

OIL PRICE SHOCKS, ECONOMIC GROWTH AND HUMAN WELLBEING NEXUS IN NIGERIA

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Abstract

The interactions between crude oil price shocks and economic growth have received a lot of attention of researchers. From early 1970s up till date, rising and falling in oil prices have characterized oil markets worldwide. These have had serious implications on the management of macroeconomic policies. The trends and fluctuations in oil prices have consequences for the general price level, the trade balance, domestic and international credit markets, and the exchange rate in the oil exporting African countries. A large body of existing studies has shown that oil price fluctuations have considerable consequences on the level of economic activity. The consequences are expected to be different in oil importing and in oil exporting countries. However, the extent to which impacts on growth have influence human wellbeing in Nigeria being one of the OPEC countries is yet to be determined. The main objective of this study is to examine the relationship among oil wealth, economic growth and human wellbeing indicator in Nigeria. The study utilized secondary sources of data and was sourced from the publications of Central Bank of Nigeria Statistical Bulletin (CBN) and World Bank's World Development Indicators (WDI). In order to achieve the objective of this study, we carry out multivariate vector auto regression analysis. The results of the study can be expressed as follows. i) There was a statistically meaningful relationship among oil price shocks GDP and the human wellbeing indicator. While there was positive and significant relationship between oil price and economic growth, the impact of oil price on human welfare is too low. The economic growth has not really impacted on human welfare. There is evidence that oil price contributed little to human welfare in Nigeria. This study concluded that oil price -growth nexus in Nigeria is not growth inclusive as evidence in high level of unemployment rate and low real wage which worsen welfare situation in Nigeria.

Keywords: Oil Prices, GDP, Human development index, VAR analysis, Nigeria

Introduction

Oil has for decades been perceived as a necessary energy commodity, fueling the world economy. It is a crucial input for most of the net-oil consumer countries and most important sources of energy contributing 38.8% of global primary energy consumption in 2015 , 0.4% higher than 2014. Oil being a finite resource is not going to last forever. At the end of 2015, oil reserve to production ratio stood at 50.7%, which means that at current production rate oil

would last about 51 years¹. Oil is also an important source of revenue for the net-oil exporter countries and any change in the oil price will affect the entire world economy. This implies that many non-oil and oil-related markets are interlinked. A change in one of them is therefore likely to affect the others which affect the economy not only in a nominal way, but also in a structural manner. A change impacts the cost of production in all industries and sectors, as well as the disposable income in the country. It also affects the overall economic performance which has effect on human welfare.

From early 1970s up till date, rising and falling in oil prices have characterized oil markets worldwide. Oil prices have witnessed profound fluctuations and this has implications for the performance of macroeconomic variables, posing great challenges for policy making (Agbede, 2013). Review of existing studies seems to disagree on what is the main driver for the oil price development. Among those factors, the following ones are intensifying complexity of oil price analysis: changes in supply and demand side strategies; level of oil proved reserves, demand of oil substitutes, policies for oil strategic reserving, efficiency of transportation and industrial appliances, rate of economic growth in emerging and developed economies, financial market circumstances, and international political challenges (Hosseini, Shakouri and Peighami 2016; Huntington H, Al-Fattah SM, Huang Z, et al. 2012). Usual and dominant explanations are resource scarcity and structure of oil industry which explain various oil shocks as the result of the concentration of supply in the hands of Organization of Petroleum Exporting Countries (OPEC) and the internal cohesion of this small group of suppliers (Baffes, Kose, Ohnsorge and Stocker 2015; Baumeister and Kilian 2016). These determinants are not mutually exclusive but rather complement each other (Hamilton 2008; Peersman and Robays 2012; Cashin, Mohaddes and Raissi 2014). The trends and fluctuations in oil prices have consequences for the general price level, the trade balance, domestic and international credit markets, and the exchange rate in the oil exporting African countries (Aliyu and Rano 2009; Olanipekun, 2016).

