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Identifying Domestic Macroeconomic Drivers for Economic Diversification in Nigeria

[1]Ebele Stella Nwokoye, [2]Nkechinyere Rose Uwajumogu, [3]Stephen Kelechi Dimnwobi

[1&3]*Department of Economics, Nnamdi Azikiwe University Awka Anambra State Nigeria*
[2]*Department of Economics and Development Studies, Alex Ekwueme Federal University, Ndufu-Alike, Ikwo, Ebonyi State*
[1]es.nwokoye@unizik.edu.ng   [2]nkechinyere.uwajumogu@funai.edu.ng   [3]stephenkcdim@gmail.com

Abstract: *Evidences in the literature show that Nigeria's consumptionist nature as well as its heavy dependence on crude oil income streams, have created room for growing unemployment, inflation and poverty rates as well as the recent shrink in its GDP growth rate. More so, the unpredictable movements in global oil price demonstrate the need for Nigeria to diversify its revenue streams in order to remain relevant and ranked amongst the vigorous economies of Africa. Based on the United Nations Industrial Organization (UNIDO)/World Bank success yardsticks and with its theoretical framework rooted in the endogenous growth model, this paper interrogated the domestic macroeconomic drivers of economic diversification in Nigeria. Employing time series for the period 1981 to 2016 data from the World Development Indicators, the study found that the drivers of economic diversification were improved infrastructure, increased credit from financial sector, reduction in lending rate and increased domestic investment while deterrents of diversification were over dependence on natural resources, trade openness, school enrollment, exchange rate depreciation and the size of the economy. We recommended deliberate and conscious policies to reduce the over dependence of the economy. These include fiscal federalism (aimed at eliminating non-inclusive growth) and increased transparency in the extractive industry. We also recommended increased investment in infrastructure (aimed at reducing transmission and distribution losses) and developments in the financial sector (so as to make cheap credit facilities available to domestic investors).*
Key words*: Crude oil, Economic Diversification, Macroeconomy, Nigeria, Revenue stream*
JEL Codes: *E32, E66, O11, O13, Q43*

I. INTRODUCTION

Given Nigeria's consumptionist nature as well as its heavy dependence on crude oil as its major income stream, its growing unemployment and poverty rates as well as its recent shrinking of its GDP growth rate and the unpredictable movements in international crude oil price are all reminders of the need for Nigeria to diversify its revenue streams so as to remain counted amongst the resilient economies in Africa. Its continuous reliance on oil - a primary product which is susceptible to volatilities in its global price – impacts negatively on Nigeria's economic growth and portrays inadequacies in government's fiscal operations.

Economic diversification is a concept aligned with the creation of additional sources of income streams. It is characterized as a process of breeding economic resilience, stability and security through the creation of a growing range of marketable commodities with the aim of ensuring easy adjustability of such economy to macroeconomic shocks usually associated with changes in flow of income streams. In more simple terms, economic diversification is the varying of a country's income streams in favour of a single income stream.

Economic diversification is achieved by fostering structural changes in the economy. World Bank (2015) indicates that successful economic diversification lies in investing in human capital, maintaining macroeconomic stability, improving the business climate, investing in infrastructure as well as boosting domestic investment. These areas are subjected to apparent market failure and are therefore amendable by government intervention. In theory however, the State is relied upon to successfully influence production, consumption and export patterns through policy institution and execution.

The quest towards economic diversification therefore emphasizes the significance of encouraging private enterprise in productive linkage and ensuring the efficiency in the delivery of public commodities. Going by the general consensus that balanced growth heralds economic development, economic diversification is a sustainable development process which will ensure the long run stability of the Nigerian economy because its process not only widen the ranges of economic activities of production and product distribution, but also creates

diverse revenue streams by ensuring the sustainability of other revenue streams should any of them fail (Ogbonna, 2017). Hence diversification will reinforce the adaptive capacity of the Nigerian economy, safeguard its long run outlooks and ensure that economic fluctuations associated with competiveness, liberalization and globalization are eased.

