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Do macroeconomic indicators determine income inequality in selected African countries?

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This study investigates the effect of macroeconomic variables on income distribution in Africa using panel data from 2001 to 2016. This is motivated by the high degree of income inequality and poverty in the region. Twenty-eight (28) African countries were selected to capture every region. The selection of countries and the choice of this period were informed by data availability. The variables of interest were income inequality obtained from the Standardized World Income Inequality Database (SWIID), while the Gross Domestic Product, Inflation, and Unemployment were obtained from the World Bank database. A dynamic panel model using the Generalized Method of Moment (GMM) estimator was used to control for both individual and time-specific effects. The Heterogeneous aspect of the Augmented Dicky-Fuller (ADF), the Levine-Lin-Chu test and, the Im-Pesaran-Shin (IPS) panel units root process were utilized to test for the stationarity of the panel data. The results of the General Method of Moment (GMM) indicate a significant negative relationship between income inequality and economic growth. The study rejected the existence of the Kuznets curve hypothesis, and concludes that Inflation rate, Wage rate and labour force impact negatively income inequality, while unemployment and education impact positively income inequality.

1 | INTRODUCTION

Income inequality is a global challenging issue hindering development in both the developed and the underdeveloped world. The rich have access to the necessities of life such as good food, clothing, convenient shelter, and basic infrastructure while the very poor struggle to live with less than a dollar per day. The poor lack the basic needs of life and are characterized by poor health, unemployment, low wage, and poverty. There is no country where inequality does not exist but the crux of the matter is on the level of inequality. In Africa and the rest of the underdeveloped countries, inequality has risen to become a global debate (Bigsten, 2014). In spite of the economic growth in Africa, the state of inequality of income has drastically increased among the population. This has brought denial of individual rights and increased global crises compared to the past

years (Lo, 2012; Melamed, 2011). In the view of Rajan (2010), high-income inequality has resulted in suboptimal allocation of human resources, concentrating political and decision making power in the hands of a few.

Many studies have shown that a high level of income inequality persisted in several African countries over the past decades (Canagarajah, Ngwafon, & Thomas, 1997; Milanovic, 2003). Africa is not only the world's second most unequal continent next to Latin America but the poorest region in the world (UNDESA, 2009). The continent has made the smallest progress in terms of improvement in the standard of living when compared with other developing regions in the world because of series of Structural adjustment programs (SAP) in the 1980s and 1990s, and various policy reforms with the aim of reducing income inequality and poverty. The 2010 National Development Plan (NDP) in Uganda, the National Economic

Empowerment and Development Strategy launched in mid-2004 in Nigeria, the 1993 Reconstruction and Development Program (RDP) to the current National Development Plan (NDP): vision 2030 in South Africa are the remarkable structural program in the region. The expectation in adopting these reforms was to reduce income inequality and poverty in the region. The inability of this reform to create the desired goal has brought differing challenges to developmental efforts. The persistence of high levels of inequality calls for an assessment of the contribution of the macroeconomic factors on income distribution (Blank, Card, Levy, & Medo, 1993).

In Africa, countries can be classified into high per capita income, middle per capita income and low per capita income. Countries with per capita income of 999 and below, 100 to 2,499 and 2,500 and above were categorized as Low, middle and high per capita income respectively. The correlation between per capita income and income inequality was done by classifying the countries based on Gini coefficient. The classification of the countries was based on 50 and above, 40–49 and 39 and below for countries with high, middle and low-income inequality respectively. Countries with high GDP per capita also exhibited a high level of inequality. These countries are South Africa, Namibia, Central Africa, Zambia, and Botswana. Most countries like Nigeria and Ghana with middle GDP per capita also exhibit average income inequality.

Income inequality has a long-run effect on poverty and harmful to development and sustainable growth as shown by World Bank, UNDP, IMF and UNICEF in Adams, 1991. Therefore, understanding how macroeconomic factors affect the distribution of income in Africa is important in devising policy measures that can allow the rising prosperity of recent decades to be shared more equally than the past.

