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RESEARCH PAPER

Income Inequality and Aggregate Demand: An Empirical Evidence from Nigeria Digitalized Economy

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Abstract

Income inequality has been so much evident in the last four decades as the rich are accumulating more wealth than the poor leading to changes in output, consumption, and employment. However, the concern in recent times of digitalized economies has been its effects on macroeconomic activities through the aggregate demand channel. This study examines the impact of income inequality on aggregate demand in Nigeria, the study data were gathered from the World Bank from 1985 to 2020. The study incorporates infant mortality rate and life expectancy as control variables while the Dynamic Ordinary Least Square (DOLS) was adopted as the method of estimation. The study's descriptive analysis shows that the variables are integrated at I(0) and I(1) while the DOLS result shows that income inequality, inflation, and life expectancy have a negative impact and significant relationship on aggregate demand. The study results also show a long-run relationship among the variables and it was thus concluded that increasing income inequality in Nigeria is detrimental to aggregate demand. The study recommends that government should increase its spending on social services, ensure direct transfer services to the poor and target fiscal and monetary policies that are inequality reduction driven.

Keywords: Aggregate Demand, Dynamic Ordinary Least Square (DOLS), Income Inequality, Infant Mortality, Life Expectancy.
JEL Classification: E24, O11, O15.

1. Introduction

One of the ancient discussions in economics is the relationship between income and the level of aggregate economic activity. The basic idea put forward has been that higher-income inequality will reduce aggregate demand, consumption, and employment level (Auclert and Rognlie, 2018). The long subject of the discourse

is cogent that it can be traced to the work of David Richardo's political-economic fundamental goal and Karl Marx (Robert, 2017). However, in this era of digitalization in which high-technological equipment and internet facilities have taken hold of economic activities and consequentially promote globalization, the world economies have been able to fight poverty to a minimal level, especially among the developed countries but income inequality on the other hand has been rising throughout the digitalized world. Even advanced countries such as the United States and emerging countries like China experienced a significant increase in income inequality in recent decades (Kohlscheen et al., 2021). This scenario does not exempt the developing countries, especially in Africa and Asia where poverty is very predominant. As a result, academic effort has shown that the general shift in income inequality is influenced by skilled-based technical dynamics and globalization, which are outcome of digitalized economy (Atkinson & Bourguignon, 2015). The rising income inequality implications concern has been on its short-term effects on macroeconomic parameters aside from its social and political effects in the long run.

Aggregate demand remains a basic function in economic growth composition and for decades, the functional distribution of income in relation to economic growth has been a major argument to the post-Keynesian economists (see Kaldor, 1955; Pasinetti, 1962; Kalecki, 1971; Steindl, 1976). The post-Keynesian however argued that economic growth nature can either be wage-led or profit-led with the view that wage-led economic growth increases wage share leading to a win-win situation of higher growth and lower inequality while the reverse is the case in the profit-led scenario (Ederen and Rehm, 2019). However, in the literature, the nature of the relationship between economic growth in general to poverty, and income inequality has led to several ideological submissions. To some school of thought, an increase in aggregate demand and economic growth leads to an increase in income which in turn reduce the level of poverty and inequality (Aghion et al., 1999); whereas, Ravallion (2001) argued that income inequality and rising poverty could sometimes be caused by economic growth. Furthermore, from these perspectives, another view surfaced that high-income inequality leads to economic expansion (Galor and Zeira, 1993; Persson and Tabelini, 1994 and Alesina and Rodrik, 1994).

In Nigeria, the problem of income inequality can be seen in the daily struggles of a large percentage of the populace whereas wealth is accumulated by a few groups of people (Igwegbu and Metu, 2021). Presently, about 100 million people in Nigeria are living in poverty and the richest man on the African

continent whose wealth can alleviate the poverty of the majority of people in this category is a Nigerian. It was estimated that lifting Nigerians above the extreme poverty line of $1.90 will cost about $24 billion; invariably this means, the total wealth of Nigeria's top four richest men will bring these people out of poverty (Oxfam, 2017).

