

Do Energy Consumption, Interest Rate and Import affect Household Consumption in Nigeria: What did the Empirical Evidence says?

Shuaibu Mukhtar¹, Shafiu Ibrahim Abdullahi² & Ibrahim Murtala³

¹Department of Social Sciences, Kebbi State Polytechnic, Dakingari

²Department of Economics, Bayero University Kano, Nigeria

³Department of Arts and Social Sciences, Kogi State Polytechnic, OsaraCompus

Correspondence Email: mukhs001@yahoo.com

Abstract

The aim of the paper is to find out the effects of changes in energy consumption, interest rate and import on household consumption in Nigeria. Nigeria has diverse population of over 200 million people. About 70% of the Nigerian population is classified as poor; hence, spend most of their income on consumption of necessities of life. The paper uses log linear regression model and generalized method of moments (GMM) for its analysis. Data was collected for the period ranging from 1985 to 2018. The result of the study shows that interest rate and energy consumption affect household consumption, while import is not statistically significant. This result has important implication for the Nigerian economy. A statistically significant relationship between interest rate and household consumption means that monetary authorities can boost household consumption by lowering the interest rate. The positive and statistically significant relationship between energy consumption and household consumption is expected a priori. It is expected that higher level of household consumption will lead to higher level of energy consumption. The major recommendations of the paper are two: reduction in interest rate and constant supply of energy to boost household consumption which in turn boosts demand for goods and services.

Keywords: Household-consumption, Energy, Interest-rate, Import, Foreign-Exchange

JEL Classification: E2, E4, F4, Q4

1. Introduction

In economics, consumption is one of the fundamental components of Gross National Product and a major variable for measuring economic growth. Consumption expenditure and the nature of consumption function have engaged much of the macroeconomic debate in the last century. According to Branson (1989), consumption expenditure accounts for about 2/3 of aggregate expenditure in virtually all economies. Aggregate consumption expenditure includes expenditure on durable and non-durable goods. But, consumption in itself is influenced by a number of factors both at micro and macro levels. Factors such as income, taste and culture were found to be the determining factors in influencing

consumption at micro level. Factors such as interest, GDP, foreign exchange and inflation were found to affect consumption at the macro level. One other factor that play a significant role in determining consumption at the macro level and whose contribution tend to be under emphasis is energy. Energy is very important for the good running of any modern economy. Modern firms and household relies on energy for day to day functions. Thus, energy economics is very important for the study of today economies. Increase in energy consumption is a pointer to increase economic activities, and an improvement in economic development of energy signifies that a country has high economic ranking. In modern economies, electricity is indispensable for certain basic household activities, such as lighting, refrigeration and the running of household appliances, and cannot easily be replaced by other forms of energy (IEA, 2002). Other important sources of domestic energy in Nigeria include liquefied natural gas, biomass, kerosene, charcoal and firewood. All these have various influences on domestic energy consumption, depending on the economic fortune of the household. Because Nigeria is a poor lower middle income country, energy consumption per capita is low. Nigeria faces the problem of electricity supply, but despite that the price of petroleum in Nigeria is one of the cheapest in the world. Majority of the poor Nigerians make use of kerosene, charcoal and firewood as the main source of their domestic energy. In a study by Abd'razack, *et al.* (2012) on household energy consumption in Niger state Nigeria, its finding shows that due to increasing price of kerosene, electricity and liquefied natural gas products in Minna, Niger State capital, households shifted their domestic energy use to biomass.

In oil producing countries like Nigeria, anytime there is an oil price increase, the income generated by the price increase gives the oil producer additional income and wealth effects. If these effects are transferred to the domestic economy, it will boost investment among agents and firms. In turn, unemployment should decrease and thereby let households consume more. Increase or decrease in interest rate in an economy also has similar effects on the economy, boosting or reducing household consumption in the process. The world itself is a global village. Globalisation has made it difficult for any country to consider its own internal working of its economy in isolation from the rest of the world. In this connection, inflation and other negative forces can be imported from abroad into the domestic economy. Thus, imported consumer goods and services can have a lot of effects on domestic household welfare. At the same time cheaper imported goods and services from abroad can influence household positively by reducing the costs of their purchases, living them with extra pocket money. But, at the same time it does this it also results in the loss of source of livelihood for the households who work in the sector that is destroyed by importation of products. Studies like that of Atkin, Faber and Gonzalez-Navarro (2015) have argued that global retail chains based in developing countries are causing a radical transformation in the way households consume. They noted that foreign retail firms cause large and significant welfare gains for the average household that are mainly driven by a reduction in the cost of living. According to their findings, about one quarter of this price index effect is due to pro-competitive effects on the prices charged by domestic stores, with the remaining three quarters due to the direct consumer gains from shopping at the new