This study is centred on tracing the effect of macroeconomic variables on the distribution of income in selected African countries The paper used current research to modify the current scholarly methodology and showed that Gini coefficient was an outcome of some macroeconomic policy mix. The study employed a statistical tool known as a panel generalized method of moments which addressed the endogeneity problem, country-specific heterogeneity, and the possibility of serial correlation in the data generating process which has not been used for investigating the subject matter in the African context. Based on the above discussion, this article addressed the following research questions.

- Do macroeconomic indicators affect income inequality in Africa?
- What is the directional causality between inequality and macroeconomic variables in Africa?

2 | REVIEW OF RELATED LITERATURE

The first income distribution theory was found in the work of David Ricardo in 1817, which showed the laws which regulate the distribution between rent, profit and wages. It maintained that output is divided among the factors of production in which rent is paid first before profits and wages. Differences in rent arise when fewer acres of land is used and this results to increase in the price of the good while the owners of the more productive acres of land receive a higher rent. The Ricardian view of the income distribution is that surplus over production cost make up the rent, while the remaining is shared between profit and wages. The Ricardian theory focuses on the conflict between rent and profits.

In the view of Karl Marx in 1887, income distribution was based on the conflict between profits and wages and class conflict between the capitalists and the workers. In this theory, only profits and wages were the main sources of income while rent, benefits and interests were accrued to the capitalists. Marx developed this theory by distinguishing between the activity of producing goods and services and the potential in a work which he called labour power. The capitalists hire a worker and make use of his or her labour-power for a certain time. Marx assumes that labour supply is unlimited. This allows the capitalists to hold wages at subsistence level. The key idea for Marx is that the price of hiring a worker and the value he produces are different. The difference between them is the surplus-value or profit. Given that the worker can create value at a certain time, the surplus-value or profit would depend on the value of labour power. The Marxian system could not hold because of falling wages and unbearable poverty among workers (Cline, 1975).

The neoclassical theory assumed that all factors are in scarce supply and are rewarded according to their marginal products. The Marginal productivity principle is generalized here as the basis for the remuneration of the factors of production.

This theory is based on the microeconomic foundations traceable to the work of Leon Walras which he stated that there exists an equilibrium price for all product and factor market. Production functions and factor substitutability form the basis of the neoclassical theory (Bigsten, 2014). The neoclassical theory explained the functional and size distribution of income.

The Keynesian school used marginal propensities to save to explain income distribution instead of marginal propensities of factors found in the neoclassical. This stated that the income of society is distributed between the capitalists and the working class. Nicholas Kaldor in 1966 used the savings-investment equality to explain income distribution which was inspired by Keynesian idea that savings depend on investment with class differences in thriftiness. In the model, distribution between wages and profit depends on investment by acting on the price level (Jhingan, 2008).

The Kalechi Theory of income distribution showed that firms operate below full capacity and their variable cost are constant over the relevant output. It indicated that that the share of labour and "average" degree of monopoly power is negatively related while aggregating for a close economy. The implication of this model is that economic growth that depends on growing monopoly power in the economy would increase the gap between wage and profit shares in total income.

The marginalist theory made some contribution in understanding the factors that affect the size distribution of incomes but the differences in factor endowment appear not to be sufficient in explaining large inequalities in developing nations. In addressing this, the theory of

individual choices was explained by Friedman and Savage (1948). The theory explained why a small number of people can assume a large proportion of total income, since, as in the lottery, the amount of money that a great number of individuals can lose is small when compared with the large amount that a few numbers can win (Casas, 1997). Risk-averse individuals will choose less risky choices and minimize income inequality while risk taking individuals create income inequality.

The human capital theory focuses on the explanations based on the individual's decision to invest in education and training, and, the pattern of the individual's lifetime earnings. Longer training periods pay higher earnings to compensate for the foregone income during training. Those who invest will likely improve on their skill and be more productive than those who do not (Beker, 1993). This theory focuses on the job earning differentials as the main cause of income inequality and, places emphasis on the impact of schooling on earnings differentials.