The paradox of growth in Nigeria negates the common metaphor 'A rising sea lifts all boats" due to the inherent income inequality in the economy. The distribution of resources is seriously skewed by income inequality in Nigeria such that as the country gets richer, only a few benefit, and the majority wallow in low aggregate demand, deprivation and poverty due to the menace of inequality. This *status quo* has been promoted by weak economic empowerment of women in the country. They are mostly regimented to the rural areas with weak economic resources to engage in farming activities. For instance, about 54 million of Nigeria's estimated 78 million women who live in rural areas are off the land to practice agriculture, the largest economic platform for women. It is mostly subsistence farming with hoes and cutlasses the women are disadvantaged at rely upon the use of the farming implements (Oxfam, 2017).

Besides, taxation is the basis of the social contract between governments and citizens is expected to be progressive. Such taxation is at the core of a fair redistribution of public resources. However, in Nigeria, the tax system is largely regressive: the burden of taxation mostly falls on poorer households and teething firms, while the big multinational corporations receive questionable tax waivers and tax holidays, and utilize loopholes in tax-laws to shift huge profits generated in the country to low tax jurisdictions. Moreover, due to pressures from the federal government to meet its revenue generation targets, the state and local governments often impose aggressive tax on the informal sector as well as the participants of the Micro, Small and Medium Enterprises (MSMEs).

As a global commitment toward development, the United Nations Sustainable Development Goal (UNSDG) which is built on the principle of leaving no one behind through its assembly included reduction of poverty and inequality to its goals. However, on the empirical ground, much has not been done to examine the nexus of income inequality and aggregate demand in Nigeria. Available literature focused on the determinants of income inequality, inequality and growth, inequality and poverty (see Akinbobola & Saibu, 2004; Okafor, 2011; Bakare, 2012; Ayinde et al., 2012; Ademola, 2019; Ewubare & Nnamdi, 2020; Enoma, 2020; Igwegbe & Metu, 2021). It is in this regard that this study formally examines the impact and relationship between income

inequality and aggregate demand in Nigeria digitalized economy. The study is then sectionalized into five sections; following this is a brief review of relevant literature; the methodology; empirical results and discussion; conclusion, and policy recommendation.

2. Literature Review

Theoretically, the Kuznets hypothesis presented around 1950 and 1960 has been fundamental for the explanation of income inequality, and following the extant discussion of this theory is the "Poverty-Inequality-Growth" hypothesis propounded by Bourguignon, which try to explain the relationship between poverty, income growth, and income inequality. However, there has not been a clear consensus about the relationship among inequality, poverty, and growth among development and welfare economists. In this regard, the possible connection between income and aggregate demand remains an issue of contention as income play a prominent role in affecting the demand for goods and services by individuals and individual households which invariably constitute aggregate demand. On the empirical ground, there has been diverse attention from scholars on income inequality; for example, Akinbobola and Saibu (2004) looked at the trend and relationship among income inequality, unemployment, and poverty in Nigeria using the vector autoregressive approach. The vector model revealed a reduction in the unemployment rate during the period of analysis improves human development which consequently reduces the poverty rate. Also, the study found increasing government capital spending to be the solution to unemployment and human development index enhancer. Ewubare and Nnamdi (2020) also assessed the relationship between unemployment and income inequality in Nigeria; the assessment conclusion showed that rising unemployment in Nigeria fuels income inequality among the populace.

Enoma (2020) verified whether government macroeconomic policies are capable of reducing poverty and income inequality in Nigeria using the ordinary least square; the study found that macroeconomic policies (monetary and fiscal) put in place by the government were consistent in reducing poverty and inequality in Nigeria over the years. In a similar study by Akinyemi et al. (2019) the nexus of inequality and poverty was examined in Nigeria and they found poverty to be decreasing as the government spend more to standardize healthcare services while inequality keeps rising on the other hand. Growth impacts of income inequality in Nigeria were studied by Ademola (2019) with the conclusion that income inequality hurts persistent economic expansion of Nigeria

