The distributional effects of fiscal and monetary policies in Africa

Article *in* Journal of Social and Economic Development · January 2022

DOI: 10.1007/s40847-021-00172-y

CITATIONS
6

READS
106

4 authors, including:

Mark Kunawotor
University of Professional Studies
18 PUBLICATIONS **141** CITATIONS
SEE PROFILE

Godfred A. Bokpin
University of Ghana
69 PUBLICATIONS **2,353** CITATIONS
SEE PROFILE

Patrick O. Asuming
University of Ghana
61 PUBLICATIONS **558** CITATIONS
SEE PROFILE

Journal of Social and Economic Development (2022) 24:127–146
https://doi.org/10.1007/s40847-021-00172-y

RESEARCH PAPER

The distributional effects of fiscal and monetary policies in Africa

Mark Edem Kunawotor[1,2] · Godfred Alufar Bokpin[2] · Patrick O. Asuming[2] · Kofi A. Amoateng[3]

Accepted: 17 November 2021 / Published online: 9 January 2022

Abstract
Income inequality has been persistent and indeed high in Africa over decades. Accordingly, a lot of empirical drivers have been identified to address it, albeit to the large neglect of fiscal and monetary policies in Africa. This paper provides empirical evidence on the distributional effects of both fiscal and monetary policies in Africa over the period 1990–2017. We employ a two-step dynamic system GMM, a simultaneous quantile regression, and also use variants of fiscal and monetary indicators including fiscal redistribution. Our results show that fiscal redistribution has been quite effective in Africa as reflected in the role played by income taxes and transfers in reducing Gini coefficients albeit to a relatively little extent. In particular, we find that direct tax is progressive and a potent tool in redistributing income in favour of the have-nots. Indirect tax unsurprisingly is regressive and income unequalizing. Similarly, we find property taxes to have income unequalizing effects in Africa. The results of the expenditure indicators reveal that government spending on basic and primary education narrows net income inequality, while government spending on secondary and tertiary education rather widens net income inequality. Lastly, we find that contractionary monetary policy has unintended distributional effects in Africa. We suggest that governments should broaden the tax net, increase the share of direct tax including property tax and spend more on basic education to improve income distribution in Africa.

Keywords Income inequality · Fiscal policy · Monetary policy · Africa

JEL Classification E 52 · E 62 · H 23 · H 52 · O 23

✉ Mark Edem Kunawotor
mark.kunawotor@upsamail.edu.gh

[1] Department of Banking and Finance, University of Professional Studies, Legon-Ghana, P.O BOX LG 149, Accra, Ghana

[2] University of Ghana Business School, Accra, Ghana

[3] School of Business, North Carolina Central University, Durham, USA

Introduction and literature

Ensuring equity in income distribution has been a topical research issue over decades and a central focus of many governments world-wide. Due to the high and persistent nature of income inequality globally, it is currently considered a defining challenge and in recent times, there is a growing public concern in many countries for governments to ensure that everybody gets a fair share of the national cake. The significance of reducing income inequality makes it imperative to be captured in the Sustainable development goals (SDGs).

It is worth noting that ensuring equitable income distribution is imperative to achieving sustainable economic growth, macroeconomic stability, poverty reduction and political stability (Anyanwu et al. 2016; OECD 2015; Cojocaru and Diagne 2014; Ostry, Berg and Tsangarides 2014; IMF 2014). Empirical evidence in Africa (see Shimeles and Nabassaga 2018; Fosu 2015), for instance, suggests that no amount of growth in GDP per capita income would be sufficient to reduce extreme poverty unless there is a corresponding decline in income inequality. High levels of income inequality destroy social cohesion and make it difficult to gain public support for growth-enhancing reforms and may also cause political instability (Anyanwu 2016; Claessens and Perotti 2007). The key concern of this paper is to identify the appropriate policy tools which will be adequate to address the widespread economic disparity in Africa. African countries have the highest Gini coefficients falling just behind Latin America and the Caribbean in the global income inequality distribution table (UNDESA 2019; Odusola 2017; World Bank 2016). Also, UNDP (2017) asserts that ten out of the world's nineteen most unequal countries are located in Africa. This notwithstanding, several empirical studies (see Asongu et al. 2020; Kunawotor et al. 2020; Shimeles and Nabassaga 2018; Adeleye et al. 2017; Anyanwu 2016) have unmasked income inequality as highly persistent on the continent.

Fiscal policy according to IMF (2014; 2015) is a primary and potent policy tool that impacts income distribution by affecting household welfare through monetary payment in the form of taxes and transfers and also through the provision of in-kind benefits such as spending on free education and health services. Similarly, Gupta (2018) argues that fiscal policy (taxation and spending) is the most powerful policy tool used by governments in advanced economies to achieve equitable income distribution in both the short and long terms. However, this policy tool has not been very effective in developing countries because they have lower tax-to-GDP ratios in the range of 15–20 percent while advanced countries have over 25 percent. Therefore, this limits the availability of funds for social spending on education and health. Fiscal redistribution is less effective in developing countries such as African countries because there is more reliance on indirect tax. Several empirical studies (see Salotti and Trecroci 2018; Cevik and Correa-Caro 2015; Muinelo-Gallo and Roca-Sagalés 2013) are available on the redistributive effects of fiscal policies albeit primarily focused on advanced and emerging market economies. In this line of thought, Odusola (2017) argues that the central role of fiscal policy in addressing income inequality has long been acknowledged in the literature but there are few empirical studies in Africa to back this assertion. A few of these studies in Africa include Odusola (2017) and Inchauste et al. (2015). But while Inchauste et al. (2015) focuses on South Africa, Odusola (2017) provides a narrative without econometric evidence. Consequently, there is a need to delve into the distributional effects of fiscal policy in the African context. This study thoroughly examines the effects of fiscal policy on income distribution in Africa by using variants of tax indicators as well as government expenditure indicators including spending on education at all levels. It should be noted however that the empirical literature on income inequality in Africa so far has been skewed towards the proximate determinants

of income inequality (Hundenborn et al. 2018; Adeleye et al. 2017; Anyanwu et al. 2016; Anyanwu 2016; Dabla-Norris et al. 2015). Some of these determinants include trade openness, human capital, GDP per capita, globalization, government spending and resource rent. Other strands of literature (see Kunawotor et al. 2020; Chu and Hoang 2020; Sulemana and Kpienbaareh 2018; Berisha et al. 2018) tend to focus on institutions and governance with more particular attention towards corruption controls in addressing income inequality.

In addition to the distributional effects of fiscal policy, this study also focuses on the unintended distributional effects of monetary policy in Africa. This is because, even though fiscal policy is considered a primary tool in addressing income inequality and has more empirical evidence pointing towards that direction, recent trend of inequality studies are beginning to pay some attention to the potential distributional effects of monetary policy albeit so far focused on the advanced economies (see Furceri et al. 2018; Coibion et al. 2017; Mumtaz and Theophilopoulou 2017; Davtyan 2016; Villarreal 2014). In particular, Furceri et al. (2018), Coibion et al. (2017) and Mumtaz and Theophilopoulou (2017) find that contractionary monetary policy increases income inequality in the USA and UK, while Davtyan (2016) and Villarreal (2014) find a negative effect in USA and Mexico, respectively. The foregoing arguments show that the effects of fiscal policy is quite clearly established in the extant literature, while that of monetary policy seems complicated, and the complexity is due to various channels of impact (Aye, Clance and Gupta 2018; Mumtaz and Theophilopoulou 2017).