The job competition approach, showed that wages are paid based on the characteristics of the job in question and workers are distributed across job opportunities based on their relative importance in the labour market The theory argues that wages are not determined by the marginal product of the worker associated with his/her educational level, but wages are set by marginal product associated with the skills the worker acquires on the job (Thurow 1975).

The relationship between economic growth and income inequality has been given much attention by development economists. Simon Kuznets (1955) contended that the income distribution within a nation was likely to change over time as it moves from a poor rural society to a rich modern society. The upper-income groups in the urban population often accumulate savings and the total impacts of such savings would be the concentration of an increasing share of income yielding assets in the upper class. Kuznets developed a hypothesis which stipulates that inequality increases with rising per capita income over time as a country develops and becomes less dependent on low productive agriculture and more dependent on industrial sectors, and it falls after a certain average income is attained. The literature in the 1960s and 1970s supported the hypothesis that per capita income level and income inequality are related (Ahluwalia, 1976). Most of the recent studies, however, challenged this hypothesis and several empirical studies found no significant relationship between inequality and per capita income (Barro, 2000); Li, Squire, & Zou, 1998); Todaro & Smith, 2009),

Sarel (1997), examined the relationship between income inequality and macroeconomic factors using cross country evidence. The study found a significant negative relationship between income inequality and macroeconomic factors such as growth rate, investment, terms of trade and real depreciation. Jantti and Jenkins (2001), used data on equalized disposable household income from the United and found out that neither inflation nor unemployment has significant effects on income inequality. Blinder and Esaki (1978) analyzed the relationship between income inequality and macroeconomic activity for the United States and the results obtained showed that unemployment significantly affected income inequality, while inflation has a weak effect among quintiles for the U.S economy. Other researchers on this are Breen and Gracia-penelosa (Breen &

Garcia-penelosa, 2005), Skare and Stjepanovic (2014). Sarel (1997) and Odedokun and Round (2004).

In a work carried out by Lee, Kim, and Cin (2013) to determine the income inequality in Korea from 1980 to 2012, the result did not support both Kuznets' inverted U-shaped relationship hypothesis between income inequality and economic growth and Barro's hypothesis of U shaped relationship. The study found that an increase in investment would decrease income inequality, while trade openness and the ageing population would increase income inequality.

Deyshappriya (2017) employed dynamic panel data analysis based on the generalized method of moments in studying the impacts of macroeconomic factors on income inequality and income distribution in 33 Asian countries. The result of the study showed an inverted U-shaped relationship between gross domestic product (GDP) and inequality, supporting, the Kuznets curve hypothesis. This finding was counteracted by the findings of Odedokun and Round (2004) that inflation and openness have no effect on income distribution.

Baker and Creedy (2009) showed that over the period 1987 to 1991, macroeconomic variations in growth and unemployment increased the inequality in New Zealand. Garcia, Prieto-Alaiz, and Other studies in support of this are Gonzalez and Menendez (2000), Monnin (2014), Afonso, Schuknecht, & Tanzi, 2008, Cingano (2014), Li and Zou (2002), Siami-Namini and Hudson (2015), and Thalassinos, Ugurlu, and Murantoglu (2012).

Income inequality on the other hand negatively affects economic growth in developing countries as pointed out by Birdsall (2007) and Mnif (2015). Other papers on the same view are Farre-Olalla and Vella (2006) in Spain, Wahiba and Weriemmi (2014) in Tunisia and Yue (2011) in Korea, Dipietro, Anoru, and Sawhey (2005) in USA and Darma and Ali (2014) in West Africa.

Based on the empirical studies reviewed, on macroeconomic factors and income distribution, there is no conclusion on the effect of macroeconomic variables on income inequality. This may be attributed to the differences in the countries studied, the time period covered or the models adopted. Most of the work reviewed were country-specific studies like Wahiba and Weriemmi (2014), Lee et al. (2013), Baker and Creedy (2009), and Gonzalez and Menendez (2000).