as an increase in income inequality has an adverse effect on investment, overall enrolment ratio, and property protection. Bakare (2012) measures income inequality in the Nigerian economy and found a wide disparity among people in terms of income. Not far from this, a study by Igwegbu and Metu (2021) examined the factors responsible for income inequality experienced in Nigeria using the fully modified ordinary least square estimation technique. Their study analyses informed that level of development, technology adoption, globalization, fiscal policy, financial accessibility, and rural-urban migration are major determinants of income inequality in Nigeria. Furthermore, the examination of aggregate demand and national unemployment in Nigeria by Okpe and Sule (2020) using the vector error correction model showed that in both the short and long-run aggregate demand exerts a positive influence on unemployment reduction in Nigeria. Yameogo and Dauda (2022) made a comparative analysis of the effect of income inequality and economic growth on the environmental quality of Nigeria and Burkina Faso adopting the autoregressive distributed lad model. The result showed that income inequality improves environmental quality by reducing the emission of carbon dioxide in Nigeria and has adverse effects on the environmental quality of Burkina Faso.

However, on the global scale, mixed and diverse empirical results have been submitted by scholars on the relationship between income inequality and economic factors. For example, Galor and Zeira, 1989; 1993; Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Birdsall et al., 1995; Perotti, 1994; 1996; Alesina and Perotti, 1993; 1996; Deininger and Squire, 1996; 1998; Knell, 1999; Mo, 2000; Barro, 2000; Rehme, 2002; De La Croix and Doepke, 2003; Banerjee and Duflo, 2003; Knowles, 2005; Easterly, 2007; Sukiassyan, 2007; Noh and Yoo, 2008; Lin et al., 2009; Castelló-Climent, 2010; Chambers and Krause, 2010; Shin, 2012; Herzer and Vollmer, 2012; Wahiba and El Weriemmi, 2013; Fawaz et al., 2014; Cingano, 2014; Darma and Ali, 2014; Bagchi and Svejnar, 2015; Njindan Iyke and Ho, 2017; and Lahouij, 2017 submitted that inequality negatively impacts growth process of nations which conform to the modern perspective expositions.

On the other hand, several studies (such as Partridge, 1997; Li and Zou, 1998; Tanninen, 1999; Deininger and Olinto, 1999; Forbes, 2000; Balisacan and Fuwa, 2003; De Dominicis et al., 2008; Halter et al., 2014; Naguib, 2017; Jauro, 2017; Joshi, 2018, etc.) underscored the impacts of inequality of income distribution for economic growth. however, several other studies (see Barro; 2000; Chang and Ram, 2000; Thornton, 2001; Panizza, 2002; Huang, 2004; Lin

and Weng, 2006; Jalil, 2009; Chambers and Dhongde, 2011; Cheema and Rehman, 2014; Vo et al., 2019) submitted that income inequality has no significance in understanding growth process. Still, a large number of studies (for instance, Furman and Stiglitz, 1998; Wan et al., 2006) found no clear relationship, different relationships at different time horizons (Partridge, 1997; Halter et al., 2014; Malinen, 2013), or different relationships at different parts of the income distribution (Voitchovsky, 2005; Fallah and Partridge, 2007; Lin and Yeh, 2009; Assa, 2012; Tiwari et al., 2013; Delbianco et al., 2014; Chen, 2018). Conclusively, under these empirical discrepancies and little empirics on the relationship between income inequality and aggregate demand in Nigeria, there is a clear cut that more research has to be devoted to this relationship. As such, this study fills the gap by providing empirical evidence of the nexus between income inequality and aggregate demand in Nigeria.