In terms of the channels of impact, Coibion et al. (2017) show 5 channels by which monetary policy affects inequality. The first channel is the income composition channel which is due to the fact that there is heterogeneity in primary income sources among different households. While some depend on labour income, others rely on business income, financial, or transfer income. Monetary policy does have a heterogeneous impact on these different income sources and may have redistributive effects. The second is the financial segmentation channel. This channel applies to agents who trade frequently in financial markets. Monetary policy tends to redistribute income in favour of these agents than others during expansionary monetary policy shocks. The third channel is the portfolio channel. Poor households who mostly tend to hold currency suffer more disproportionately from inflationary impact stemming from monetary policy than high-income households. The fourth channel is the savings redistribution channel which explains that an increase in interest rate will be of more benefit to savers than borrowers and savers are generally considered to be wealthier than borrowers. The final channel is the earnings heterogeneity channel. Monetary policy shocks affect high-income labour earnings and low-income labour earnings quite differently.

The novelty and strength of our paper lie in the fact that we are one of the few in Africa to comprehensively study the redistributive roles of both fiscal and monetary policies. We also use various indicators of fiscal and monetary policies. The rest of the paper comprise the methodology in Sect. 2, results and discussion in Sect.3 and ends with summary and recommendations in Sect. 4.

Methodology

Model specification, definition and measurement of variables and a priori expectations

The baseline specification of our empirical model takes root from the large strand of literature on the determinants of income inequality (see Salotti and Trecroci 2018;

Anyanwu 2016; Cevik and Correa 2015). Also, we follow recent studies (see Kunawotor et al. 2020; Adeleye et al. 2017; Anyanwu 2016; Anyanwu et al. 2016) that use similar specifications of income inequality in their empirical modelling and identify income inequality to be persistent. Our empirical models therefore, have income inequality to be predicted by the first period lag of income inequality, fiscal and monetary policies as the explanatory variables, and a vector of controls shown below;

$$IncInequality_{i,t} = \alpha_0 + \alpha_1 IncInequality_{i,t-1} + \alpha_2 PolicyVariable_{i,t} + \beta' X_{i,t} + \mu_i + \mu_t + \varepsilon_{i,t} \quad (1)$$

Income inequality ($IncInequality_{it}$) is the outcome variable, and it is measured using the net/disposable Gini index. The net/disposable Gini index estimates inequality using equivalized household disposable (post-tax, post-transfer) income. The index ranges from 0 to 100 with 0 indicating perfect equality, while 100 indicates perfect inequality. The within-country Gini coefficient measures the distribution of income or consumption among households or individuals in a country. The subscripts 'i' and 't' represent a given country and a given year, respectively. $IncInequality_{i,t-1}$ represents the first period lag of income inequality in a given country. It is expected that the immediate past level of income inequality will drag the current income inequality from falling and hence exhibiting a great degree of inertia.

Our explanatory variables are variants of fiscal policy and monetary policy variables ($Policyvariables_{it}$) shown in Eq. 1. We proxy fiscal policy using fiscal redistribution, tax indicators as well as general government expenditure indicators. Fiscal redistribution is defined as the difference between the market Gini coefficient (pre-tax, pre-transfer Gini) and disposable Gini coefficient (post-tax, post-transfer Gini). The tax indicators are total tax revenue, total direct tax, total indirect tax and property tax. The total direct tax includes taxes on income, profits and capital gains. The total indirect taxes include taxes on goods and services, taxes on international trade and other taxes. A negative relationship between fiscal distribution and income inequality implies an improvement in fiscal redistribution, while a positive relationship implies an erosion in fiscal redistribution. It is also our expectation that direct taxes will be progressive and indirect taxes will be regressive. The general government expenditure indicators are general government final consumption expenditure (% of GDP), total general government expenditure on education (% of GDP), expenditure on primary education (% of government expenditure on education), expenditure on secondary education (% of government expenditure on education) and expenditure on tertiary education (% of government expenditure on education). The general government final consumption expenditure comprises all government current expenditures for purchases of goods and services including compensation of employees and expenditures on national defence and security. We expect that general government expenditure and spending on public good provision will trickle down to the poor households through job creation and social interventions hence, a negative relationship with income inequality. We also expect spending on primary and secondary education to reduce income inequality while spending on tertiary education to further widen the income inequality gap. We measure monetary policy using the monetary policy interest rates. However, due to limited data for monetary policy interest rates, we introduce lending interest rates and deposit interest rates as alternative proxies for monetary policy. The nexus between the interest rates and income inequality is a priori indeterminate as indicated in literature.

The control variables are represented by the vector 'X_{it}'. These set of controls include real GDP per capita and its squared term, political globalization and, democracy, trade

openness, foreign direct investment, age dependency ratio, population growth rate, school enrolment rate, unemployment rate, gross capital formation and natural resource rent.

Real Gross domestic product (GDP) per capita is measured by taking the natural log of constant GDP per capita. Also, we introduce the squared of real GDP per capita. It is expected that real GDP per capita will increase income inequality in the short term and decrease it in the long term in line with Kuznets' hypothesis.

School enrolment is measured by the gross secondary school enrolment rate which is the most frequently used measure of human capital (see Kunawotor et al. 2020; Salotti and Trecroci 2018; Anyanwu 2016). As a measure of skills diffusion and human capital development, we expect a higher enrolment rate to decrease income inequality in Africa all things being equal. We also expect a positive relationship between population growth rate, unemployment rate and income inequality.

Trade openness is measured as the sum of total export and total imports scaled by GDP. The relationship between trade openness and income inequality is mixed, as posited by Dabla-Norris et al. (2015). A negative relationship could mean that trade liberalization opens more opportunities for employment of low-skilled and low-income earners in a country where there are many low-skilled workers. A positive relationship means that the highly skilled and affluent get better opportunities in exporting firms based on the assumption that technological change is high-skilled biased. Foreign direct investment (FDI) is measured as the net inflow of foreign direct investments as a ratio of GDP. We expect a negative relationship with income inequality.

Natural resource rents depict the extent to which a country relies on natural resources for development, and it is measured by total natural resource rents as a percentage of GDP. It is our expectation that these resources will reduce income inequality when applied well, all things being equal. Similarly, gross capital formation as a percentage of GDP proxies the usage of physical capital in production. This is expected to generate more jobs and higher earnings and hence the potential to reduce income inequality.

Age dependency ratio is the sum of the proportion of the young age population (0–15 years) and the old age population (65 years and above) to the working-age population (16–64 years). We expect a higher dependency ratio to translate to lower-income per capita and hence a higher income inequality.

Political globalization is measured by KOF's index and comprises the absolute number of embassies in a country, personnel contributed to UN Security Council missions (% of the population), number of internationally oriented non-governmental organizations (NGOs) operating in a country, number of international inter-governmental organization in which a country is a member, international treaties signed and number of distinct treaty partners of a country with bilateral investment treaties. We expect political globalization to reduce inequality. Finally, democracy is proxied by the polity2 index and it ranges from − 10 to 10 with higher values indicating a high level of democracy in a country, while lower values indicate autocracy. We expect democracy to reduce inequality as there is a guaranteed fair share of the national cake. Finally, u_i and η_i represent the country fixed effects, while ω_t and u_t represent the time fixed effects. $\varepsilon_{i,t}$ and $\lambda_{i,t}$ represent the idiosyncratic error term, respectively.