foreign stores. This impact of globalisation on domestic consumers is by way of foreign direct investment (FDI); many other ways exist by which the world affects what and how a household located in Nigeria can be affected by what is going elsewhere around the world. The main aim of this paper is to empirically test how households in Nigeria are affected by changes in foreign exchange, interest rate and energy supply. The paper is divided into introduction, literature review, methodology, analysis of results and conclusion.

2. Literature Review

Economists such as Milton Friedman, Modigliani, John M. Keynes and Duesenberry were fascinated with finding out the factors that determined consumption. They studied factors such as income, wealth, interest rate, capital gain, liquid assets and psychological factors that can influence consumption. Interest rate plays an important role in influencing consumption. Understanding the impact of interest rate on consumption is thus important. It is hypothesized that variations in interest rate would result in variations in consumption. Under Irving Fisher's Intertemporal Choice hypothesis, consumption depends on interest because of the need to borrow between periods of time in order to balance consumption when there is shortfall in income. Economists have decomposed the impact of an increase in the real interest rate on consumption into two effects: an income effect and a substitution effect (Mankiw, 2007). The income effect tends to make the consumer want more consumption in both periods (current and future periods). While the substitution effect tends to make the consumer choose more consumption in future period and less consumption in current period. Thus, an increase in the real interest rate raises future-period consumption. Economists such as Mankiw (1981), Hansen and Singleton (1983) and Hall (1988) have examined how consumption responds to changes in real interest rate. Their findings show that change in consumption relatively do little to change in real interest rate. Raut and Virmani (1989) found positive relationship between the real interest rate and consumption in a study on developing countries.

Various scholars have described the way policy-induced changes in the nominal money stock or the short-term nominal interest rate impact real variables such as aggregate output, consumption and employment. Mishkin (1995) has identified four channels of monetary transmission, which are interest rate, credit, exchange rate and Assets Price effects. The interest rate channel of monetary policy transmission is the standard Keynesian channel of monetary transmission (Mishkin, 1995). A contractionary monetary policy leads to a rise in real interest rate, which in turn raises the cost of capital; thereby causing a decline in investment spending. This process also leads to a decline in aggregate demand and eventually a fall in output. A higher real long-term interest rate leads to a decline in real investment, real consumption, and thereby on real GDP. Low level of inflation is key to the effectiveness of monetary transmission. The exchange Rate channel of transmission works through the aggregate demand as well as the aggregate supply effects which is more effective under the flexible exchange rate regime. A contractionary monetary policy, led to increase in interest rate (real) which in turn led to increase in exchange rate, that action led to decrease in net export and finally a fall in

output. A possible channel through an oil price increase affect households through domestic fuel prices. Increase in fuel prices decrease household's disposable income leading to reduce expenditure on consumption. If the effects of the increase are long-lasting, the effect would affect unemployment and lead to changes in industries production structures. In turn, this leads to labor and capital reallocations and changes the unemployment level due to layoff or hiring (Boman, 2018). Hickman *et al.* (1987) describe transmission channel through the "terms of trade" mechanism. According to this, an oil price increase would lead to an income transfer between importing countries and exporting countries. For the importing countries, the effects would lead to reduced spending and lower aggregated demand in the domestic economy. That resulted in inflationary pressure due to effects on production industry leading the central bank to tighten monetary policy. This further resulted in reduce households demand for goods and services. For the exporting country like Nigeria, the additional revenues from an increase in oil-prices could overturn the negative effect from lower global demand and stimulate the domestic economy.