Since the oil price shocks in 1973 and following the stagnation especially in the developed countries, studies on the relationship between oil price shocks and economic activities have increased (see Hamilton, 2013). Much has been written on transmission mechanism of oil price shock in Nigeria (Akpan 2009; Alley et al 2014; Ekong and Effiong 2015; Alhassan and Kilishi 2016; Olomola and Adejumo 2006). Though the literature have a long standing in oil price, previous studies have concentrate on other macroeconomic impact of oil price shock without paying attention to human welfare which is a good indicator of growth that is inclusive. Thus, there is a dearth in the literature of studies on the impact of oil shock on human wellbeing. The facts that review studies on oil price –economic growth nexus have produced mixed results (Shafi and Hua, 2014; Jiranyakul, 2015; Mgbame, Donwa and Onyeokweni 2015; Eneji ,Mai-Lafia and Nnamdi 2016) indicating that question of whether oil price shock play any significant role in explaining variations in output in oil exporting countries like Nigeria remain contentious. While this debate remains, the interactive causality and tripartite relationship among oil price, economic growth and human welfare is still not established in the literature.

The main objective of this study is to examine the relationship among oil wealth, economic growth and human wellbeing indicator in Nigeria. This study is organized under five

¹ See BP Statistical Review of Energy (2016)

sections. Following this is section two which presents theoretical, empirical methodology issues. Data sources and research methodology are presented in section three. Empirical results and conclusions are included in section four and five respectively.

Conceptual, Theoretical and Empirical Issues

The concept of human welfare is employed to focus on the impact of economic growth on the material living standards of households and individual citizens, rather than on production. It includes in-kind services provided by government such as subsidized health care and educational services, defense and general government expenditure which promote human wellbeing (UNDP, 1999). It also emphasizes the importance of the distribution of income and wealth in society. Economic welfare is commonly measured in terms of per capita GDP or per capita household consumption expenditure at constant currency value. International comparisons are made in purchasing power parity equivalent. In addition to measuring personal disposable income and welfare-related consumption, it monitors two negative components that limit present welfare which are income inequality and unemployment and three positive components that have the potential to significantly enhance long term sustainability; education, energy efficiency and net household savings (Max-Neff 1995). Income inequality is viewed as a constraint on growth of consumer demand, which limits present consumption and employment. Unemployment is viewed as a constraint on the full utilization of human resources and social productivity, which limits the economic welfare of both the unemployed and the rest of society. Rising levels of education are viewed as an investment in human capital that promotes future economic welfare. Rising levels of fossil fuel energy efficiency are viewed as an investment in physical capital that supports future ecological welfare. Net household savings provides the financial basis for future investment and human welfare consumption.

Existing studies have shown that oil price fluctuations have considerable consequences on the level of economic activity. Many empirical studies on the effect of oil prices on the macro-economy have provided different results on the relationships. While some studies have shown that an oil price increase had positive effect on the growth of an economy (Shafi and Hua, 2014; Jiranyakul, 2015; Alley et al 2014), others studies showed that increase in the price of oil could have detrimental effects on macroeconomic performance (Hamilton, 1983; Gosh et al, 2009; Elder and Serletis, 2010; Jin, 2008). Although, the findings depend on whether the economies in question are oil exporting or importing and the degree of their dependency on oil. Specifically, in Nigeria, Agbede (2013) revealed that a little shock in the price of crude oil in the global oil market in the current period will produce a long-term effect on economic growth.

Mgbame, Donwa and Onyeokweni (2015) revealed that there is significant relationship between oil price volatility and economic growth in Nigeria. Alhassan and Kilishi (2016) employed GARCH model and its variants (GARCH-M, E GARCH and T GARCH) to examined macroeconomic response to oil price shock in Nigeria. The study revealed that the Nigeria economy is vulnerable to both internal shocks in relation to interest rate volatility and real GDP volatility; and external shocks in relation to exchange rate volatility and oil price volatility. Also, Alley, Asekomeh, Mobolaji, and Adeniran (2014) employed the general methods of moment (GMM) to examine the impact of oil price shocks on the Nigerian economy, using data from 1981 to 2012. After appropriate robustness checks, the study finds out that oil price shocks

insignificantly retards economic growth while oil price itself significantly improves it. The significant positive effect of oil price on economic growth confirms the conventional wisdom that oil price increase is beneficial to oil-exporting country like Nigeria. Shocks however create uncertainty and undermine effective fiscal management of crude oil revenue; hence the negative effect of oil price shocks. Ogundipe Ojeaga and Ogundipe examined the effect of oil price, external reserves and interest rate on exchange rate volatility in Nigeria using co integration technique to determine long run relationship among the variables and vector error correction technique was used to examine speed of adjustment of the variables from short run dynamics to the long run equilibrium. The study revealed that a proportionate change in oil price leads to a more than proportionate change in exchange rate volatility in Nigeria.