Sources of data and scope of the study

The study employs panel data over the period 1990–2017 and this includes 40 African countries (see Appendix 1). The restrictions in the number of countries is due to data

unavailability issues. The data on income inequality are sourced from the Standardized world income inequality database (SWIID)) at the United Nations University World institute for development economics research (UNU-WIDER). Data from SWIID are more preferable as it collates data with comparable figures across various countries over a relatively long period. Data on tax revenue are sourced from the International centre for tax and development (ICTD) and UNU-WIDER government revenue dataset. Data on political globalization are gleaned from the KOF 2019 index of globalization while that of democracy (polity2) is taken from Marshall's Polity IV Project. Monetary policy interest rate is taken from the International monetary fund (IMF). The other variables including all government expenditure variables, lending interest rate, deposit interest rate, real GDP per capita, trade openness, foreign direct investment, age dependency ratio, population growth rate, school enrolment, unemployment, gross capital formation and natural resource rent are all taken from World Banks World development indicators (WDI).

Estimation technique

In this study, we employ the two-step system Generalized method of moments (GMM) estimation approach with robust standard errors as well as the simultaneous quantile regression technique. The choice of the dynamic approach is motivated by five reasons in line with recent GMM-centric literature (Kunawotor et al. 2020; Asongu et al. 2019; Tchamyou et al. 2019; Agoba et al. 2019; Fosu and Abass 2019). First, the cross-sectional units (N) are higher than the time series (T). Thus, the countries are 40, while the sampled period is 28 years. Secondly, the dataset is a panel data and the empirical approach accounts for cross-country differences in the estimation process. Thirdly, GMM has the ability to address inherent endogeneity issues in two ways; GMM controls for unobserved heterogeneity by accounting for time-invariant omitted variables. Also, GMM generates internal instruments that account for simultaneity bias or reverse causality. Reverse causality may be a concern in this study since fiscal policy can also affect income inequality. Thus, the desire of the authorities to mitigate inequality may trigger tax and spending decisions (Salotti and Trecroci 2018). Fourth, income inequality is known to be persistent and depends on its lag(s) (see Asongu et al. 2020; Kunawotor et al. 2020; Salotti and Trecroci 2018; Shimeles and Nabassaga 2018; Adeleye et al. 2017; Anyanwu et al. 2016; Cevik and Correa 2015). The persistent nature of income inequality requires a dynamic empirical modelling and the need to use a dynamic estimation technique such as GMM. Persistency is confirmed in our study as the data show evidence of correlation (0.9993) between our outcome variable in levels and its first-period lag and this exceeds the threshold (0.8) needed to establish persistence in literature (Asongu et al. 2020; Tchamyou et al. 2019). This is also confirmed in our result as the first period lag of the income inequality appears statistically significant in all the models. Finally, GMM is preferred as an estimation strategy because there are general difficulties in finding external instruments. The robustness of GMM is evidenced in several diagnostic tests. The Hansen test for over-identifying restrictions tests for the validity of the moment conditions. Also, the test of the null hypothesis of no second-order serial correlation is performed by the Arellano–Bond test for autocorrelation (AR (2)). All these diagnostic tests proved satisfactory. The bootstrap simultaneous quantile regression estimation technique is used to check for robustness of some of the results. The quantile regression detects and controls for outliers. Its usage is consistent with recent development literature in economics (see Altunbas and Thornton, 2019; Asongu and Nwachukwu 2016; Asongu 2014).

Empirical results

Descriptive statistics and correlation matrix

The mean score of income inequality measured by net Gini or disposable income Gini coefficient in Africa is 43.34, while the corresponding market income Gini coefficient is 48.25, and this is shown in Table 1. This means that income taxes and transfers are responsible for reducing the market Gini coefficient by 4.91 points. Gupta (2018) and IMF (2015) find that income taxes and transfers are responsible for a reduction in market Gini coefficients in some selected advanced economies and Latin American economies by 17 and 4 points, respectively. This explains that the redistributive impact of taxes and transfers in Africa and Latin America has not been so effective relative to the advanced economies probably due to the higher composition and greater reliance on indirect taxes in the tax structure. Regionally, Southern Africa has the highest mean net Gini of 53.23. This is followed by East Africa (41.24), West Africa (41.05) and North Africa (37.83). This result is in line with the findings of Kunawotor et al. (2020); Adeleye et al. (2017); and Odusola (2017). Odusola (2017) particularly mentions that Northern African countries such as Egypt, Morocco, Mauritius and Tunisia have low Gini coefficients because of massive

Table 1 Descriptive statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Net Gini	986	43.344	7.099	30.2	62.4
Market Gini	986	48.254	7.921	33.7	70.7
Total tax (% of GDP)	565	15.958	8.532	.573	55.698
Direct tax (% of GDP)	578	6.166	4.005	.199	18.846
Indirect tax (% of GDP)	639	8.895	6.142	0	45.834
Property tax (% of GDP)	556	.139	.276	0	1.469
Government expenditure (GDP)	1263	15.302	7.497	.911	73.577
Expenditure on education (GDP)	658	4.265	2.591	1.012	44.334
Expend on primary education	448	44.062	11.352	17.574	98.668
Expend on secondary education	443	30.185	10.182	0	71.587
Expend on tertiary education	478	19.534	9.093	0	59.02
Monetary policy rate	312	10.881	11.154	2	70
Lending rate	875	18.291	12.671	4.737	97.336
GDP per capita	1390	2211.006	2926.692	164.337	20,512.941
Political globalization	1453	53.602	17.936	8.21	92.148
Democracy—polity2	1345	.616	5.658	− 10	10
Trade openness	1251	.693	.35	.191	3.762
FDI	1388	4.036	9.132	− 8.589	161.824
Age dependency ratio	1450	84.509	15.633	41.293	112.849
Population growth	1450	2.379	1.085	− 6.766	8.118
Secondary school enrolment rate	862	41.225	25.644	5.221	115.957
Unemployment rate	1377	9.299	7.593	.285	37.94
Gross capital formation	1293	21.575	9.888	− 2.424	85.101
Natural resource rent	1423	12.263	12.336	0	84.24

investments in quality education and affordable health services. The tax effort in Africa also appears low with an average of 15.96 percent. This implies that there is more space for revenue-generating capacity in Africa. As expected, indirect tax (8.895%) dominates direct tax (6.166%) in Africa. The property tax collection rate in Africa is almost negligible (0.139%). African governments also appear to spend more on primary and secondary education than on tertiary education (Table 2). There is no general concern for multicollinearity as reflected in the correlation matrix and the variance inflation factors with none greater than 10. The Variance inflation factors (VIFs) are shown in Appendix 2.

