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Income Inequality Effects of Globalization in Oil-Rich Nigeria: Evidence from Time Series

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Abstract Incidences of rising income inequality in Nigeria have raised questions on its link with globalization. Using quarterly time-series data on an empirical model which is hinged on Stolper-Samuelson theorem, the Johnson cointegration test and error correction model showed that globalization, technology and foreign direct investment significantly heightened income inequality while that of productivity significantly diminished income inequality in Nigeria in the long run. This study recommends support for domestic entrepreneurship through import substitution and export promotion strategies so that Nigeria to enjoy gains from globalization. Furthermore, increased access to public service such as health care and high quality education among the poor and vulnerable is desirable for sustained increase in labour productivity.

Keywords Globalization, FDI inflow, Income inequality, Nigeria, Productivity, Wage

1. Introduction

In the past two decades, there has been a continuous rise in inequality in many developed and developing countries [1]. Global income inequality is possibly the most important policy threats facing the world at present. While there is full understanding about the seriousness of the problem, there are considerable contentions about its worsening over time. The issue is important for policy; anti-globalization agitators often times argue that globalization leads to ever-rising inequality, both within and between nations. The opponents of free trade are however, not alone when maintaining that global inequality has risen; large international organizations have also supported this perception - especially concerning inequality between countries as high level of income inequality exists in developing countries [2].

Contrary to the impressions fuelled by inaccurate economic statistics, the welfare issue in Nigeria, Africa's most populous nation, is not only that poverty is rising nor that unemployment is extremely high but that the challenge facing its government include that of dealing with increasing income inequality, particularly, the disparity in income for people living in different parts of the country. Although the national poverty rate was 33.1 percent in 2012-2013, the rate was 44.9 percent in rural areas but only 12.6 percent in urban areas [3]. Perhaps more disturbing is the wealth inequality among Nigeria's different geographical regions, with more destitute found in the North than in the Southern part of Nigeria. Whereas the poverty headcount in the relatively more industrialized South-west, with the lowest poverty rate, fell from 21.2 percent in 2010-2011 to 16 percent in 2012-2013, the count in North-east rose from 47.1 percent to 50.2 percent over the same period [4].

Some of the consequences of the widening income gaps are the negative impact on socio- economic indices brought about by the large disparity between the rich and the poor which produce a series of cyclic reactions [5]. Large income gap results in inadequate consumption which reduces market demand and creates a vicious cycle of decreased business efficiency. It also creates a situation where the weaker SMEs go bankrupt, unemployment rate increases, socio-economic statues decline and state revenue dwindles. Income inequality is a big problem in both developed and developing countries. It hinders economic opportunity and innovation [6]. Rising income disparity affects how people perceive things around them (including government policies); it affects level of happiness, and makes people feel that life is too hard and unfair.

Some of the most popular explanations for increasing income inequality in Nigeria are increase in literacy rate [7], rural/urban disparity [8], profession and occupation, lack of skills and gainful employment [9]. Other explanations for raising inequality in both developed and developing countries are the role of skill-biased technological progress [10] and [11], skill-skewed demand of foreign investors [12], complementarily between lower cost of capital (which comes in form of financial reforms that accompany trade liberalization) and skilled labour [13, 14]. It is arguable that

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wage-setting rules may also be a cause as the study found that wage inequality was greater in poor countries because the highly skilled workers' wages responded to global wage-setting conditions, while low skilled wages depended on local conditions [15]. Nevertheless, much less emphasis has been put on the analysis of income inequality and globalization in least developed countries (LDC) and in Nigeria particularly.

The principal intuition is that if trade was behind the relative wages movements in developed countries, we should observe a movement in the opposite direction in the relative wages of developing countries. That is, if trade with developing countries was increasing the income inequality in developed countries, we should observe a corresponding reduction in the income inequality in developing countries. Similarly, if skill-biased technological change was the main force behind the relative income movements in developed countries, a similar pattern should be present in developing countries too. There is therefore the need to investigate the relationship between globalization and income inequality in Nigeria.

A fundamental prediction of trade theories is that the adjustment process to trade reform would involve labour reallocations from sectors that experience price increases and hence expand. Thus, the greater demand for low-skilled labour is expected to lead to higher income in the long run and consequentially close up the gap between the skilled and low skilled workers and in turn reduce poverty. No wonder the last decades have witnessed tremendous pressure on developing countries to liberalize their trade. The free trade mantra advocated by developed nations and major international development organizations has become like a religion, holding out the promise, if only poor countries will accept.

Contrary to free trade predictions, several developed and developing countries have experienced a substantial increase in income inequality following globalization and increased international trade [16]. Nigeria's experience with globalization has attracted much attention because it has also been experiencing rising income inequality [17].

The coincidence of globalization and income inequality has cast a serious doubt on the efficacy of the neoclassical trade theory, the Heckscher-Ohlin model in general and the Stolper-Samuelson theorem in particular. Surprisingly, much less emphasis has been put on the analysis of income inequality in less developed countries but no known study on globalization and income inequality in Nigeria has measured globalization from a broader perspective. Those carried out in other countries had inconsistencies in their results hence the need to carry out a detailed analysis of the relationship between globalization and income inequality in Nigeria. Certainly, such an analysis is capable of yielding results which would serve to resolve the conundrum faced by the country's policy-makers in their considerations on further opening of the Nigerian borders.

