence of energy prices on the unemployment rate in Nigeria, considering the energy crises that have affected the global economy, particularly emerging nations, in recent years. We will proceed with our investigation by examining pertinent literature pertaining to the subject, followed by outlining the methodology for data analysis, presenting the upshots of our research, discussing the findings, and finally, providing the study's conclusion and suggestions.

LITERATURE REVIEW

Kardashev's biophysical theory, proposed in 1964, posits that energy is a fundamental need for both economic development and repeatability. The global economic expansion is contingent upon the utilisation of the human work force, energy, and material resources. Energy availability and affordability are essential for economic growth, sectoral development, and job creation. Therefore, energy plays a crucial role in fostering effective and efficient economic activity. Energy has the potential to impact economic operations by creating and adding value, rather than just producing products. The economic advantages of having energy readily available and accessible for production and employment development are of utmost importance to natural scientists and ecological economists. In congruent with proponents of the biophysical and theory of economic development, energy is the only element of production (Stern, 1999). In contrast, traditional economists deliberately disregarded energy as a production element because of the constraints imposed by land on economic activity, particularly in the agricultural sector. The economy implicitly incorporates energy via the acknowledgment of land as a production input in the agriculture sector (Babanyara & Saleh, 2010). This is corroborated by the neutrality theory, which posits that energy and economic development are not interdependent. Aghion and Howitt (2009) argue that energy conservation initiatives may not substantially affect economic growth. Ecological and mainstream economists acknowledge that petroleum and other energy sources serve as intermediate inputs for economic development and industrial

value enhancement. On the other hand, energy, labour, and land are considered basic components of production.

In their study, Williams, Edem, Francis, Marie-Stella, and Nadjath (2022) investigated the impact of electricity prices on the growth and development of SMEs in the Ashanti Region of Ghana. They employed the Vector Error Correction Model (VECM) and the Johansen co-integration method to analyse the data. The study's upshots indicate a detrimental, enduring nexus between power costs and the growth and development of SMEs. The research also discovered a detrimental long-term nexus between power costs and the development of SMEs. Elevated energy tariffs were shown to have an adverse impact on the expansion and advancement of SMEs. The data indicate that for every 1 percent rise in average energy price upturns (ELEC), there exist a 0.68 percent delay in the decline of PRO. In addition, according on the upshots of the VECM analysis, there exist a 1.2 percent lag in PRO for every 1 percent rise in PPI.

Ademola, Ditimi, and Johnson (2022) investigated the nexus between Nigeria's electricity tariff, natural gas prices, and crude oil prices. For the purpose of analysing the three resources, the study utilised time series data spanning 1980–2021. In this study, we utilised the ARDL bound test approach, a VAR model, and a paired causality test to examine the data. We utilised these techniques to look at the variables' causal effects, nexus, and cointegration. In congruent with the study's findings, there exist a long-term nexus between the prices of crude oil, electricity tariff and natural gas, which are all energy resources. But among them, there exist no discernible causal effect. In Nigeria's energy sector, the study discovered a nexus between the Natural Gas Price (NGP), Electricity Tariff (EET), and Crude Oil Price (COBP). But these elements' effects are out of proportion. The research proposes government involvement in the energy market to mitigate the effects of rising energy costs on people' welfare outcomes by addressing the causes that contribute to this rise.

Energy prices and economic growth in South Africa were the subjects of an investigation by Siyakudumisa, Kin, and Yiseyon-Sunday (2022). For the analysis, they utilised the ARDL method, which analyses data from 1994 to 2019. There exists a long-term nexus between the elements, in congruent with the study. There exists a strong unfavourable link between electricity costs and economic development in the long and short term, in congruent with the data. On the other hand, price of crude oils shows a strong favourable nexus with economic upswing in both the long and short term. Granger causality analysis in South Africa did not find that rising energy prices caused the country's economy to grow. But it only showed one way of looking at things: how productivity in the workplace and new gross fixed capital both contribute

to economic growth. Hence, it was proposed that the government take steps to reduce the unfavourable effect of high electricity prices on South Africa's economic growth.

In their study, Athanasios, Michael, and Symeoni-Eleni (2020) conducted a thorough examination of the enduring nexus between energy costs and economic development in the peripheral regions of the European Union. The work utilised the Engle–Granger approach to calculate an estimation of a Vector-Error Correction Model. The research also utilised Variance Decomposition Analysis to quantify the causal impact of energy costs on economic growth. The research presented empirical support for the conservation hypothesis in relation to real GDP and residential electricity costs, likewise for the growth hypothesis in relation to real output and industrial electricity prices. The residential electricity sector has the greatest amount of effect, since changes in industrial electricity costs and price of crude oils are shown to be a causal factor for changes in home electricity prices. The investigation discovered indications supporting the feedback hypothesis about the nexus between final energy use and residential electricity pricing. In conclusion, the short-term level of economic growth, as measured by real GDP, is highly influenced by internal factors, whereas external factors have a temporary impact.

In their study, Dagoumas, Polemis, and Soursou (2020) examined the nexus between energy prices and economic development in Europe from 1990 to 2018. They utilised the Engle-Granger technique to estimate yearly data and employed the VECM (Vector Error Correction Model). The research established a causal nexus between the price of crude oil and the prices of industrial and household power. The findings also indicated that a rise in power costs will not have a detrimental effect on European growth rates.