Anyaechie and Areji (2015) asserts that economic diversification has the potentials to meet the basic requirements for sustainable development because it opens diverse avenues for economic activities which accommodate a wide range of people. It is an important strategy which supports economic and business aspects and increases their competitive advantages (Ahmed, 2015) because it creates a broad based economy that has the ability to secure equity both within and between generations. It propels the expansion of environmental ability to meet people's needs by improving on the technology, social organization, and does not over exploit one aspect of natural resources to the point of extinction and environmental degradation. Figure 1 shows Nigeria's Herfindahl-Hirschman diversification index which is interpreted, according to Tauer (1992) cited in Dimnwobi et al (2017), thus: a diversification index of between 0.00 and 0.01, higher than 0.01 but below 0.15, between 0.15 to 0.25 and above 0.25 indicate a highly diversified economy, fairly diversified economy, reasonably diversified economy and undiversified economy respectively. Nigeria's steps towards diversification are not fruitful as seen by its Herfindahl-Hirschman diversification index which is presented in Figure 1.
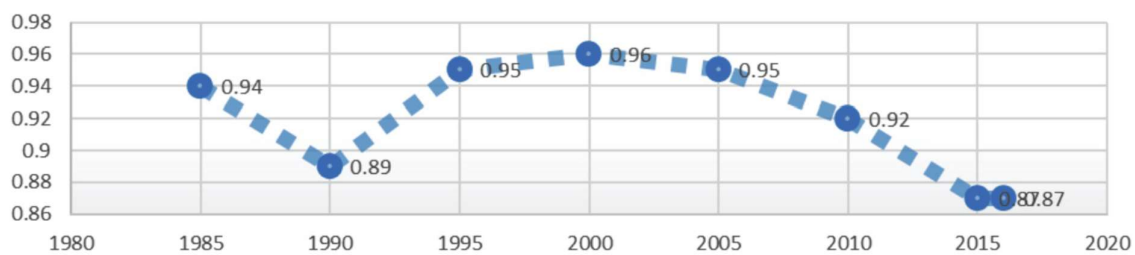
Figure 1. Herfindahl-Hirschman Diversification Index for Nigeria (1985-2015)
Source: Dimnwobi, Nwokoye, Ekesiobi,& Igboanugo (2017)

According to Dimnwobi, et al (2017), the dominance of the oil sector in the economy shown by its concentration ratio (which is a measure of the extent to which economic activities are concentrated in economic activities with respect to other sectors) were 0.93, 0.95 and 0.87 in 1985, 2005 and 2015 respectively. Since the start of oil exploration in Nigeria, the non-oil sector's concentration ratios have been below 0.01 with the highest concentration ratio obtained in 2015 at a record of 0.008. Between 2009 and 2011, the diversification ranking published by the African Centre for Economic Transformation (ACET, 2014) shows that Nigeria occupies the bottom position in the diversification ranking among African economies of high status. Figure 2 presents this information.
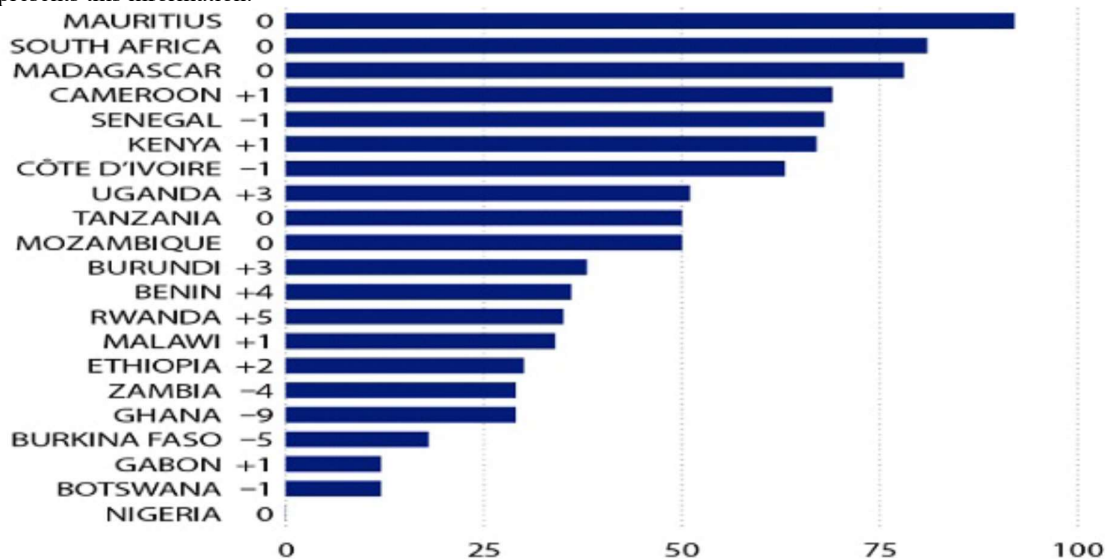
Figure 2: Average Diversification Ranking among Top African Economies (2009- 2011)
Source:ACET (2014).