3. Data and Methodology

To empirically examine the nexus between income inequality and aggregate demand, the study formulated a model based on theoretical explanations. Income inequality was measured by Gini coefficient while aggregate demand was proxy by gross domestic product (GDP). The GDP though has been argued by Keynesian economists to be equal aggregate in the long run, nevertheless it remains the best measure of aggregate demand as both are quantitatively measured in the same manner. Aggregate demand entails consumption spending on goods, investment, government spending and net exports. The study model is thus formulated based on the linear relationship established by theory to be between income and components of aggregate demand;

$$AD = IE, LE, IMR, SAV, INF \quad (1)$$

AD = aggregate demand, IE = income inequality, LE = life expectancy, IMR = infant mortality rate, SAV = savings, and INF = inflation. LE, and IMR are included in the above model specification being the major immediate effects of the prevalence of income inequality on the social economy while SAV and INF are included being some of the major factors that influence demand for goods and services by households. The data for this study are sourced from the World Bank ranging from 1985 to 2020. Categorically, the individual data identity are presented in Table 1 below:

Table 1. Description of Variables

Variables	Proxy
Aggregate demand	GDP
Income inequality	Gini Coefficient
Life expectancy	Life expectancy
Mortality rate	Infant Mortality Rate
Savings	Gross Savings (% GDP)
Inflation	Consumer Price Index

Source: World Bank: WDI.

To estimate the study model, the Dynamic Ordinary Least Square (DOLS) by Stock and Watson (1993) was adopted. This method was chosen based on its supremacy over the conventional ordinary least square that does not consider the emergence of autocorrelation between the error term and regressors of a model i.e., COV(e, X) = 0 which in most cases is not true and leads to biasedness of result coefficients. To solve the biasedness problem of endogeneity in the case when the error term is correlated with the regressors, approaches such as the use of instrumental variables and dynamic least square were suggested. However, the use of instrumental variable requires a large sample size and it's in most cases difficult to find appropriate variables. Given these limitations, this study thus adopted the Dynamic Ordinary Least Square which solves the problem of endogeneity for both small and large sample sizes.

In any time-series analysis, there is need for preliminary diagnostics such as the descriptive and unit root test to confirm the order of integration. Another supremacy of the Dynamic Ordinary Least Square is its applicability to variables of a model that are integrated of order one I(1) and those of mixed order of integration i.e., I(0) and I(1).

4. Results and Discussions

Table 2 below shows the descriptive statistics of the variables employed in the study model using the mean, median, standard deviation, skewness, kurtosis and the Jarque-Bera statistics. It was observed from the table that the mean and median of each of the variables are not equal to each other which imply the distribution of each variable is asymmetric and skewed. The greater values of Gini coefficient, life expectancy, savings, and inflation mean over the median imply the variables are positively skewed which can also be confirmed from the skewness values of 0.9231, 0.6791, 0.2575, and 1.7422 while the greater value of infant mortality rate median value over the mean implies the variable is negatively skewed and can also be confirmed from the skewness value of -0.0842

and finally using the mean and median values of aggregate demand, the result fluctuates as a result of negative values that are present in the dataset. However, going by the skewness value, aggregate demand is positively skewed. It can also be deduced from the table that the standard deviation of all variables is less than their mean. This implies all the variables are normally distributed. The result further shows that all the variables have positive kurtosis values and the Jarque-Bera informed that all variables are normally distributed except inflation.

Table 2. Descriptive Analysis

	AD	GINI	IMR	LE	SAV	INF
Mean	4.250666	42.25000	101.7694	48.72758	36.22236	19.17818
Median	4.430627	40.10000	102.3000	47.03850	33.66436	12.38637
Std. Dev.	3.914905	5.326564	19.27192	3.221771	13.27443	17.68451
Skewness	0.440571	0.923177	-0.084249	0.679060	0.257530	1.742216
Kurtosis	3.302194	2.562953	1.382320	1.909221	1.982249	4.695105
Jarque-Bera	1.301600	5.400045	3.967922	4.551429	1.951655	22.52197
Probability	0.521628	0.067204	0.137523	0.102723	0.376880	0.000013

Source: Research finding.

Table 3 shows the correlation between the variables under study. In this case, focus is on the relationship between the dependent variable (aggregate demand) and other independent variables. It is shown in the table that Gini coefficient has a weak positive correlation with aggregate demand while infant mortality rate, life expectancy, savings, and inflation have weak negative correlation with aggregate demand over the period under study.