To find out how changes in oil prices affect Nigeria's currency rate, inflation rate, and interest rate, Gylych, Jibrin, Celik, and Isik (2020) set out to do empirical investigations with a focus on the near term. This study utilised the Forecast Error Variance Decomposition (FEVD), TY Modified Wald (MWALD) test for causality, and Impulse Response Functions (IRFs) to analyse the widely utilised Toda-Yamamoto model (TY model). The research conducted monthly analyses of data spanning from 1995 to 2018. With a significance threshold of 10 percent, the MWALD test demonstrated a one-way causal link between the logarithm of the oil price (lnoilpr) and the logarithm of the exchange rate (lnexchr). The logarithms of the the exchange rate (lnexchr), consumer price index (lncpi), and the interest rate (lnintr) all interact with one another at the same time. In addition, lncpi is Granger-caused by the combined effects of lnoilpr, lncpi, and lnintr. In addition, it was demonstrated that, at a 5 percent level of significance, lnintr, the natural logarithm of interest rates, responded favourably to changes in lnoilpr and lnexchr, the natural logarithm of oil prices and exchange rates, respectively, and that these factors collectively had a substantial impact on lnintr. We find more evidence for this in the

form of findings in Impulse Response Functions and Forecast Error Variance Decompositions. Research into the real world has shown that oil prices substantially affect Nigeria's currency rate, borrowing costs, and inflationary and deflationary trends.

Ifeonyemetalu and Ogu (2020) investigated the stimulus of oil price volatility on the economic expansion in Nigeria. To determine how oil price volatility affects GDP growth in Nigeria, this study utilised the Generalised Auto-Regressive Conditional Heteroskedasticity GARCH (1,1) model. Utilising data sourced from the CBN Statistical Bulletin and the OPEC database of 2018, the data set included quarterly data from 1984 to 2017. The study's independent variables were the rates of oil, currency, and interest; the dependent variable was gross domestic product (GDP). Upshots show that oil price substantially affects GDP growth in Nigeria for the better. Although the outcomes of oil price variations on economic advancement are not statistically substantial, they are nonetheless favourable. There exist a favourable and statistically substantial nexus between the exchange rate and GDP growth in Nigeria. Since there exist a direct nexus between oil prices and economic growth, it stands to reason that the government should put the extra money it gets from higher oil prices towards improving basic infrastructure like roads, schools, and power grids. Rapidly establishing vertical and horizontal links within the oil business is crucial for the government to diversify the economy via the use of oil money. The government should keep investing wisely in infrastructure development to overcome major challenges, which will reduce the costs of domestic manufacturing and upturn local supply.

Geetilaxmi and Giri (2020) analysed the empirical nexus between power consumption, economic growth, energy pricing, and technological development in India. They utilised yearly time series data from 1981 to 2017. The study found a long-run equilibrium nexus between the variables by utilising the ARDL limits testing method to co-integration. Economic growth substantially affects power consumption in the long run, in congruent with the study, whereas technological progress has an unfavourable impact on power consumption in the short and long run. In congruent with the Granger causality research, development in the Indian economy and technological progress have an unidirectional effect on energy consumption. Hence, the research proposed that Indian policy makers should augment their investment in power infrastructure to bolster the country's robust economic development. Moreover, it is imperative for policy makers and the government to actively promote technical innovation as a means to reduce reliance on fossil fuels and promote the use of renewable energy sources. Implementing this measure has the potential to facilitate the economy in attaining a long-term economic expansion while simultaneously improving the state of the environment.

In their study, Musa, Maijama'a, Shaibu, and Muhammad (2019) observed the effect of price of crude oil and forex rate on Nigeria's economic development. They utilised an ARDL model to analyse data from 1982 to 2018. The upshots showed that the exchange rate and the price of crude oil had a favourable and large effect on economic growth in the long and short terms, respectively. The research's key elements, price of crude oil and forex rate, were shown to have an effect on economic expansion in both the long-run and the short-run. Hence, the government should broaden its sources of revenue by engaging in agriculture, industry, and investment. This would help mitigate the excessive dependence on crude oil and the consequent income volatility caused by fluctuations in price of crude oils.

Sunday (2019) examined the nexus between fluctuations in oil prices and the development of infrastructure in Nigeria. The study utilised co-integration and error correction modelling techniques to analyse data from 1981 to 2016. The findings indicated that both the fluctuation in oil prices and the inflation rate have a detrimental effect on the development of infrastructure. On the other side, infrastructure investment often rises in tandem with an appreciation of the real exchange rate. In order to improve the country's income trajectory, the report recommends creating and executing effective plans to diversify the economy. In conclusion, much of the literature on Nigeria focuses on how price of crude oil volatility and unanticipated shifts affect GDP, exchange rates, and economic growth. To get to the bottom of this, we are looking at how the price of crude oil and the exchange rate have affected Nigeria's economic growth.

Ukoima and Ekwe (2019) investigated the impact of electricity availability on economic growth rate comprehensively in their research. The state of Nigeria's electricity supply from 1983 to 2017 was the primary subject of the research. The upshots show that in Umudike, Abia State, Nigeria, 68 percent of the people and all stakeholders agree that Nigeria's power supply has been much better in the last several years. If the electricity supply were to rise by only 1 percent, the GDP would grow by 3.94 percent. There exist a 0.34 percent upturn in electricity demand and supply for every 1 percent growth in real gross domestic product. Power outages continue to affect many parts of Nigeria despite the country's present generating capacity of 7,000 MW and distribution capacity of 4,600 MW. This is because of factors such as rising demand, poor maintenance of transmission and distribution facilities, and a lack of physical infrastructure. Based on these findings, it is prudent to support measures that aim to improve Nigeria's power generation and distribution. To put it another way, the economy will benefit from this.

Research by Jahangir and Dural (2018) looked at how the Caspian Sea region's economy has grown in nexus to natural gas and crude oil. Utilising time series data from 1997

to 2015, the researchers in this article performed a Granger causality test utilising the OLS technique. The goal was to find out how crude oil, natural gas, and their link to economic development work. Upshots from the ordinary least squares method show that natural gas and crude oil both substantially impact the region's economic growth. Further, a causality test has shown that GDP has a one-way effect on crude oil export prices and prices. A possible use of GDP in price of crude oil and export forecasting follows. Having said that, it is not possible to use crude oil exports and prices to predict GDP. Neither GDP nor natural gas look likely to follow this path, which is surprising. Natural gas and GDP have a one-way, inverse nexus. It is possible to use changes in the price and export of natural gas as a proxy for GDP because of the causal nexus between the two variables. On the other hand, GDP is not a good indicator of future export and price of crude oils.

