DBN Development Bank of Nigeria
...Financing Sustainable Growth

DBN JOURNAL OF ECONOMICS & SUSTAINABLE GROWTH

VOLUME 5, ISSUE 2, 2023

Export Diversification And Income Inequality In Nigeria

Oziengbe Scott AIGHEYISI

Institute of Health Technology, University of Benin Teaching Hospital, Benin City, Nigeria
and
Centre for Economic Policy and Development Research (CEPDeR), Covenant University, Ota, Nigeria

oziengbeaigheyisi@gmail.com

www.devbankng.com

@DevBankNG

Abstract

The paper examines the effect of export diversification/concentration on income inequality in Nigeria during the period 1981-2015, while controlling for the effects of financial development, inflation, and exchange rate. It employs the dynamic OLS estimator for analysis of relevant data. The study finds positive and significant effect of export concentration on income inequality, implying that export concentration contributes significantly to income inequality in the country. This suggests that export diversification will serve to reduce income inequality therein.

The study also finds that inflation and currency depreciation engenders increase in income inequality. This is indicated by the estimated positive and significant coefficients of inflation and exchange rate variables. However, the income-inequality effect of financial development is found to be negative and significant, suggesting that financial development tends to reduce income inequality in the country.

Measures to reduce income inequality recommended by the study based on the empirical evidence include efforts by the government to diversify the nation's exports basket away from crude oil to manufactures and other value added products and services, as well as expand the markets (or destinations) of her exports items through economic diversification and implementation of investment- and export-friendly policies; development of the financial system; control of inflation to attain price stability (or low inflation, preferably single-digit inflation) using appropriate monetary and fiscal policy instruments; and strengthening of the national currency.

Keywords: Export Diversification, Export Concentration, Financial Development, Inflation, Exchange Rate, Income Inequality

JEL Classification Codes: B17, D63, E31, F31

1. Introduction.

Income inequality is a major problem facing both developed and less developed countries. The phenomenon, especially within-country income inequality has been associated with various socio-economic problems such as slow growth, high poverty rate, low quality of life, low labour productivity, inadequate access to basic necessities of life (such as clean water, food, electricity, clothing housing, etc.) high crime rate etc., all of which tend to adversely affect the economic wellbeing of countries (Adekoya, 2019; Anser, et al., 2020; Bağlıtaş, 2021; Shen & Zhao, 2022). Hence, the United Nations identifies it as a global problem which calls for the urgent attention of governments all over the world which are expected to reduce inequalities by year 2030 (United Nations, 2015). This actually is the tenth sustainable development goal (SDG-10).

Income inequality (within-country) refers to inequitable distribution of income therein, manifested in concentration of income in a small segment of the population or a wide gap between the rich and the poor. (In)equality in the distribution of income in a country could be a major indicator of welfare. Equitable distribution of income could be an indicator of improved welfare, while low level of welfare could be a reflector of wide income gap. Thus reducing income inequality is a major policy goal of governments across the world.

The welfare and growth effects of income inequality in a country may not be too harsh (in the short run) if income is concentrated in the hands of few economic agents or units with entrepreneurial capacity, that is, which are capable of channeling it into productive investment. However, where a country is endowed with enormous stock of human capital (skilled and unskilled) which is capable of contributing to the growth of the economy, but are constrained or restrained from doing so due to limited opportunities, income inequality could pose serious socio-economic problems. This has been the case with several developing countries, including Nigeria where unemployment, underemployment and poverty rates are quite high.

One of the prescriptions for the unemployment problem is export diversification. This refers to the spread in the structure of a country's exports product mix and/or destination. Export products diversification and diversification of export destinations are viewed as strategies to meet the challenges of unemployment and low growth rates of less developed countries (Samen, 2010).

In Nigeria, income inequality is quite high. The Gender in Nigeria Report cited in Oxfam (2015) placed the country in the category of the 30 most unequal countries in the world. While a small segment of the population live in opulence, a large portion live in abject poverty (Oxfam, 2015). Nigeria's middle-class is

shrinking (Eremi, 2019), as a large portion continue to plunge to the lower-class due to harsh economic conditions such as high inflation, high unemployment rate, dwindling employment caused by business closure attributable to high cost of doing business, unfavorable government policies, infrastructural decay, etc. Despite efforts by successive governments to savage the situation through various policies and programmes aimed at addressing the problem such as establishment of the National Directorate of Employment, the National Poverty Eradication Programme (NAPEP), N-Power, etc., the problem persists and varies across states, regions or geopolitical zones in the country. In fact, Oxfam (2015, p.5) reported that "poverty and inequality in Nigeria are not due to lack of resources, but to ill-use, misallocation and misappropriation of such resources". Oxfam also reported that income inequality is more obvious in the Northern part of the country.

Though various governments at various times made effort to diversify the nation's export by attempting to diversify the productive base of the economy away from the crude oil sector to manufactures, services and agriculture, the nation's export basket remains highly concentrated in crude oil and several other primary commodities whose prices in the global commodities markets are not only low, but also unstable. These adversely affect economic decisions and key macroeconomic variables including investment, production, government spending, consumption as well as income and its distribution.

It can be gleaned from the foregoing discussion that Nigeria's economy has been characterized by both export concentration and income inequality (or concentration of income in a small segment of the population). A possible linkage therefore seems to exist between both variables. This linkage is the motivation for this study. Thus the objective of the study is to examine the effect of export diversification (or concentration) on income inequality in Nigeria. Hence, its significance lies in determining whether diversification of the country's export products will help reduce income inequality therein with a view to positioning the country to achieve the tenth Sustainable Development Goal (SDG-10) of the United Nations which has to do with reduction in inequalities by the year 2030. The effects of other variables such as financial development, inflation and exchange rate also affect income inequality as seen in the literature, are also investigated. This is done to identify other policy variables relevant for reducing income inequality in the country.

Several studies have examined the effect of export diversification on income growth (Agosin, 2009; Hodey, et al., 2015; Aigheyisi, 2019). Quite a few have

examined the effect of export diversification on income inequality (Blanchenton and Chhorrn, 2018; Le, et al., 2020; Buyan and Oh, 2021). To my knowledge, the effect of export diversification on income inequality in Nigeria has not been investigated – a gap that shall be filled in this study. This is a major contribution of the study to knowledge.

Following this introduction, the next section (Section 2) reviews extant relevant literature on the relationship between export diversification/concentration and income inequality. Section 3 discusses the data and the methodology of the study. Section 4 presents and discusses the estimation results. Section 5 concludes the paper with some evidence-based recommendations for policy considerations.

2. Literature Review

The theoretical and empirical literature on the relationship between trade (particularly export, diversification) and the distribution of income in an economy or region are reviewed in this section. This is done with a view to understanding the theoretical underpinnings of the relationship and the state of the current related empirical literature. The gap in the empirical literature and the contribution of the study to knowledge are also discussed.

2.1. Theoretical Literature

Existing theories posit a positive relationship between export and income. The classical theory such as the Absolute advantage theory of trade postulated by Adam Smith posits that trade is determined by the absolute advantage which a country has over another or other countries. The country which has greater absolute advantage in production of a commodity is expected to concentrate in its production and export same to the country with less absolute advantage while importing goods for which it has less absolute advantage therefrom. The comparative advantage theory propounded by David Ricardo however suggests that trade should be determined by comparative advantage. The neoclassical theories of trade such as the factor endowment theory attributed to Hecksher and Ohlin argued that trade between countries should be determined by factor endowment. Countries should specialise in the production of commodities whose production is intensive in their factor of relative abundance. The classical and neoclassical theories of trade argued that trade will engender expansion of countries' income as they concentrate or specialise in production of commodities for which they have either absolute advantage or, comparative advantage, or are relatively more factor-endowed than their trading partners.