Other papers reviewed such as Siami-Namini and Hudson (2015), and García, Prieto-Alaiz, & Simon, 2013) were centred on developed countries and a few developing countries outside Africa. The results obtained from them cannot be used for generalization because of the heterogeneous environment. The few studies that were done in Africa, Odedokun & Round, 2004; Abida and Sghaier (2012), Darma and Ali (2014) did not consider the effect of macroeconomic variables on income distribution but concentrated on the causality between a single macroeconomic variable and income distribution.

3 | MODEL SPECIFICATION AND DATA DESCRIPTION

The theoretical framework of this paper is derived from the Kuznets model of Simon Kuznets (1955). As seen in Bahmani-Oskooee, Scott,

and Harvey (2008). The standard Kuznets curve regression model was stated as;

$$LGINIit = \alpha_i + \gamma_i + \beta_1 LRRGDP_{it} + \beta_2 LRGDP_{it}^2 + \varepsilon_{it} \quad (1)$$

where: GINI = the Gini coefficient representing income inequality. α_i and γ_i = the intercept parameters which vary across countries i and years t. RGDP = (GDP/P) = the real GDP per capita and RGDP/P 2 = the square of real GDP per capita, which is a measure of Kuznets Curve. β_i = the slope parameter of the model and ε_t = the error term.

Kuznets curve exists when $\beta_1 > 0$ and $\beta_2 < 0$ and the turning point occurs at a point in which RGDP per capita is at maximum level.

Adding other explanatory variables to the model;

$$LGINI_{it} = \alpha_i + \gamma_i + \beta_1 LRGDP_{it} + \beta_2 LRGDP_{it}^2 + \sum_{j=1}^{n}(X_{it}) + \varepsilon_{it} \quad (2)$$

where X is a vector of other explanatory variables.

From the above framework, the model for the paper is specified as

$$LGINI_{it} = \alpha_0 + \lambda_1 LRGDP_{it} + \lambda_2 UNEM_{it} + \lambda_3 INF_{it} + \lambda_4 EDU_{it} + \lambda_5 WGE_{it}$$
$$+ \lambda_6 LBF_{it} + \pi_i + \theta_{it} \quad (3)$$

where GINI = Gini coefficient, GDP = gross domestic product, UNEM = unemployment rate, INF = inflation rate, COV = control variables (education, wages, and labour force).

The test for Kuznets' curve hypothesis and the effect of the lagged value of the explanatory variable was reflected in Equation 3 as:

$$LGINI_{it} = \alpha_0 + v_t LGINI_{it-1} + \beta_1 LGDP_{it} + \beta_2 L(GDP)_{it}^2 + \beta_3 UNEM_{it} + \beta_4 INF_{it}$$
$$+ \beta_5 EDU_{it} + \beta_6 WGE_{it} + \beta_7 LBF_{it} + \pi_i + \theta_{it} \quad (4)$$

Where, i = 1, 2,... N for each country, t = 1,2......T for each time period.

L = natural log, $v_t \beta' s \beta's$ = are the parameters to be estimated, GINI = Gini coefficient. $LGINI_{it-1}$ = represents the lagged value of the Gini coefficient. GDP = Gross Domestic Product Per Capita (constant local currency). UNEM = Total Unemployment rate (% of total labour force). INF = Inflation rate. EDU = Education proxied by Primary School Enrolment (gross). WGE = Wages and salaried workers (% of total employment)

LBR = Labour Force (% of total population ages 15–64). π_i = Country specific effect across individual countries. θ_{it}= Independently distributed error term in all time periods of the countries.

A dynamic panel data generalized method of moment (GMM) estimator was used because it allows for controlling for both individual and time-specific effects. The unobserved heterogeneity effect in the data was eliminated by first-differencing the original model, which allows using instrumental variables estimator (Arellano & Bond, 1991; Arellano and Bover (1995) and Bundell and Bond (1998). The Augmented Dicky-Fuller (ADF), the Levine-Lin-Chu test and, the Im-Pesaran-Shin (IPS) tests were used in verifying the presence of unit root in the panel series while panel cointegration test investigated the presence of a long-run relationship. Secondary data on income inequality was sourced from the Standardized World Income Inequality Database (SWIID), while data on Gross Domestic Product, Inflation, and Unemployment, Trade, Labour force, and Population growth rate were obtained from World Bank Development Indicators 2017. Stata 15 econometric package was used in estimating the data.