From Figure 2, we observe show that Mauritius, South Africa, Madagascar, Cameroon, Senegal, Kenya, and Côte d'Ivoire are tops on the diversification ranking and we observe the position of Nigeria at the bottom of the ladder. As reported by the ACET (2014), most African economies are making conspicuous advancement towards economic diversification but between the years 2000 and 2010, the Nigerian economy made no obvious progress towards achieving this feat. The arguments for economic diversification contradicts those of the theory of comparative advantage which supports that an economy can benefit from specializing on *what it does best*. This is because diversification in economic activities of production and exports preserves a country by ensuring that its economy is less prone to negative economic shocks. Empirical works of Imbs and Wacziarg (2003) support this assertion by demonstrating that economies of low-income countries are distinctively concentrated in narrow ranges of products. Diversification is thus looked upon as an economic tool with which to mitigate the negative impact of economic dependence on sole sources of revenue.

Further researches have shown that as countries' per capita GDP increases, the structure within which these goods and services are produced broaden via the launch of new products and through diversification within those goods that are already being produced. Some of these empirical evidences that diversified economies perform better than the others are located in Hesse (2008), Lenderman and Maloney (2007), etc cited in Gelb (2010). Interrogations have further shown that as a nation's GDP per capita further increases, the diversification inclination slows down and eventually swerves towards re-specialization and this pattern of the relation between specialization and GDP per capita is depicted as a *U-curve*. Figure 3 shows exhibits the relation between Nigeria's pattern of specialization and its per capita GDP 1990 to 2017.

There are evidences that economic diversification thrives in countries which work towards economic development. Such evidences found in *resource based* economies such as Mauritius and Indonesia (as documented in Zhang (2003) and Gelb (1988) respectively) and in *resource scarce* economies like China, India, Singapore, South Korea, etc (as documented in World bank, 1993), have provided the impetus and optimism about the cause of promoting economic diversification in Nigeria.

The main objective of this study is to identify the domestic macroeconomic drivers of economic diversification in Nigeria (1981 to 2016) in line with economic literature and the UNIDO/World Bank success yardsticks. Although the importance of political will, long-term domestic strategies and the catalysis of external agents are acknowledged, the present study limits itself to the domestic drivers of economic diversification in Nigeria with a view to proffering policy advices aimed at improving Nigeria's diversification index. In other to achieve this, this paper is structured as follows: Section one has already introduced the paper, Section two contains the theoretical framework doe this study, Section three contains the research procedure, Section four presents and discusses the results while Section five conclude the study and makes some policy proposals.