The general objective of this study is therefore to examine the effect of globalization on rising income inequality in Nigeria. Unlike the several existing studies, which are based on the United States and Latin American data, this paper focuses on Nigeria. In view of this, this paper seeks to provide answers to the following research questions: Is there a long run relationship between income inequality and globalization index, foreign direct investment inflow, productivity and technological advancement in Nigeria? What short run impact does globalization, foreign direct investment inflow, productivity and technological advancement have on income inequality in Nigeria?

To this end, the paper is arranged thus: Following this introductory section is Section two which contains the relevant literature upon which this study is based; Section three describes the theoretical and empirical frameworks adopted by this study; Section 4 is reports the empirical results and discusses the important findings of this study while Section 5 concludes the paper and proffers policy recommendations.

2. The Literature

2.1. Review of Conceptual Literature

1. Concept of Inequality

The standard measure of inequality is based on comparisons of individuals' well-being over their entire lifetime. Arguably, the most appropriate variable for capturing lifetime well-being is consumption [18]. Measures of inequality are consumption, income and wages but when compared with income, consumption offers three advantages. First, consumers can inter-temporally shift resources through lending and borrowing, so current consumption, more appropriately, captures lifetime well-being. This argument may not have much relevance for developing economies which are majorly characterized by severe capital market imperfections. Second, consumption is less associated with reporting problems as compared to income and third, trade policies affect the relative prices of consumer goods so that they impact consumers not only through changes in the purchasing power of their current incomes. To this effect, consumption seems a better suited measure of inequality. In spite of these advantages, the use of consumption as a measure of inequality is rarely seen in empirical studies on the effects of globalization. This is because many developing countries do not consistently report expenditures in their household surveys [18]. To date however, most empirical studies employ income based measures of inequality, given that some measure of income is always included in household surveys.

The most frequently used inequality indices is the gini coefficient. The suitability of these indices for capturing the real changes in inequality, especially over longer periods of time, has been questioned recently for a variety of reasons. To avoid these problems, many studies have focused on a more narrow measure of inequality-wage inequality. Another potential problem of inequality measurement is that household surveys are often redesigned so that the wage and

income data are not comparable across years. In addition to this reporting problem all inequality studies face conceptual issue of whether to focus on households or individuals. To take this into account, many studies have focused on some variant of per capita income.

The rise in inequality reported in developing countries has been associated with an increase in the skill premium, that is, the wage difference between skilled and unskilled workers. This explains why a substantial amount of related work has focused on an even more narrow measure of inequality; the inequality between skilled and unskilled workers. The definition on skill depends on the kind of data employed. For the purpose of the study, the researcher measures inequality based on income; share of income shared by the highest and lowest class in Nigeria.

2. Concept of Globalization

Globalization is a broad concept which describes a variety of phenomena that reflects increased economic interdependence of countries. Such phenomena include flows of goods and services across borders, reduction in policy and transport barriers to trade, free international capital flows, increased multinational activities, increased foreign direct investment flows, increased outsourcing, increased exposure to exchange rate volatility and increased international migration. These movements of goods, services, capital, firms and people are believed to contribute to the spread of technology, knowledge, culture and information across borders. Research on globalization has concentrated on those aspects of globalization that are easier to capture empirically. Measurement challenges abound and the first obstacle is data availability. Detailed information on trade barriers, outsourcing and foreign direct investment are often not readily available, especially when the analysis requires highly disaggregate data or longer periods of time that span periods of policy liberalization. This is especially pronounced in developing countries. Consequently, researchers have often measured globalization using trade volume data, which in most cases, is readily available. Trade volume is not exclusively determined by policy thus, studies that used trade volumes to measure inequality basically study the impact of trade volume on inequality. This is because many other factors can influence a country's trade volume such as technology, country's geography, demand conditions in importing countries, weather, competitor's supply conditions etc [19].

2.2. Review of Basic Theories

There are two important economic theories which seek to explain the link between income inequality and the movement of other macroeconomic aggregates in a country. These theories are the Heckscher-Ohlin trade theory and the Stolper-Samuelson theorem and are briefly discussed below.

1. Heckscher-Ohlin Trade Theory

The perceptive insight about the links between international trade and income distribution arise from the static neoclassical trade theory developed by Eli Heckscher and Bertil Ohlin in 1933. This theory states that a country should specialize in production and export using the factor that is most relatively abundant and thus cheaper. Based on a two-country, two-factor, two-good setting, with identical technology in the two countries assumptions, the this theory concludes that if country one is abundant in skilled labour, and country two, in unskilled labour, trade will increase country one skilled wages and country two unskilled wages. Thus trade leads to an increase in the demand for abundant (and cheap) factors of production, thus raising their price, while trade leads to a decline in the demand for scare (and expensive) factors of production, thus lowering their price. It also recognizes that migration of unskilled workers from country two to country one, or of skilled workers from country one to country two, will have identical effects on factor prices.

Though critics of the Heckscher-Ohlin theory argue that the theory is based on unrealistic assumptions, this theory is relevant because it gives useful insights in explaining how differences in countries factor endowment affects trade. This theory predicts that trade leads to greater wage inequality in the country one and lower wage inequality in country two.