Table 3. Correlation Matrix

	AD	GINI	IMR	LE	SAV	INF
AD	1.000000	0.070452	-0.063753	-0.119725	-0.069031	-0.321499
GINI		1.000000	0.411966	-0.543385	0.161684	0.107887
IMR			1.000000	-0.946804	0.852203	0.466353
LE				1.000000	-0.792928	-0.372274
SAV					1.00000	0.307553
INF						1.00000

Source: Research finding.

The Augmented Dickey Fuller test result was used to confirm the stationarity and order of integration of each variable. The result show that all the variables are stationary; categorically, aggregate demand, infant mortality rate

and life expectancy are stationary at levels while the Gini coefficient and inflation are stationary after the first difference. The result of the unit root test conforms to the provision for the adoption of the Dynamic Ordinary Least Square for variables that are of combine order of I(0) and I(1).

Table 4. Unit Root Test

Variables	Test Equation	ADF Stat.	5% Crit. Value	Prob.	I(0)/I(1)	Inference
AD	Trend and Intercept	-3.6688	-3.5442	0.0382	I(0)	Stationary
GINI	Trend and Intercept	-5.8418	-3.5485	0.0002	I(1)	Stationary
IMR	Trend and Intercept	-8.7707	-3.5485	0.0000	I(0)	Stationary
LE	Trend and Intercept	-5.1052	-3.5578	0.0013	I(0)	Stationary
SAV	Trend and Intercept	-4.2899	-3.5443	0.0089	I(0)	Stationary
INF	Trend and Intercept	-4.2477	-3.5950	0.0127	I(1)	Stationary

Source: Research finding.

Table 5. Dynamics Ordinary Least Square

Variables	Coefficients	Std. Errors	t-statistics	Prob.
GINI	-1.6134	0.3534	-4.5650	0.0008
IMR	-1.2730	1.0072	-1.2638	0.2324
LE	-11.3121	4.5510	-2.4856	0.0303
SAV	0.1642	0.1844	0.8908	0.3921
INF	-0.1196	0.0554	-2.1569	0.0540
C	732.6564	326.5383	2.2406	0.0466
@TREND	1.3460	0.7421	1.8140	0.0970
	R^2	0.8673	Adjusted R^2	0.6140

Source: Research finding.

Note: Dependent Variable: AD; Fixed leads and lags specification (lead=1, lag=1).

Results from the Dynamic Ordinary Least Square (DOLS) analysis showed that there exist negative and significant relationships between aggregate demand and all regressors of the study model except savings. The implication of these results means a unit increase in income inequality, infant mortality, life expectancy, and inflation rate decrease aggregate demand in Nigeria economy over the period of analysis while a positive change in savings increases aggregate demand. These results conform to the correlation matrix results that show that there is a negative correlation between aggregate demand and infant mortality, life expectancy, and inflation. The significance of Gini coefficient, life expectancy, and inflation at 5% critical level shows they were significant factors

influencing changes in volume of aggregate demand in Nigeria from 1985 to 2020. Furthermore, the R-squared and adjusted R-squared which measure the model goodness of fit show that the explanatory variables of the model explain about 61 percent variation in the explained variables, that is, income inequality, infant mortality, life expectancy, savings, and inflation account for about 61 percent of changes in aggregate demand. The result of the DOLS of negative significant relationship between income inequality and aggregate demand conforms to literature that widespread of income inequality increase poverty rate and affects aggregate demand aside other side effects on output, consumption, savings and employment.

The result of the Enger-Granger cointegration post estimation test for the existence of long-run relationship among the variables show that there exists a long-run relationship among aggregate demand, income inequality, infant mortality rate, life expectancy, savings, and inflation in Nigeria. Using the Jarque-Bera statistics value and probability results from Figure 1 below which presents the normality test result, indicates that the study model residuals are normally distributed for Jarque-Bera probability is 0.853.