II. THEORETICAL AND EMPIRICAL FRAMEWORKS

The new growth theory of economic growthprovides the theoretical framework for this study because the endogenous growth model is a framework for analyzing long-run determinants of national output/income. It hinges on the assumption of increasing returns to scale in the real sectors of the economy with constant returns to scale for the production activities going on in the primary sector. The endogenous growth model elucidates the possibility of achieving economic progress within the system governing an economy's production process rather than by exogenous forces as presented by the Solow residual in the neoclassical growth model. The endogenous growth model of the AK type, as fashioned by Newman (1957), introduces capital such as human capital, knowledge and infrastructure, whose buildup is not subject to the assumption of diminishing marginal returns and assumes an economy with a production function specified as:

$$Y = aK \qquad (1)$$

where output (Y) is proportional to the capital stock (*K*); the marginal product of capital is simply the constant (*a*). More so, the endogenous growth theory is pivoted on the notion that there are considerable external returns to capital particularly human capital as each new knowledge makes the next initiative possible hence knowledge can grow indefinitely hence Equation 1 may be further expressed as

$$Y_t = A K_t^{\alpha} L_t^{\beta} \qquad (2)$$

where α and β are the respective shares of capital and labour in the production process. By dividing (2) by L, the concentrated form of the equation becomes:

$$y_t = A k_t^{\alpha} \qquad (3)$$

where (*Y*) is economic progress presenting national output and national income; (*A*) is any factor that influences the intensity of domestic production technique, (*K*) is capital per worker.

In order to ascertain and interrogate the domestic macroeconomic drivers for economic diversification in Nigeria, this paper relies on the literature of which economic diversification and its correlates have recently been

major objects of discourse. Even though the literature acknowledges the gains from economic diversification, there is no general harmony on the domestic drivers and inhibitors of economic diversification. Specifically, various studies have interrogated this issue and a compendium of literature has it that the following factors have been recognized in determining the level of a countries' economic diversification: production structure (Cimoli & Rovira, 2008), political structure (Cuberes & Jerzmanowski (2009); Malik & Temple, 2009; de Waldemar, 2010), economic structure (Djankov et al., 2002; Denis & Shepherd, 2007; Malik & Temple, 2009; Klinger & Lederman, 2011; Kaulich, 2012), geography (Redding & Venables, 2004; Malik & Temple 2009), human and material resources (Kaulich, 2012; World Bank, 2015), as well as quality of institutions (Acemoglu et al., 2003; Kaulich, 2012).

III.   RESEARCH METHODS AND PROCEDURES

Economic diversification, just like trade flows between two countries, increases with the size of the economies of the trading partners and decreases with the distance between the partners (Baldwin, 2011). There are a number of other factors that determine economic diversification as examined in the literature review. However, for this study, we focused on domestic macroeconomic environment so as to identify the domestic policies that should be prescribed to promote diversification.

The general model for the study following models of previous studies such as Ferdous (2011); Nair, et al (2016) and Esanov (2017) is stated in functional form as:

$$DIV = f(MACROE) \tag{4}$$

where DIV is economic diversification and MACROE represents hosts of economic, social and political and institutional conditions obtainable in a country. To achieve the objectives of the study, our specific mathematical model is stated as:

$$DIE = ENRG, POWC, EXC, TRA, DCF, LINT, LRGDP, NAT, LGCF \tag{5}$$

An econometric model of (5) is formulated as follows:

$$DIE = \alpha_0 + \alpha_1 ENRG + \alpha_2 POWC + \alpha_3 EXC + \alpha_4 TRA + \alpha_5 DCF + \alpha_6 LINT + \alpha_7 LRGDP + \alpha_8 NAT + \alpha_9 LGCF + \mu \tag{6}$$

where α_{0-9} are parameters to be estimated. The data for this study were sourced from World Bank's World Development Indicators (WDI, 2017), except for the diversification index that was calculated by the authors using the Herfindahl-Hirschman formula. All variables are in time series span from 1981 to 2016. The choice of the scope of this study is based on data availability and the variables are explained on Table 1.