To determine how changes in oil prices affect Nigeria's economy, Okonkwo and Ogbonna (2018) performed research. The Dutch disease theory served as the foundation for the inquiry. We use price of crude oil, gross domestic product, exchange rate, unemployment rate, and government expenditure as our variables. Dates ranged from 1997 all the way up to 2015, and the data came from the National Bureau of Statistics (NBS) annual report and the CBN statistical bulletin. The study found that the Nigerian economy, the rate of unemployment, the exchange rate, and the price of crude oil were all favourably correlated. The nexus between government expenditure and the Nigerian economy is not linear, but it is indirect. The fluctuation of price of crude oils has the greatest effect on the Nigerian economy. Researchers concluded that the Nigerian government should try to diversify the country's economy.

Okwanya and Abah (2018) examined the influence of energy consumption on the alleviation of poverty in a group of 12 African nations throughout the time span of 1981-2014. The research utilised the Fully Modified Ordinary Least Square (FMOLS) approach to demonstrate a long-term unfavourable nexus between energy consumption and poverty level in the chosen African nations. This highlights the significance of energy in reducing poverty. The findings also demonstrated that other determinants, i.e. capital stock and political stability, have a substantial impact on poverty reduction, suggesting that these variables play a crucial role in alleviating poverty. Moreover, the granger causality test revealed that there exist a one-way causal nexus in the short term, where energy use causes poverty. The datan unequivocally indicate that higher energy usage is associated with a decline in poverty levels. Hence, the research suggests that the governments of the chosen nations should enhance their infrastructure and ensure political stability to optimise the bearing of energy consumption on alleviating poverty.

In a study conducted by Orlu (2017), the author examined the influence of the price of Premium Motor Spirit (PMS) on the economic development of Nigeria. Additionally, the study analysed the effects of labour employment (LEMP), gross domestic investment (GDI), and lending interest rate (LIR) on the country's economic growth between 1970 and 2013. The research utilised the Error Correction Mechanism technique and found that a rise in PMS Price has a statistically substantial unfavourable effect on the Nigerian economy (Real GDP) at a significance level of 5 percent. This data suggests that a 1 percent upturn in the price of PMS (Petrol, Motor Spirit) from the previous year upshots in a 0.7 percent loss in Real GDP (Gross Domestic Product). In other words, an upturn in the price of energy (PMS) will have an unfavourable effect on the output of enterprises, households, and government institutions, ultimately leading to a decline in real GDP. The study found that there exist a favourable and substantial nexus between GDI and Real GDP. Specifically, a 1 percent upturn in GDI from the previous year will upshot in an 8.5 percent upturn in Real GDP. Similarly, the study found that a 1 percent upturn in LEMP will lead to a 2 percent upturn in Real GDP. On the other hand, the study found that LIR, when lagged by two or three years, has an unfavourable and substantial impact on Real GDP. This means that any percentage upturn in LIR will upshot in a corresponding percentage decline in Real GDP. Overall, the study concluded that PMS price, GDI, LEMP, and LIR are important factors influencing Real GDP in Nigeria. Therefore, the research suggests that the government should lower the price of PMS by deregulating it and promoting active involvement of the private sector in the downstream of the petroleum industry. This would foster competition and provide employment opportunities in the nation.

Roland (2017) examined the influence of premium motor spirit (PMS), GDI, labour employment, and lending interest rate on economic development in Nigeria from 1970 to 2013. The use of an error correction model revealed that PMS and the lagged values of interest rate had an unfavourable and statistically substantial effect on economic growth. Conversely, GDI and the lagged values of labour employment had a favourable and statistically substantial influence on economic growth. The report proposed that the government should decline the price of PMS at the pump by deregulation and the inclusion of private sector involvement.

A research by Chikwe, Ujah, and Uzoma (2016) looked at the effects of oil prices on Nigerian macroeconomic indices from 1990 to 2015. Multiple regression analysis shows that price of crude oil and unemployment rate are favourably and statistically substantially related. Vacillations in interest rates had a devastating effect on the price of crude oil. The upshots also showed that real GDP, currency rate, and inflation did not substantially affect price of crude oils.

In 2008, François and Mignon piloted a research to examine the nexus between oil prices and various macroeconomic factors in many countries, including both oil-importing and

oil-exporting nations. The research examined many economic indicators, including Gross Domestic Product (GDP), household consumption, consumer price index (CPI), unemployment rate, and share prices. The findings demonstrated the existence of nexus between oil prices and macroeconomic factors. Specifically, there exist a temporary nexus between oil prices and share prices. Furthermore, a substantial nexus was found between the prices of oil and macroeconomic factors, indicating a long-term nexus.

A number of studies have looked at how energy prices affect national economies throughout the globe, in congruent with the study on the topic. However, the majority of the consulted research focused on the nexus between energy pricing and economic growth, or energy consumption and economic growth. Only a small number of studies examined the impact of energy costs on job creation. It is essential to examine how energy costs in Nigeria help to lowering unemployment, considering the substantial impact energy availability and pricing have on the industrial process and job creation.