Therefore, since specialization in production would lead to export concentration, it can be inferred that the classical and neoclassical theories attribute expansion of a country's output or income to export concentration, rather than export diversification. Exports based on specialization imply shifting resources from other sectors to the export-driving sector(s), thereby engendering decrease in demand for labour (job-destruction, unemployment) in the non-export-driving sectors and in the economy in general. It also implies concentration of income (from exporting activities) in the export-driving sector(s) of the economy. Hence, though specialization in production, and concentration of exports resulting thereby could engender expansion in income, it could engender income inequality or uneven distribution of income within an economy if appropriate steps are not taken by the government to achieve redistribution of income.

Though the export-led growth hypothesis attributed to Findley (1984) and Krueger (1985) posits that exports engender economic growth, the structuralists argued that reliance on a few primary commodities could engender unfavourable terms of trade and income instability. This is because prices of primary commodities in the international markets are not only low but also unstable (Stanley, 1999). The Prebisch-Singer hypothesis attributed to Prebisch (1950) and Singer (1950) also argued that prices of primary commodities decrease relative to those of manufactures in the long run. Consequently, concentration in a few primary commodities could engender deterioration of a country's terms of trade, income volatility and poor growth performance in the long-run (Dogruel & Tekce, 2010). This implies that diversification of a nation's exports, rather than export concentration would lead to enhancement and stabilization of a nation's income. Spetan and Saqfahait (2013) linked the theoretical positive relationship between export diversification and income growth to the Modern Portfolio Theory in the field of Finance propounded by Markowitz (1952) which emphasizes the need for risk-averse investors to diversify their investment portfolio in order to maximize expected returns. The theoretical model developed by Agosin (2009) shows that export diversification engenders income growth through the *portfolio effect* which reduces income volatility and enhances income stability and growth, and the *diversification of comparative advantage effect* resulting from learning and information externalities which could position low and middle countries to export products whose profile match those of highly industrialised countries, thereby leading to convergence of their incomes to those of the highly industrialised countries.

The thesis of this study is that export diversification (including vertical and horizontal diversification) not only enhances income (as posited by various

theories), but can also reduce income gap, as it engenders job creation or reduction of unemployment which in turn reduces income inequality in an economy (Le, et al., 2020). Economic growth resulting from export diversification could engender reduction in unemployment as predicted by Okun's law, or improve employment as posited by the Keynesian income-employment theory. Cysne (2009) demonstrates that unemployment is positively correlated with income inequality. Reduction in unemployment (or improvement in employment) may therefore engender reduction in income inequality.

2.2. Empirical Literature Review

Several studies have examined the effect of export diversification on unemployment considered as a major cause of inequality (Cysne, 2009). UNCTAD (2018) found that export concentration is strongly linked to unemployment in Africa. Güneri and Erünlü (2020) also found that in international trade export diversification engendered reduction in unemployment rate in OECD countries. Several others examined the effect of export diversification on poverty. Hvidt et al (2015) found no significant relationship between export performance and poverty reduction in developing countries, but when combined with improved access to credit, export significantly engendered poverty reduction. Lwesya (2018) found that both vertical and horizontal export diversification were significant factors in reducing poverty in Tanzania. In the remainder of this sub-section, we review other relevant previous empirical studies.

Aradhyula, et al. (2007) investigated the effect of international trade on income and the distribution of income using a balanced panel of 60 countries for the period 1985-1994, and an unbalanced panel of 44 countries for the 1984-1997 period, estimated using the error component two-stage least squares (EC2SLS). The study found that trade openness increases income inequality for the totality of developing and developed countries, but when examined separately, trade openness was found to reduce inequality in developed in developed countries, but its effect on inequality was found to be statistically non-significant.

Mendonça and Esteves (2014) examined the effects of trade openness and other economic, social and political variables on income inequality in Brazil during the period 1999 to 2008 within a panel setting of 26 Brazilian states and the Federal district (making a total of 27 units). The system GMM estimator was employed for estimating the dynamic panel model specified for the study. To ensure robustness, two measures of income inequality were used, namely the Gini inequality index and the Theil inequality index. The study found robust evidence of negative relationship between trade openness and the different measures of income

inequality. This implies that trade openness helped to reduce income inequality in the country.

Hazama (2017) estimated a dynamic fixed effect model in a study to examine the effect of export growth on income inequality in 106 developing countries during the period 1971-2012. The countries were grouped into 70 lower-income developing countries (LIDCs) and 36 higher income developing countries (HIDCs). The study found a negative and significant effect of export (as a percentage of GDP) on income inequality in LIDCs, but no significant effects in HIDCs. This suggests that exports had the effect of reducing income inequality in LIDCs.

The impact of international trade on income inequality in the United States was investigated in Barusman and Barusman (2017) using OLS estimator. Annual time series data on relevant variables spanning the period 1970-2014 were used for the analysis. The effects of trade volume, export intensity (exports as a percentage of GDP), import openness (import as a percentage of GDP) and other relevant variables on income inequality were investigated. The study found that increased trade volume, exports share of GDP and imports share of GDP positively affected income inequality, suggesting that trade generally contributes to widening the income gap in the country.

Blanchenton and Chhorrn (2018) studied the effect of sector export diversification and manufacturing specialization on income inequality in a sample of 52 Asian and Western countries during the 198-2014 period, using the system GMM estimator. The countries were grouped into high-income Asian countries, low-income Asian countries, Anglo-Saxon countries and European Union (EU) member states. For the entire sample, no significant relationship between manufacturing specialization and income inequality was found. However, export diversification was found to be a significant driver of inequality. For the sub-groups, the study found that higher sectoral export diversification increased income inequality, and higher manufacturing specialization reduced inequality in high-income Asian countries and EU member states. No significant effects of export diversification and manufacturing specialization on income inequality were found for low income Asian countries and Anglo-Saxon countries.

Le, et al. (2020) found an inverted u-shaped relationship between different measures of export diversification and different measures of income equality in a panel of 90 countries grouped into three sub-samples comprising 41 higher income countries, 22 upper middle income countries and 27 low and lower-middle income countries during the period 2002-2014. Income inequality rose with increase in extent of diversification of the nation's exports up to a point, beyond

which inequality began to fall with higher levels of export diversification. The study which applied different estimation techniques also found that trade openness reduced inequality across the three sub-samples.

Wang, et al. (2020) investigate the effects of international trade and FDI on income inequality in a sample of 58 developed and developing countries during the period from 2005 to 2014 using panel vector error correction mechanism. The empirical evidence revealed that higher export-GDP ratio and higher import import-GDP ratio were associated with greater inequality in both developing and developed countries, but the inequality resulting from higher export-GDP ratio and higher import-GDP were respectively 1.79 times and 2.44 times higher in developing countries than in developed countries. The effect of FDI on income inequality was also found be positive in developed and developing countries, but it was 1.43 times higher in developing countries. The results suggested that international trade and FDI tended to worsen the income incequality problem in developing countries.

Rodríguez-Castelán, et al. (2020) investigated the impact of exports on income inequality and poverty in Mexico using data datasets spanning the period from 2014 to 2014 on 2000 Mexican municipalities. The data analysis involved the IV technique. The study found that a 10% increase in export per worker was associated with 0.17 point reduction in the Gini index measure of income inequality. It however found no significant effect of export (per worker) on poverty and average household income.

The effect of textile and garment (T and G) exports on income inequality in Bangladesh on account of T and G's contribution of over 90% of the country's export, was investigated in Buyan and Oh (2021). The study period was 1991-2015, and the ARDL bounds testing approach to cointegration was employed for analysis of annual time series data on the variables of the study. The study found that high export concentration (that is the concentration of the country' export on T and G) significantly contributed to widening income inequality in the country. This evidence suggests that policies which aim to diversify the country's export basket should be articulated, formulated and implemented by the government.