Table 1: Variables of the Study

Variables	Definitions
ENRg	Gross Primary school enrollment (%). Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music. This is a measure of human capital and we expect school enrollment to aid economic diversification
POWc	Kilowatt of electricity consumption per capita. This represents the level and state of infrastructure in Nigeria. We expect a positive relationship with economic diversification
EXC	Official exchange rate (₦/ US$). A depreciation of the exchange rate will increase demand for domestic goods and therefore increase economic diversification
TRA	Trade as a % of GDP. This is the level of openness and we expect a positive impact on diversification
DCF	Domestic credit provided by financial sector (% of GDP). We expect a positive link between credit and diversification
LINT	Lending interest rate. This is the cost of borrowing and should have a negative impact on diversification
LRGDP	Log of Real GDP. This is the size of the economy and we expect a positive impact on diversification
NAT	Contributions of natural resource as a percentage of GDP. We expect a negative impact on diversification
LGCF	Log of real gross capital formation. This is expected to correlate positively with diversification
DIE	Economic Diversification for Nigeria calculated using the Herfindahl-Hirschman Diversification Index. If N sectors share all economic activities, each one with a contribution k_i and sectoral share

$$S_i = \frac{k_i}{\sum_{j=1}^{N} k_j}$$ Then the DI can be expressed as: $DI = \sum_{i=1}^{N} S^2{}_i$ Since DI computed using

Herfindahl–Hirschman (H) procedure can range from $1/N$ to one, we place a restriction such that it ranges from zero to one:

$$DI^* = \frac{DI - \frac{1}{N}}{1 - \frac{1}{N}}$$ for N >1. H* ranges from 0 to 1: btw 0.00 and 0.01 is for a highly diversified

economy, btw 0.01 and 0.15 is for a somewhat diversified economy, between 0.15 and 0.25 is for a moderately diversified economy and above 0.25 is for a highly undiversified economy.

Source: Authors' Compilation (2018)

IV.   RESULT ANALYSIS AND DISCUSSION OF MAJOR FINDINGS
A.   Tests and Results

The results contained in this section were generated from data analysis performed using E-Views 9.0 econometric software. We began by conducting unit root tests for all the variables using Augmented Dickey Fuller (ADF) test. The outcome is presented on Table 2.

Table 2: Augmented Dickey Fuller Test

Variable	ADF Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Remark
DIE	-6.415782	-4.252879	-3.548490	-3.207094	I(1)
ENRG	-5.153984	-4.252879	-3.548490	-3.207094	I(1)
POWC	-7.679962	-4.252879	-3.548490	-3.207094	I(1)
EXC	-3.972837	-4.252879	-3.548490	-3.207094	I(1)
TRA	-5.475879	-4.323979	-3.580623	-3.225334	I(1)
DCF	-5.450947	-4.273277	-3.557759	-3.212361	I(1)
LINT	-5.382539	-4.262735	-3.552973	-3.209642	I(1)
LRGDP	-4.643706	4.252879	-3.548490	-3.209642	I(1)
NAT	-8.065354	4.252879	-3.548490	-3.209642	I(1)
LGCF	-6.733433	-4.262735	-3.552973	-3.209642	I(1)

Having established that all the variables were integrated at first difference, we went ahead to apply the Engle-Granger method of co-integration. We first of all ran a regression model at level form to get the long run equation. This is shown on Table 3.