METHODOLOGY

This work is theoretically grounded on the Paul Romer Endogenous Growth hypothesis. Romer's (1986) Endogenous development theory posits that innovation and technological advancements, i.e. those related to energy, have the capacity to foster continuous economic development, promote employment, and alleviate poverty. Those that exhibit high energy consumption at reasonable rates tend to have lower levels of unemployment in comparison to those with low energy use and excessively high energy prices. Building upon this standpoint, the aggregate production function of the Endogenous Theory may be constructed as follows:

$Y = f(A, K, L)$ 1

Where: Y = Aggregate real output, K = Stock of capital, L = Stock of labour, A = Technology (or technological advancement). In terms of the significance of energy in driving economic development, the Endogenous development theory highlights technology (energy) as the endogenous element that is associated with energy and has the potential to stimulate economic growth. The Nigeria's economy is modelled utilising an energy price and unemployment rate model, which is based on the theoretical grounding:

$$UMPR_t = f(\delta_0, HEP_t^{\delta_1}, OIP_t^{\delta_2}, NGP_t^{\delta_3}, ETR_t^{\delta_4}, ECP_t^{\delta_5}, e^{u_t}) \quad 2$$

To simplify the estimate process, equation 2 is converted into a logarithmic linear form as follows:

$$\ln UMPR_t = \delta_0 + \delta_1 \ln HEP_t + \delta_2 \ln OIP_t + \delta_3 \ln NGP_t + \delta_4 \ln ETR_t + \delta_5 \ln ECP_t + e_t \quad 3$$

Where: Ln = Natural Logarithm; $UMPR_t$= Unemployment rate, HEP_t= Hydro energy price, ETR_t= Electricity tariffs, OIP_t= crude oil price, NGP_t =Natural gas price, ECPt =Electricity Consumption and e_t = Disturbance or error term. Sources for these numbers include the International Energy Agency and the World Bank database.

Data Collection and Sources

The nature of data for any research depends entirely on the objectives of the research and the type of research that is being undertaken. In line with the above submission, this study made use of secondary data sourced/extracted from the International Energy Agency, World Bank Development Indicator and Central Bank of Nigeria statistical bulletin. The data sets (time series data) consisted of forty (40) yearly observations from 1981 to 2021 on both Nigerian economy (proxied by growth rate of Gross Domestic Product, unemployment rate and inflation rate) and energy pricing (proxied by hydro energy price, solar energy price, oil price and natural gas price).

The ARDL estimation technique

In order to verify that the data meet the fundamental requirements of ordinary least squares estimation, the stochastic characteristics of the series were examined. In this work, the Philip-Perron approach was utilised to assess the stationarity of the data series. The ARDL model was chosen as the most suitable econometric technique for this investigation due to the presence of variables with a combination of stationary orders, including I(0) and I(1). Utilising the OLS approach to check for cointegration across variables, the ARDL methodology is appropriate for building short-run and long-run nexus for a realistic sample size at the same time. The variables under consideration have the following ARDL equation:

$$\Delta\ln(UMPR_t) = \sum_{i=1}^{n} \alpha\delta_0 \Delta ln(UMPR_{t-1}) + \sum_{i=1}^{n} \delta_1 \Delta 1n(HEP_{t-1}) + \sum_{i=1}^{n} \delta_2 \Delta 1n(OIP_{t-1}) + \sum_{t=1}^{n} \delta_3 \Delta 1n(NGP_{t-1}) + \sum_{t=1}^{n} \delta_4 \Delta 1n(ETR_{t-1}) \sum_{t=1}^{n} \delta_5 \Delta 1n(ECP_{t-1}) \eta_0 \Delta\ln(UMPR_{t-1}) + \eta_1 \Delta\ln(HEP_{t-1}) + \eta_2 \Delta\ln(OIP_{t-1}) + \eta_3 \Delta\ln(NGP_{t-1}) + \eta_4 \Delta\ln(ETR_{t-1}) + \eta_5 \Delta\ln(ECP_{t-1}) + U_t - - -(4)$$

Where: $\delta_1 - \delta_5$ = short-run multipliers; U_t is serially uncorrelated stochastic term with zero mean and constant variance, $\eta_1 - \eta_5$ = are coefficients of the long-run dynamic of the ARDL model, and Δ is the first difference operator. Once we determined the long-term nexus between the variables, we proceeded to calculate the long-term equations for the unemployment rate as follows:

$$\ln UMPR_t = \delta_0 + \delta_1 InHEP_{t-1} + \delta_2 InOIP_{t-1} + \delta_3 InNGP_{t-1} + \delta_4 InETR_{t-1} + \delta_5 InECP_{t-1} + \mu_t \text{ - 5}$$

To determine the ideal ARDL model lag length, the Akaike Information Criterion (AIC) was utilised. In both cases, the regressors and the regress itself utilised a lag duration of one (1). The short-run dynamics were estimated utilising the ARDL error correction equation.

$$\Delta \ln(UMPR_t) = \sum_{i=1}^{n} \delta_0 \Delta 1n(UMPR_{t-1}) + \sum_{i=1}^{n} \delta_1 \Delta 1n(HEP_{t-1}) + \sum_{i=1}^{n} \delta_2 \Delta 1n(OIP_{t-1}) + \sum_{t=1}^{n} \delta_3 \Delta 1n(NGP_{t-1}) + \sum_{t=1}^{n} \delta_4 \Delta 1n(ETR_{t-1}) + \sum_{t=1}^{n} \delta_5 \Delta 1n(ECP_{t-1}) + \sum_{t=1}^{n} ECM_{t-1} + U_t \quad 6$$

Where: $\delta_1 - \delta_{5,}$ = short-run parameters. ECM is the lagged error correction term estimated from the long-run dynamics. The coefficient adjustment is often unfavourable and often statistically substantial, indicating the presence of a long-term nexus.

RESULTS

Based on the mean and standard deviation values, the descriptive statistics in Table 1 show that the following variables: hydro energy price (HEP), natural gas price (NGP), crude oil price (OIP), electricity tariff (ETR), and electricity consumption (ECP) are very volatile. The lowest and highest values of these variables also indicate the substantial volatility of the variables throughout the years. The Jarque-Bera, Skewness, and kurtosis statistics indicate that only the hydro energy price and electricity consumption variables follow a normal distribution, as seen by their probability values. The unemployment rate, price of natural gas, price of crude oil, and electricity tariff exhibited a non-normal distribution around their respective mean values. This suggests that the fluctuations seen in the unemployment rate in Nigeria may be attributed to the unpredictable changes in energy costs over time.