2. Stolper Samuelson Theorem

Within the Heckscher-Ohlin framework, Wolfgang Stolper and Paul Samuelson in 1941 propounded the Stolper-Samuelson theorem. This theorem describes the link between globalization and wage inequality as a relationship between the relative output prices and relative wages. An increase in the relative price of skill intensive goods could explain an increase in the relative wage of skill workers, even in a developing (or labour-abundant) country.

Stolper-Samuelson theorem has been criticized as being too restrictive. Nevertheless, the relevance of this theorem still stands as it provides a definite insight to a central question in applied economics on the effect of changes in prices of goods caused by changes in tariff on the prices of factors of production.

The central prediction of this theorem is that trade reduces wage inequality in unskilled-labor-abundant countries, and vice versa in skilled-labor-abundant countries through changes in relative prices.

2.3. Review of Empirical Literature

Various strands of empirical literature show how openness can impact on income inequality. For instance, some of the studies which provide support that openness to international trade increases income inequality include that of [20] which examined the increase in relative wages for skilled workers in Mexico in the period 1975 to 1988. This study measured FDI using regional data on foreign assembly plants and trade (outsourcing) and found that increases in FDI positively correlated with the relative demand for skilled workers. The study concluded that rising wage inequality in Mexico is linked to foreign capital inflows and that trade can cause increases in wage inequality in developing countries, just as

it does in developed countries.

[21] examined the relationship between globalization and wage inequality using a panel data on 20 countries during the period 1970 to 2011. The variables used in the regression model were FDI inward ratio of GDP, globalization index, average income of highest and lowest 1% in the countries. The results showed that income inequality increased as FDI inflow increased.

[22] also examined the effects of trade openness on income inequality in Brazil, the Russian Federation, India and China (BRIC) during the period 1975 to 2013. The variables in the model include GINI coefficient, trade, import, export, terms of trade, real effective exchange rate index, education and GDP per capita. Using the GMM estimator, the study found a positive and significant relationship between trade openness and income inequality in the BRIC countries.

In contrast, a strand of studies found openness to significantly reduce income inequality. For instance, [23] got a similar result in its study of openness and wage inequality in Kenya for the period of 1964 to 2000. This study measured wage inequality by the ratio of wages in manufacturing sector to the wages in the agricultural sector. Other variables in the regression model included capital-labour ratio, educational attainment, relative labour productivity and the ratio between agricultural and manufacturing prices in Kenya. This study concluded that changes in relative wages had primarily been driven by the degree of openness and that international market integration had reduced wage inequality in Kenya.

Some other studies argue that openness did not directly affect inequality but rather skill-biased technological change. For instance, [24] in a cross-country analysis covering the period of the 1970s to the 1990s argued that increased openness can also induce technical changes; there can be productivity growth through scale effects and increased awareness of best-practice technology and production techniques abroad. When technological change is skill-biased, then lower tariffs might lead to higher wage-premiums, and a tariff reduction could increase the relative wages of skilled labor.

[25] looked at the impact of various policies (trade, financial liberalization, privatization, and tax reform) either jointly or independently on wage differentials in Latin America during the previous 20 years. The study concluded that more liberal trade regimes did not have an impact on wage differentials between different education categories. Financial liberalization and high technology exports in the context of a liberal trade regime, however, contributed to the rising inequality. Thus, it was not increases in trade but changes in technology that were associated with growing wage gap.

There is a strand of studies which found weak evidences that income inequality was associated with increasing income disparities. For instance, [26] analyzed trade and inequality in Bangladesh over the period of 1973 to 2002. The study found no evidence that trade liberalization had changed the relation between wages of unskilled and skilled workers. Hence, it concluded that greater openness had not decreased wage inequality, as predicted by the Stolper-Samuelson theorem.

[27] also adopted the GMM estimator to analyze the evolution and determinants of skilled/unskilled wage premium in a group of 20 European countries for the period 1995 to 2005. This study found that trade was not a significant determinant of growth skilled/unskilled wage gap in the selected 20 countries in the European Union.

A review of various studies that have been conducted on globalization and income inequality has shown that scholars had employed different measurements and various definitions of key variables used including the measure of openness, with some authors using quantities (trade volumes or flow of FDI) and some others using policies (tariff levels). There is also scanty literature in this area of study especially in Nigeria and Africa as a whole. The few studies found in this area were conducted in Latin America and United States. Thus, the available empirical literature, however, does not lead easily to robust conclusions regarding the relationship between globalization and income inequality in Nigeria.

This study fills this knowledge gap in the measurement of globalization by using the KOF globalization index which, as defined by [28], captures both trade volumes, flow of FDI and policies into one aggregate index, as opposed to other studies that proxied openness using just one aspect of measuring openness or using two or more variables to represent measurements of openness in their models.

3. Theoretical and Empirical Framework

The general equilibrium model developed by Hecksher-Ohlin is a widely used model for explaining the link between trade and its distributional effects. Under the assumption of two homogeneous goods, with each freely mobile between the two countries, the theory focused on differences in relative factor intensities across industries and relative factor endowment across countries. The Stolper-Samuelson model formalized the logic of the Hecksher-Ohlin model to link trade directly with relative prices and indirectly with factor rewards - wages. The factor price equalization theorem, as it is commonly known as, explains that trade increases the real return to the factor that is relatively abundant in a country and lowers the real return to the other factor that is relatively scarce [29].