The effect of export dynamics on income inequality in lower-middle income, upper-middle income and high-income economies during the 2002-2014 period was investigated in Nguyen and Su (2022). Applying the 2-step system GMM method, the study found that export quality had a negative and significant impact on income-inequality in lower-middle income and upper-middle income economies, implying that export quality tended to reduce income inequality in those economies. It was however found that export quality positively and

significantly impacted income inequality in high income economies, implying that export quality tended to raise income inequality in the economies.

Lee, et al (2022) investigated the effect of export diversification on inequality in a sample of 90 countries with varying levels of income inequality during the period from 2002 to 2014. The study found that for countries with low and middle levels of income inequality, export diversification exacerbated income inequality. Interacting political risk variable with export diversification, the study found that in countries with lower and middle levels of income inequality, political risk engenders greater diversification of exports, thereby mitigating income inequality.

Adão, et al. (2022) investigated the effect of international trade (exports and imports) on earnings inequality in Ecuador using granular data spanning the period from 2009 to 2012. The study was premised on the assumption that earnings of individuals depend on factor services supplied by them. The OLS and IV techniques were employed to estimate models specified for the study. The empirical evidence revealed that the relative demand for factor services supplied by the middle class was enhanced by exports, while the relative demand for factor services supplied by the rich (upper class) was enhanced by imports. Hence, increased exports was associated with increased earners of the middle class, while increased imports engendered enhancement of earnings of the upper class.

Li, et al. (2022) investigated the effect of sectoral export diversification on income inequality in 19 Asian countries during the 2004-2017 period. The analysis involved application of the system GMM technique for estimation of dynamic panel model specified for the study. The results of the analysis revealed that sectoral export diversification generally exacerbates income inequality. Specifically, it was found that export diversification engendered increase in income inequality in high-income Asian countries, but had no relatively less impact on income inequality in low-income Asian countries.

2.3. Gaps in Literature and Intended Contribution to Knowledge

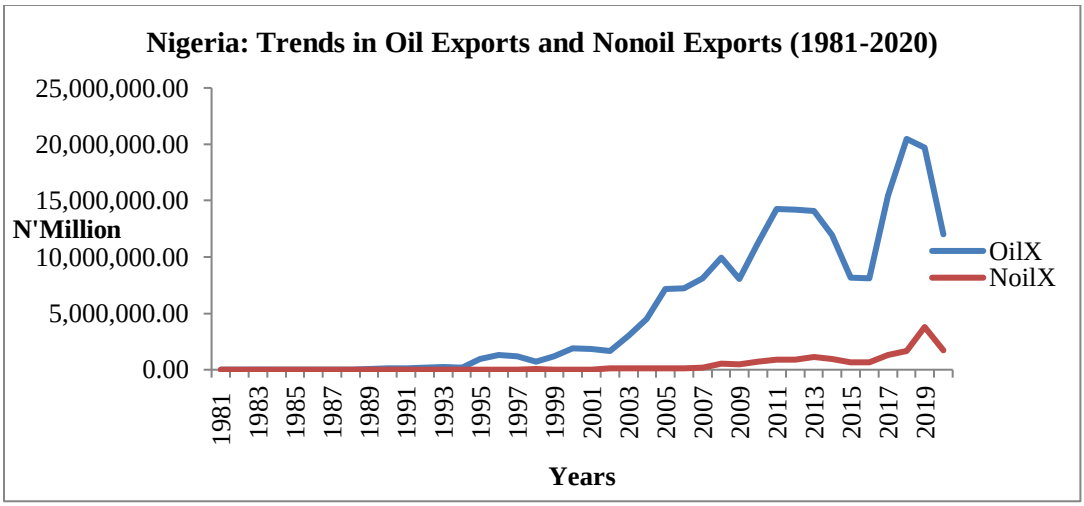
We observed from the review of the literature that empirical studies that focused on the relationship between export diversification/concentration and income inequality are quite few. To my knowledge, based on the literature search, there is as yet no previous study, which empirically investigated the effects of export concentration (or diversification) on income inequality in Nigeria – a country with highly concentrated export basket, where income is also concentrated in a small

segment of the population. Also, to my knowledge based on literature search, no prior study on Nigeria employed the Atkinson index of income inequality (which is a more realistic measure of income inequality than the Gini index) in the study of the relationship between international trade variables and income inequality. Previous studies utilized the Gini index. These gaps identified in the literature are filled in this study in view of the need to reduce income inequality in the country. The methodology employed – the dynamic ordinary least squares (DOLS) technique, whose justification is discussed under the methodology section – also contributes to its novelty.

2.4. Some Stylised Facts

Nigeria's economy is a near mono-product economy, relying precariously on the crude oil sector which accounts for over 80% of the nation's total export earnings. The country's annual budget has always been based on developments in the international crude oil markets reflected in crude oil prices. Instability in crude oil prices engenders instability in export earnings and causes uncertainty in the economy. The dominance of crude oil in the nation's exports are depicted in Figures 1 and 2 which show the trend in oil and nonoil exports earnings, and the relative shares of oil and nonoil exports in total exports, respectively. This is further reflected in the trends in the relative contributions of oil and nonoil exports to GDP shown in Figure 3, which reveals that over the past four decades, the contribution of oil exports to GDP has been more than that of nonoil exports. Thus, Nigeria's export basket has been concentrated mainly in crude oil exports. This is buttressed by the trends in the country's export products concentration index shown in Figure 4.

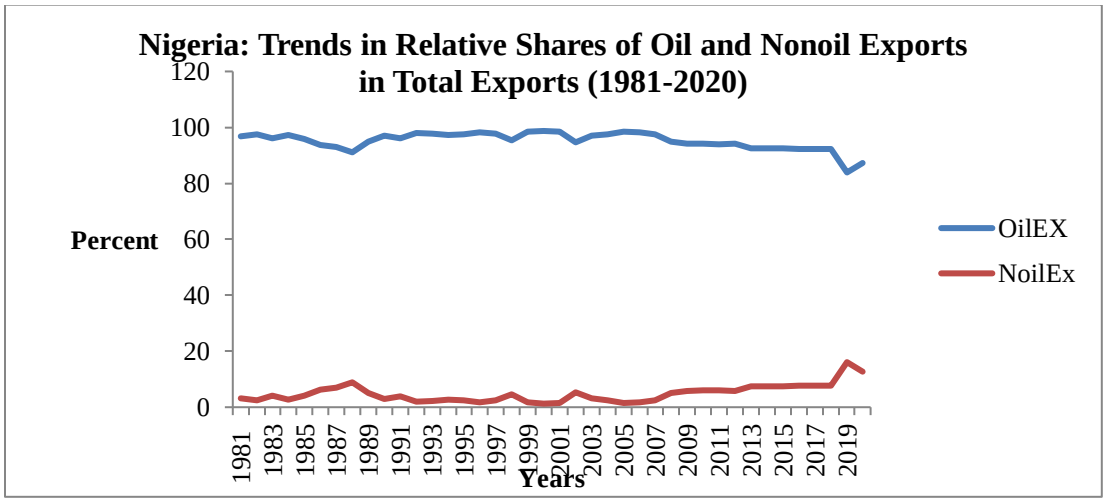
Figure 1: *Nigeria's Oil and Nonoil Exports Earnings*



Source: Data from CBN Statistical Bulletin 2020

Figure 1 shows that earnings from oil exports oil leads earnings from non-oil exports. This is not unexpected considering that investment (particularly foreign and domestic investment) and exporting activities in the oil sector significantly exceeds investment and exporting activities in the non-oil sector, in view of the leading role of the commodity (and its derivatives) in the global economy.