Table 1. Descriptive statistics Result (E-view 12 output)

Statistic	UMPR (%)	HEP(Kwh)	OIP ($/Barrel	NGP ($/mmbtu)	ETR(N/KWh)	ECP(KWh)
Mean	4.44	3.81	42.58	5.45	21.07	107.12
Median	3.77	3.50	29.04	4.05	18.62	100.89
Maximum	9.85	9.11	109.45	16.12	87.26	156.80
Minimum	1.09	0.92	12.28	2.09	4.26	50.90
Std. Dev.	2.00	2.11	29.15	3.49	15.32	28.16
Skewness	1.26	0.48	0.99	1.30	2.31	0.12
Kurtosis	3.81	2.58	2.82	3.88	9.77	1.81
Jarque-Bera	12.04	1.88	6.77	12.82	114.58	2.51
Probability	0.00	0.39	0.03	0.00	0.00	0.29
Sum	182.05	156.21	1745.57	223.36	863.90	4391.76
Sum Sq. Dev.	160.29	177.48	33978.94	487.08	9386.45	31709.72
Observations	41	41	41	41	41	41

The unit roots test findings shown in Tables 2 suggest that the unemployment rate (UMPR) exhibited stationarity either at the level or at order zero. Consequently, the variables reached a state of stationarity without the need for differencing. Nevertheless, the hydro energy price (HEP), natural gas price (NGP), crude oil price (OIP), electricity tariff (ETR), and electricity consumption (ECP) did not exhibit stationarity at the level, but instead achieved stationarity at order one i (1). This suggests that the prices of hydro energy, crude oil, and natural gas, likewise the electricity tariff and electricity usage, exhibited stationary behaviour or rejected the null hypothesis of having unit roots after undergoing first differencing.

The decision on which estimating approach to utilise in evaluating the effect of energy pricing on macroeconomic performance in Nigeria was based on the establishment of stability in the variables and the order in which they are cointegrated. The variables in Tables 2 exhibit a combination of several orders of integration. The unemployment rate remained constant at a level of i(0), whereas all the independent variables exhibited stationarity at order one i(1). Therefore, the Autoregressive and Distributed lag (ARDL) approach was utilised.

To determine whether the dependent and independent variables have a co-integrating (long-run) nexus, an alternate method to traditional econometric research is the ARDL bound testing (Pesaram Shin and Smith, 2001). In congruent with Pesaran, Shin, and Smith (2001) and Sulaiman and Mohammad (2010), this strategy has several advantages over other approaches. Some of these advantages include being suitable for small data sets, being simple to implement utilising ordinary least squares (OLS), not having endogeneity problems, being able to estimate both long-run and short-run coefficients at the same time, and being applicable to a combination of both I(1) and I(0) variables. Our unit roots test upshots indicate that ARDL is a must-have for any empirical study.

Table 2. Unit Root Test Result utilising Philip -Perron method (E-view 12 output)

Variable	PP Statistic	1%	5%	Remark
Log(UMPR)	-3.543	-3.606	-2.937	Stationary @I(0)
Log(HEP)	-6.850	-3.611	-2.939	Stationary@i(1)
Log(OIP)	-6.150	-3.611	-2.939	Stationary@i(1)
Log(NGP)	-4.555	-3.611	-2.939	Stationary@i(1)
Log(ETR)	-6.454	-3.611	-2.939	Stationary@i(1)
Log(ECP)	-9.567	-3.611	-2.939	Stationary@i(1)

The ARDL bound test upshot in Table 3 confirms the presence of a long-term nexus between the unemployment rate and energy prices in Nigeria. This is indicated by the F-statistic value of 4.661725, which exceeds the theoretical values at significance levels of 10 percent, 5 percent, 2.5 percent, and 1 percent for both the lower and upper bounds. Therefore, the null

hypothesis, which suggests that there exists no link between the dependent and explanatory factors, is rejected. This indicates that there exists a long-term nexus between these variables.

Table 3. ARDL Bound Test for Long run Nexus –
UMPR/Unemployment rate model (E-view 12 output)

F-Bounds Test		Null Hypothesis: No levels nexus		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	4.661725	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

The ARDL analysis conducted on the nexus between energy costs and unemployment levels in Nigeria, as shown in Table 4, reveals an unfavourable nexus between hydro energy price, natural gas price, electricity usage, and the degree of unemployment. This suggests that an upturn in the prices of hydro energy, natural gas, and electricity usage led to a decline in the unemployment rate, whereas a decline in the price of these energy sources resulted in an upturn in joblessness in Nigeria throughout the research period. The findings also demonstrate that the influence of hydro energy prices and electricity usage on the unemployment rate was substantial, but the impact of natural gas prices on unemployment was minimal throughout the period. Conversely, it was shown that there exists a favourable nexus between the price of crude oil and power tariff, and the unemployment rate. This suggests that the rise in price of crude oils and electricity tariffs contributed to an upturn in the unemployment rate, whereas a decline in the costs of both energy sources hindered the level of unemployment over the research period. The findings indicate that the impact of crude oil was not statistically substantial, however the influence of electricity pricing on unemployment level was statistically substantial throughout the research period.

Table 4. ARDL Result for Long run Nexus –
Unemployment rate model - ARDL(1, 0, 3, 2, 3, 3) (E-view 12 output)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(HEP)	-0.896123	0.171197	-5.234443	0.0000
LOG(OIP)	1.259693	0.685685	1.837131	0.0811
LOG(NGP)	-0.982119	0.642457	-1.528692	0.1420
LOG(ETR)	1.402189	0.244323	5.739089	0.0000
LOG(ECP)	-1.398016	0.649581	-2.152182	0.0438
C	2.087175	1.938584	1.076649	0.2945

The ARDL upshot shown in Table 5 demonstrates a statistically substantial unfavourable nexus between the price of crude oil and the unemployment rate in the near term. The obtained outcome aligns with the anticipated theoretical prediction and suggests that the rise in price of crude oil substantially declined unemployment in Nigeria throughout the research period. The decline in natural gas price had a major impact on reducing the unemployment rate at the same time, but also caused a big upturn in joblessness one period later throughout the research period in Nigeria. This indicates that the price of natural gas has a varied but substantial influence on unemployment in the nation. The electricity tariff is shown to have a favourable and substantial nexus with unemployment at the current level and one time period in the past, but an unfavourable and large nexus with unemployment at two time periods in the past. This research demonstrates that the electricity price/tariff has a complex but substantial influence on unemployment in Nigeria over the time under investigation. Our findings indicate that there exist a favourable but statistically insubstantial nexus between electricity consumption and unemployment at the first lag, and an unfavourable but statistically insubstantial nexus at the second lag. Consequently, the research found that electricity consumption had a varied effect but a negligible influence on the unemployment level in Nigeria over the study period.