In addition, Olomola (2006) found that oil price shocks in Nigeria explained about 48% of the shocks to the real exchange rates in the 1st quarter, 33% in the 8th quarter, and about 32% in the 10th quarter. Olanipekun (2016) also revealed that oil price shocks had negative effect on external reserve, exchange rate and economic growth. He also showed that negative effect of oil price shocks on external reserves and economic growth tended to be more significant in the long run. The findings of this study revealed that oil price shocks had a deleterious effect on the macroeconomic performance of Nigeria. However, the extent to which impacts on growth have influence human wellbeing in Nigeria is yet to be determined. The main objective of this study is to examine the relationship among oil wealth, economic growth and human wellbeing indicator in Nigeria.

Data and Estimation Techniques

The study utilized secondary sources of data and was sourced from the publications of Central Bank of Nigeria Statistical Bulletin (Various years) and World Bank's World Development Indicators (WDI).

To investigate interactive relationships among these variables, a VAR model was used with assumptions that oil price, economic growth and human welfare are endogenous. In the VAR model each variable is regressed on its own lag and the lag of other variables so as to allow each variable to be affected by its history and the history of every other variable to take into consideration the existing problem of simultaneity. The VAR Model is given as:

$$y_t = Ay_{t-1} + Ay_{t-2} + \dots + A_k y_{t-k} + BZ_t + \varepsilon_t$$

Where y_t is a vector of endogenous variable where Z_t is a vector of exogenous variable, A and B are coefficient matrices and k is lag length determined by lag selection criterion. The VAR approach made popular by Sims (1980) has become an important tool in empirical macroeconomics. Prior to VAR estimation, proceed to investigate the stochastic properties of the series considered in the model by analyzing their order of integration on the basis of a series of unit root tests. Specifically, we perform the Augmented Dickey-Fuller (ADF) test. In order to assess the impact of shocks on endogenous variables, we carried out the impulse-response functions, using Cholesky decomposition, as well as the accumulated responses. To do so, we should choose an ordering for the variables in the system, since this method involves the assignment of contemporaneous correlation only to specific series.

Empirical Results

Table 1 shows the result of unit root test regarding the order of integration based on Augmented Dickey –Fuller test (ADF) and Phillip Peron test (PP). The stationarity test shows

that oil price has unit root at level; however the first difference transformation is stationarity. Also gross domestic product, human development index and other intervening variables like minimum wage and unemployment are not also stationary at level. However, the first difference transformation of each variable is stationary. Thus, we conclude that the series are integrated of order one $1(1)$.

Unit Root Test

| Variables | Augumented Dikey | | Phillip Peron(PP) | | Decision |
|------------------------------|--------------------|--------------------|--------------------|--------------------|----------|
| | Fuller(ADF) | | | | |
| | Level | First Difference | Level | First Difference | |
| Oil Price(OIP) | 0.0382 (0.3931) | 4.9161 (0.002) | 0.0136 (0.9729) | 4.8733 (0.0001) | 1(1) |
| Economic Growth (GDP) | 0.7880 (0.7551) | 6.4439 (0.0319) | 2.9118 (0.8117) | 0.1899 (0.0011) | 1(1) |
| Human Well being index (HDI) | 0.1197 (0.1181) | 0.3359 (0.0219) | 1.6551 (0.9117) | 1.2219 (0.0017) | 1(1) |
| Unemployment (UER) | 0.6144 (0.9880) | 0.6920 (0.0022) | 0.7711 (0.0731) | 0.2180 (0.0655) | 1(1) |
| Minimum Wage (MW) | 1.3106 (0.0719) | 0.1127 (0.0031) | 2.3449 (0.7981) | 1.0170 (0.021) | 1(1) |

Authors' Computation. P-value in parenthesis

Long-run relationship among Oil Price, Economic Growth and Human Welfare

The long –run relationship among oil price, gross domestic product (GDP), and human development Index (HDI) is presented in table 2. It is observed from the stationary result, there is need to verify if the variable co integrated (if a long run relationship exist among the variable) The Johansen co-integration from VAR cointegration result which tests the null hypothesis of no co-integration exist among variables. From the result, the test statistics indicates the hypothesis of no cointegration (H_0) among the variables can be rejected. Since the variables are cointegrated, there is, therefore a long run relationship among the variables.