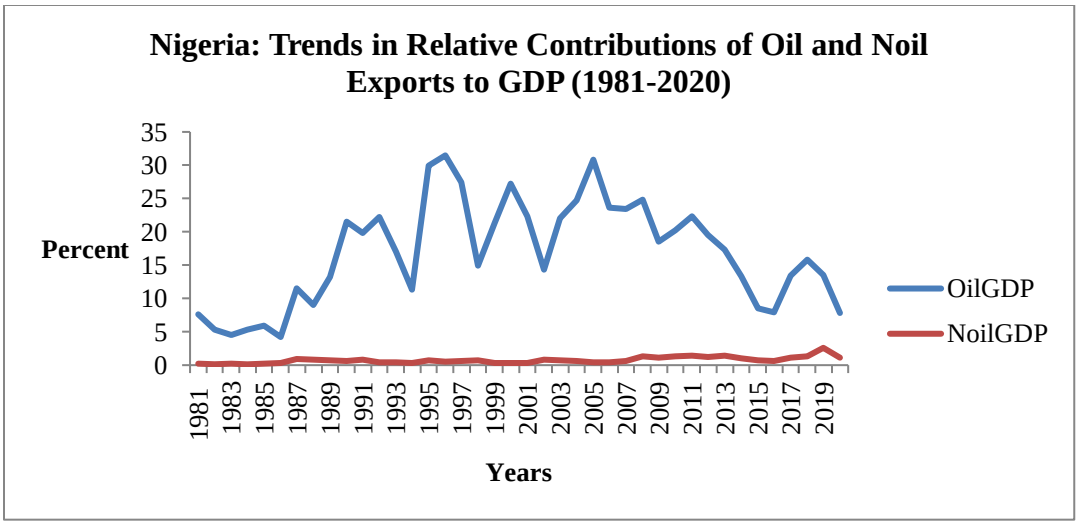
Figure 2: *Relative Shares of Oil and Nonoil Exports in Total Exports in Nigeria*



Source: Data from CBN Statistical Bulletin 2020

Figure 2 further sheds light on the dominance of Nigeria's total exports earnings by oil exports, and the lackluster performance of non-oil exports over the last four decades, owing to near-neglect of the non-oil sectors of the economy, particularly manufacturing, agriculture and services sectors over the years.

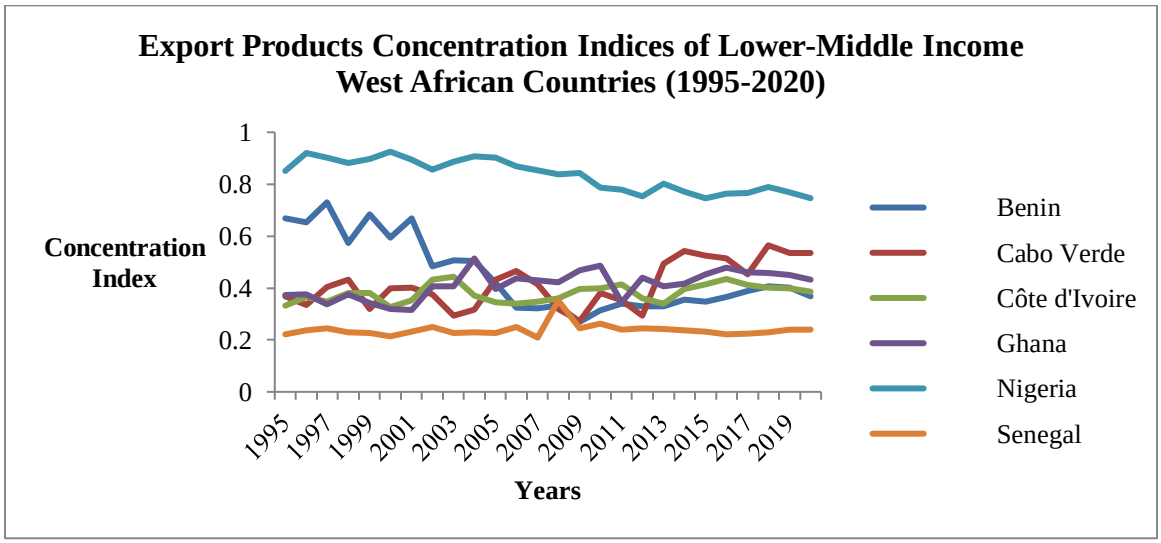
Figure 3: *Relative Contributions of Oil and Nonoil Exports to GDP*



Source: Data from CBN Statistical Bulletin 2020

Figure 3 shows the relative importance (contributions) of oil exports and non-oil exports to Nigeria's economy. Over the last four decades, the contributions of earnings from oil exports earnings to the country's GDP substantially exceeded contributions of non-oil exports earnings to the GDP.

Figure 4: *Export concentration indices of Nigeria and other Lower Middle-Income West African Countries*



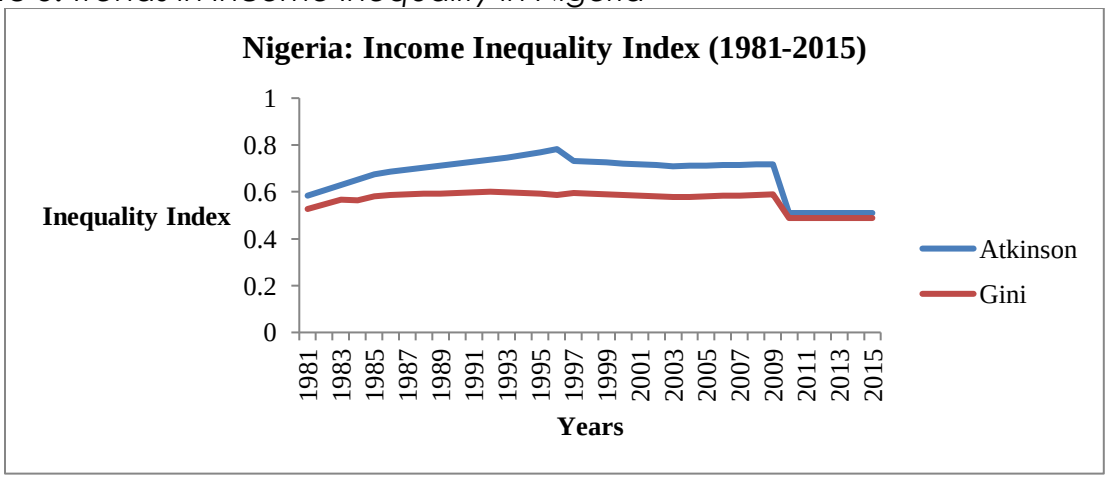
Source: Data from UNCTAD Export Diversification Database, 2020

From data used for plotting the graph in Figure 4, the export product concentration index for Nigeria averaged 0.83 in the 1995-2020 period, and ranged between 0.75 and 0.93, compared to the export product concentration

indices of countries at a comparable level of development[1] in the West African sub-region such as Benin (average: 0.45; range: 0.23-0.73), Cape Verde (average: 0.41, range: 0.27-0.56), Cote d'Ivoire (average: 0.38, range: 0.33-0.44), Ghana (average: 0.41, range: 0.32-0.51), and Senegal (average: 0.24; range: 0.21-0.35). Apart from indicating that Nigeria's exports had been the most concentrated among the lower-middle income West African countries, the figures also reveal that Nigeria made less effort at diversifying her exports during the period under review.

The trends in Nigeria's income inequality index are shown in Figure 5 for both the Atkinson index and the Gini index measures. According to the UNDP (undated, para.3), "By its construction, the Gini coefficient puts equal weights to the entire distribution, while the Atkinson inequality measure puts more weight to the lower end, thus it accounts better for child mortality, illiteracy, and income poverty". This index is also used by the UNDP for computation of the inequality-adjusted human development index (IHDI). Thus, our focus shall be on the Atkinson index which shows that income inequality in the country had been very high. It began to decrease recently in 2010 probably due to increase in services sector employment which has become the largest employment-generating sector in the country as indicated by data on sectoral shares of employment from the World Bank's World Development Indicators (2020).