Empirical results of the effects of fiscal policy on income inequality

The results of the redistributive effects of fiscal policy comprise the tax dimension, the expenditure dimension and fiscal redistribution (the difference between gross Gini and net Gini). The results of the tax variants as well as fiscal redistribution are presented in Model 1–Model 5 in Table 3, while that of the expenditure side is presented in Model 6–Model 10 in Table 4. The result in Model 1 shows the effectiveness of fiscal policy in income redistribution as reflected in the negative nexus between income inequality and 'fiscal redistribution'. Income inequality is reduced by 2.3 percent implying that income taxes and transfers play a significant role in income redistribution in Africa. A similar assertion is made by Odusola (2017) who avers that the composition of taxes and quality spending are yielding fruits in reducing income inequality in Africa. More particularly, our findings indicate that total tax revenue has a negative effect on income inequality shown in Model 2. Total tax thus reduces income inequality by 3.2 percent, and this implies that total tax revenue has the potential to narrow the economic gap between the haves and have-nots. Salotti and Trecroci (2018) had similar findings for OECD countries. Further and more interestingly, the findings reveal that direct tax has a negative and statistically significant effect on income inequality as shown in Model 3. The income inequality-reducing effect of direct tax which comprise tax on income, profit, and capital gains is 4. 3 percent. This appears to be more progressive than other form of taxes, and hence, direct tax has the potency to effectively redistribute income in favour of the less privileged. Salotti and Trecroci (2018) also find a negative nexus between income tax and economic inequality. We also find that indirect tax has a positive effect on income inequality and this can be seen in Model 4 but appears statistically insignificant. Thus, taxes on goods and services and taxes on international trade have no statistically significant effect on income inequality in our sample. Earlier findings of Muinelo-Gallo and Roca-Sagalés (2013) are quite similar to ours as they find a significant negative effect of direct taxes on income inequality in OECD countries and an insignificant effect of indirect taxes on income inequality. Efforts by governments to increase the share of direct tax to the total tax net will greatly improve income redistribution in Africa. This is because the current tax structure in Africa appears quite regressive as a higher percentage comes from indirect tax (8.895) than direct tax (6.166). Lastly, but concerning the tax side, we find property tax to be positively associated with income inequality by 2.7 percent and statistically significant as well in Model 5. Thus, levying property tax has income un-equalizing and regressive impact in Africa. This may be due to the insignificant proportion of people who fall within this tax bracket. Also, property prices keep soaring in most African countries and property owners make significant windfalls but pay insignificant amounts in property taxes. Gupta (2018) asserts that property taxes have less progressivity in developing economies due to weak compliance levels as well as a narrow tax base. Because we expected property tax to rather cause a decrease in income

Table 2 Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Net Gini	1.000														
(2) Tax	0.320	1.000													
(3) Gov't expenditure	0.309	0.538	1.000												
(4) Lending rate	0.020	− 0.146	− 0.132	1.000											
(5) GDP per capita	0.190	0.207	0.207	− 0.096	1.000										
(6) Political glob	− 0.201	− 0.071	− 0.209	− 0.007	− 0.070	1.000									
(7) Polity2	0.248	0.253	0.044	− 0.087	− 0.009	0.105	1.000								
(8) Trade openness	0.115	0.166	0.266	0.040	0.357	− 0.086	0.101	1.000							
(9) FDI	− 0.052	0.160	0.085	0.000	0.040	− 0.132	0.019	0.300	1.000						
(10) Age dependency	− 0.065	− 0.471	− 0.253	0.072	− 0.627	− 0.229	− 0.148	− 0.356	− 0.033	1.000					
(11) Population growth	− 0.166	− 0.534	− 0.228	− 0.054	− 0.172	− 0.007	− 0.032	− 0.202	0.094	0.450	1.000				
(12) School enrolment	0.193	0.411	0.216	− 0.268	0.687	0.215	0.245	0.291	0.024	− 0.812	− 0.501	1.000			
(13) Unemployment	0.466	0.552	0.310	− 0.033	0.458	− 0.066	0.010	0.362	0.013	− 0.435	− 0.327	0.451	1.000		
(14) Gross capital	0.004	0.252	0.200	− 0.131	0.273	0.139	0.084	0.343	0.292	− 0.276	− 0.006	0.176	0.141	1.000	
(15) Resource rent	− 0.308	− 0.461	− 0.153	0.064	0.169	0.019	− 0.216	0.168	0.219	0.098	0.269	− 0.208	− 0.026	0.076	1.000

Table 3 The effects of fiscal distribution and taxes on income inequality

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Lag of income inequality	1.035*** (0.017)	1.039*** (0.024)	1.058*** (0.021)	1.067*** (0.036)	1.003*** (0.019)
Fiscal redistribution	− 0.024* (0.014)				
Total tax		− 0.032** (0.013)			
Direct tax			− 0.043** (0.021)		
Indirect tax				0.013 (0.020)	
Property tax					0.270** (0.126)
Real GDP per capita	0.617 (0.560)	0.266 (1.346)	0.051 (1.109)	0.717 (1.717)	0.912* (0.514)
Real GDP per capita^2	− 0.041 (0.039)	− 0.030 (0.099)	− 0.006 (0.080)	− 0.046 (0.129)	− 0.060* (0.034)
Political globalization	0.002 (0.003)	0.005 (0.004)	0.008 (0.005)	0.005 (0.008)	− 0.005 (0.005)
Democracy—polity2	− 0.005* (0.003)	− 0.006 (0.006)	− 0.008 (0.005)	− 0.002 (0.009)	− 0.005 (0.005)
Trade openness	− 0.005* (0.002)	0.274 (0.317)	0.367 (0.265)	0.425 (0.427)	0.145 (0.225)
FDI	0.002 (0.003)	0.000 (0.005)	0.001 (0.005)	0.002 (0.011)	0.004 (0.005)
Age dependency ratio	− 0.006 (0.005)	− 0.020** (0.007)	− 0.018*** (0.005)	− 0.016** (0.008)	− 0.004 (0.003)
Population growth	− 0.006 (0.047)	0.089 (0.064)	0.119** (0.044)	0.124** (0.053)	0.099*** (0.019)
School enrolment	− 0.002 (0.001)	− 0.003 (0.003)	− 0.004 (0.003)	− 0.007 (0.005)	0.001 (0.002)
Unemployment	− 0.018** (0.007)	− 0.005 (0.013)	− 0.024** (0.011)	− 0.046 (0.032)	− 0.009 (0.012)
Gross capital formation	− 0.006* (0.003)	− 0.004 (0.004)	− 0.007* (0.004)	− 0.010 (0.007)	− 0.015*** (0.003)
Natural resource rent	0.003 (0.004)	− 0.007** (0.003)	− 0.002 (0.004)	− 0.002 (0.007)	− 0.003 (0.003)
Constant	− 2.889 (2.277)	− 0.326 (4.873)	− 1.412 (3.053)	− 4.384 (4.270)	− 2.880 (2.443)
Observations	472	260	267	273	254
Number of countries	40	23	24	25	24
Number of instruments	18	21	21	21	16
Wald test (Prob > F)	0.000	0.000	0.000	0.000	0.000
AR(1):(Pr > z)	− 1.94(0.052)	− 2.13(0.033)	− 2.20(0.028)	− 2.41(0.016)	− 3.09(0.002)
AR(2):(Pr > z)	− 0.89(0.376)	− 0.56(0.576)	0.64(0.523)	0.80(0.422)	− 0.55(0.580)
Sargan: (Prob > chi2)	0.78(0.854)	1.10(0.982)	0.93(0.988)	3.56(0.735)	0.48(0.487)
Hansen: (Prob > chi2)	1.76(0.623)	3.32(0.768)	2.86(0.826)	3.75(0.710)	0.24(0.621)

Standard errors in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$ Model 1 addresses the role of fiscal redistribution.

Model 2 concerns the effects of total taxes on income inequality.

