ISSN No:-2456-2165

Relationship between per Capita National Income and Income Inequality: Is the Kuznets Hypothesis True for Nigeria?

James Tumba Henry[1]
Department of Economics, Faculty of Social and Management Sciences, Adamawa State University, Mubi

Phillips Asaph Panotani[2]
Department of Economics, Faculty of Social and Management Sciences, Adamawa State University, Mubi

Abstract:- The main concern of this study is to examine the relationship between per capita national income (economic growth) and income inequality in Nigeria from 1981 to 2017. The study employed descriptive and inferential design to investigate the relationship among the variables (Inequality proxied by GINI index, GDP per capita, GDP per capita squared and gross national savings) used in this study. The Vector Error Correction Model (VECM) and VEC Granger Causality/Block Exogeneity Wald Tests were used for this study because all the variables were integrated of order I(1). The hypotheses used in this study were tested at 5% level of significance. The results revealed that there is a positive relationship between per capita income and income inequality. Similarly, the Kuznets U-shaped hypothesis was found to be true. It also showed that when economic growth (GDP per capita) is doubled, income inequality will fall by 87.36% in the long-run. The causality result revealed a unidirectional causality from income inequality to gross national savings. Based on these findings, it was recommended that the Nigerian government should urgently pursue economic programmes that can promote the establishment and survival of micro, small and medium enterprises.

Keywords:- *per Capita National Income, Income Inequality, Kuznets U-Shaped Hypothesis.*

I. INTRODUCTION

One of the objectives of the Sustainable Development Goals (SDGs) is to achieve reduce inequality within and between countries. The concern here is to make strides into reducing poverty especially in developing and under-developed countries like Nigeria. In spite of this, inequality perdures and the gap between the few "haves" and the majority "have not" widens with regards access to good quality education, health services, income/wealth and nutrition. According to the United Nations (2015), inequality is the state of not being equal, especially in status, rights, and opportunities. These facts are more prevalent in third world countries.

A careful study of income inequality within world regions and countries shows that it varies greatly. In 2016, the total share of national income accounted for by nation's top 10 per cent earners (top 10 per cent income share) was 37 per cent in the entire Europe, 41 per cent in China, 46 per cent in Russia, 47 per cent in US-Canada, around 54 per cent in Sub-Saharan Africa, 55 per cent in Brazil-India and 61 per cent in the Middle East (World Inequality Report [WIR], (2018). This implies that the Middle East is the World's most unequal region, Brazil-India is second and Africa is third on the inequality ranking. In recent decades, income inequality has increased in nearly all countries, but at different speeds, suggesting that institutions and policies matters in shaping inequality (WIR, 2018).

The Kuznets' inverted U-hypothesis suggested that as per capita national income of a country increase, in the initial stages of growth, inequality in income distribution rises and after reaching the highest degree in the intermediate level, the income inequality falls. This shows that as countries strive to develop and per capita income rises, income inequality also increases initially and will begin to fall when it gets to the maximum level even as GDP per capita increases further. This implies that income inequality to some extent depends on per capita national income. In other words, an increase in per capita national income is expected to reduce inequality and improve standard of living.

In Nigeria, the gap between the rich and poor can no doubt be traceable to inequality in income distribution. It fundamentally retards growth and development of both the individual and the nation. Oxfam International (2016) opined that inequality in Nigeria has reached extreme levels, despite being the second largest economy on the African continent, with abundant human capital and the economic potentials to lift millions of her population out of poverty. Currently, Nigeria is the "poverty capital" of the world (The World Poverty Clock, 2018) which shows that her human capital spending and efforts in eliminating poverty vis-a-viz income inequality are still very low. To further support this assertion, Oxfam report (2018) on the commitment to reducing inequality index revealed that Nigeria's social spending on education, health, and social protection is regrettably low and that this is reflected in her poor social outcomes.

Similarly, the World Economic Forum [WEF] (2018) report on inclusive development index ranked Nigeria as 63rd challenged country to achieve inclusive growth and development despite growth recorded in previous years. This goes a long way to show that Nigerians have not benefitted from such growth as the poverty rate stands at 77.6 per cent and the daily median income level is $1.80 (WEF, 2018).