Figure 5: *Trends in Income Inequality in Nigeria*



Source: Global Consumption and Income Project 2020

Export concentration appeared to have been (positively) associated with income inequality in Nigeria. The UNCTAD (2018, p. vii) noted that "A strong link is

[1] The World Bank (2021) classified Benin, Cape Verde, Cote d'Ivoire, Ghana, Nigeria and Senegal as lower middle income economies with gross national income (GNI) per capita of $1,046 to $4,095. Other West African countries were classified as low income economies (GNI per capita of $1,045 or less).

deemed to exist between the poor state of export diversification and the dismal nature of employment creation in developing countries, especially in Africa. Indeed, there is a major concern that the pattern of African exports manifests instability that has been found to be independently growth-inhibiting". Thus, growth inhibition adversely affects employment generation, thereby engendering upsurge in poverty and increasing income inequality. The linkage between export diversification/concentration and income inequality in Nigeria shall be empirically investigated in this paper.

3. Methodology

3.1. Theoretical Framework

The theoretical framework of this study is based on the review of the theoretical literature in the preceding section. In the field of finance, diversification of an investment portfolio reduces investment risks and maximizes expected returns on investment as predicted by the Modern Portfolio theory postulated by Markowitz (1953). Applying this to the field of international trade, all other things being equal, the diversification of a nation's export basket or portfolio is expected to reduce the risks associated with export concentration, and stabilize and enhance export earnings thereby engendering sustainable economic growth.

The theoretical model developed by Agosin (2009) shows that export diversification enhances the growth of an economy. Economic growth resulting from export diversification will serve to reduce unemployment (and poverty) as predicted by the Okun's Law which predicts negative relationship between economic growth and unemployment, or enhance job creation as predicted by the Keynesian theory of output and employment. Thus, as the economy grows, unemployment is expected to reduce, or employment is generated. Considering that unemployment is positively correlated with income inequality (Cysne, 2009), implying that decrease (increase) in unemployment is associated with decrease (increase) in inequality, the decrease in unemployment (or increase in employment) expected to result from export diversification-led economic growth, may engender decrease in income inequality. Thus, export diversification is expected to reduce income inequality, while export concentration (which adversely affects long run economic growth in the absence of an appropriate mechanism for income redistribution, quality institutions and external shock buffers) is expected to increase income inequality in an economy.

3.2. Model and Estimation Technique

Based on the theoretical framework, and in line with the objective of the study, the model to investigate the effect of export diversification (and other control variables) on income inequality in specified in its functional form as:

$$\text{Atkinson} = f(\text{expcon}, \text{findev}, \text{inf}, \text{exr}) \quad (1)$$

Where Atkinson is the Atkinson index of income inequality which gives a better picture of income inequality than the Gini index as it "attaches greater weights to the lower end of the distribution of income, thus accounting better for child mortality, illiteracy, and income poverty" (UNDP, undated, para. 3). The index is also used by the UNDP in computing the inequality-adjusted human development index (IHDI). Its values range between 0 and 1, with higher values implying greater inequality in the distribution of income. E*xpcon* is a measure of export product concentration based on the Theil index. Higher values of this index imply greater concentration or less diversification of exports (IMF, 2022). This study uses the IMF-computed Theil index of export product diversification instead of the UNCTAD Herfindahl-Hirscman index because the IMF export diversification index provides more data observations. In fact, the data observations on export product concentration index from the UNCTAD database starts from 1995. *findev* measures financial development as monetary sector credit to the private sector as a percentage of GDP. *inf* stands for inflation measured as annual percentage change in consumer price index. *exr* represents the official nominal ₦/$ exchange rate.

The model is specified econometrically as:

$$\text{Atkinson}_t = \delta_0 + \delta_1 \text{expcon}_t + \delta_2 \text{findev}_t + \delta_3 \text{inf}_t + \delta_4 \text{Lnexr}_t + \mu_t \quad (2)$$

The variables are as earlier defined. *Ln* stands for natural logarithm; *μ* is the error (residual) term capturing other variables affecting income inequality not incorporated in the model; t indexes time.

Estimating equation (2) using the ordinary least squares (OLS) estimator will yield biased and inconsistent estimates as the OLS assumption that the explanatory variables are uncorrelated with the residuals will certainly be violated since there is the likelihood of each of the explanatory variables to being correlated with the residual term. This is called the endogeneity problem. One way to overcome this problem is to use the dynamic OLS (DOLS) estimator, which is a single equation estimator developed by Stock and Watson (1993). This is one of the advantages of the DOLS estimator. The estimator overcomes the endogeneity problem by incorporating first differences of the explanatory variables as well as their leads and lags in the model, to yield efficient (consistent and unbiased) long run estimates.

The DOLS model for this study is specified as:

$$\text{Atkinson}_1 = \theta_0 + \theta_1\text{expcon} + \theta_2\text{findev} + \theta_3\text{inf} + \theta_4\text{Lnexr} + \sum_{j=-k}^{p}\left(\beta_1\Delta\text{expcon}_{t-j}\right) + \sum_{j=-k}^{p}\left(\beta_2\Delta\text{findev}_{t-j}\right) + \sum_{j=-k}^{P}\left(\beta_3\Delta\text{inf}_{t-j}\right) + \sum_{j=-k}^{p}\left(\beta_4\Delta\text{Lnexrt}_{t-j}\right) + \varepsilon_t \quad (3)$$

The *θis* are long-run parameters indicating the long-run effects of changes in the explanatory variables on the dependent variable; Δ is the first difference operator, *p* and *k* respectively represents the lag length and lead length of each explanatory variable. The estimated *β*'s are of no economic relevance and are usually not generated along with the results using DOLS option in EVIEWS 9, except the DOLS model estimation is manually done using the OLS option.

Other advantages of the DOLS estimator are its applicability irrespective of the order of integration of the variables [I(0), I(1)]; its ability to correct the problem of heteroskedasticity using a generalized least squares (GLS) procedure; and its superiority in small samples over alternative estimators (Stock & Watson, 1993; Masih & Masih, 1996; Anastasiou, et al., 2016).

Prior to estimating the model, the variables were tested for unit root using the Augmented Dickey Fuller (ADF) test; and stationarity test using the Kwiatkowski-Phillips-Schmidt-Shin (KPSS), though this was not strictly necessary for the estimation technique employed. Since the DOLS estimator yields long run estimates, it was also considered appropriate to test for cointegration of the variables *ab initio*. For this, the Johansen and the bounds test procedures were employed.

Post estimation tests were also performed. These include the Jarque-Bera (JB) residual normality test, the Breusch-Godfrey (BG) serial correlation test, the Breusch-Pagan-Godfrey (BPG) Heteroskedasticity test, the Ramsey regression equation specification error test (RESET) and the model stability test using the Brown-Durbin-Evans cumulative sum of recursive residual test. The EVIEWS 9 software was used for all computations and estimations.

3.3. Expected Results and Justification

The *a priori* expectations are $\theta_1 > 0$, $\theta_2 < 0$, $\theta_3 > 0$, $\theta_4 > 0$. These imply that more concentrated exports (or less diversified exports) will worsen the income inequality problem, and improvement in financial system development will help reduce income inequality. This is expected to result from the increase in credit to the private sector involved in production and employment. Other things being equal, increased credit to the private sector boosts investment and production therein, leading to employment generation, poverty reduction and reduction in income

inequality. Inflation is expected to engender an increase in income inequality. This implies that a decrease in inflation rate would decrease income inequality. This will result from decrease in production cost and possible increase in output and employment and decrease in poverty rate, other things being equal. Depreciation of the domestic currency is also expected to increase income inequality especially in an import-dependent country as Nigeria, where demand for import is highly inelastic, as it contributes to rising inflation which adversely affects production and demand for labour by domestic firms therein.

3.4. Data and sources

Data used for the study are annual time series data spanning the period from 1981-2015. The scope was limited by data availability. For example, the last data observation on Atkinson index from the source database was for 2015. The data were obtained from different databases. Data on export product concentration were obtained from the IMF Export Diversification Database (2020); data on income inequality (Atkinson index) were obtained from the Global Consumption and Income Project database (2020); data on other variables were obtained from the World Bank's World Development Indicators (2020). Measurements of these variables are discussed briefly under Section 4.2 of this paper.