4 | RESULTS PRESENTATION AND DISCUSSIONS

4.1 | Panel unit root and cointegration tests

The results of Pesaran, Levine-Lin-Chu, and Fisher's ADF Augmented Dickey-Fuller stationarity tests showed that all the variables appear to

TABLE 1 Pesaran heterogeneous test, Levine-Lin-Chu homogenous test and ADF heterogeneous test

Variables	Pesaran heterogeneous test		Levine-Lin-Chu homogenous test		ADF heterogeneous test	
	p = 0	p = 1	p = 0	p = 1	p = 0	p = 1
LGINI	(.000) -4.043[a]	(.0052) -6.292[a]	(.0000)-6.57[a]	(.0003)-3.442[a]	(.0013) 3.013[a]	(.0000) 7.3129[a]
LGDP	(.7355) 0.6297	(.000) -8.583[a]	(.0000) -4.799[a]	(.0000) -9.573[a]	(.8593)-1.0771	(.0000)24.118[a]
LEDU	(.2660) -0.625	(.0004) -8.162[a]	(.0000) -9.562[a]	(.000) -34.750[a]	(.0000) 11.257[a]	(.000) 20.709[a]
LWGE	(.0002) -3.5436[a]	(.0026) -9.588[a]	(.0000) -12.04[a]	(.0000) -12.04[a]	(.2869) 0.5625	(.000) 28.475[a]
INF	(.0000) -6.819[a]	(.0056) -10.89[a]	(.0000) -7.045[a]	(.0000) -13.76[a]	(.0000) 9.947[a]	(.0000) 40.88[a]
LGINI (−1)	(.0045) -2.61[a]	(.0491) -8.540[a]	(.0000) -6.215[a]	(.0003) -3.824[a]	(.000) 4.463[a]	(.0000) 10.97[a]
LGINI²	(.0000) -4.165[a]	(.0047) -2.99[a]	(.0000) -6.63[a]	(.0000) -6.63[a]	(.0013) 3.013[a]	(.0072) 2.447[a]
UEMP	(.7989) 0.8377	(.003)-3.811[a]	(.0009) -3.119[a]	(.0004) -3.39[a]	(.8775) -1.1628	(.0000) 7.680[a]
LNLBF	(.9753) 1.9659	(.005) -2.656[a]	(.0000) -4.49[a]	(.0005) -2.74[a]	(.1100) 1.2264	(.0150) 2.17[a]

Source: Computed by the Authors using EViews 9.0 Statistical Software.

[a]It is statistically significant at 10% significance lag length (p) was determined by A1C and SIC criteria.

TABLE 2 The result of static panel estimation of the pooled OLS and fixed effects (GMM)

	POOLED OLS			Fixed effects (FE)		
Variables	Coefficients	t-values	p > t	Coefficient	t-values	p > t
GINI(−1)	1.0130	392.16	.000	0.9829	102.59	.000
LGDP	0.0001	0.05	.962	0.0109	1.32	.170
L(GDP)^2	−0.0002	0.4	.687	−0.0005	−1.28	.201
LEDU	0.0034	2.27	.024	0.0004	−0.33	.865
LWGE	0.0011	1.35	.177	−0.0059	0.08	.052
LNLBF	0.0037	1.48	.140	0.0127	0.17	.168
INF	−0.0004	−0.77	.440	0.0000	−1.95	.940
UNEMP	−0.0002	−2.57	.010	−0.0004	1.38	.741
CONSTANT	−0.0823	−6.53	.000	−0.0355	−0.56	.573

Source: Computed by the authors using EViews 9.0 statistical software.

be integrated of order one at 10% significance level using the heterogeneous approach. The results were presented in Table 1.