However, from 1986 after the adoption of the World Bank/International Monetary Fund Structural Adjustment Programme, successive governments in Nigeria has made frantic efforts in achieving inclusive economic growth so as to reduce the scourge of poverty and income inequality. These programmes include; National Program for the Eradication of Poverty (NAPEP), National Millennium Development Goals (MDGs), National Economic Empowerment Development Strategy (NEEDS), Vision 20:20, Sustainable Development Goals (SDGs), most recent is the Economic Recovery and Growth Plan (ERGP) among others. These programmes, however, did not yield the expected results. Similarly, there is a mixed conclusion about the relationship between GDP per capita and income inequality. Some study showed positive relationship (Wang, 2017; Shinhye, Rangan & Stephen, 2015; Constanza, 2017; Nemati & Raisi, 2015; Irma, Indah & Nugroho, 2018; Chisom, 2017) while others showed a negative relationship (Tian, 2012; Wang, 2017; Akpoilih & Farayibi, 2012) Thus, the study seeks to investigate the relationship between per capita national income and income inequality as well test the validity of the Kuznets Hypothesis on Nigeria.

II. LITERATURE REVIEW

There is no much study done on the relationship between national income per capita and income inequality. However, few studies available showed a mixed conclusion. In China, Tian (2012) studied the effect of income inequality on economic growth from 1985 to 2007. The study employed the Ordinary Least Square (OLS) technique. The result revealed that Gini coefficient which serves as a measure of income inequality has a negative impact on economic growth.

Wang (2017) on the other hand employed annual data from 1980 to 2012 to study the effects of income inequality on real GDP per capita and real GDP of both USA and China. The study used co-integration technique to investigate the short and long-run relationship between the variables. The result revealed that in the short run, income inequality has a negative impact on economic growth but positive in the long run in the USA. In China, however, the result showed that income inequality promotes economic growth in the short and long runs.

Shinhye et al. (2015) used wavelet analysis to study causality between per capita real GDP and income inequality in the United States from 1917 to 2012 with breaks. The result showed robust evidence of a positive correlation between economic growth and inequality across frequencies. The study also revealed that periods and direction of short and long term causality vary. Furthermore, the study opined that short term relationship does not necessarily coincide with long term relationships.

Constanza (2017) used Arellano-Bond GMM technique to study the relationship between inequality and economic growth in 146 countries from 2010 to 2014. This study used wealth Gini coefficient as a proxy for inequality. The result showed that there is a positive relationship between wealth inequality and real per capita GDP growth.

Nemati and Raisi (2015) used panel data and OLS to study impact of economic growth on income inequality in 28 developing countries (Argentina, Bangladesh, Brazil, Colombia, Dominican Republic, Ecuador, Egypt, Georgia, Guatemala, Honduras, Hong Kong, Iran, Jordan, Kazakhstan, Kyrgyzstan, Malaysia, Nigeria, the Philippines, Paraguay, Peru, Singapore, Thailand, Tunisia, Turkey, Venezuela, North Korea, and Macedonia) from 1990 to 2010. The result showed that there is a positive and significant relationship between per capita income and income inequality in the selected countries. The study, therefore, concluded that economic growth is an important factor in addressing income inequality.

To support the findings of Nemati and Raisi (2015); Irma et al. (2018) studied the impact of economic growth per capita and foreign direct investment on income inequality in Indonesia. The study used OLS (multiple regression analysis) on annual data from 2007 to 2016. The results showed that GDP per capita and foreign direct investment has a positive influence on income inequality. The study concluded that there is enough evidence to believe that GDP per capita and foreign direct investment has a positive impact on income inequality in Indonesia.

Similarly, Utari and Cristina (2014) used dynamic data panel with 26 provincial panel data from 2000 to 2011 to test whether the Kuznets Curve Hypothesis is true for Indonesia. The results revealed that the Kuznets Curve Hypothesis is true and that inequality is expected to decline after the average per capita income of the region reached 18,000 U.S dollars per year.

To reaffirm the finding of Utari and Cristina (2014), Oksana and Jakub (2014) tested the Kuznets hypothesis using panel data for 145 countries from 1979 to 2009. The study employed marginal Probability Density Function (PDF) to examine the relationship between Gini index and GDP per capita. The result revealed that social contributions have strong influence on income inequality and that inverted U-curve was found in countries with low amount of social contributions.

In Nigeria, Akpoilih and Farayibi (2012) examined the phenomenon of growth-inequality nexus by employing annual data from 1960 to 2010. The study used trend analysis to examine the magnitude and the challenges of the prevailing inequality scenario in the country. The result revealed that inequality has a negative impact on economic growth through decreased investment. It was therefore concluded that improving economic well being of Nigerians can be enhanced by reducing the prevailing level of inequality in the country.