4. Results and Discussion

We begin the analysis by presenting and discussing the summary statistics on the variables used for the study. This is followed by the unit root and stationary tests, and then the cointegration test. The model estimation result is thereafter presented and discussed. Post estimation diagnostics and model stability test results are also presented.

4.1. Descriptive Statistics

Table 1 shows the descriptive statistics of the variables used for the analysis. The statistics show that on average, the Atkinson index and the Theil index of export concentration had been quite high. This shows that income had been unequally distributed and the nation's exports basket been concentration had been quite high. The shallowness of the nation's financial system is indicated by the measure of financial development, which shows that monetary sector credit to the private sector averaged about 9% and attained a maximum of about 20% and minimum of about 5% during the period under consideration. The nation's economy had also suffered much inflation as indicated by the mean (average) inflation of about 20%. It actually reached a peak (maximum) of about 73% during the period under consideration. The weakness of the domestic currency is reflected in the high nominal (₦/$) exchange rate, which averaged about ₦71 to a dollar and

reached a high of over ₦192 per dollar within the scope of the study. The currency depreciated further thereafter as the exchange rate more than doubled over the next five years and beyond.

The p-values of the Jarque-Bera statistic for *Atkinson*, *findev* and *inf* series reject the normality hypothesis at the 5% significance level an indication that the series are not normally distributed considering that they are less than 0.05. *expcon and exr* series exhibit normality as the p-values of their Jarque-Bera statistics are greater than 0.05, thereby failing to reject the normality hypothesis at the 5% significance level.

Table 1: *Summary Descriptive Statistics*

	Atkinson	expcon	Findev	inf	exr
Mean	0.6735	5.9345	8.8665	19.7435	71.4088
Maximum	0.7825	6.2162	19.6256	72.8355	192.4403
Minimum	0.5098	5.7240	4.9575	5.3880	0.6177
Skewness	-1.0806	0.2442	1.4939	1.6256	0.2257
Kurtosis	2.7298	1.9956	4.8318	4.3733	1.3498
Jarque-Bera	6.9180	1.8189	17.9112	18.1661	4.2686
Probability	0.0315	0.4027	0.0001	0.0001	0.1183
Observations	35	35	35	35	35

4.2. Unit Root and Stationary Tests

The results of the unit root test (ADF) and stationarity test (KPSS) are presented in Table 2A in the Appendix. The results show that some of the variables – *expcon*, *findev* and *inf* – are stationary, that is, level I(0), while others – Atkinson and Lnexr) are nonstationary at levels, but stationary at first difference I(1). However, there exists the possibility that a linear combination of the variables will be stationary – that is, a long run relationship could exist between them.

4.3. Cointegration Tests

The variables were tested for long run relationships using the Johansen cointegration test. The results of the test are presented in Table 3A in the Appendix. The Johansen approach generates two tests, namely the Trace test and the Maximum Eigenvalue test. The results of both test indicates at least two cointegrating equations at the 5% significance level. Thus, we infer that the variables are cointegrated.

However, given that the variables are of mixed order of cointegration, and considering that the dependent variable is I(1), the ARDL bounds test for cointegration was also performed to test the robustness of the result of the Johansen cointegration test. The result of the test is shown in Table 2. It shows that the null hypothesis of "no long-run relationship" is rejected even at the 5% level, since the computed F-statistic is greater than the upper bound critical value at the 5% significance level. Thus, we can confidently infer that a long-run relationship exists between the dependent variable (Atkinson) and the explanatory variables.

Table 2: *ARDL Bounds Test*

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	4.55	4
Critical Value Bounds		
Significance	Lower Bound	Upper Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49

k = number of explanatory variables

Since the variables are cointegrated, the short-run and the long run relationships can be estimated. However, we are particularly interested in the long run relationships. An ARDL-based error correction model and a DOLS model were estimated. The DOLS estimator was employed based on the advantages it has over other single equation estimators (Masih & Masih, 1996). These were discussed in the methodology section of this paper. Indeed, the results of the DOLS estimator appeared better and more reliable than those of the ARDL-based (ECM and long run) model, which are not reported in this paper. The DOLS estimates are reported.

4.4. Model Estimation Results

The result of estimation of the DOLS model is presented in Table 3.

Table 3: *Estimated Model*

Dependent Variable: Atkinson		
Method: Dynamic Least Squares (DOLS)		
Variable	Coefficient	t-Statistic
Expcon	1.0879***	6.509899

Findev	-0.0183***	-4.335868
Inf	0.0027***	4.077789
Ln(exr)	0.0789***	7.579071
C	-5.9592***	-5.763626
R-squared	0.903875	
Adjusted R-squared	0.801342	
F-statistic	8.815440	
Prob(F-statistic)	0.000060	
D-W stat	2.074870	
Long-run variance	0.000951	

****** indicates statistical significance at 1% level***

The estimated model shows that increase in export concentration increases income inequality in the long run in Nigeria. This conforms to *a priori* expectation. The effect is highly significant at the 1% level. A unit rise in the export concentration index is associated with about 1.09 unit rise in the Atkinson index of income inequality. This is an indication that exports concentration (the concentration of Nigeria's exports basket in crude oil and a few primary commodities) is a major cause of the rising inequality in the distribution of income in the country. The implication is that diversification of the nation's exports will help reduce income inequality, *ceteris paribus*. This could result from the high likelihood that export diversification will enhance economic growth which will in turn engender job creation or employment generation and poverty reduction. This evidence is in sync with the evidence from Buyan and Oh (2021) which also found that export concentration was associated with increased inequality in the distribution of income in Bangladesh, and the evidence from Buyan and Oh (2021) which showed that income inequality reduces when export diversification rises beyond a threshold or inflexion point.

Financial development negatively affects income inequality in the long run, and the effect is significant at the 1% level. A unit rise in the measure of financial development is associated with about 0.02 unit decrease in the index of income inequality. This implies that financial system development will help reduce income inequality. This effect could be attributed to the expansion in credit to the private sector which channels same into productive activities (or investments), leading to expansion of output and employment, thereby engendering decrease in income inequality in the economy. This corroborates evidence from the studies by Bulif (1998), Chen and Kinkyo (2016), and Jauch and Watzka (2016) which also found that financial development reduces income inequality in the long run in developed and developing countries.

Inflation is positively related to income inequality and the effect is highly significant at the 1% level. A unit rise in inflation is associated with 0.003 unit rise in the Atkinson index of income inequality. This implies that inflation significantly increases income inequality in Nigeria. The mechanisms through which this transpires are the adverse effects of inflation on investment, production, consumption, economic growth, and employment, which tend to worsen the income inequality problem. This finding buttresses the evidence from Bulif (1998) which found that higher inflation increased income inequality especially in hyperinflation countries, and the evidence from Law and Soon (2020) which also found that inflation increased income inequality, but the effect was abated by institutional quality, and also the evidence from Muhibbullah and Das (2019) which found that inflation was associated with increase in income inequality in Bangladesh.

The relationship between exchange rate and income inequality in Nigeria is positive and significant at the 1% level. A unit rise in the nominal exchange rate of the Naira is associated with 7.89% rise in the income inequality index. This implies that depreciation of the domestic currency (increase in the exchange rate) increases income inequality in the country. This may be attributed to the adverse effect of currency depreciation on domestic firms' production and profitability, domestic demand, economic growth and employment in an import-dependent economy like Nigeria. This evidence corroborates findings from Bahmani-Oskooee and Motavallizadeh-Ardakani (2018) and Güzel and Arslan (2019) which also found that currency depreciation increases income inequality.

The model has a high goodness of fit as it explains over 90% of the systematic variation in the dependent variable, as indicated by the coefficient of determination (R-squared). The F-statistic which is significant at the 1% level attests to the joint significance of the regressors in explaining income inequality in Nigeria. The D-W statistic indicates absence of autocorrelation. The very low long run variance indicates long run stability of the model.