The Stolper-Samuelson theorem assumed two homogeneous goods A and B, each produced under constant returns to scale using labour L and capital K but with good A using more capital relative to good B and good B using more labour than good A. This is to say, that good A is capital intensive and good B is labour intensive. The two factors are assumed to be freely mobile between the two countries' industries and assumed fixed in total supply. Mathematically, this is expressed in (1) as:

$$L_A + L_B = L$$
$$K_A + K_B = K \quad (1)$$

The assumption of full employment holds here and this implies that the economy's overall capital-labour ratio K can be expressed as the weighted average of the capital-labour ratio K_A and K_B used in the two industries.

$$\lambda_A K_A + \lambda_B K_B = K \quad (2)$$

where $\lambda_A = L_A/L$ and $\lambda_B = L_B/L$ are the shares of the total labour supply used in the two industries, $\lambda_A + \lambda_B = 1$. Thus, as the production mix moves towards specialization in good A and λ_A approaches unity, the capital-labour ratio used in good A production must fall towards K. The assumptions of perfect competition and factor mobility imply that the equilibrium factors wage (w) and rent (r) are equal across industries and the return to each factor is equal to the value of its marginal product in the industry: Thus,

$$w = P_A \frac{\partial A}{\partial L_A} = P_B \frac{\partial B}{\partial L_B}, \quad r = P_A \frac{\partial A}{\partial K_A} = P_B \frac{\partial B}{\partial K_B} \quad (3)$$

The ratio of the marginal physical products of the two factors must therefore be equal across industries.

$$\frac{\partial A/\partial K_A}{\partial A/\partial L_A} = \frac{\partial B/\partial K_B}{\partial B_B/\partial L_B} \quad (4)$$

Stolper and Samuelson used an edgeworth box diagram to represent the model geometrically. Each point in the box represents a feasible full-employment allocation of the factors between the two industries. Points along the contract curve indicate alternative efficient allocations of the two factors between industries and thus alternative efficient output combinations for the economy, with a one-to-one correspondence between points on the contract curve and points on the economy's production possibility frontier. At the corners of the box representing specialization in one of the two products, the capital-labor ratio in the industry of specialization must equal the country's overall capital-labor ratio as expressed in (4). In between where both goods are produced, the capital-labor ratios in the two industries change systematically, with both falling monotonically as the economy moves from production of only labor-intensive B toward production of only capital-intensive A. As a consequence of the changing capital-labor ratios in the two industries, the physical marginal product of labor must fall, and the physical marginal product of capital must rise in both industries as the economy produces more A and less B. The actual output combination produced depends on the relative price change in the domestic relative price of the goods.

This is thus applicable to a change in relative price that occurs for any other reason and this, invariably, implies that trade would reduce the relative price of the import-competing good B, which, by the Heckscher-Ohlin theorem, was assumed to be labor-intensive for a labor-scarce country like the United States. The lower relative price of good B would cause a shift in the economy's production toward good A - a movement along the production possibility frontier and the contract curve in the Edgeworth-Bowley box. If each industry were to use the same factor proportions as before, the change in output mix would raise the country's total demand for capital and reduce its total demand for labor. Given fixed total factor supplies and full employment of both factors before and after the rise in relative price of good A, the new output mix would thus be feasible only if both industries were now to employ a lower capital-labor ratio, or equivalently, if there was a rise in the rental-wage ratio facing the firms in both industries. These lower capital-labor ratios imply a lower marginal physical product of labor in both industries and thus, an unambiguously lower real wage (and higher real rental) measured in terms of either good. This outcome is independent of the pattern of consumption.

The Stolper-Samuelson theorem of relative output and relative wages provides the theoretical framework of the analysis done in this study. Its general statement is that if the price of a good rises, the price of the factor used intensively in that industry will rise, while the price of the other factor will fall and vice versa. Relating this to international trade, this implies that income inequality increases as trade increases for developed countries with abundant supply of high skilled workers. This theorem also implies a reverse in less developed or developing countries with abundant supply of low skilled workers. Thus, as less developed countries increases trade, income inequality decreases.

In outlining the Stolper-Samuelson model, this research follows the exposition of [30] whose model is as stated in (5):

$$IEQ = (FDII, FDIO, GLO, GDP, Y) \quad (5)$$

where, *IEQ* is the difference in income of workers, *FDII* is foreign direct investment inflow as a ratio of GDP, *FDIO* is foreign direct investment outflow as a ratio of GDP, *GDP* is economic growth and *Y* is a variable for year.