Table 3: Long Run Result
Dependent Variable: DIE
Method: Least Squares
Date: 06/22/18   Time: 11:39
Sample: 1981 2016
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ENRG	0.001576	0.000578	2.727487	0.0111
POWC	-0.000592	0.000304	-1.945927	0.0621
EXC	0.000147	0.000139	1.061641	0.2978
TRA	0.001103	0.000376	2.935758	0.0067
DCF	-0.000347	0.000501	-0.692274	0.4947
LINT	-0.002038	0.001382	-1.475228	0.1517
LRGDP	0.014098	0.012360	1.140646	0.2640
NAT	0.002310	0.000636	3.630061	0.0012
LRGCF	0.010894	0.013231	0.823325	0.4175

R-squared	0.753329	Mean dependent var		0.924779
Adjusted R-squared	0.680242	S.D. dependent var		0.039141

S.E. of regression	0.022133	Akaike info criterion	-4.571179
Sum squared resid	0.013226	Schwarz criterion	-4.175300
Log likelihood	91.28123	Hannan-Quinn criter.	-4.433007
Durbin-Watson stat	1.743883		

The long run regression results show that coefficient of determination R^2 of is 0.753329 while the adjusted R^2 is 0.680242. This means that that the estimated model has a strong goodness of fit. We can therefore say that the chosen independent variables on the average accounted for about 68% of the changes in economic diversification. The calculated F-statistic is also statistically significant at 5 percent level, indicating that the explanatory variables are jointly significant in explaining the long run income inequality in Nigeria.

We generated the residual out of the results of the long run model and then ran a unit root test on it. The residual which is the error correction term was found to have unit root at level form which showed that these variables are cointegrated. We proceeded to run an error correction model with the lagged variable of the residual and first differenced form of the other variables that enabled us to get the short run relationship. This is shown on Table 4.

Table 4: Error Correction Model Result
Dependent Variable: D(DIE)
Method: Least Squares
Date: 06/22/18   Time: 11:44
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ENRG)	0.001125	0.000707	1.591486	0.1241
D(POWC)	-0.000677	0.000284	-2.379576	0.0253
D(EXC)	0.000315	0.000199	1.584935	0.1256
D(TRA)	0.000593	0.000322	1.839390	0.0778
D(DCF)	-0.000152	0.000443	-0.342882	0.7346
D(LINT)	-0.001946	0.001306	-1.490239	0.1487
D(LRGDP)	0.027851	0.055503	0.501790	0.6202
D(NAT)	0.001949	0.000476	4.092753	0.0004
D(LRGCF)	-0.000494	0.015614	-0.031647	0.9750
ECM(-1)	-0.768816	0.188486	-4.078909	0.0004

R-squared	0.650181	Mean dependent var	-0.002210
Adjusted R-squared	0.524246	S.D. dependent var	0.028781
S.E. of regression	0.019852	Akaike info criterion	-4.766066
Sum squared resid	0.009853	Schwarz criterion	-4.321681
Log likelihood	93.40615	Hannan-Quinn criter.	-4.612664
Durbin-Watson stat	1.776066		

The error correction term is negatively signed and significant. The result shows that the speed of adjustment to any distortion in the economy is about 77%. The Durbin-Watson statistic shows low autocorrelation.

B.   Discussions of Findings
The signs for the coefficients of the variables were the same in the two time periods, apart from the coefficient of gross capital formation; though there were differences in the level of significance between the time periods. The discussions for each variable are as follows:

The coefficient of gross primary school enrollment (ENRG) was found to be positive and significant impact in the long run but positive and insignificant impact in the short run. This positive sign indicates that an increase in primary school enrollment increases the diversification index. This means that when primary school enrollment increases, the economy becomes less diversified. This is contrary to our expectations. We argue that enrollment is a necessary but not a sufficient condition for improved human resources. The quality of education is also very important. When there is increased funding of education, quality will increase and then impact more on diversification.

The electric power consumption (POWC) measured in kilowatts per capita represents the level and state of infrastructure in Nigeria. The regression coefficients show negative signs in the two periods though it is not significant in the long run period. This indicates that as level and quality of infrastructure increases, the diversification index falls, signifying that the level and quality of infrastructure engenders a more diversified economy.