4.5. Model Diagnostics

Several diagnostic tests were performed on the estimated model to ascertain its reliability. The test included the JB tests for residual normality, the BG test for serial correlation, the BPG test for heteroskedasticity and the Ramsey RESET for accuracy of the model specification. The results of the tests are summarized in Table 4A presented in the Appendix. The results show that the model is reliable as the residuals are normally distributed as indicated by the p-value (-0.5645) of the JB statistic which fails to reject the normality assumption or hypothesis at the 5%

level as it is greater than 0.05; there is no problem of serial correlation as indicated by the p-value (0.5725) of the BP statistic which also fails to reject the null hypothesis of absence of serially correlated errors at the 5% level as it is greater 0.05; the BPG test for heteroskedasticity indicates that the homoskedastic assumption (hypothesis) is also not rejected as the p-value of the test statistic (0.9625) is greater than 0.05. The Ramsey test for accuracy of the specified model shows that the specification of the model is error-free. In view of these, it can reasonably be inferred that the model is reliable, and suitable for policy formulation.

4.6. Model Stability Test

The stability of a model enhances its reliability for policy purposes. The cumulative sum of recursive residuals (CUSUM) was used to test the stability of the estimated model. The CUSUM developed by Brown et al. (1975) is used to test the constancy of regression parameters over time. The plot of the CUSUM of the model is shown in Figure 6A in the Appendix. The plot indicates that the model is structurally stable as it (the blue curve) lies between the 5% significance critical bounds (dotted red lines). Thus, it can be deployed for articulation and formulation of evidence-based policies.

5. Conclusion and Recommendations

The paper examined the effect of export diversification/concentration on income inequality in Nigeria. The income distribution effects of other variables including financial development, inflation and exchange rate were also examined. The DOLS technique was employed for the analysis in consideration of its advantages over other estimators. The findings were that export concentration increases income inequality in the country, implying that export diversification would have the effect of reducing income inequality therein. Inflation and currency depreciation were also found to increase income inequality in the country. However, the study found that income inequality would be reduced by financial development.

In view of the empirical evidence, in order to reduce income inequality in the country, the study recommends the following:

i. The observed positive effect of export concentration on income inequality in Nigeria implies that export diversification would help reduce income inequality in the country. To this end, the country's government needs to prioritize diversification of her exports away from crude oil to manufactures and other value-added products and services as well as expand the markets (or destinations) of her exports items. This will require *inter alia*,

diversification of the production base of the economy, .i.e., economic diversification, intensive research and development, investment friendly policies, etc., backed up by a strong political will.

ii. Considering that inflation was found to exacerbate income inequality in the country, there is need for the government to deploy appropriate monetary and fiscal policy tools to bring inflation under control. It should aim at achieving price stability (lower inflation rates) preferably single-digit inflation rates since higher inflation is associated with increase in income inequality.

iii. Nigeria's government needs to take deliberate and conscious steps to halt the depreciation of the domestic currency and to strengthen it, since currency depreciation was found to exacerbate income inequality in the country. This could be achieved by encouraging domestic production, improving value-addition, depending less on imported goods particularly consumption goods (this entails encouraging patronage of made-in-Nigeria items), export promotion, etc., so as to reduce demand for foreign currency thereby reducing the pressure on the country's reserves of foreign exchange and boosting the nation's exports earnings, backed by appropriate foreign exchange management thereby strengthening the domestic currency.

iv. The observed negative effect of financial development on income inequality is desirable, and suggests the need for the government to take conscious steps to strengthen the nation's financial system to better position the various financial institutions to be able to provide more credits to the private sector to boost output and, create jobs, thereby reducing income inequality in the country.

References

Adão, R., Carrillo, P., Costinot, A, Donaldson, D., & Pomeranz, D. (2022). Imports, Exports, and Earnings Inequality: Measures of Exposure and Estimates of Incidence. *The Quarterly Journal of Economics, 137*(3), 1553–1614.

Adekoya, A. F. (2019). Income Inequality and Violent Crime in Nigeria: A Panel Corrected Standard Error Approach. *Ibadan Journal of Peace & Development, 9*(2), 1-10.

Agosin, M. R. (2009). Export Diversification and Growth in Emerging Economies. *CEPAL Review, 97*, 115-131.

Aigheyisi, O. S. (2019). *Export Diversification, Import Penetration and Economic Growth in ECOWAS Subregion*. Unpublished PhD dissertation submitted to the School of Post Graduate Studies, University of Benin, Nigeria.

Anastasiou, D., Louri, H. & Tsionas, M. G. (2016). *Non-performing loans in the euro area: are core-periphery banking markets fragmented?* Bank of Greece Working Paper No. 219, December

Anser, M. K., Yousaf, Z., Nassani, A. A., Alotaibi, S. M., Kabbani, A., & Zaman, K. (2020). Dynamic Linkages between Poverty, Inequality, Crime, and Social Expenditures in a Panel of 16 Countries: Two-Step GMM Estimates. Journal of Economic Structure, 9(43), 1-25.

Aradhyula, S., Rahman, T. & Seenivasan, K. (2007). *Impact of International Trade on Income and Income Inequality*. Selected Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Portland, July 29-August 1, 2007

Bağlıtaş, H. (2021). Income Inequality-Labor Productivity Relationship: CS-ARDL Approach. Journal of Applied Microeconometrics, 1(2), 101-111.

Bahmani-Oskooee, M. & Motavallizadeh-Ardakani, A. (2018). Exchange rate changes and income distribution in 41 countries: Asymmetry analysis. *The Quarterly Review of Economics and Finance, 68*, 266-282.

Barusman, A. F., & Barusman, M. Y. S. (2017). The Impact of International Trade on Income Inequality in the United States since 1970's. *European Research Studies Journal, 20*(4A), 35-50.

Blanchenton, B., & Chhorrn, D. (2018). Export Diversification, Specialisation and Inequality: Evidence from Asian and Western Countries. *The Journal of International Trade and Economic Development, 28*(2), 189-229.

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for Testing the Constancy of Regression Relationships over Time. *Journal of the Royal Statistical Society. Series B (Methodological), 37*(2), 149-192.

Bulif, A. (1998). *Income Inequality: Does Inflation Matter?* IMF Working Paper, no. WP/98/7.

Buyan, M. I., & Oh, K. (2021). Exports and Inequality: Evidence from the Highly Concentrated Textile and Garment Sector of Bangladesh. *Journal of South Asian Development, 16*(2), 293-309.

CBN (2020). *Statistical Bulletin*. Central Bank of Nigeria.

Chen, W., & Kinkyo, T. (2016). Financial Development and Income Inequality: Long-Run Relationship and Short-Run Heterogeneity. *Emerging Markets Finance and Trade 52*(3), 733–742

Cysne, R. P. (2009). On the Positive Correlation between Income Inequality and Unemployment. *The Review of Economics and Statistics, 91*(1), 218-226.

Dogruel, A. S., & Tekce, M. (2010). Trade Liberalisation and Export Diversification in Selected MENA Countries, *Topics in Middle Eastern and African Economies, 13*, 1-24.

Eremi, C. (2019). *The Shrinking Nigerian Middle Class – Can Credit Help to Minimize the Economic Impact?* The Corvus, Guaranty Trust Bank Plc.

Findley, R. (1984). Trade and Development: Theory and Asian Experience. *Asian Development Review*, *2*, 23-42

GCIP (2020). *Income Inequality*. Global Consumption and Income Project.