Contrary to the findings of Akpoilih and Farayibi (2012), Chisom (2017) studied the impact of income inequality on economic growth in Nigeria from 1984 to 2010. The study used a quadratic model to test the validity of the Kuznets curve using ordinary OLS and causality technique. The result revealed that the Kuznets hypothesis does not hold for Nigeria and that there is unidirectional causality running from GDP to income inequality. The study also found that economic growth has a positive relationship with income inequality.

More so, Nwosa (2019) studied the relationship between income inequality and economic growth in Nigeria from 1981 to 2017. The study employed the Autoregressive Distributed Lag (ARDL) technique. The result showed that there is a positive relationship between income inequality and economic growth but however, it is not significant. The study concluded that there is a serious need for the government to ensure equitable distribution of economic gains among poor citizens.

From empirical literature reviewed, there is no clear relationship between GDP per capita and income inequality. Similarly, Most of the studies done outside Nigeria are not country-specific and even those that are, used estimation techniques like Ordinary Least Squares, ARDL and Wavelet Analysis. This study however, provides a new evidence of the relationship between per capita income (GDP per capita) and income inequality in Nigeria by employing a Vector Error Correction Model (VECM). This study also tested the validity of the Kuznets U-shaped hpothesis using a quadratic equation but introducing savings (as control variable) as proposed by Kuznets.

III. METHODS AND DATA

A. Methods

This study adopted descriptive and inferential design to examine the relationship between per capita income and income inequality as well as test the validity of Kuznets U-shaped Hypothesis using the Nigerian data. This hypothesis was put forward by Simon Kuznets in 1955 to know the relationship between per capita national income and the degree of inequality in income distribution. Due to the unavailability of data, the study employed an inequality measure of the ratio of income share of the richest 20 percent of the population to the bottom 60 percent of the population known as Kuznets' ratio.

According to this hypothesis, as per capita national income of a country increases, in the early stages of economic growth, income inequality rises and after reaching its peak in the intermediate level it falls as GDP per capita increases further. Thus, this study adopted the model used in the study of Utari and Cristina (2014) and Chisom (2017) where income inequality proxied by Gini index is expressed as a function of GDP per capita and squared GDP per capita.

$$GINI_t = \text{f(GDPCAP, } GDPCAP^2) \quad 1$$

In this study, however, national savings was used to augment the model because Kuznets proposed that one of the forces that promote inequality in the distribution of income is the concentration of savings in the upper-income bracket of a country. This is because those at the upper-income bracket save more than those below. Thus, our model becomes:

$$INEQ_t = f(GDPCAP, GDPCAP^2, SAV) \quad 2$$

Stating the non-linear form of equation 2 becomes:

$$INEQ_t = \lambda_0 + \lambda_1 GDPCAP + \lambda_2 LogGDPCAP^2 + \lambda_3 LogSAV + \varepsilon_t \quad 3$$

In equation 3, $INEQ_t$ is income inequality at time t, GDPCAP is GDP per capita, $LogGDPCAP^2$ is the natural log of squared GDP per capita, LogSAV is the natural log of savings and ε_t is the stochastic error term at time t.

From the above model, Arcand et al. (2012) and Lind and Mehlum (2011) as cited in Utari and Cristina (2014) suggested that checking for the presence of a U-shaped relationship requires stating a joint null and alternate hypothesis of the form:

$$\boldsymbol{H_0}: (\lambda_1 + 2\lambda_2(GDPCAP)_{min} \leq 0) \cup (\lambda_1 + 2\lambda_2(GDPCAP)_{max} \geq 0) \quad 4$$

$$\boldsymbol{H_1}: (\lambda_1 + 2\lambda_2(GDPCAP)_{min} > 0) \cap (\lambda_1 + 2\lambda_2(GDPCAP)_{max} < 0) \quad 5$$

Where $(GDPCAP)_{min}$ and $(GDPCAP)_{max}$ are the minimum and maximum values of GDP per capita respectively. The null hypothesis signify non U-shaped conditions, if this is rejected, we conclude that there is a U-shaped relationship. The U-shaped condition shown in equation 5 suggests that when GDPCAP is under the maximum value, the curve will have increasing trend but the trend is likely to decrease after GDPCAP reaches a certain maximum value (Utari & Cristina, 2015).