Results also show that depreciation of the exchange rate will increase demand for domestic goods and therefore increase economic diversification. However, we found that a depreciation of the exchange rate reduces the level of economic diversification. Therefore, depreciation leads to more specialization. This means that the current exchange rate policy does not induce exporters in the non-core export sectors. An economy can only take advantage of exchange rate depreciation if it has many products to offer in the international market. As it is, Nigeria does not have many products that are demanded in the international market, apart from its crude oil.

We expected a negative impact of domestic credit on economic diversification (DCF)and the results obtained confirmed this. We found that an increase in domestic credit lowers the diversification index. This indicates that increase in credit to the private sector leads to a more diversified economy.

Lending interest rate (LINT) is the cost of borrowing and is expected to have a negative impact on diversification. Our findings support this postulation as we found that an increase in interest rate leads to a fall in the diversification index which signifies a more diversified economy.

Trade as a percentage of GDP presents the level of openness and we expected a positive impact on economic diversification. Our result showed the contrary; that an increase in the level of openness increases the diversification index. This invariably means that with more trade comes less diversification and more specialization.

We expected a large economy (captured by the real GDP) to be more diversified than a small economy. However, we found that for Nigeria, when the economy grows, the diversification index also rises, signifying that the economy becomes more specialized. This finding is consistent with the seminal work by Imbs and Wacziag (2003) on the existence of a U-shaped relationship between the size of the economy and economic diversification and further supports the non-inclusive growth currently experienced in Nigeria.

We expected a negative impact of natural resource as a percentage of GDP (NAT) on diversification due to the *resource-curse* phenomenon which portrays the often neglect of other sectors and high dependence on the extractive sector. Our long run result supported the existence of resource curse as an increase in natural resource contributions to GDP raises the diversification index which signifies a lower level of economic diversification.

The real gross capital formation (LRGCF) consists of outlays on additions to the fixed assets (land improvements; plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings) of the economy plus net changes in the level of inventories. These are expected to correlate positively with diversification.

We found that in the short run, an increase in the level of capital formation leads to a more diversified economy. However, we found that in the long run, it would rather lead to a more specialized economy.

V.   CONCLUSION AND RECOMMENDATIONS

Our study found that the drivers of economic diversification in Nigeria are improved infrastructure, increased credit from financial sector, reduction in lending rate and increased domestic investment. Their positive impacts on the level of diversification were rather insignificant in the long run and short run, apart from infrastructure which was significant in the short run. On the other hand, we found the following to deter economic diversification: over dependence on natural resources, trade openness, school enrollment, exchange rate depreciation and the size of the economy.

While impact of dependence on natural resources; openness to trade and school enrollment on economic diversification were significant in the long run, the impact of infrastructure; lending rate; GDP; exchange rate; credit from financial sector and gross investment on economic diversification were not significant in the long run. In the short run, dependence on natural resources; openness to trade and infrastructure had significant impacts on economic diversification. On the other hand, enrollment; exchange rate depreciation; lending rate; GDP; credit and gross investment had insignificant impacts on economic diversification.

These findings have a range of far reaching policy implications. First, deliberate and conscious policies to reduce the over dependence of the economy on extractive resources should be formulated, implemented and sustained. Such policies may include fiscal federalism and increased transparency in the extractive industry. The importance of investment in infrastructure and financial sector development on economic diversification was highlighted by the study. Quality infrastructure reduces cost of productive, which reduces prices of goods and services and increases the competitiveness of Nigerian-made goods. In addition, if credit is cheap, cost of production also reduces.

Therefore, it is important that investment in infrastructure is made a priority as well as advancing credits and incentives to producers. Policies to protect domestic industries should be pursued. Our increasing level of openness and trade, especially in consumer goods has adverse effect on the nation's desire to diversify. Therefore, we should ban the importation of those products that we can efficiently produce in the country. Also efforts should be made to increase the quality of education. This will increase the skills and capability of the human resources in the country.

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