The common unit root test (Levin-Lin-Chu [LLC]) shows a common unit roots in the model. This helped in ascertaining the time long-run conditions of the model (Pesaran, Shin, and Smith (2001). The Westlund cointegration test showed that there was a co-integrating relationship among the variables thereby showing the presence of long-run feedback effects on the short-run dynamics of the specified model in the selected countries in Africa. This is in order with Westerlund- Durbin Hausinan (Westerlund, 2007).

The OLS and GMM regression results on the relationship between income inequality and macroeconomic variables were presented in Table 2.

The link between income inequality (Gini coefficient) and macroeconomic variables (LGDP, LEDU, LWGE, LNBF, INF and UNEMP) were analyzed using pooled OLS, fixed effect, and the generalized method of moments indifference (GMM-difference) and in system (GMM-system) (Arellano & Bond, 1991, Blundell and bond,1995). The results showed that GDP, EDU, WGE and LBF are positively affecting income inequality in Africa while inflation (INF) and unemployment (UNEMP) are negatively related. Unemployment, education and the previous level of inequality have a significant effect on income inequality. The result of the fixed-effect model showed that GDP, EDU, LBF and INF were positively and insignificantly affecting inequality in Africa while unemployment affects negatively but still insignificant. The implication of the above result is that income inequality and macroeconomic variables have a long-run relationship and the signs of the parameter may be attributed to the level of poverty in the region. An increase in education, GDP, labour force and inflation favours the rich in the region thereby increasing income inequality. This result is consistent with Wahiba and Weriemi (Wahiba & Weriemmi, 2014) and Gabis, (Gabis, 2015).

The result of the Panel VAR-Granger Causality Wald Test in Table 3 showed that there is no existence of the causal relationship between LGINI and LGDP.

This is contrary to the findings of Nuruddeen and Ibrahim (2014) which showed a unidirectional relationship between growth, poverty

TABLE 3 Granger-causality test

Equation/excluded		Chi2	df	Prob> chi2
LGINI	**LGDP**	**0.009**	**1**	**0.923**
	ALL	0.009	1	0.923
LGDP	LGINI	0.103	1	0.748
	ALL	0.103	1	0.748

Source: Computed by the authors using EViews 9.0 statistical software.

TABLE 4 Cross-sectional dependency test

Test	Test statistic	P-value
Lm CD* (Pesaran 2004)	−0.510	1.3898
Fredman's (1937)	11.111	.9970
Frees (2004)	1.513	
	10%	.1719
	5%	.2262
	1%	.3351

Source: Computed by the authors using EViews 9.0 statistical software.

and Gini coefficient. The result of the correlation analysis showed that the Gini index and its lag exhibit strong correlation which is well expected. There exist a strong correlation between the log of GDP and its square which is also well expected. The cross-sectional dependency was investigated using the Pesaran test, and Friedman's statistic as shown in Table 4.

The Pesaran CD test indicated that there is strong evidence against the hypothesis that the sampled African countries move together with respect to the group of growth-enhancing variables, as selected African countries should be further studied independently. The test of heteroscedasticity showed that the error terms do not have constant variance as Prob value of .6644 was greater than the critical significant level, 0.05.

In conclusion, the GMM system result showed a significant negative relationship between income inequality and economic growth within the selected African countries for the period (2001–2016).

The study did not support the existence of the Kuznets curve hypothesis. While Inflation rate and unemployment exhibited a negative and positive but insignificant relationship with income inequality respectively, Wage rate and labour force possessed a significant negative relationship with income inequality. Education level showed a positive but insignificant relationship with income inequality as many are being denied access to it because of poverty in the selected region. There is a need to address inequality in this region through more public expenditures in education as the main determinant of workers' income is the level and quality of education. If governments ensure equal access to education, then the distribution of wages will reflect the distribution of abilities and the extent to which the education system attempts to compensate for differences in abilities and backgrounds.

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