The Kuznets U-shaped relationship is verified by examining the signs and magnitude of λ_1 and λ_2. The hypothesis holds if $\lambda_1 > 0$ and $\lambda_2 < 0$. If this condition holds, then the turning point or the maximum point of the Kuznets curve is derived by using the formula (Taguchi, 2012 & Tam, 2008 as cited in Utari & Cristina, 2015):

$$K = exp\ (-\lambda_1/2\lambda_2) \quad 6$$

To understand the relationship between per capita national income and income inequality in Nigeria, this study employed descriptive statistics, correlation test, Augmented Dicker Fuller Fuller (ADF) unit root test, Johansen Cointegration test, Vector Error Correction Model (VECM), VEC Granger Causality/Block Exogeneity Wald Tests and robustness test.

B. Data

This study used annual data of income Inequality proxied by the Gini Index, GDP per capita and Gross National Savings from 1981 to 2017. The data for $GDPCAP^2$ was derived by taking the square of GDPCAP to capture the U-shaped relationship between per capital national income and income inequality. This period was chosen to give a broader analysis of the relationship between per capita national and income inequality in Nigeria. In specific term, this period concise with when crude oil was discovered in large quantity in the country and subsequent conscious efforts towards growing the economy were undertaken during these periods.

Variable	DESCRIPTION	SOURCE(S)	A PRIORI EXPECTATION
INEQ	Proxied by GINI index. It measures the deviation of the distribution of income among individuals or households within a country.	World Bank World Development Indicator.	Dependent Variable
GDPCAP	It is a measure of a country's economic output that accounts for its number of people.	World Bank World Development Indicator.	+ –
$GDPCAP^2$	Squared GDP per capita that captures the inverted U-shaped	Computed by the Author.	–
SAV	Proxied by gross national savings. This is gross disposable income less final consumption expenditure.	World Bank World Development Indicator.	–

Table 1:- Description of Variables in the Model
Source:- Compiled by the Authors

IV. ANALYSIS AND DISCUSSION OF RESULTS

A. Descriptive Statistics

Descriptive statistics was used to get a first impression on the relationship between per capita national income and income inequality in Nigeria. This is important because it tells whether the sample data are normally distributed, whether there are outliers in the data set (Maximum and Minimum values), measures of central tendency (Mean and Median), measures of dispersion (standard Deviation) and measures of normality (Kurtosis and Skewness). The study investigated the result in terms of income inequality proxied by GINI Index, GDP per capita, GDP per capita squared and gross national savings. The result is presented in Table 2 below:

	INEQ	GDPCAP	GDPCAPSQR	SAV
MEAN	44.40649	253960.1	6.97E+10	6.09E+12
MEDIAN	43.90000	214460.7	4.60E+10	2.54E+12
MAXIMUM	56.00000	385227.6	1.48E+11	2.31E+13
MINIMUM	36.70000	173011.9	2.99E+10	9.10E+10
STD. DEV	5.208774	73196.38	4.07E+10	7.14E+12
SKEWNESS	0.596859	0.644131	0.786488	0.912540
KURTOSIS	2.495258	1.777261	2.000466	2.418012
JARQUE-BERA	2.589578	4.863510	5.354705	5.657342
PROBABILITY	0.273956	0.087882	0.068745	0.059091
OBSERVATION	**37**	**37**	**37**	**37**

Table 2:- Descriptive Statistics
Source: Computed by the Authors (Eviews 9)

ISSN No:-2456-2165

From Table 2 above, maximum and average values for INEQ, GDPCAP, GDPCAPSQR and SAV are 56(44.41), 385227.6(253960.1), 1.48(6.97) and 2.31(6.09) respectively. This suggests that the variables in the inequality equation (Eq. 3) are essential in explaining the relationship between per capita national income and income inequality in Nigeria, due to the excess of their maximum values over their mean values. INEQ, GDPCAP, GDPCAPSQR and SAV have skewness values of 0.59, 0.64, 0.78 and 0.91and Kurtosis values of 2.49, 1.77, 2.00 and 2.41 respectively. This implies all the variables have normal skewness and platykurtic (that is negative kurtosis, flatted curve and more lower values) because their kurtosis values are less than 3. The Jarque-Bera Statistic revealed that the variables are normally distributed. This is because the probability values (0.27, 0.08, 0.06 & 0.05) for INEQ, GDPCAP, GDPCAPSQR and SAV respectively are greater than or equal to 0.05.