The rapidity of modifications of the Error correction term indicates that the unemployment rate in Nigeria responds swiftly to fluctuations in energy costs, as shown by the coefficient of -0.68. In addition, changes in Nigeria's energy prices during the course of this study account for 78 percent of the expected variance in the unemployment rate, in congruent with the coefficient of determination.

Table 5. ARDL Result for Short run/ECM –

Unemployment rate model - ARDL(1, 0, 3, 2, 3, 3) (E-view 12 output)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(OIP)	0.126324	0.113452	1.113455	0.2787
DLOG(OIP(-1))	-0.836295	0.158561	-5.274285	0.0000
DLOG(OIP(-2))	-0.457287	0.121711	-3.757168	0.0012
DLOG(NGP)	-0.224316	0.101247	-2.215540	0.0385
DLOG(NGP(-1))	0.725446	0.166292	4.362493	0.0003
DLOG(ETR)	0.576360	0.197782	2.914115	0.0086
DLOG(ETR(-1))	0.420323	0.202100	2.079780	0.0506
DLOG(ETR(-2))	-0.466042	0.172121	-2.707648	0.0135
DLOG(ECP)	0.086147	0.210247	0.409742	0.6864
DLOG(ECP(-1))	0.410150	0.230396	1.780192	0.0902
DLOG(ECP(-2))	-0.317587	0.198283	-1.601682	0.1249
CointEq(-1)*	-0.680158	0.104428	-6.513194	0.0000

R-squared	0.775406	Mean dependent var	0.032636
Adjusted R-squared	0.680385	S.D. dependent var	0.237036
S.E. of regression	0.134007	Akaike info criterion	-0.929760
Sum squared resid	0.466905	Schwarz criterion	-0.412627
Log likelihood	29.66544	Hannan-Quinn criter.	-0.745768
Durbin-Watson stat	2.405766		

Table 5…

Table 6 displays the upshots of the diagnostic tests conducted on the unemployment rate model. With a probability of 0.936, the Jarque-Bera normalcy test was able to confirm the upshots, which are statistically substantial at the 5 percent level. Given the acceptance of the null hypothesis of normal distribution, this suggests that the error terms follow a normal distribution. Utilising the Breusch-Godfrey or Lagrange Multiplier (LM) tests, we checked the residuals for serial nexus. By exceeding the 5 percent significance level, the probability value of 0.325 supported the acceptance of the null hypothesis that there was no serial link. Our model did not show heteroscedasticity, in congruent with the Bresch-Pagan-Godfrey Heteroskedasticity test. This is because we maintained that homoscedasticity is a null hypothesis. Since the explanatory variables had no effect on the error terms (probability = 0.552), we can say that they were homoscedastic. Also, the RESET test's probability value of 0.654 was higher than the specified 5 percent significance level. This led to the confirmation of the null hypothesis, which stated that the model had been properly specified. As an upshot, there was zero room for error in the model statement, which may have resulted in the missing data. Once again, the model does not possess an incorrect functional form. Based on these findings, we have determined that the model is well-suited and sufficient for analysis, and any conclusions obtained from it are reliable for prediction.

Table 6. Model Diagnostic/Post Estimation Test Result
for Unemployment rate Model (E-view 12 output)

Diagnostic test	**F-statistic**	**Probability**
Jarque-Bera test for normality	0.133	0.936
Bresch-Gofrey serial nexus LM test	1.197	0.325
Bresch –Pagan-Godfrey Heteroskedasticity test	0.934	0.552
Ramsey RESET test for specification error	0.207	0.654

To verify that the long-run coefficients and the short-run dynamics of the unemployment model are stable, we utilised the Recursive Residual, Cumulative Sum (CUSUM), and CUSUM of Squares graphs. The Recursive Residual, CUSUM, and CUSUM of Squares lines constantly remained below the critical threshold of 5 percent, as seen in Figures 1, 2, and 3. Recursion, CUSUM, and CUSUM of Squares plots do not cross the 5 percent critical lines, indicating that

the long-run coefficients of energy price on unemployment level in Nigeria's economy are stable. The model's ability to anticipate the impact of energy price on unemployment levels in Nigeria is shown by the existence of parameter stability.