Using modified consumer spending model and data that span the period of 1981–2011, Manasseh, Abada and Ogbuabor (2018) examines the effects of interest and inflation rates on consumer spending. The study extended its investigation into the causal relationship between consumer spending, interest and inflation rates using granger causality Wald test. The effect of inflation which was measured with CPI on consumer spending is found to be statistically significant, while Interest is insignificant. The outcome of the granger causality using Wald test shows that future interest and inflation rates cannot be predicted using PCE. Adedeji and Adegboye (2013) examined the factors that determine the private consumption spending in Nigeria, using an Error Correction Mechanism (ECM) after testing for the stationarity of the data, the study revealed that except for real interest rate in current year which was not statistically significant in all experimental runs, all other explanatory variables were statistically significant. The old-age dependency ratio, inflation rate, gross domestic product (GDP) per capita and disposable income have significantly positive effect on private consumption spending, while real GDP growth, foreign direct investment, public spending and change in real effective exchange rate had negative impact. Ishioro (2013) study examines the channels of monetary transmission mechanism in Nigeria. The study concludes that three channels are functional in Nigeria: the interest rate, exchange rate and the credit channels.

Tule and Osude (2014) investigated the relationship between oil price and real exchange rate movement in Nigeria. Using monthly data covering the period 2000 to 2013, this study employs GARCH process to test the relationship between oil price and exchange rate volatility. The results suggest the persistence of volatility between real oil prices and the real exchange rate. They conclude that oil price fluctuations lead exchange rates movement in Nigeria. Englama, Oputa, Sanni, Yakub, Adesanya and Sani (2013) estimate the aggregate import demand function for Nigeria using quarterly data covering the period 1970 to 2011. The study found that the coefficients of external reserves, domestic consumer prices, level of income

and exchange rate were all statistically significant, suggesting that these variables were important factors determining the level of imports in Nigeria. Muse (2014) examined the causal relationship between economic growth and energy consumption in Nigeria during period 1980-2012. The cointegration test result revealed that there was a long run relationship among the variable. The study found that electricity is an important factor in economic growth in Nigeria. The result is thus an indication that energy consumption enhances economic growth. Bassey and Ekong (2019) investigated the dynamic relationship between energy consumption and inflation in Nigeria using data for the period 1980 to 2017. Applying Autoregressive Distributed Lag (ADL) technique, the study found that Premium Motor Spirit (PMS), Dual Purpose Kerosene (DPK) and Natural gas were noninflationary. Also, Automotive Gas Oil (AGO) consumption produces strong evidence of positive inflationary pressure. They found a strong causality between natural gas consumption and inflation. Rehman (2014) has examined the relationship between energy consumption monetary policy and inflation in five Asian countries in the years following the global financial crisis using Granger causality; the results showed evidence of strong interaction between oil consumption and inflation for at least two Asian countries. The study argued that if there are high oil prices in the international market, the domestic inflation in these two countries is likely to be the oil price push inflation.

3. Methodology

The paper used Log Linear regression and generalized method of moments (GMM) models for the analysis of the data for the study. A log-linear model is a mathematical model that takes the form of a function whose logarithm equals a linear combination of the parameters of the model, which makes it possible to apply (possibly multivariate) linear regression (Gujarati and Porter, 2009). It has the general form.

$$\exp(c + \sum_i W_i f_i(X)) \dots\dots\dots 1$$

Where, $f_i(X)$ is quantities that are functions of the variable X, as well as c and w_i are the model parameters

The GMM estimators are known to be consistent, asymptotically normal, and efficient in the class of all estimators that do not use any extra information aside from that contained in the moment conditions. GMM were championed by Lars Peter Hansen in 1982 as a generalization of the method of moments. The Generalized Method of Moments (GMM) is a generic method for estimating parameters in statistical models. The GMM method then minimizes a certain norm of the sample averages of the moment conditions. Thus, the GMM estimator can be written as:

$$\hat{\theta} = \arg \min \left(\frac{1}{T} \sum_{t=1}^T g(Y_t, \theta) \right)^T \hat{W} \left(\frac{1}{T} \sum_{t=1}^T g(Y_t, \theta) \right) \dots\dots\dots 2$$