B. Correlation

Having quantitatively described the collection of information about the variables used in this study, test for correlation was conducted to determine relationship between the dependent variable (INEQ) and independent variables (GDPCAP, GDPCAPSQR & SAV). The result is presented in Table 3 below:

	INEQ	**GDPCAP**	**GDPCAPSQ**	**SAV**
INEQ	1.000000			
GDPCAP	-0.050381	1.000000		
GDPCAPSQR	-0.011191	0.996942	1.000000	
SAV	0.147285	0.928806	0.935440	1.000000

Table 3:- Correlation Matrix
Source:- Computed by the Authors (Eviews 9)

From the correlation result presented in Table 3, there is a weak negative relationship between income inequality (INEQ), per capita national income (GDPCAP) and per capita national income squared (GDPCAPSQR) in Nigeria. This is because the reported coefficient between INEQ-GDPCAP and INEQ-GDPCAPSQR are -0.050381 and -0.011191 respectively. This suggests that has the economy grows (per capita national income), income inequality reduces by that much. This is in line with the Kuznets U-shaped hypothesis that proposed that, at the early stage of a Country's growth, income inequality will fall. On the other hand, a weak positive relationship between INEQ and gross national savings (SAV) is reported. This implies gross national savings promotes income inequality as proposed by Kuznets in 1955.

C. Unit Root Test

To avoid spurious regression results that characterize non-stationary stochastic time series data, Gujarati, Porter and Gunasekar (2009) suggested that they must be subjected to a stationarity test. Thus, this study tested the stationarity status of all the variables (INEQ, GDPCAP, GDPCAPSQR & SAV) used. The stationarity test employed was the Augmented Dickey-Fuller (ADF) unit root test with constant proposed by Dickey and Fuller in 1979. The results obtained are summarized in Table 4 below:

Variables	**Level**	**Prob.**	**1st Difference**	**Prob.**	**Order of Integration**
INEQ	-2.502842	0.1234	-3.040450	0.0408	**I(1)**
GDPCAP	0.288523	0.9744	-4.287475	0.0018	**I(1)**
LGDPCAPSQR	0.048857	0.9570	-4.416550	0.0013	**I(1)**
LSAV	-0.680953	0.8386	-6.819498	0.0000	**I(1)**
Critical Val 5%	-2.948404		-2.948404		

Table 4:- Augmented Dickey Fuller (ADF) Unit Root Test Results (5%)
Source:- Computed by the Authors (Eviews 9)

The unit root results presented in Table 4 shows that the variables are stationary after first difference. This implies the test statistic at first difference is greater than the critical value at 5% level of significance, thus, the variables are integrated of order I(1). This is also evidence from the probability values obtained after differencing the variables ones. These values are all less than 0.05%. Consequently, Johansen Cointegration test will be appropriate to check for long run relationship among the variables in the inequality equation (Eq. 3). This is because this test requires that all the variables must be stationary at order I(1). Although, there are other Cointegration test that can be used (Engel-Granger, 1987 & Johansen-Juselieus, 1990) but this study choose Johansen (1988) because of its ability to handle several time series data. The Trace and Maximum Eigenvalue results obtained are presented in Table 5 below:

D. Cointegration Test

Since all the variables are integrated of order I(1) as shown by the results of the unit root test conducted above, the study went further to test for long-run relationship that exists among the variables in the model. The results are summarized in table 5 below:

ISSN No:-2456-2165

Test	Hypothesized No. of CE(s)	Eigen Value	Trace/Max Eigen Statistics	0.05 Critical Value	Prob.**
Unrestricted Cointegration Rank Test (Trace)	None *	0.610512	57.68676	47.85613	0.0046
	At most 1	0.335248	24.68445	29.79707	0.1730
	At most 2	0.201788	10.39251	15.49471	0.2517
	At most 3	0.069049	2.504198	3.841466	0.1135
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)	None *	0.610512	33.00232	27.58434	0.0091
	At most 1	0.335248	14.29194	21.13162	0.3415
	At most 2	0.201788	7.888316	14.26460	0.3901
	At most 3	0.069049	2.504198	3.841466	0.1135
Trace and Max-Eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values					

Table 5:- Johansen Co-integration Test
Source:- Computed by the Authors (Eviews 9)

The Cointegration results presented in Table 5 as shown by the Trace and Max-Eigenvalue revealed that there is one cointegrating equation at 5 per cent level of significance. Similarly, long-run relationship exists when the Trace and Max-Eigenvalue statistics are greater than there corresponding critical values at 0.05 per cent level. The Johansen Cointegration tests suggested that there is a long-run relationship among the variables used in this study.