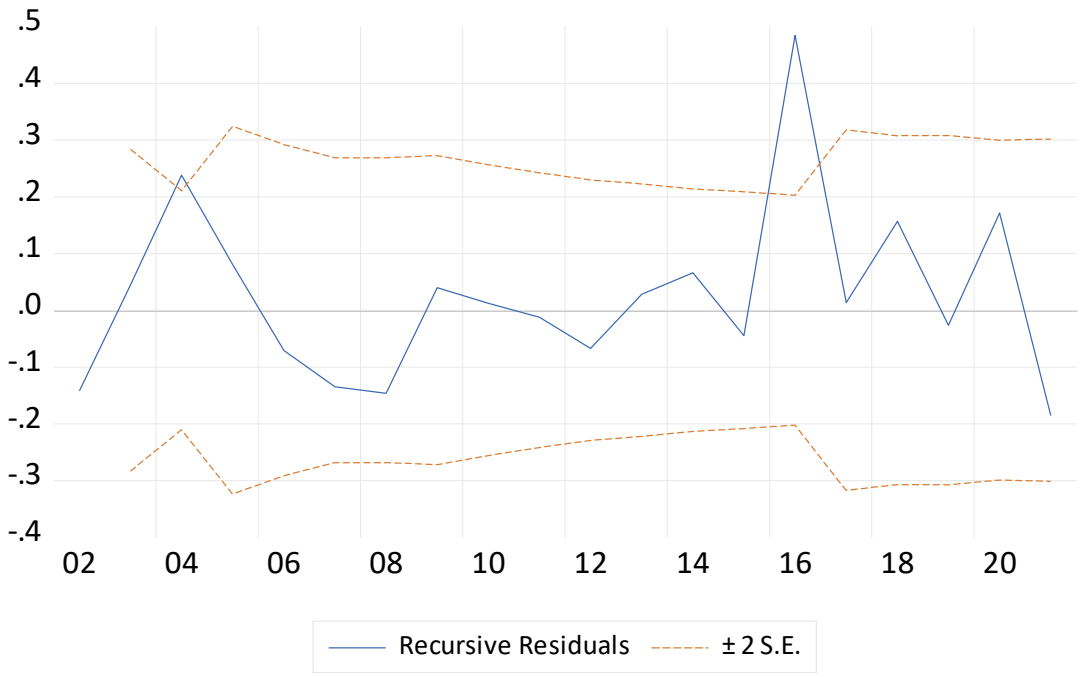

Figure 1. Recursive Residuals graph for Stability of the Unemployment rate model (E-view 12 output)

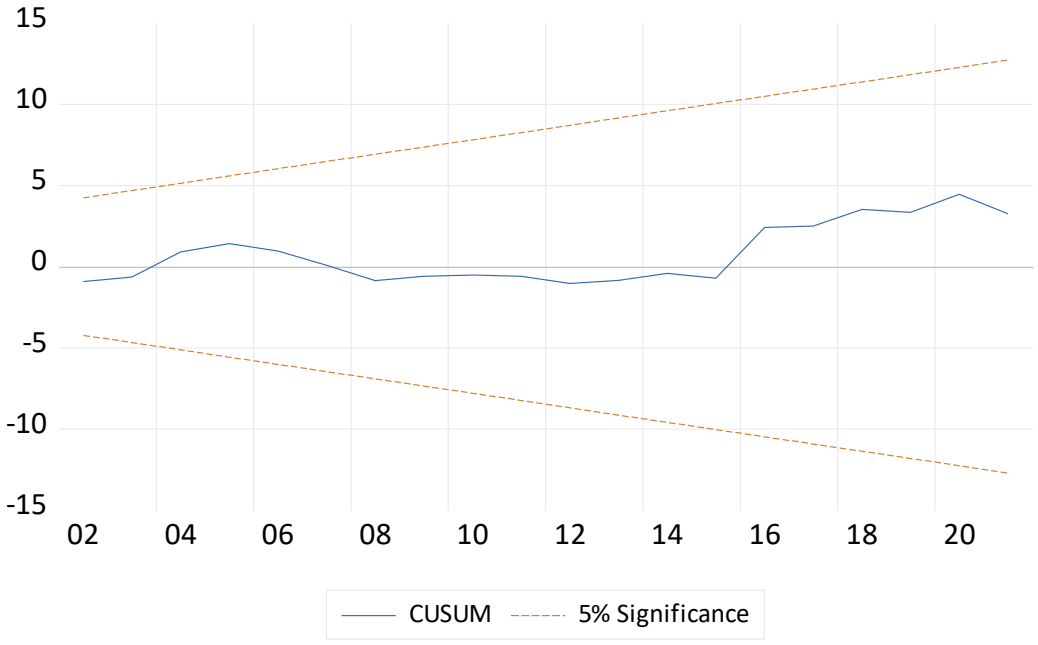

Figure 2. CUSUM graph for Stability of the Unemployment rate model (E-view 12 output)

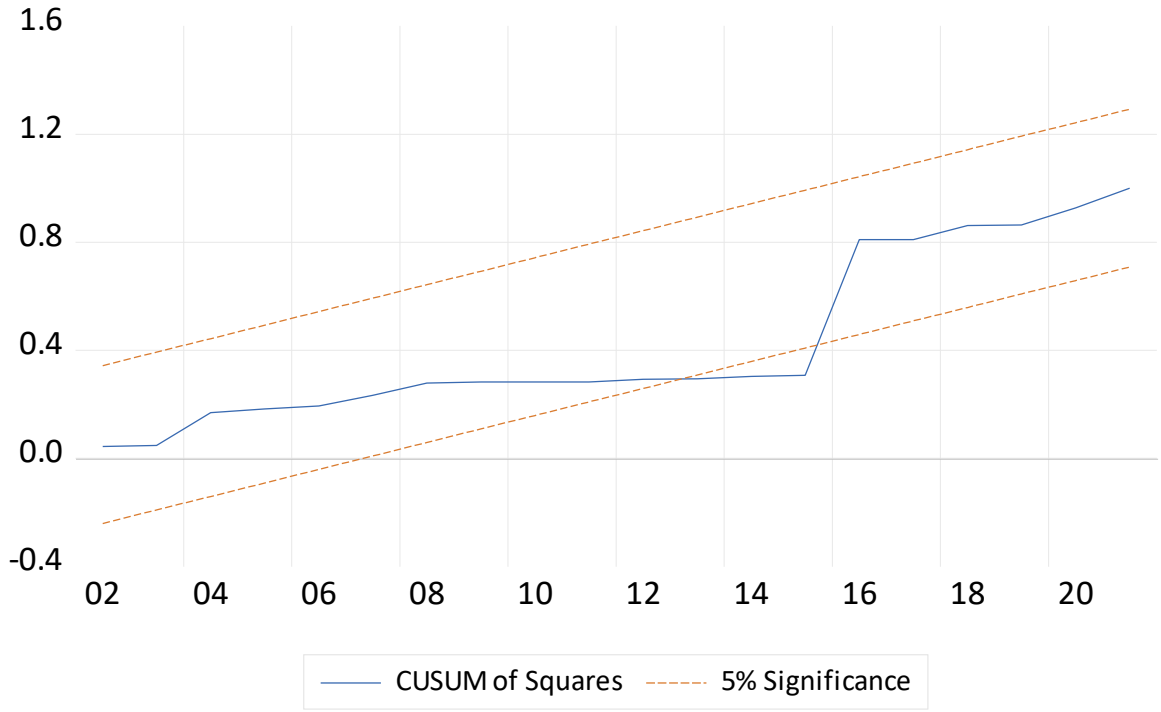

Figure 3. CUSUM of Squares graph for Stability of the Unemployment rate model (E-view 12 output)