Studies on wage/income inequality in Nigeria suggest that productivity and minimum wage policies influence wages and since many scholars have suggested a spillover between technology and income inequality, the present study has, therefore, included productivity, minimum wage policy and technology as explanatory variables for income inequality. Thus, the empirical model for this study is presented in (6) as:

$$IEQ = f(GLO, PDY, FDI, GDPG, TEC, POL) \quad (6)$$

where *IEQ* is income inequality captured by difference in income shared by the highest 20% and lowest 20%, *GLO* is globalization captured using the KOF globalization index for Nigeria, *PDY* is productivity measured by the output-labour ratio in Nigeria, *FDI* is foreign direct investment inflow measured by the total inflow of FDI into Nigeria, *GDPG* is economic growth measured by Nigeria's gross domestic product growth rate, *TEC* is technological advancement captured by Nigeria's electricity consumption per kilowatts, *POL* is minimum wage policy captured with a dummy variable using the one to represent years when the Nigerian

government increased minimum wage and the other years were represented by 0. (7) below gives the econometric version of (6) as:

$$LnIEQ_t = \beta_0 + \beta_1 LnGLO_t + \beta_2 LnPDY_t + \beta_3 FDI_t + \beta_4 LnGDP_t + \beta_5 LnTec_t + \beta_6 LnPOL_t + \varepsilon_t \quad (7)$$

where ε_t is the white noise, β_0 is the constant, and β_1, β_2, β_3, β_4, β_5, and β_6 are the coefficients of globalization, productivity, foreign direct investment inflow, economic growth, technological change, and minimum wage policy respectively. The data used for this study are quarterly times series covering the period of 1985 to 2015. All the data used in this study were all collected from World Development Indicators (2016).

4. Result Analysis and Discussion of Major Findings

First, we begin with the result of Zivot-Andrew Unit Root Test which shows the critical values as 5.57, -5.08 and -4.82 at 1%, 5% and 10% level of significance respectively.

Table 1. Summary of Zivot-Andrew Unit Root Test

Variable	t-Statistics	Breakpoint	K
LIEQ	-5.572790	2002Q1	0
LGLO	-5.054597	1991Q1	0
LPDY	-3.917347	2011Q1	0
LTEC	-3.942522	1994Q1	4
LGDPG	-4.969217	1991Q1	0
LFDI	-3.181309	2008Q1	4

Source: Authors' computation using E-views 7.0

Table 1 shows the periods where structural breaks occur in the series. LIEQ, LGLO, LPDY, LTEC, LGDPG and LFDI experience structural breaks in 2002Q1, 1991Q1, 2011Q1, 1994Q1, 1991Q1 and 2008Q1 respectively. Sequel to this, the Ng-Perron modified unit root test was employed for the stationarity test on the time series in order to determine the order of integration which is a prerequisite for determining the lag length.

Table 2. Summary of Ng-Perron Modified Unit Root Test

Variables	At Level				At First Difference				Order
	MZa	MZt	MSB	MPT	MZa	MZt	MSB	MPT	I(1)
LIEQ	-3.651	-1.165	0.319	22.243	-60.991	-5.522	0.090	1.494	I(1)
LGLO	-6.896	-1.844	0.267	13.230	-60.878	-5.515	0.090	1.505	I(1)
LPDY	-9.996	-2.212	0.221	9.227	-60.999	-5.522	0.090	1.494	I(1)
LTEC	-12.752	-2.503	0.196	7.272	-3.844	-1.386	0.360	23.706	I(1)
LGDPG	-17.665	-2.971	0.168	5.161	-60.999	-5.522	0.90	1.494	I(1)
LFDI	-10.258	-2.123	0.207	9.549	-60.997	-5.522	0.090	1.495	I(1)
Asymptotic critical values					Asymptotic critical values				
1%	-23.800	-3.420	0.143	4.030	-23.800	-3.420	0.143	4.030	
5%	-17.300	-2.910	0.168	5.480	-17.300	-2.910	0.168	5.480	
10%	-14.200	-2.620	0.185	6.670	-14.200	-2.620	0.185	6.670	

Source: Authors' computation using E-views 7.0

Table 3. Results of Co integration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.275406	129.4094	125.6154	0.0288
At most 1	0.247171	90.42995	95.75366	0.1099
At most 2	0.159891	56.07594	69.81889	0.3749
At most 3	0.128793	34.99484	47.85613	0.4483
At most 4	0.100169	18.31182	29.79707	0.5431
At most 5	0.038989	5.540531	15.49471	0.7490
At most 6	0.006002	0.728422	3.841466	0.3934

Trace 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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.275406	48.97941	46.23142	0.0418
At most 1	0.247171	34.35401	40.07757	0.1916
At most 2	0.159891	21.08110	33.87687	0.6781
At most 3	0.128793	16.68302	27.58434	0.6073
At most 4	0.100169	12.77129	21.13162	0.4735
At most 5	0.038989	4.812109	14.26460	0.7654
At most 6	0.006002	0.728422	3.841466	0.3934

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
Source: Authors'computation using E-views 7.0

Table 2 shows the stationarity of all variables at first difference at 5 percent level of significance. Thus, the null hypothesis of non stationary of the data was rejected.

Second, we conducted the test for co integration with unrestricted intercept and no trend. The results were based on the maximal eigenvalue test and the trace statistic test with a view to determining the co integrating relationships. The results are reported on Table 3.