Table 6. Enger-Granger Cointegration

Specification: AD GINI IMR LE SAV INFC @TREND		
Cointegrating equation deterministics: C @TREND		
Null hypothesis: Series are not cointegrated		
Automatic lag specification (lag=2 based on Akaike Info Criterion, maxlag=7)		
	Value	Prob.*
Engle-Granger tau-statistic	-4.963257	0.1429
Engle-Granger z-statistic	-164.0175	0.0000

Source: Research finding.

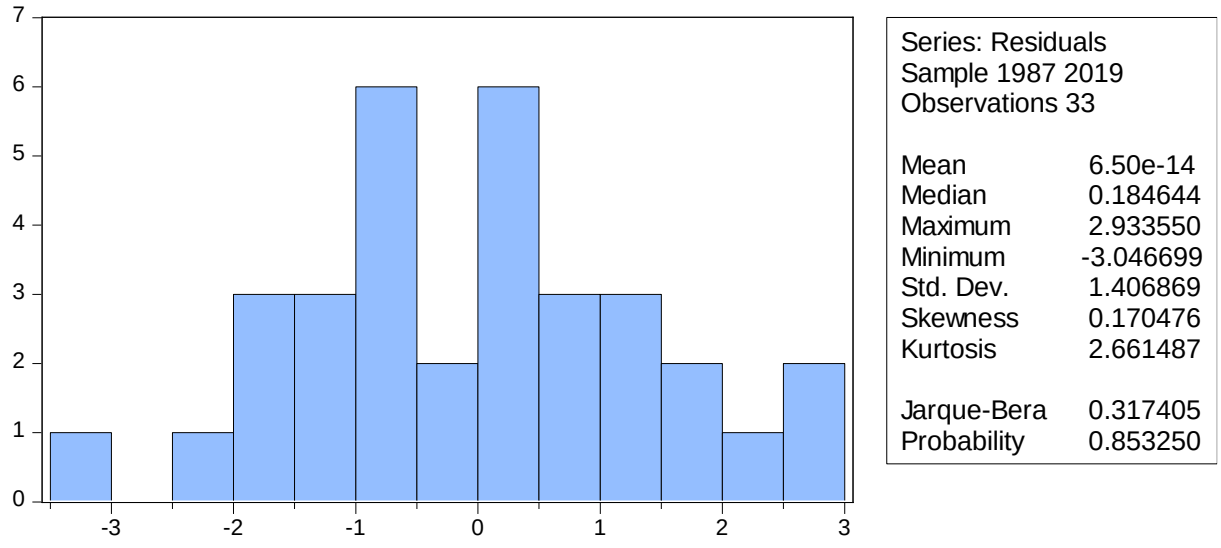

Figure 1. Normality Test
Source: Research finding.

5. Conclusion and Recommendations

Over the years, income has become widely unequally distributed among the poor and the rich across developed and developing countries of the world. This disparity in income distribution pronounced so much in developing countries made this study to examine the impact and relationship between income inequality and aggregate demand in Nigeria from 1985 to 2020. Aggregate demand which is the totality of domestic demand for goods and services remains an economic variable that depends on income; the study incorporated infant mortality rate, life expectancy, savings, and inflation as control variables while it adopted the Dynamic Ordinary Least Square (DOLS) as estimation technique for its provision for solution to endogeneity problem that may arise. The DOLS result shows that there are a negative and statistically significant relationships between aggregate demand and income inequality as well as between aggregate demand and some control variables (i.e. life expectancy and inflation).

The study thus concludes based on its findings that increasing income inequality in Nigeria is detrimental to aggregate demand through its social and economic effects. The implication of the study findings is that if policies are not adequately put in place, income inequality will in the long run reduce aggregate demand and as well increase the prevalence of poverty within the economy. This study recommends based on its findings that the government should increase its

spending on social services, ensure direct transfer services to poor households and ensure fiscal and monetary policies that are inequality reduction driven. This can be manifested in a strengthened progressive tax system, promotion of employment and civic inclusion through encouragement of citizens in Micro Small and Medium Enterprises (MSME), as well as the need to strengthen policies and laws that promote gender equality in Nigeria.

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