E. Vector Error Correction Model (VECM)

Having established Cointegration among the variables using the Johansen test, it is therefore important to understand the long-run behavior and short-run dynamics of the model developed for this study. Thus, VECM is appropriate to modeling these behaviors because it is more reliable when long-run forecast is desired as against Vector Autoregressive (VAR) Model that does not take account of long-run relationship. The result of the long-run and short-run dynamics of the model is presented below:

Variables	INEQ	GDPCAP	LGDPCAPSQR	LSAV
λ_1	1.0000	-0.0005	87.3621	-4.7338
λ_2		(-4.21254)	(5.4020)	(-8.0934)
	-0.0789	-1066.470	-0.01125	-0.0522
	(-0.6629)	(-1.3117)	(-1.6634)	(-3.3882)
The parentheses ( ) denotes the t-values at 5% level of significance				

Table 6:- Long-run relationship of the variables with INEQ
Source:- Computed by the Authors (Eviews 9)

Table 6 summarized the results of the long-run equilibrium relationship normalized on Income inequality (INEQ). This can be written econometrically as:

$$INEQ_t = C + 0.0005GDPCAP - 87.3621LogGDPCAP^2 + 4.7338LogSAV \quad 7$$

The coefficients suggest that in the long-run, an increase in GDPCAP (Gross Domestic Product Per Capita) increases INEQ (income inequality) by 0.05 per cent. This implies if GDP per capita changes by 100 per cent, it will affect INEQ by 0.05 percent. This suggested that there is positive and significant relationship between GDP per capita (GDPCAP) and income inequality (INEQ). This is in conformity with the Kuznets U-shaped Hypothesis that opined that as growth reaches the intermediate level in the long-run, income inequality will increase.

On the other hand, LGDPCAPSQR (Logged GDP per capita squared) showed a negative and significant relationship with income inequality in Nigeria. One per cent increase in GDGPCAPSQR reduces income inequality by 87.36 per cent. This suggests that when economic growth in Nigeria is doubled and inclusive, income inequality will fall by a huge percentage. Finally, LSAV (log of gross national savings) has a highly significant and positive relationship with income inequality. One per cent increase in gross national savings increases income inequality by 4.73 per cent. This is in conformity with the a priori expectation of this study and the hypothesis put forward by Kuznets in 1955. Kuznets is of the view that, one of the greatest factors that promote inequality in income distribution is the concentration of savings in the upper-income bracket of a country. This is because those at the upper-income spectrum tend to save more than those at the bottom.

The short-run dynamic (Error Correction Mechanisms) result revealed that the speed of adjustment of INEQ to its own long-run equilibrium is very slow. The adjustment coefficient for income inequality is -0.0789. This implies that only 7.8 per cent of the total short-run disequilibrium converges back to equilibrium in the long-run. In specific terms, only 7.8 per cent of the disequilibrium is adjusted for annually, thus it will take about 12 months for INEQ to adjust to its own long-run equilibrium.

F. Checking for U-Shaped Relationship

To ascertain the U-shaped relationship between per capita national income and income inequality in Nigeria, we compare the signs and magnitude of λ_1 and λ_2 in equation 7. From the equation, λ_1 is 0.005 and great than 0 ($\lambda_1 > 0$) and λ_2 is -87.3621 less than 0 ($\lambda_2 < 0$). It therefore concluded that U-shaped relationship exists between per capita national income and income inequality in Nigeria. To arrive at the turning point, the formula stated in equation 6 was employed as follows:

$$K = exp (-\lambda_1/2\lambda_2)$$

Where: the value of λ_1 is 0.0005 and λ_2 is -87.3621. Substituting into the formula:

$$K = \exp (-0.0005/2*-87.3621) \quad 8$$

$$\text{Therefore, } k = \exp (-0.0005/-174.7242) \quad 9$$

Thus the turning point of the relationship between per capita income and income inequality in Nigeria becomes:

$$K = \exp (0.0000028616) \quad 10$$

G. Causality Tests

Having discovered long-run/U-shaped relationship between per capita national income (GDPCAP) and income inequality in Nigeria, the study also investigated the direction of causality between them using the VEC Granger Causality/Block Exogeneity Wald tests. The result obtained is summarized in Table 7 below:

Dependent variable: D(INEQ)			
Excluded	**Chi-sq**	**df**	**Prob.**
D(GDPCAP)	0.091121	2	0.9555
D(LGDPCAPSQR)	0.180783	2	0.9136
D(LSAV)	0.584412	2	0.7466
Dependent variable: D(GDPCAP)			
Excluded	**Chi-sq**	**df**	**Prob.**
D(INEQ)	5.826910	2	0.0543
D(LGDPCAPSQR)	2.133626	2	0.3441
D(LSAV)	0.887805	2	0.6415
Dependent variable: D(LGDPCAPSQR)			
Excluded	**Chi-sq**	**df**	**Prob.**
D(INEQ)	5.022549	2	0.0812
D(GDPCAP)	2.426583	2	0.2972
D(LSAV)	0.564470	2	0.7541
Dependent variable: D(LSAV)			
Excluded	**Chi-sq**	**df**	**Prob.**
D(INEQ)	7.164288	2	0.0278
D(GDPCAP)	3.721353	2	0.1556
D(LGDPCAPSQR)	3.878448	2	0.1438

Table 7:- Granger Causality/Block Exogeneity Wald Tests
Source:- Computed by the Authors

Table 7 summarized the short-run causal relationship among INEQ, GDPCAP, LGDPCAPSQR and LSAV for each equation in the Vector Error Correction Model (VECM). The first equation revealed that there is no short-run casual relationship among D(GDPCAP), D(LGDPCAPSQR), D(LSAV) and D(INEQ). This is so because there probability values (0.9555, 0.9136 and 0.7466) are greater than 0.05 per cent. Thus we accept the null hypothesis of no short-run causal relationship among the variables at 5 per cent level of significance. This is also true for the GDPCAP and LGDPCAPSQR equations. However in the LSAV equation, there is a short-run causal relationship from INEQ to LSAV. Similarly, GDPCAP and LGDPCAPSQR do not granger cause LSAV in the short-run. Overall, it is concluded that there unidirectional causality from income inequality to gross national savings in the short-run. This implies income inequality is promoting gross national savings in Nigeria and therefore contradicts the Kuznets hypothesis that postulates that savings promotes income inequality.

H. VECM Model Robustness Test

The following residual tests were used to determine the efficacy of the VECM results: The VEC Residual Portmanteau Tests for Autocorrelations, VEC Residual Serial Correlation LM Tests and VEC Residual Heteroskedasticity Tests. The results are presented in table 8 below:

Residual Tests	**P-values**	**Decisions**
Portmanteau LB Test	0.9911	Accept H_0
Serial Correlation LM Tests	0.6029	Accept H_0
Heteroskedasticity Tests	0.5936	Accept H_0

Table 8: Residual test (Robustness Test)
Source:- Computed by the Authors (Eviews 9)

The results in Table 8 revealed that the null hypothesis of no autocorrelation, serial correlation and conditional heteroskedasticity will be accepted for Portmanteau LB test, Serial Correlation LM test and Heteroskedasticity tests since there p-values are greater than 0.05 at 5 per cent level of significance.

V. CONCLUSION AND RECOMMENDATION

This study used Vector Error Correction Model (VECM) and VEC Granger Causality/Block Exogeneity Wald Test to investigate the relationship between per capita national income (Measure of Economic Growth) and income inequality (Proxied by the GINI Index) from 1981 to 2017. This was done to test the validity of the Kuznets U-shaped hypothesis propounded in 1955 using the Nigerian data. The results revealed the evidence of a positive relationship between per capita national income and income inequality in the long-run. This is in conformity with previous studies (Wang, 2017; Shinhye et al., 2015; Constanza, 2017; Nemati and Raisi, 2015; Irma et al., 2018; Chisom, 2017; and Philip, 2019) who found positive relationship between per capita income and income inequality. However, this does not conform to the result of the correlation matrix and some studies (Roland & Adesoji, 2012; Tian, 2012). This result also support the Kuznets hypothesis (1955) that at the early stage of a country's growth, as per capita income increases, income inequality increase initial and falls when per capita income gets to an intermediate level.

This study also found that the Kuznets U-shaped hypothesis is true for Nigeria like the study done by Utari and Cristina (2014) for Indonesia and contrary to previous study done by Chisom (2017) for Nigeria. In addition, this study found savings to have positive and significant relationship with per capita income. This also conforms to the Kuznets hypothesis that savings is an important factor that promotes income inequality in the long-run because those at the upper-income spectrum saves more than those at the bottom. Finally, the causality result revealed a unidirectional causality from income inequality to savings. This implies income inequality is promoting savings in Nigeria because there is an increased awareness of the importance savings for the future.