Table 4. Long-run Results

Explanatory Variables	Long-run Coefficients	Standard Errors	t-values
LGLO	0.421166	0.035260	11.9448
LPDY	-0.040256	0.011008	-3.656873
LFDI	0.024366	0.006845	3.559488
LGDPG	-0.057258	0.033031	-1.733456
LTEC	0.218895	0.025829	8.476281
LPOL	0.007339	0.008189	0.896222
C	1.486221	0.162877	9.124822
R-squared	0.790919	Mean dependent var	3.806295
Adjusted R-squared	0.780196	S.D. dependent var	0.084929
S.E. of regression	0.039818	Akaike info criterion	-3.554221
Sum squared resid	0.185496	Schwarz criterion	-3.395012
Log likelihood	227.3617	Hannan-Quinn criter.	-3.489547
F-statistic	73.76509	Durbin-Watson stat	1.636094
Prob(F-statistic)	0.000000		

Source: Authors' computation using E-views 7.0

From all indication, both the maximal eigenvalue and the trace statistic detected one co integrating relationship. This invariably suggests that there exist a unique relationship between income inequality and the explanatory variables at 0.05 level of significance. Hence, the null hypothesis of no co integrating relationship was rejected.

Third, we estimated the long run coefficients for the income inequality model as shown on Table 4. The long run results show that in the long run, globalization increases income inequality, productivity reduces income inequality, activities of multinational enterprises increase income inequality, economic growth is not strong enough to reduce income inequality, technological advancement encourages income inequality, and minimum wage policies are too weak to propel reductions in income inequality in Nigeria. The long run regression results also show that the coefficient of determination R^2 is 0.790919 while the adjusted R^2 is 0.780196. This implies that the estimated model achieved a strong goodness of fit. Thus, we conclude that the mix of regressors in the model on average account for about 78% of the changes in wage inequality in the long run while the remaining 22% variation is accounted for by the error term (ε). 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.

Fourth, we estimated the short run dynamics for wage gap using the error correction mechanism (ECM) model which enabled us to observe the speed of adjustment to any distortion in the economy. The results presented on Table 5 show the conclusions for the diagnostic tests for normality, heteroscedasticity, and serial correlation: The p-value of the Breusch-Pagan-Godfrey heteroscedasticity test of 0.3447 suggests that there is constant variance for all the variables used in the model. Based on the Jacque-Bera normality test, the p-value is 0.0838 shows that the residuals are not normally distributed. Results of the Ramsey Reset specification error test show a p-value of 0.0596 which signifies that the coefficients are stable at 5% level of significance hence, the model is correctly specified.

Table 5. Error Correction Model Result

Dependent Variable: D(LIEQ)
Method: Least Squares
Sample (adjusted): 1985Q3 2015Q4
Included observations: 122 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000306	0.001593	0.192261	0.8479
D(LIEQ(-1))	0.036266	0.079262	0.457543	0.6482
D(LGLO)	0.392465	0.107785	3.641173	0.0004
D(LPDY)	-0.014848	0.009421	-1.576041	0.1178
D(LFDI)	0.006271	0.005591	1.121628	0.2644
D(LGDPG)	-0.053191	0.024748	-2.149276	0.0337
D(LTEC)	0.113591	0.022855	4.970024	0.0000
D(POL)	0.012442	0.004724	2.633989	0.0096
ECT(-1)	-0.084407	0.042237	-1.998402	0.0481
R-squared	0.333716	Mean dependent var		0.001973
Adjusted R-squared	0.286545	S.D. dependent var		0.020124
S.E. of regression	0.016998	Akaike info criterion		-5.240530
Sum squared resid	0.032649	Schwarz criterion		-5.033676
Log likelihood	328.6723	Hannan-Quinn criter.		-5.156512
F-statistic	7.074663	Durbin-Watson stat		1.981319
Prob(F-statistic)	0.000000			

Source: Authors' computation using E-views 7.0

Results on Table 5 further suggest that, in the short run, about 29 percent of variance in income inequality is explained by the joint interaction of the independent variables. The calculated F-statistic is also statistically significant at 5 percent level, indicating that the explanatory variables are jointly significant in explaining short run income inequality in Nigeria. The performance of the individual explanatory variables shows that globalization coefficient is significant and positively signed with a p-value of 0.0004. This is not consistent with the economic a prior expectation. This indicates that in the short run, globalization is a strong driver of income inequality in Nigeria. From our result, a 100% increase in globalization will result in a 39% increase in income inequality.

One can observe that the productivity coefficient is negatively signed but not significant with a p-value of 0.118. The negative sign is consistent with a priori expectation. This indicates that in the short run, productivity is too low to

account for changes in income inequality in Nigeria. Increase in productivity is achieved through acquiring education and skills. This takes years to attain and thus is the reason why, in the short run, productivity does not influence income inequality. One can also observe that FDI coefficient is positive but not significant with a p-value of 0.264. This is an indication that in the short run, FDI does not propel reductions in income inequality. This contradicts the result of [31]. The GDP coefficient is negatively signed and significant with a p-value of 0.033. This means that in the short run, increases in economic growth reduces income inequality in Nigeria. This supports the Kuznets hypothesis of income distribution.

The technology coefficient is significant and positively signed with a p-value of 0.000. This implies that increases in technological advancement increases income inequality in Nigeria. This is in line with the works of [32] and other authors that found skill-biased technological change as the main cause of widening income inequality in developed countries. The minimum wage policy coefficient is positive and significant with a p-value of 0.009. This implies that increases in minimum wage increases income inequality in the short run. This result does not follow wage and employment theory and could be so because in Nigeria, increases in minimum wage are usually accompanied by simultaneous increases in wages of other categories of workers at a percentage greater than that of the wages of the lower working class.