Table 3 (continued)

Models 3, 4 and 5 discuss the effects of direct tax, indirect tax and property taxes on income inequality, respectively

inequality as it is considered a form of direct tax, we use the simultaneous quantile regression for robustness checks. The results presented in Appendix 3 show that property tax in a similar fashion increases income inequality at the lower and mid quantiles of the income inequality distribution. Thus, property tax appears statistically significant with a positive sign at the 10th, 25th and 50th percent quantiles in Model 14, Model 15, and Model 16, respectively. The 75th and 90th percent quantiles appear statistically insignificant in Model 17 and Model 18.

The second part of the distributional impact of fiscal policy focuses on the government expenditure side. First, we find no statistically significant effect of general government final consumption expenditure on income inequality as depicted in Model 6. This implies that untargeted general government spending has no statistically significant redistributive effect. Kunawotor et al. (2020), however, find that final government expenditure widens the income inequality gap. Similarly, we find no statistically significant impact of total general government expenditure on education in Model 7. However and more intriguingly, the findings in Model 8 reveal that general government spending on primary education is statistically significant with a negative sign. Spending on primary education reduces income inequality by about 0.72 percent. Thus, government expenditure on primary education which includes both current expenditure and capital expenditure plays a major role in redistributing income in favour of the less resourceful. This implies that granting more access to children of the less privilege to acquire basic education has an income-equalizing effect. This appears plausible since lower income groups are the main patronizers of government basic schools in Africa. Also, the findings show that government expenditure on secondary education rather promotes unequal distribution of income in Model 9 by about 1.3 percent. A similar result holds for government expenditure on tertiary education as it appears to increase income inequality by about 1 percent as depicted in Model 10. These results corroborate the assertion by Gupta (2018) and IMF (2014) that basic and primary education spending is more progressive, while spending on secondary and tertiary education is regressive. Gupta (2018) also argues that non-cash spending to expand basic education and health services is more likely to ensure equitable income distribution. Intuitively, government spending on primary education has a significant equalizing effect as the income inequality gap appears bridged when the government spends more on primary education. This is probably because a much larger chunk of total educational spending (44 percent) goes to primary education shown in Table 1 and the redistributive effects of lower education trickle down more easily due to its wider coverage. Thus, a larger proportion of people are empowered through human capital development and hence are more likely to secure employment, and this helps narrow the income inequality gap.

The first period lag of income inequality appears statistically significant with high coefficients in all models, and this is consistent with the essence of the usage of the dynamic GMM model. This implies the persistent nature of income inequality as higher-income inequality levels in the past may cause a slow change in the current levels. This is similar to the findings of Chu and Hoang (2020); Kunawotor et al. (2020); Salotti and Trecroci (2018) and Adeleye et al. (2017).

The result in Model 5 supports the Kuznets hypothesis of an inverted U-shaped effect between economic development and income inequality. Thus, income distribution in

Table 4 The Effects of government expenditure on income inequality

Variables	Model 6	Model 7	Model 8	Model 9	Model 10
Lag of income inequality	1.007*** (0.012)	1.016*** (0.013)	1.013*** (0.011)	1.106*** (0.030)	1.035*** (0.019)
Gov't expenditure	0.003 (0.006)				
Expenditure on education		0.017 (0.016)			
Expenditure—primary edu			− 0.007** (0.003)		
Expenditure—secondary edu				0.013* (0.007)	
Expenditure—tertiary edu					0.010** (0.005)
Real GDP per capita	0.003 (0.440)	0.024 (0.584)	− 0.014 (0.440)	0.162 (1.336)	− 0.298 (0.863)
Real GDP per capita^2	0.001 (0.029)	0.003 (0.039)	0.002 (0.029)	− 0.016 (0.095)	0.027 (0.061)
Political globalization	− 0.002 (0.002)	0.001 (0.003)	0.001 (0.002)	0.009 (0.006)	0.003 (0.003)
Democracy—polity2	− 0.004 (0.003)	− 0.008* (0.004)	− 0.002 (0.004)	0.001 (0.009)	− 0.001 (0.005)
Trade openness	− 0.022 (0.101)	0.223 (0.134)	0.242* (0.121)	0.806** (0.362)	0.261 (0.190)
FDI	0.005 (0.003)	0.006 (0.005)	0.005 (0.007)	0.004 (0.006)	0.001 (0.006)
Age dependency ratio	− 0.001 (0.003)	− 0.006* (0.004)	− 0.006 (0.004)	− 0.022** (0.009)	− 0.005 (0.004)
Population growth	− 0.025 (0.017)	0.145*** (0.042)	0.157** (0.059)	0.101 (0.076)	0.145** (0.061)
School enrolment	− 0.000 (0.002)	− 0.001 (0.003)	− 0.001 (0.003)	− 0.014** (0.006)	− 0.001 (0.003)
Unemployment	− 0.008 (0.005)	− 0.014* (0.008)	− 0.008 (0.010)	− 0.060** (0.024)	− 0.027* (0.016)
Gross capital formation	− 0.006** (0.003)	− 0.006** (0.003)	− 0.008** (0.003)	− 0.009* (0.005)	− 0.006** (0.003)
Natural resource rent	− 0.003 (0.003)	− 0.006 (0.004)	− 0.006 (0.004)	− 0.002 (0.005)	− 0.002 (0.004)
Constant	0.008 (1.583)	− 0.742 (2.015)	− 0.052 (1.594)	− 3.635 (4.674)	− 0.856 (3.214)
Observations	469	268	196	196	215
Number of countries	40	37	32	32	34
Number of instruments	21	21	21	21	21
Wald test (Prob > F)	0.000	0.000	0.000	0.000	0.000
AR(1):(Pr > z)	− 2.06(0.039)	− 2.89(0.004)	− 1.85(0.065)	− 0.76(0.447)	− 1.66(0.096)
AR(2):(Pr > z)	− 0.96(0.337)	0.90(0.370)	0.25(0.803)	0.71(0.477)	1.11(0.265)
Sargan test:(Prob > chi2)	2.13(0.908)	5.79(0.447)	2.67(0.849)	2.29(0.892)	9.90(0.129)
Hansen test: (Prob > chi2)	2.00(0.919)	3.71(0.716)	2.47(0.872)	1.46(0.962)	7.01(0.320)

Standard errors in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$ Model 6 discusses the effects of government spending on income inequality.

Model 7 discusses the effects of total educational spending on income inequality.

Table 4 (continued)

Models 8, 9, and 10 address the relationship between government spending on primary, secondary and tertiary education and income inequality, respectively

African countries may become more even with higher economic development and the threshold or point of inflection for real GDP per capita occurs at US$1924.44. This can be observed in Model 5 as real GDP per capita has a positive sign, while its square term has a negative sign and they both appear statistically significant. The existence of the Kuznets curve in Africa is in line with the findings of Anyanwu et al. (2016) for West Africa, Anyanwu (2016) for Southern Africa and Cevik and Correa-Caro (2015) for China.

School enrolment as a measure of skill premium and human capital development has a negative and statistically significant effect on income inequality in Model 9. This means that the diffusion of human capital among the populace in Africa may empower households economically and this may help reduce the income inequality gap. That is, as more people become enlightened through our educational systems, their skill set is enhanced and a greater propensity to acquire a job or reduce the earnings gap between the skilled and unskilled. This result is in line with the findings of Kunawotor et al. (2020) for Africa, Anyanwu (2016) for Southern African countries, Anyanwu et al (2016) for West Africa and Dincer and Gunalp (2012) for the USA.