Cointegration Test

| Trace Test | | | | Maximum Eigen value test | | | |
|------------|------------|-----------------|---------------------|--------------------------|------------|---------------|---------------------|
| H_0 | H_A | λ trace | Critical value (5%) | H_0 | H_A | λ max | Critical value (5%) |
| $r \leq 0$ | $r \geq 0$ | 22.96 | 14.86 | $r \leq 0$ | $r \geq 0$ | 22.69 | 14.31 |
| $r \leq 1$ | $r > 0$ | 1.91 | 3.64 | $r \leq 1$ | $r > 0$ | 1.11 | 3.81 |

Authors' estimation

Dynamic Interactions among oil price, economic growth and Human welfare

The table 3 below presents the VAR estimate dynamic interaction among oil price, economic growth and human welfare indicator in Nigeria from 1990-2015. The R-square value 0.86, 0.63 and 0.71 shows that explanatory variables jointly account for 86%, 63% and 71% variation in oil price, economic growth and human well being indicator respectively. This

implies that the model has good fit. The F-test value 18.10 ($P < 0.05$), 7.06 ($P < 0.005$), and 10.28 ($P < 0.05$) indicates explanatory variables are jointly statistically significant in explain oil price, economic growth, and human welfare. Generally, past levels of economic growth and human welfare are significant determinants current level economic growth and human welfare. However, previous oil prices are not significant determinant of current oil price.

Table 3: VAR Results

| | Oil Price(OILP) | Economic Growth(GDP) | Human welfare(HDI)) |
|----------------|------------------|----------------------|---------------------|
| C | 1.1870 (3.0381) | 32.7418 (16.071) | 0.9461(0.7194) |
| LOGOILP (-1) | 0.9418 (0.9861) | 0.7361(0.9681)** | 0.1226(0.8411)*** |
| LOGOILP(-2) | 0.3321 (0.7766) | 0.6657(0.1170)** | 0.0062(0.9866) |
| LOGGDP(-1) | 1.8429(0.7810)** | 0.7693 (0.3769)** | 0.0916(0.2974)** |
| LOGGDP(-2) | 0.8097(0.9889)** | 1.6970(0.6653)** | 0.0100(0.7211)*** |
| HDI (-1) | 0.6008(0.1873) | 0.1078(0.0071)* | 0.8955(0.544) |
| HDI(-2) | 0.8779(0.1154) | 0.6778(0.1122)* | 0.5511(0.0341) |
| LOG (MW) | 0.5710 (0.1060) | 0.9770(0.2210) | 0.4988(0.2210) |
| UER | -0.8031(0.0221) | -1.9219(0.5110) | -1.1789(0.0279)** |
| R-square | 0.8609 | 0.6314 | 0.7140 |
| Adj R-square | 0.7931 | 0.6019 | 0.6920 |
| Sum sq.resids | 3.2611 | 8.3813 | 13.3115 |
| S.E. equation | 0.3861 | 0.7114 | 0.5188 |
| F- statistics | 18.1083 | 7.0381 | 10.2841 |
| Log likelihood | -10.2215 | -9.0512 | -0.8311 |
| Akaike AIC | 1.0227 | 7.1941 | 3.2118 |
| Schwarz SC | 1.5521 | 3.5310 | 1.0815 |
| Mean dependent | 9.7105 | 12.4196 | 7.6301 |
| S.D dependent | 1.9801 | 5.0811 | 11.0312 |

Source: Authors' computation * (10%) ** (5%) and * (1%)**

Specifically, the result shows that there is positive and significant relationship between one and two periods lagged oil price and economic growth. The positive relationship is statistically significant at 5% level. Current level of GDP will increase by 76.9 percent (%) given a 100 percent (%) increase in one period lagged in oil price. Oil price has significant impact on economic growth. This result is in line with what obtained by Alley *et al* 2016 and Agbede 2013, but different with that of Mgbame, Donwa and Onyeokweni (2015). Likewise, a positive and significant relationship exists between oil price and human welfare. The positive relationship is statistically significant at 10% level. This result also revealed that oil price is significant to human welfare but the impact is too low. Human welfare will increase by 12 percent (%) given a 100 percent in one period lagged oil price. The impact of economic growth on human wellbeing is low though statistically significant at 5% level. Human welfare will increase by 10 percent given a 100 percent increase in GDP. The minimum wage has positive but insignificant relationship with human welfare in Nigeria. This may be as a result of persistence increase in price of commodities which render nominal wage not to be effective in improving human welfare in Nigeria. Human welfare will decrease by 117 percent given a 100 percent increase in

unemployment rate. Unemployment worsens human welfare indicators in Nigeria as in the result.