Discussion of Findings and Responses to Research Questions

In both the short and long run, globalization coefficients are positive and statistically significant but this is not consistent with Stolper-Samuelson theorem. According to neo-classical trade theorists, free trade will decrease inequality in developing countries because they have a comparative advantage in labour. Following this argument, Nigeria does not trade labor-abundant products internationally because its major export, which is crude oil, is capital-intensively produced. Its oil sector makes use of imported advanced technologies.

The result of this study supports the works of [33] and [34] but contradicts the results of [35] which found openness to reduce income inequality in Kenya. This study also proves that Nigeria may have entered the globalization era with the wrong assets thus its Dutch disease syndrome. The global market is imperfect and favour countries with high financial capital, high human capital development and sophisticated entrepreneurship skills. Compared with advanced economies like the USA and Europe, Nigeria is lacking in these assets. Its skilled labour cannot compete with its counterpart globally. Likewise, the locally manufactured goods cannot compete with its imported counterparts both locally and globally because of lack of these assets needed for competitive globalization.

Thus, Nigeria opened up to globalization with its skill-biased technology, pulling the skilled workers from the domestic firms with the promise of higher wages and leaving behind a wider gap in the income of workers. Though globalization fulfilled its promises of higher wages in Nigeria, which is evident that the increase of wages of workers from the structural adjustment period of 1986 till present, it has been partial in the magnitude of increase in the income of workers in general. This result counters the Heskscher-Ohlin theory in general and the Stolper-Samuelson theory in particular.

Furthermore, Nigeria is commonly referred to as a labour-abundant country but its labour is deficiently-skilled compared with its labour-abundant counterparts like China and India who are not just abundant in labour but are highly-skilled with sophisticated entrepreneurial skills. This is evident in the shift of production stage of industries in the USA and Europe to China in a bid to enjoy abundant low-cost manpower. Sophisticated and abundant labour in China have made Chinese goods compete favourably with its oversees counterparts in the international market.

It is also pertinent to note that in the short run, though negative but not significant, the coefficient of productivity indicates that it takes a long time for educational attainment to influence productivity. This is evident in the long run results which showed a negative but statistically significant coefficient. In line with a priori expectation, the result shows that 1% increase in productivity implies a 4% decrease in wage inequality. Our results show that productivity is one factor that can close up the gap in wages. This result supports the work of [36] which assert that both globalization and technology are skill-biased driven. The rise in technological advancement, sophisticated computer-machines, communication and robotic machines including the internet has made the demand for skilled worker increase and continue to increase. Consequentially, this increase in demand has increased the rewards to skill and education. Evidence of improved productivity in the poorer levels and Nigeria in general can be seen from increased school enrollment ratio across all levels of educational attainment and decline in literacy ratio.

There are evidences that in Nigeria, very few of poorer families can afford quality education and training that can boost their productivity to compete with rich families in employments and business endeavours. This explains why productivity has not been able to sufficiently close up the gap between the skilled and unskilled workers wages in Nigeria.

In summary, the answers to the research questions for this study are provided thus: First, in the long run, globalization, foreign direct investment inflow, productivity, and technological advancement all have a long run relationship with income inequality in Nigeria as indicated by Table 3. Second, it is clear that in the short run, globalization and technological advancement both have positive and significant effects on income inequality, the short run impacts of foreign direct investment inflow, though not significant, are positive and negative respectively. In order words globalization, captured in the globalization index and technological advancement amplifies income inequality in Nigeria.

5. Conclusion and Policy Recommendations

The dearth of literature on globalization and income inequality together with variations in the measurements of globalization have all raised questions on the relationship between globalization and income inequality in Nigeria. The study was undertaken to examine the effect of globalization on income inequality in Nigeria. Several studies adopted different measures of globalization with some studies using one aspect or two aspects of globalization to measure openness. Their findings differed and did not lead to a robust conclusion on the link between globalization and income inequality. This study fills up this knowledge gap in measurement of globalization by using the KOF globalization index which captures all aspects of globalization which are social, economic and political aspects.

Since globalization had a long run positive and significant effect on income inequality, this study therefore advocates that economic policies targeted at international trade should neither be aimed at deterring the advancement of domestic industries nor discouraging competitiveness of the young industries. The government must embark on protectionist domestic policies that breed innovation and entrepreneurship, while providing adequate infrastructure for diversification of the non-oil sectors. This will be effective in shrinking the gap between incomes of skilled and unskilled workers. Policies, which boost affordability, availability and effectiveness of Nigeria's educational system, and encourage people to seek enlightenment, should be put in place. This will help to improve people's productivity. Innovations should be encouraged and promoted in all field and technology adoption should be preferred to technology adaptation. Technical schools should therefore focus on constructive and innovative changes as well as improvement on foreign technologies.

REFERENCES

[1] Yan, Y. (2013). Relationship between globalization and wage inequality. All Theses Paper 1687.

[2] Kanbur, R. and Lustig. N. (1999). Why is inequality back on the agenda. Paper prepared for the Annual Bank Conference on Development Economics. World Bank, Washington D.C. April 28–30.

[3] World Bank (2012). Nigeria economic report No 2. World Bank Group, Washington, DC.

[4] World Bank (2014). World Development Indicators 2014, World Bank, Washington, DC.