The study finds natural resource rent to be statistically significant with a negative effect on income inequality in Model 2. African countries can leverage the abundance and dependence on natural resources to help poor households catch up on the income and wealth ladder lending support to the findings of Kunawotor et al. (2020), Anyanwu (2016) but contradicts that of Anyanwu et al (2016).

Similarly, we find gross capital formation which proxies for domestic capital investment to have a negative and significant effect on income inequality in Africa in most of the models including Model 1, Model 3, and Models 5–13. This confirms the findings of Kunawotor et al. (2020) in Africa and Lee et al. (2013) in Korea but contradicts that of Anyanwu (2016) and Anyanwu et al (2016) in South and West Africa, respectively. This finding is in line with our a priori expectations, and the implication is that as more domestic investments are made, it creates more employment and earnings opportunities for the less privileged, hence reducing the income inequality gap.

Age dependency ratio and unemployment contrary to our expectation rather appear to reduce income inequality, while trade openness increases income inequality as shown in Models 8 and 9. Thus, trade liberalization favours the rich than the poor probably due to the high-skill levels required for those new jobs in the exporting sector. Population growth has a positive relationship with income inequality in Models 3, 4, 5, 7, 8, 10, and 12. As more and more people are made to share the limited available resources, the per capita distribution reduces, and due to unfair distribution, the economic gap may further widen. This conforms to the result of Salotti and Trecroci (2018) who find larger countries to have higher Gini indices.

Finally, among the set of controls, we find democracy to have a negative and statistically significant effect on income inequality in Model 1 and Model 7. Countries that tend to practice democracy may see their inequality gap narrowing than those that lean towards autocracy probably because of fairness in the distribution of the national cake.

All the other variables including real GDP per capita and its square, political globalization and foreign direct investment inflows remain statistically insignificant.

Empirical results of the effects of monetary policy on income inequality

This section addresses the role monetary policy plays in income redistribution. The findings show that increases in the monetary policy interest rate causes a reduction in income inequality albeit statistically insignificant, and this is shown in Model 11. Given that the available data on monetary policy interest rate are very limited reducing the sample of countries to only 17, we use lending interest rates and deposit interest rates as alternative proxies for monetary policy. We find that contractionary monetary policy (increase in the lending interest rate) reduces income inequality in Model 12 and it is statistically significant. This is probably because contractionary monetary policy lowers the incomes of business owners as a lot more is required in debt servicing hence narrowing the income gap. This is also because richer households according to Coibion et al. (2017) receive relatively more business income. Also, a rise in the lending interest rate may have a detrimental consequence on the incomes of variable interest mortgage payers who usually form part of the richer households. Our result corroborates the findings of Davtyan (2016) who also find that contractionary monetary policy reduces income inequality in the USA in both the short run and long run. The findings in Model 13 also show that increases in the deposit rate raises the financial income of depositors or surplus fund holders and may increase income inequality. This is, however, not statistically significant. Coibion et al. (2017) similarly find that contractionary monetary policy shocks tend to increase the income of those who receive lots of financial income but lowers the incomes of business owners. Also, Coibion and Gorodnichenko (2012) narrate that monetary policy is highly persistent and policy shocks do propagate for a long time, and this aligns with our findings of a long-run effect of lending rate. We also employ the simultaneous quantile regression in this case for robustness checks, and this is shown in Appendix 4. Our findings reveal that increases in lending rate actually causes an increase in income inequality at all percent quantiles albeit statistically significant only at the lower and mid-quantiles. Thus, contractionary monetary policy causes an increase in income inequality and this appears statistically significant at the 10th, 25th and 50th percent quantiles of the income inequality distribution, and this is shown in Model 19, Model 20, and Model 21, respectively. This finding is in line with the results of Coibion et al. (2017) and Furceri et al. (2018) who find that contractionary monetary policy increases income inequality. This finding also supports the savings redistribution channel argument which explains that an increase in interest rate will be of more benefit to savers (surplus fund holders) than borrowers (those in need of funds) since savers are generally considered to be wealthier than borrowers. This is likely to widen the income inequality gap (Table 5).

Conclusion and recommendations

Income inequality has become a global defining challenge and continues to be one of the focal issues in the Sustainable Development Goals. In this study, we comprehensively examine the roles of fiscal and monetary policies in income redistribution in

Table 5 The effects of monetary policy on income inequality

Variables	Model 11	Model 12	Model 13
Lag of income inequality	0.998***	1.049***	1.046***
	(0.043)	(0.021)	(0.020)
Monetary policy interest rate	− 0.001		
	(0.005)		
Lending interest rate		− 0.006***	
		(0.002)	
Deposit interest rate			0.002
			(0.005)
Real GDP per capita	0.041	0.316	0.477
	(1.603)	(0.916)	(0.653)
Real GDP per capita square	− 0.004	− 0.023	− 0.031
	(0.112)	(0.068)	(0.046)
Political globalization	− 0.005	0.002	0.002
	(0.008)	(0.003)	(0.003)
Democracy—polity2	0.018	− 0.011	− 0.010
	(0.012)	(0.008)	(0.007)
Trade openness	0.234	0.137	0.186
	(0.354)	(0.162)	(0.165)
FDI	− 0.002	0.003	0.002
	(0.006)	(0.003)	(0.003)
Age dependency ratio	− 0.008	− 0.013**	− 0.011***
	(0.009)	(0.006)	(0.004)
Population growth	− 0.033	0.081**	0.087
	(0.142)	(0.031)	(0.057)
School enrolment rate	0.002	− 0.004	− 0.003
	(0.003)	(0.003)	(0.004)
Unemployment	− 0.015	− 0.025*	− 0.026*
	(0.017)	(0.013)	(0.014)
Gross capital formation	− 0.012**	− 0.007**	− 0.006*
	(0.005)	(0.003)	(0.003)
Natural resource rent	− 0.004	0.002	− 0.000
	(0.006)	(0.006)	(0.005)
Constant	1.220	− 1.945	− 2.796
	(8.583)	(3.152)	(2.282)
Observations	128	328	361
Number of countries	17	33	36
Number of instruments	16	16	16
Wald test (Prob > F)	0.000	0.000	0.000
AR(1):(Pr > z)	− 1.67(0.094)	− 1.17(0.243)	− 1.51(0.132)
AR(2):(Pr > z)	− 0.56(0.577)	− 0.99(0.322)	− 0.85(0.396)
Sargan test:(Prob > chi2)	12.09(0.001)	2.03(0.154)	6.31(0.012)
Hansen test: (Prob > chi2)	2.84(0.092)	0.69(0.406)	2.09(0.148)

Standard errors in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$ Model 11, 12, and 13 discuss the effects of monetary policy rate, lending rate and deposit rate on income inequality, respectively

Africa. We use fiscal redistribution, total tax revenue, direct taxes, indirect taxes, property tax, government final consumption expenditure, expenditure on education, expenditure on primary, secondary and tertiary education as indicators of fiscal policy. We also use monetary policy rate, lending rate and deposit interest rate as alternative measures of monetary policy. We find evidence that supports the notion that direct taxes are more progressive and able to provide both short- and long-run mitigation for economic inequality, while indirect taxes and property tax have income unequalizing effects in Africa. Furthermore, we find government spending on basic education to have income equalizing effects, while spending on secondary and tertiary education appears income unequalizing. Also, some form of short- and long-run relationship exists between contractionary monetary policy and income inequality in Africa. Lastly, we find evidence of the existence of the inverted U-shaped Kuznets curve in our model.