Impulse Response function

It analyses the different channels through which human welfare responds to shock from oil price and economic growth. In table 4, the impulse response function (IRF) shows the response of target variable human welfare to impulse from oil price. Explicitly, IRF results show the effect of a one standard deviation shock or innovation of oil price on human welfare. The IRF showed that a positive shock oil price will increase human welfare in all periods. The respond is positive and significant since it falls within the bounds. Considering the response of human welfare indicator to shock from oil price, the result shows that the response is not instantaneous, human welfare respond started only from period 2, it is positive throughout the period. This implies positive oil price will improve human welfare.

Table 4: Impulse Response Function (Response of human welfare to one standard deviation shock in oil price)

| Response of HDI | | |
|-----------------|-------------------------|------------------------|
| Period | HDI | LOG(OILP_N) |
| 1 | 0.264912 (0.002281) | 0.000000 (0.000000) |
| 2 | 0.241911 (0.016910) | 0.123154 (0.07038) |
| 3 | 0.230618 (0.1033860) | 0.103551 0.10262 |
| 4 | 0.214486 (0.14925) | 0.042947 (0.10708) |
| 5 | 0.162030 (0.13375) | 0.001592 (0.08475) |
| 6 | 0.152076 (0.13737) | 0.000920 (0.13570) |
| 7 | 0.143661 (0.14564) | 0.024770 (0.03433) |
| 8 | 0.137168 0.116949 | 0.041661 (0.03433) |
| 9 | 0.116949 (0.14495) | 0.035378 (0.04740) |

| | | |
|-------------------|-----------|----------|
| 10 | 0.092700 | 0.017855 |
| | (0.14541) | 0.05286) |
| Cholesky Ordering | | |
| LOG(OILP_N) | | |

Source: Authors' Computation using E-view 10

Forecast Error Variance Decomposition (FEVD) Results

Variance decomposition indicates the proportion of the movements in a sequence due to its "own" shocks versus shock to the other variables. This also shows that fraction of forecast error variance for each variable that is attributable to its innovations and innovations in the other variables in the system. The relative contributions of oil price shock to variation in human welfare indicator are captured using the forecast error variance decomposition (FEVD) analysis.

Table 5 displays FEVD results for the VAR model. The numbers reported indicate the percentage of the forecast error of variables shock at different time horizons from period 1(short run) to period 10 (long –run).

Table 5: Variance Decomposition Human Welfare

| Variance Decomposition of HDI | | | |
|-------------------------------|----------|----------|-----------|
| Period | S.E | HDI | LOG(OILP) |
| 1 | 0.381507 | 100.0000 | 0.000000 |
| 2 | 0.609834 | 93.17339 | 5.926610 |
| 3 | 0.630319 | 92.07070 | 7.871054 |
| 4 | 0.644364 | 92.30374 | 7.696256 |
| 5 | 0.664426 | 92.06091 | 7.239090 |
| 6 | 0.679678 | 93.08197 | 6.918031 |
| 7 | 0.695132 | 93.08197 | 6.739794 |
| 8 | 0.719760 | 93.10045 | 6.03176 |
| 9 | 0.720200 | 93.14530 | 6.854705 |
| 10 | 0.726351 | 93.99931 | 6.799343 |
| Cholesky Ordering :HDI | | | |

Source: Authors Computation using E-view 10

Considering period 2, the result show that shocks in HDI (own shock) account for 93.17% variation in HDI; in period 5 (medium term) own shock account for 92%. On the long run (period 10), own shock account for 94% in HDI. Considering shock from oil price , the result shows that in period 2(short –run), shocks from oil price account for 5.9% fluctuation in HDI, while in the medium term (5th period) and the long term (10th period) the shocks from oil price account for 7.2% and 6.7%respectively HDI.

Conclusion

The main objective of this study is to examine the interactive effect of oil price and economic growth on human welfare indicators in Nigeria. The result revealed there is a positive and significant relationship between oil price and economic growth. It was also found that the impact of oil price on human welfare is significant and positive though it is very low. This study concluded that oil price -growth nexus in Nigeria is not growth inclusive as evidence in high level of unemployment rate and low real wage which worsen welfare situation in Nigeria.

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