[5] Mani, S. (2001). Globalization, markets for technology and the relevance of innovation policies in developing countries. African Technology Policy Studies Network, Nairobi special Paper No. 2.

[6] Acemoglu, D. (2003). Cross-country inequality trends, Economic Journal, 113, pp. 121-149.

[7] Bakare, A. S. (2012). Measuring the income inequality in Nigeria: The Lorenz curve and gini co-efficient approach. American Journal of Economics, 2(1), 47-52.

[8] Ladipo, O.O. and Adesimi, A.A. (1981). Income distribution in the rural sector. Inequality and Development in Nigeria. Holmes and Meier, New York.

[9] Olayemi, J.K. (1995). A survey approach to poverty alleviation. A paper presented at NCEMA National workshop on Integration of Poverty Alleviation Strategies into plans and programmes in Nigeria. Ibadan, 27th November to 1st December.

[10] Slaughter, M. (1999). Globalization and wages: A tale of two perspectives. World Economy, 22(5), 609-629.

[11] Singh, A., and Dhumale, R. (2000). Globalization, technology and income inequality: A critical analysis. Mimeo, version, September 2000. Paper presented to WIDER workshop on rising income inequality and poverty reduction, held in Helsinki in December 1999.

[12] Feenstra, R. and Hanson, G. (1997). Foreign direct investment and relative wages; Evidence from Mexico's mcquiladoras. Journal of International Economics, 42, 371-394.

[13] Greiner, A. and Semmler, W. (2001). Endogeneous growth, skill-biased technical progress and wage inequality. Centre for Empirical Macroeconomics, University of Bielefeld (Germany) Working Paper No. 8, February.

[14] Arbache, J.S., Andy, D., and Francis, G. (2004). Trade liberalization and wages in developing countries. Economic Journal, Royal Economic Society, 114(493), 73-96.

[15] Warner, A. W. (2002). International wage determination and globalization. A revised version of the paper presented at the NBER Conference on Labour and Global Economy in May 2001.

[16] Durevall, D. and Munshi, F. (2002). Trade liberalization and wage inequality: Empirical evidence from Bangladesh. Working Paper No. 205, Department of Economics, University of Gothenbury.

[17] Awoyemi, T. T. (2007). Explaining income inequality in Nigeria: A regression based approach. M.Sc. Thesis, Department of Economics, University of Ibadan, Oyo State Nigeria.

[18] Goldberg, P. and Pavcnik, N. (2007). Distributional effects of globalization in developing countries, Journal of Economic Literature, 45(1), 39-82.

[19] Milanovic, B. and Squire, L. (2005). Does tariff liberalization increase wage inequality? Some empirical evidence. The World Bank Development Research Group Poverty Team, April.

[20] Feenstra, R. and Hanson, G. (1996). Foreign investment, outsourcing and relative wages. In honour of Jagdish Bhagwati, pp. 89 -127. MIT Press.

[21] Yan, Y. (2013). Relationship between globalization and wage inequality. All Theses Paper 1687.

[22] Mahesh, M. (2016). The effects of trade openness on income inequality- Evidence for BRIC countries, Economic Bulletin, 36(3), 1751-1761.

[23] Bigsten, A. and Durevall, D. (2006). Openness and wage inequality in Kenya, World Development, 34(3), 465-480.

[24] Acemoglu, D. (2003). Cross-country inequality trends, Economic Journal, 113, pp. 121-149.

[25] Behrman, J. R., Birdsall, N., and Szekely, M. (2003). Economic policy and wage differentials in Latin America. Centre for Global Development, Washington DC Working Paper No.29.

[26] Durevall, D. and Munshi, F. (2002). Trade liberalization and wage inequality: Empirical evidence from Bangladesh. Working Paper No. 205, Department of Economics, University of Gothenbury.

[27] Parteka, A. (2010). Skilled-unskilled wage gap in the enlarged EU: Sectoral analysis based on the experience of EU-15 countries and five New Member States. Paper presented at the 12th ETSG, Lausanne, 9th to11th September.

[28] World Bank (2016). World Development Indicators 2016. World Bank, Washington, DC.

[29] Mani, S. (2001). Globalization, markets for technology and the relevance of innovation policies in developing countries. African Technology Policy Studies Network, Nairobi special Paper No. 2.

[30] Yan, Y. (2013). Relationship between globalization and wage inequality. All Theses Paper 1687.

[31] Driffield, N. Girma, S., Henry, M., and Taylor, K. (2010). Wage inequality, linkages and FDI. Discussion Paper Series, IZA DP No. 4722.

[32] Acemoglu, D. (2003). Cross-country inequality trends. Economic Journal, 113, pp. 121-149.

[33] Yan, Y. (2013). Relationship between globalization and wage inequality. All Theses Paper 1687.

[34] Ogunyomi, O., Daisi, R., and Oluwashikemi, R. (2013). Economic globalization, income inequality and economic growth in Nigeria: A static data analysis. ABC Journal of Advanced Research, 2(2), 00-00.

[35] Bigsten, A. and Durevall, D. (2006). Openness and wage inequality in Kenya. World Development, 34(3), 465-480.

[36] Acemoglu, D. (2003). Cross-country inequality trends. Economic Journal, 113, pp. 121-149.