We suggest that tax reforms should be geared towards broadening the tax base with a particular focus on making the tax structure more progressive if income redistribution is of significance in tax administration in Africa. Thus, efforts need to be put in place to roll in more direct taxes. Also, there should be greater improvement in compliance in paying property taxes while enrolling more households in the property tax net. Furthermore, a more equitable redistribution of household income can be enforced through higher spending on basic education. Monetary policy authorities should also take notice of the unintended redistributive effects of contractionary monetary policy.

Appendix 1

See Table 6

Table 6 List of countries used in the study

1. Algeria	2. Benin	3. Botswana	4. Burkina Faso	5. Burundi
6. Cabo Verde	7. Cameroon	8. CAR	9. Chad	10. Comoros
11. DRC	12. Côte D'Ivoire	13. Egypt	14. Eswatini	15. Gabon
16. Gambia	17. Ghana	18. Guinea	19. Guinea Bissau	20. Kenya
21. Lesotho	22. Liberia	23. Madagascar	24. Malawi	25. Mali
26. Mauritania	27. Mauritius	28. Morocco	29. Mozambique	30. Niger
31. Nigeria	32. Rwanda	33. Senegal	34. Sierra Leone	35. South Africa
36. Tanzania	37. Togo	38. Tunisia	39. Uganda	40. Zimbabwe

Appendix 2

See Table 7

Table 7 Variance inflation factor

	VIF	1/VIF
Real GDP per capita	6.188	.162
School enrolment rate	5.256	.19
Tax	4.163	.24
Population growth	4.121	.243
Unemployment	3.701	.27
Trade openness	3.297	.303
Age dependency	2.823	.354
Government expenditure	2.695	.371
Political globalization	2.478	.404
Polity2	2.316	.432
Gross capital formation	2.15	.465
FDI	2.114	.473
Natural resource rent	1.8	.556
Lending rate	1.419	.705
Mean VIF	3.18	

Appendix 3

See Table 8

Table 8 The effects of property tax on income inequality—quantile regression

Variables	Model 14	Model 15	Model 16	Model 17	Model 18
Quantiles	**0.10**	**0.25**	**0.50**	**0.75**	**0.90**
Property tax	**4.563***** (1.477)	**5.046***** (1.512)	**6.509***** (1.836)	**5.370** (3.312)	**− 0.778** (2.562)
Real GDP per capita	22.09*** (5.434)	21.73** (8.797)	30.59*** (8.649)	15.81 (12.57)	− 19.50 (16.98)
Real GDP per capita—squared	− 1.562*** (0.370)	− 1.578*** (0.592)	− 2.131*** (0.567)	− 1.115 (0.935)	1.382 (1.207)
Political globalization	− 0.138*** (0.0466)	− 0.204*** (0.0378)	− 0.232*** (0.0383)	− 0.210*** (0.0526)	− 0.161*** (0.0572)
Democracy—polity2	− 0.169*** (0.0633)	− 0.0882 (0.0717)	− 0.0465 (0.0458)	− 0.0110 (0.0786)	− 0.247** (0.0980)
Trade openness	− 0.551 (2.151)	− 4.599 (2.910)	− 7.868*** (1.904)	− 8.785*** (1.925)	− 3.906 (2.485)
FDI	0.0899 (0.0838)	0.0197 (0.0685)	0.117 (0.0954)	0.0676 (0.0916)	0.0122 (0.0786)
Age dependency ratio	0.230*** (0.0755)	0.251*** (0.0612)	0.150** (0.0719)	0.108 (0.101)	− 0.213** (0.0912)

Table 8 (continued)

Variables	Model 14	Model 15	Model 16	Model 17	Model 18
Population growth	− 1.531**	− 1.172	0.176	− 0.248	2.424**
	(0.760)	(0.800)	(0.669)	(1.375)	(1.208)
School enrolment	0.148***	0.184***	0.142***	0.107***	0.00522
	(0.0490)	(0.0296)	(0.0322)	(0.0325)	(0.0292)
Unemployment	0.204	0.451***	0.538***	0.684***	0.604***
	(0.143)	(0.142)	(0.0703)	(0.0985)	(0.144)
Gross capital formation	− 0.133**	− 0.0950*	− 0.178***	− 0.152***	− 0.0574
	(0.0565)	(0.0499)	(0.0633)	(0.0404)	(0.0632)
Natural resource rent	− 0.0332	− 0.0484	− 0.0541	− 0.00604	− 0.111
	(0.0459)	(0.0378)	(0.0526)	(0.0892)	(0.102)
Constant	− 48.75**	− 43.71	− 64.13**	− 6.141	137.2**
	(21.23)	(33.96)	(30.14)	(39.23)	(57.61)
Observations	256	256	256	256	256
Pseudo-R^2	0.3334	0.3642	0.4376	0.5602	0.6467

Standard errors in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Appendix 4

See Table 9

Table 9 The effects of monetary policy on income inequality

Variables	Model 19	Model 20	Model 21	Model 22	Model 23
Quantiles	**0.10**	**0.25**	**0.50**	**0.75**	**0.90**
Lending rate	**0.128*** **	**0.0764*** **	**0.0624*** **	**0.0244**	**0.0238**
	(0.0295)	(0.0260)	(0.0216)	(0.0373)	(0.0468)
Real GDP per capita	8.609	10.67	− 19.80	− 37.29***	− 24.91***
	(7.730)	(12.12)	(15.30)	(7.598)	(6.574)
Real GDP per capita-squared	− 0.740	− 0.866	1.552	2.776***	1.880***
	(0.591)	(0.862)	(1.131)	(0.535)	(0.446)
Political globalization	− 0.0762	− 0.107***	− 0.0252	− 0.0440	− 0.122***
	(0.0475)	(0.0369)	(0.0386)	(0.0325)	(0.0360)
Democracy—polity2	0.0641	0.199	0.0956	− 0.0354	− 0.0852
	(0.0698)	(0.140)	(0.0815)	(0.0593)	(0.0576)
Trade openness	− 1.525	− 1.864	0.757	1.729	− 1.763
	(1.537)	(3.333)	(2.774)	(2.508)	(2.448)
FDI	− 0.00664	− 0.0217	− 0.00405	0.0358	0.0877*
	(0.0548)	(0.0666)	(0.0926)	(0.0671)	(0.0479)
Age dependency ratio	0.0274	0.230*	0.200***	0.0564	− 0.00971
	(0.103)	(0.124)	(0.0623)	(0.0691)	(0.0505)
Population growth	0.282	− 2.116	− 0.646	− 0.423	− 0.816*
	(0.945)	(1.464)	(0.678)	(0.437)	(0.493)
School enrolment	0.0495	0.113***	− 0.000505	0.00911	0.0539
	(0.0510)	(0.0421)	(0.0358)	(0.0333)	(0.0346)

Table 9 (continued)

Variables	Model 19	Model 20	Model 21	Model 22	Model 23
Unemployment	0.189*	0.355	0.454***	0.208**	0.169**
	(0.104)	(0.220)	(0.126)	(0.0957)	(0.0797)
Gross capital formation	0.00485	0.0639	0.00282	0.0161	0.0292
	(0.0361)	(0.0411)	(0.0468)	(0.0370)	(0.0338)
Natural resource rent	− 0.171***	− 0.135**	− 0.280***	− 0.272***	− 0.229***
	(0.0359)	(0.0661)	(0.0548)	(0.0712)	(0.0450)
Constant	12.35	− 7.870	88.69*	167.1***	137.7***
	(23.61)	(43.64)	(50.38)	(24.06)	(20.82)
Observations	335	335	335	335	335
Pseudo-R^2	0.2759	0.2589	0.3533	0.5112	0.6008

Standard errors in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Funding No funding was received to assist with the preparation of this manuscript.