DISCUSSION

The ARDL analysis of the unemployment model shows that hydro energy price, natural gas price, and electricity usage had a detrimental influence on the level of unemployment. Nevertheless, the hydro energy price had a substantial effect on power usage. Lowering the price of natural gas as well as hydro energy for end users has the potential to decline production costs, boost output, and provide extra employment opportunities. Nevertheless, a decline in power use might also lead to a decline in economic activity and an upturn in unemployment. The upturn in price of crude oils and power tariffs has a favourable impact on unemployment. This suggests that the rise in crude oil and energy prices contributed to the upturn in unemployment rates in Nigeria. The findings of Okonkwo and Ogbonna (2018) and Chikwe, Ujah & Uzoma (2016) align with the nexus seen between price of crude oil and unemployment rate in Nigeria. A rise in power rate may upshot in job losses due to the higher cost of electricity, which might boost production costs and compel firms to reduce their workforce.

The ARDL Error Correction Model analysis in the short term indicates that the unemployment level in Nigeria is influenced by a combination of factors including price of crude oil, natural gas price, electricity tariffs, and power usage, with varying effects. This outcome may closely align with policy incongruity, particularly in relation to policies pertaining to the oil and

gas industry and the advancement of electricity. The Federal Government of Nigeria has had a monopoly on the country's oil and gas industry likewise the electricity sector. The government has had substantial influence over investments in production and, to some degree, consumption in both sectors, mostly via regulated pricing. various factors have impeded private investment in various areas. Despite the government's efforts to liberalise the oil and gas industry by eliminating price subsidies, the impact of this strategy has not yet been seen by the public. It is crucial to acknowledge that energy cost in Nigeria is still subsidised. This may contribute to the limited private investment and slow growth of existing infrastructure in the power industry, particularly in generation and distribution, inside the nation. Nigeria now produces around 4000 megawatts (MW) of energy, which is just a fraction of its full potential of 12000 MW. Despite these advancements, the regression equation's goodness of fit indicates that around 68 percent of the predictable changes in unemployment may be attributed to energy price in Nigeria throughout the studied period.

CONCLUSION AND RECOMMENDATIONS

Utilising the ARDL technique, this research looked at the impact of energy prices on Nigeria's unemployment rate from 1981 to 2021. The research and conclusions indicate that: Hydro energy has had a little impact on reducing unemployment in Nigeria's economy over a lengthy period of time, but it does not have any stimulus on the unemployment rate in the near term. The long-term influence of price of crude oil on unemployment in Nigeria is little, however in the short term it has a substantial effect on reducing jobless levels. The long-term impact of the decline in natural gas price on the unemployment rate was only somewhat favourable, but in the near term, it had a mixed effect on the level of unemployment, which was also considerable. Electricity rates had a long-term impact on the unemployment rate, leading to an upturn in unemployment. However, in the short term, the influence of electricity tariffs on unemployment was varied and substantial. Electricity consumption had a favourable impact on job creation over a long period of time, but its effects on unemployment in the near term were varied and not substantial. The findings also indicated a substantial and enduring nexus between energy cost and unemployment levels in Nigeria throughout the research period.

The study suggests increasing investment in hydro energy and natural gas energies to promote competition, stabilise prices, create jobs, and improve economic performance and job creation. The recommendation on increasing investment in hydro energy and natural gas is because both were found to be friendly with price stability and job creation in Nigeria, thus promoting investments in hydro power generation and gas-to-power generation will boost power supply in the country, stabilize the price of energy and improve employment and stabilize

general price levels in the economy. The vast natural gas deposit and the vast rivers in Nigeria are of serious advantage in this direction. Channelling these natural resources will also reduce gas flaring and flooding in the country.

Additionally, the study recommends implementing competitive pricing/tariffs for electricity to further enhance economic performance and job creation. Government has continuously fixed and controlled electricity tariffs without generating and transmitting the needed power for consumption. This monopoly by the government has resulted in low level of private investment and consequently low power generation and consumption. Nigeria currently generates about 4000Mw and consumes far less than what is been generated. This has serious negative implications on economic indices like economic growth, price stability, job creation and poverty level in the country.

The study also recommended increased domestic investment in crude oil production and refining to increase revenue of government and improve economic performance in Nigeria. It should be noted that greater percentage of investors in the oil and gas sector are foreigners. This development is not very healthy for our local economy as most the foreign companies repatriate income earned from their investments in Nigeria to their home countries. Also, most of the equipment and personnel are from the home countries of the investors. This creates imported inflation and job losses as most of the equipment prices are inflated and job seekers from the home countries are considered for recruitment before those from the host country/Nigeria.

Lastly, a complete deregulation of the energy and power sectors in Nigeria is a key recommendation of this study. Although the Nigerian government has taken serious steps through the enactment of the Petroleum Industry Act and part deregulation of the power sector, a lot remains to be seen in terms of the economic benefits that an effective implementation of such reforms can trigger. Nigeria is a developing economy with underdeveloped institutions and high level of poverty and inequality, inefficiency and corruption in the energy sector thwarts government's efforts at improving the living standard of the people. A complete deregulation of the oil and gas and the power sectors will bring about better energy pricing and economic development and engender job creation.

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