Güneri, B., & Erünlü, Z. (2020). The Effects of Trade Liberalization and Export Diversification on Unemployment: An Empirical Analysis. *Çankırı Karatekin Üniversitesi İİBF Dergisi, 10*(2), 617- 638. Doi: 10.18074/ckuiibfd.739340

Güzel, A. S., & Arslan, Ü. (2019). *On the nexus between exchange rate and income distribution in Turkey: ARDL bound testing analysis*. *Economic Journal of Emerging Markets, 11*(1), 1-7

Hazama, Y. (2017). *The Impact of Exports on Income Inequality in Developing Countries*. IDE Discussion Papers No. 650 IDE Chiba, Japan.

Hodey, L. S., Oduro, A. D., & Senadza, B. (2015). Export Diversification and Economic Growth in Sub-Saharan Africa. *Journal of African Development, 17*(2), 67-81

IMF(2020). *Export Diversification Database*. International Monetary Fund.

IMF (2022). *Export Diversification and Quality*. https://data.imf.org/?sk=A093DF7D-E0B8-4913-80E0-A07CF90B44DB

Jauch, S., & Watzka, S. (2016). Financial Development and income inequality: A Panel Data Approach. *Empirical Economics, 51*(1), 291–314.

Krueger, A. O. (1985). Import Substitution versus Export Promotion, *Finance and Development, 22*, 20-23.

Law, C., & Soon, S. (2020). The Impact of Inflation on Income Inequality: The Role of Institutional Quality. *Applied Economics Letters, 27*, 1735-1738.

Le, T., Nguyen, C. P., Su, T. D., & Tran-Nam, B. (2020). The Kuznets curve for export diversification and income inequality: Evidence from a global sample. *Economic Analysis and Policy, 65*, 21-39.

Lee, C., Yuan, Z., & Ho, S. (2022). How does export diversification affect income inequality? International evidence. *Structural Change and Economic Dynamics, 63*, 410-421.

Lwesya, F. (2018). Export Diversification and Poverty Reduction in Tanzania. *Romanian Economic Journal, 21*(68), 93-110.

Li, D., Wang, X., Xu, Y., & Ren, Y. (2022). Analysis of Export Diversification and Impact of Globalisation on Income Inequality: Evidence from Asian Countries. *Global Economic Review, 51*(3), 195-215.

Markowitz, H. (1952). Portfolio Selection. *Journal of Finance, 7*(1), 77-91.

Masih, R., & Masih, A. M. M. (1996). Stock-Watson Dynamic OLS (DOLS) and Error-Correction Modelling Approaches to Estimating Long- and Short-Run Elasticities in a Demand Function: New Evidence and Methodological Implications from an Application to the Demand for Coal in Mainland China. *Energy Economics, 18*(4), 315-334.

Mendonça, H. F., & Esteves, D. M. (2014). Income Inequality in Brazil: What has changed in recent years? *CEPAL Review*, 107-123.

Muhibbullah, M., & Das, M. (2019). The Impact of Inflation on the Income Inequality of Bangladesh: A Time Series Analysis. *International Journal of Business and Technopreneurship* 9(2), 141-150.

Nguyen, C. P. &, Su, T. D. (2022). Export Dynamics and Income Inequality: New Evidence on Export Quality. *Social Indicators Research, 163*, 1063–1113.

Oxfam (2015). *Inequality in Nigeria: Exploring the Drivers*. Oxfam International.

Prebisch, R. (1950). *The Economic Development of Latin America and its Principal Problems*. United Nations Department of Economic Affairs.

Rodríguez-Castelán, C., Vazquez, E., & Winkler, H. (2020). *Tracing the Local Impacts of Exports on Poverty and Inequality in Mexico*. World Bank Group, Poverty and Equity Global Practice, Policy Research Working Paper, 9459, October.

Samen, S. (2010). *A Primer on Export Diversification: Key Concepts, Theoretical Underpinnings, and Empirical Evidence*. World Bank Institute.

Shen, C., & Zhao, X. (2022). How Does Income Inequality Affect Economic Growth at Different Income Levels? *Economic Research-Ekonomska Istraživanja*, DOI: 10.1080/1331677X.2022.2080742

Singer, H. (1950). The Distributions of Gains between Investing and Borrowing Countries. *American Economic Review, 40,* 473-485.

Spetan, K. A. A., & Saqfalhait, N. (2013). Export Diversification and Economic Growth: Case of Jordan and other selected Arab Countries. *International Research Journal of Finance and Economics, 105*, 22-37.

Stanley, D. L. (1999). Export Diversification as a Stabilisation Strategy: The Central American Case Revisited. *The Journal of Developing Areas, 33*, 531-548.

Stock, J. H., & Watson, M. W. (1993). A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems. *Econometrica, 61*(4), 783-820.

Thelle, M. H., Jeppesen, T., Gjodesen-Lund, C., & Biesebroeck, J. V. (2015). *Export Performance and Poverty Reduction (Volume 2)*. Europa.

UNCTAD (2018). *Exports Diversification and Employment in Africa*. United Nations Conference on Trade and Development.

UNDP (undated). *Is the Gini coefficient not a sufficient measure of inequality? What is the difference between Gini and Atkinson measures of inequality?* https://hdr.undp.org/en/content/gini-coefficient-not-sufficient-measure-inequality-what-difference-between-gini-and-atkinson#:~:text=By%20its%20construction%2C%20the%20Gini,%2C%20illiteracy%2C%20and%20income%20poverty

United Nations (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*. The United Nations.

Wang, M., Park, N., & Choi, C. H. (2020). The Nexus between International Trade, FDI and Income Inequality. *Journal of Korea Trade, 24*(4), 18-33.

World Bank (2020). *World Development Indicators*. The World Bank.

World Bank (2021). *World Bank Country and Lending Groups (Country Classification)*. https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

APPENDIX

Table 2A: *Unit Root and Stationarity Test Results*

ADF Unit Root Tests							
Variables	**Levels**			**1st Difference**			**I(d)**
	test Stat	Critical Value (5%)	Inference	test Stat	Critical Value (5%)	Inference	
Atkinson	-1.6655	-3.5485	NS	-6.0218	-3.5530	S	1
Expcon	-4.1943	-3.5530	S	-	-	-	0
Findev	-3.9779	-3.5530	S		-	-	0
Inf	-3.7799	-3.5530	S	-	-	-	0
Lnexr	-1.0132	-3.5485	NS	-5.3985	-3.5530	S	1
KPSS Stationarity Test							
Variables	**Levels**			**1st Difference**			**I(d)**
	test Stat	Critical Value (5%)	Inference	test Stat	Critical Value (5%)	Inference	
Atkinson	0.1538	0.1460	NS	0.0358	0.1460	S	1
Expcon	0.1150	0.1460	S	-	-	-	0
Findev	0.1184	0.1460	S	-	-	-	0
Inf	0.1035	0.1460	S	-	-	-	0
Lnexr	0.1780	0.1460	NS	0.0472	0.1460	S	1

Table 3A: *Johansen Cointegration Test*

Trend assumption: Linear deterministic trend
Series: Atkinson Expcon Findev Inf Lnexr
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
0 *	0.7395	101.5139	69.8189	0.0000
≤ 1 *	0.6011	57.1192	47.8561	0.0053
≤ 2	0.3771	26.7877	29.7971	0.1069
≤ 3	0.2512	11.1613	15.4947	0.2018
≤ 4	0.0477	1.6137	3.8415	0.2040
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

0 *	0.7395	44.3947	33.8769	0.0020
≤ 1 *	0.6011	30.3315	27.5843	0.0216
≤ 2	0.3772	15.6264	21.1316	0.2474
≤ 3	0.2512	9.5476	14.2646	0.2434
≤ 4	0.0477	1.6137	3.8415	0.2040

Trace test and Max-eigenvalue test indicate 2 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 4A: *Summary Diagnostic Test Results*

Tests	**Test Stat**	**p-value**
Residual Normality	1.1436	0.5645
Serial Correlation	0.5823	0.5725
Heteroscedasticity	0.3954	0.9625
RESET	1.7853	0.0959

Figure 6A: *Cumulative Sum of Recursive Residuals (CUSUM)*