References

Adeleye N, Osabuohien E, Bowale E (2017) The Role of Institutions in the Finance-Inequality Nexus in Sub-Saharan Africa. J Contextual Econ 137:173–192

Agoba AM, Abor J, Osei KA, Sa-Aadu J (2019) Do independent Central Banks Exhibit Varied Bahaviour in Election and Non-Election Years? The Case of Fiscal Policy in Africa. J Afr Bus 21(1):105–125

Altunbas Y, Thornton J (2019) The impact of financial development on income inequality: A quantile regression approach. Econ Lett 175:51–56

Anyanwu JC (2016) Empirical analysis of the main drivers of income inequality in Southern Africa. Ann Econ Financ 17(2):337–364

Anyanwu J, C., Erhijakpor, A. E. O., & Obi, E. (2016) Empirical Analysis of the Key Drivers of Income Inequality in West Africa. Afr Dev Rev 28(1):18–38

Asongu SA (2014) Financial development dynamic thresholds of financial globalization: evidence from Africa. J Econ Stud 41(2):166–195

Asongu, S. A & Nwachukwu, J. (2016). Determinants of Mobile Phone Penetration: Panel Threshold Evidence from Sub-Saharan Africa. African Governance and Development Institute working paper, WP/16/046.

Asongu SA, Orim SI, Ntig RT (2019) Inequality, information technology and inclusive education in sub-Saharan Africa. Technol Forecasting Social Change 146:380–389

Asongu SA, Nnanna J, Acha-Anyi, (2020) Finance, inequality and inclusive education in Sub-Saharan Africa. Econ Anal Policy 67:162–177

Aye GC, Clance MW, Gupta R (2018) The effectiveness of monetary and fiscal policy shocks on US inequality: the role of uncertainty. Qual Quant: Int J Methodol 53(1):283–295

Berisha E, Meszaros J, Olson E (2018) Income inequality, equities, household debt, and interest rates: Evidence from a century of data. J Int Money Finance 80:1–14

Cevik, S. & Correa-Caro, C. (2015). 'Growing (Un) equal: Fiscal Policy and Income Inequality in China and BRIC+', IMF Working Paper Doi: https://doi.org/10.5089/9781475519976.001

Chu LK, Hoang DP (2020) How does economic complexity influence income inequality? New evidence from international data. Economic Analysis and Policy 68:44–57

Claessens S, Perotti E (2007) Finance and Inequality: Channels and evidence. J Comp Econ 35(4):748–773

Coibion O, Gorodnichenko Y (2012) Why are target interest rate changes so persistent? American Economic Journal 4:126–162

Coibion, O., Gorodnichenko, Y., Kueng, L. & Silvia, J. (2012), "Innocent Bystanders? Monetary Policy and Inequality in the U.S," NBER Working Paper 18170, National Bureau of Economic Research, Inc.
Coibion O, Gorodnichenko Y, Kueng L, Silvia J (2017) Innocent bystanders? Monetary policy and inequality. J Monet Econ 88:70–89
Cojocaru A & Diagne MF (2014) Should Income Inequality Be Reduced and Who Should Benefit? Redistributive Preferences in Europe and Central Asia. World Bank Policy Research Working Paper 7097, November 2014
Dabla-Norris E, Kochhar K, Suphaphiphat N, Ricka F, Tsounta E (2015) Causes and consequences of income inequality: A global perspective. Staff Discussion Notes 15(13):1
Davtyan K (2016) Income Inequality and Monetary Policy: An Analysis on the Long Run Relation. Research Institute of Applied Economics & Regional Quantitative Analysis Research Group, working paper 2016/04.
Dincer O, Gunalp B (2012) Corruption and Income Inequality in the United States. Contemp Econ Policy 30(2):283–292
Furceri D, Loungani P, Zdzienicka A (2018) The effects of monetary policy shocks on inequality. J Int Money Financ 85:168–186
Fosu AK (2015) Growth, Inequality and Poverty in Sub-Saharan Africa: Recent Progress in a Global Context. Oxf Dev Stud 43(1):44–59
Fosu AK, Abass AF (2019) Domestic Credit and Export Diversification: Africa from a Global Perspective. J Afr Bus 20(2):160–179
Gupta S (2018) Income inequality and fiscal policy: Agenda for reform in developing countries. Working Paper commissioned by the Group of 24 and Friedrich-Ebert-Stiftung New York.
Hundenborn J, Leibbrandt M & Woolard I (2018) Drivers of inequality in South Africa. WIDER Working Paper, No. 2018/162. The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki.
Inchauste G, Lustig N, Maboshe M, Purfield C & Woolard I (2015) The distributional impact of fiscal policy in South Africa. World Bank Policy Research Working Paper 7194. February, 2015.
International Monetary Fund (2014). Fiscal Policy and Income Inequality. Policy paper.
International Monetary Fund (2015) Inequality and Fiscal Policy. Washington D.C, USA
Kunawotor ME, Bokpin AG & Barnor C (2020) Drivers of income inequality in Africa: Does institutional quality matter? *African Development Review*. Forthcoming.
Lee H, Kim J & Cin BC (2013) Empirical Analysis on the Determinants of Income Inequality in Korea. *International Journal of Advanced Science and Technology*, 53 (April)
Mumtaz H, Theophilopoulou A (2017) The impact of monetary policy on inequality in the UK. Empirical Anal Eur Econ Rev 98:410–423
Muinelo-Gallo L, Roca-Sagalés O (2013) Joint determinants of fiscal policy, income inequality and economic growth. Econ Model 30:814–824
Tchamyou VS, Asongu SA, Odhiambo NM (2019) The Role of ICT in Modulating the Effect of Education and Lifelong Learning on Income Inequality and Economic Growth in Africa. Afr Dev Rev 31(3):261–274
Odusola A (2017) Fiscal Space, Poverty and Inequality in Africa. Afr Dev Rev 29(1):1–14
OECD (2015) In it together: Why less inequality benefits all. OECD Publishing, Paris
Ostry JD, Berg A & Tsangarides C (2014) "Redistribution, Inequality, and Growth." IMF Staff Discussion Note 14/02, International Monetary Fund, Washington.
Salotti S, Trecroci C (2018) Cross country evidence on the distributional impact of fiscal policy. Appl Econ 50(51):5521–5542
Shimeles A, Nabassaga T (2018) Why is inequality high in Africa? J Afr Econ 27(1):108–126
Sulemana I, Kpienbaareh D (2018) An empirical examination of the relationship between income inequality and corruption in Africa. Econ Anal Policy 60:27–42
United Nations Department of Economic and Social Affairs (2019). Income Inequality trends: the choice of indicators matters. Social Development Brief.
United Nations Development Programme (2017). Income Inequality Trends in Sub-Saharan Africa: Divergence, Determinants and Consequences. UNDP report, USA.
Villarreal F (2014),"Monetary Policy and Inequality in Mexico," MPRA Paper 57074
World Bank (2016) Poverty and Shared Prosperity, Taking on inequality. Washington D.C