Data for the study was collected from Nigerian Bureau of Statistics and World Bank for the period 1985 to 2018. For the variables used for the study, monetary

policy rate of the CBN is used as proxy for interest rate; and total final energy consumption is used as proxy for energy consumption. For the household consumption variable, we used the household consumption data generated by national bureau of statistics. Household has been defined as group of more than one individual (though, it can consist of one individual) that foster economic and social relationship between its members and maintain mutual relationship with the wider economy and society (Mattila-Wiro, 1999). Household consumption refers to the use of goods and services to satisfy the needs of the household. Scholars such as Gary Becker put family at the centre of their household theory (Mattila-Wiro, 1999). In the case of exchange rate, we attempt to capture how households react to changes in price of foreign goods by including exchange rate of Naira to dollar. Exchange rate serves as proxy for import. When exchange rate falls, consumption expenditure on imported products falls, because Naira loses value (depreciates). As a result, more Naira would be needed to buy a dollar unit of foreign goods; hence, causing an inverse relationship between exchange rate and consumption of import.

Specifications and Expectations of the model

To capture the determinants of household consumption in Nigeria, our model is specified as follows:

$$HC = f(INT, EC, EXR) \dots\dots\dots 3$$

Where HC is Household Consumption, INT refers to Interest Rate, EC indicates Energy Consumption, and EXR represents Foreign Exchange Rate.

The log linear form of the model is:

$$\ln HC = \beta_0 + \beta_1 \ln INT_1 + \beta_2 \ln EC_2 + \beta_3 \ln EXR_3 + \varepsilon \dots\dots\dots 4$$

Where, ln represents log transformation, β is the parameters and ε stands for error term.

4. Results

Log Linear Regression Result

The result of the log linear regression shows that household consumption is affected by changes in interest rate and energy consumption. However, it is not affected by changes in foreign exchange. The result of the analysis shows that interest rate and energy consumption are statistically significant while foreign exchange is not statistically significant. The result also shows that while the relationship between household consumption and interest is negative, the relationship between household consumption and energy consumption is positive. This means that increase in interest rate lead to reduction in consumption while reduction in interest rate leads to increase in consumption. For the energy consumption, the positive relationship means that increase in energy consumption is associated with increase in household consumption. Base on their respective coefficients, it means that 1% increase in interest rate leads to 0.229% decrease in household consumption; while 1% increase in energy consumption leads to 1.696% increase in household consumption.

Table 1: Log Linear Regression Results

Variable	Coefficient	Statistical Level (P.Value)
LOG(INT)	-0.2292	0.0207
LOG(EC)	1.6958	0.0000
LOG(EXR)	0.0098	0.8047

Source: Authors' Computation

GMM Result

The result from GMM analysis show close statistical significance level for the variables in the study, as it was found in the case of log linear regression analysis. See appendix section for details about the tests results.

Table 2: GMM Results

Variable	Coefficient	Statistical Level (P.Value)
INT	-5.45	0.0060
EC	4.43	0.0000
EXR	-1.49	0.5432

Source: Authors' Computation

5. Conclusion and Recommendation

The aim of this paper is to find out the effects of changes in energy consumption, interest rate and import (represented by foreign exchange) on household consumption in Nigeria. Nigeria has diverse population of over 200 million people. About 70% of the Nigerian population is classified as poor; hence, spend most of their income on consumption of necessities of life. Per capital income in Nigeria is put at \$2,222 in 2019. It is under this circumstance that we tried to find out the effects of energy, interest rate and import on household consumption in Nigeria. The result of the study shows that interest rate and energy consumption affect household consumption, while import is not statistically significant. This result has important implication for the Nigerian economy. A statistically significant relationship between interest rate and household consumption means that monetary authority can boost household consumption by lowering the interest rate. This alone has a lot of repercussions; because higher consumption means higher market for domestically produce goods and services, which also mean more employment for citizens. More consumption by household also means more tax for government in form of consumption tax, income tax (as more people get job), and industrial taxes. For economy in recession and facing economic collapse, this is the thoughtful measure to take. The positive and statistically significant relationship between energy consumption and household consumption is expected. It is expected that higher level of household consumption will lead to higher level of energy consumption. Looking at the benefits of higher consumption in a depressing economy we have mentioned here, Nigerian government should make energy affordable and available to Nigerians in order to facilitate higher level of consumption. Various sources of energy such as electricity, fuel, renewable energy should be encouraged. Without constant supply of energy Nigerian economic development is not realizable. Thus, the major recommendations of this paper are

two which are: reduction in interest rate and constant supply of energy to boost household consumption which in turn boosts demand for goods and services.

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