From the findings and results of this study, it important for the Nigerian government to pursue objectively, economic policies that can promote inclusive growth since the long-run VECM result revealed a positive relationship between GDP per capita and income inequality. This implies that, though Nigeria recorded economic growth within this period but income inequality is also growing. Thus, economic programmes that can promote the establishment and survival of micro, small and medium enterprises are required urgently. Similarly, the Central Bank of Nigeria should redirect her monetary and fiscal policy towards a more just redistribution of income across households in the country.

REFERENCES

[1]. Akpoilih, A. R., & Farayibi, R. A (2012). Economic Growth and Inequality in Nigeria: Magnitudes and Challenges. *Munich Personal RePEc Archive*, 1-19. Retrieved from https://mpra.ub.uni-muenchen.de/74156/

[2]. Chisom, S. A. (2017). The impact of income inequality on economic growth: A Case Study on Nigeria (Master's Dissertation). Retrieved from https//www.academia.edu/35320833/The_Impact_of_Income_Inequality_on_Economic_Growth_A_Case_Study_On_Nigeria

[3]. Costanza, N. (2017). The Relationship between Inequality and Growth: Evidence from New Data. Research Gate. 1-31. doi: 10.1007/BF03399507

[4]. Gujarati, N. D., Porter, C. D. & Gunasekar, S. (2009). Basic econometrics: special Indian Edition (5th ed.). New Delhi: McGraw Hill.

[5]. Irma, S., Indah, S., & Nugroho, S. B. M. (2018). Impact of economic growth per capita and foreign direct investment on income inequality in Indonesia. EDP Sciences, 73(10013), 1-4. Retrieved from https://doi.org/10.1051/e3sconf/201873

[6]. Kuznets, S. (1955). Economic growth and income inequality. The American Economic Review, 45(1), 1-30.

[7]. Nemati, M., & Raisi, G. R. (2015). Economic growth and income inequality in developing countries. International Journal of Life Sciences, 9(6), 79-82. doi:dx.doi.org/10.3126/ijls.v9i6.12743

[8]. Nwosa, P. I. (2019). Income inequality and economic growth in Nigeria: Implication for Economic Development. OECONOMICA, 15(1), 108-116.

[9]. Oksana, M., & Jakub, C. (2014). Kuznets inverted U-curve hypothesis examined on up-to date observations for 145 countries. *Praque Economic Papers*, 2014(3), 388-410. doi: 10.18267/j.pep.490

[10]. Oxfam International. (2016). Inequality in Nigeria: Exploring the Drivers. Retrieved from https:www-

cdn.oxfam.org/s3fs-public/file_attachments/cr-inequality-in-nigeria-170517-en.pdf

[11]. Oxfam Report. (2018). The Commitment to Reducing Inequality Index. Retrieved from https://s3.amazonaws.com/oxfam/..../The_Commitment_to_Reducing_Inequality_Index_2018.pdf

[12]. Utari, G. A., & Cristina, R. (2015). Growth & inequality in Indonesia: Does Kuznets Curve Hold?. Economic researcher in Center for Central Banking Research and Education (PRES) Bank of Indonesia. Retrieved from https://pdfs.semanticscholar.org/aebd/aa15c4a34c81965b55992703860692ca67a4.pdf

[13]. Shinhye, C., Rangan, G., & Stephen, M. M. (2015). Causality between per capita real GDP and income inequality in the U.S.: Evidence from a Wavelet Analysis. Social Indicators Research: An International and Interdisciplinary Journal for Quality-of-Life Measurement, 135(1), 269-289. doi: 10.1007/s11205-0161485-0

[14]. The United Nations. (2015). Concepts of Inequality. Retrieved from https://www.un.org/en/development/desa/policy/wess_dev_issues/dsp_policy_01.pdf

[15]. The World Poverty Clock. (2018). World Data Lab. Retrieved from https://www.worldpoverty.io/

[16]. Tian, Y. (2012). The Effect of Income Inequality on Economic Growth in China. *Economics & Business Journal:Inquiries & Perspectives*, 4(1), 150-157.

[17]. Wang, Y. (2017). Will inequality affect growth? evidence from USA and China since 1980. *Research in World Economy*, 8(2), 1-11. Retrieved from http://rwe.sciedupress.com

[18]. World Inequality Report. (2018). Executive Summary. Retrieved https://wir2018.wid.world/executive-summary.html

[19]. World Economic Forum. (2018). The Inclusive Development Index. Retrieved from http://www3.weforum.org/docs/WEF_Forum_IncGrwth_2018.pdf