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ORIGINAL RESEARCH

Income Inequality, Human Capital and Institutional Quality in Sub-Saharan Africa

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Abstract
This paper aligns with Sustainable Development Goal 10 to investigate the role of quality institutions in the human capital-income inequality nexus. It uses an unbalanced panel data on the Gini index (measure of income inequality), human capital index and institutional quality index on 46 sub-Saharan African countries from 2010 to 2019. The Driscoll and Kraay (Rev Econ Stat 80:549–560, 1998) panel spatial correlation consistent (PSCC) and Firpo et al. (Unconditional quantile regressions. National Bureau of Economic Research Working Paper, No. 339, pp 1–54, 2007. https://doi.org/10.3982/ECTA6822) bootstrap unconditional quantile regression (UQR) techniques are deployed. Among others, findings reveal that: (1) human capital and institutions aggravate inequality; (2) the interaction of human capital and institution reduce inequality; (3) UQR reveals that the interaction effect is negative at lower quantiles of 0.10, 0.25 and 0.50; and (4) results across the sub-regions are mixed. In addition, evidence from the margin plots reveals that the conditional effect of human capital on income inequality is negative as institutions are strengthened. The downward trend of the plot within the 95% confidence interval shows that institutional quality enhances the impact of human capital on income inequality. These are novel contributions to the literature as it suggests that quality institutions matter in the drive towards reducing the menace of income inequality. Policy recommendations include strengthening institutions and making basic education affordable.

Keywords Human capital · Institutions · Income inequality · SSA

1 Introduction

There is no doubt that income inequality is a deeply rooted and multifaceted problem, with both moral and economic aspects, which is why the topic spurs a continuous global discussion. This current study is situated within the human capital-inequality and institutions-inequality theories that indicate a variety of direct and indirect ways through which changes in human capital and institutional quality can exacerbate or reduce the inequality of pecuniary

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opportunities. Since human capital and institutions play critical roles in theories of persistent inequality as they shape the gap between the rich and the poor, the theoretical exposé of Galor and Moav (2004, 2006) show that investments in human capital and distribution of human capital accumulation can distort the demand for production inputs (particularly labour) with adverse consequences on poverty and income distribution. Similarly, institutionalists (Acemoglu & Johnson, 2005; Acemoglu & Robinson, 2010) argue that the existence of quality and efficient institutions is a precursor for ensuring the equitable distribution of resources. Hence, the conjecture is that both human capital and quality institutions are essential determinants of income inequality.

This study further situates the 2030 United Nations Sustainable Development Goals 3 (ensure good health and well-being), 4 (basic schooling for all) and 10 (reduce income inequality) to assess the impact of human capital on income inequality. According to human capital theorists, human capital accumulation is paramount to maximising the potentials of a given population (Aiyar & Ebeke, 2020; Sylwester, 2000) and from the theoretical exposé of Galor and Zeira (1993) and Galor and Moav (2004, 2006), human capital shapes the gap between the rich and the poor and affects the extent to which that gap widens or contracts across generations. To reduce the inequality gap, studies have shown the importance of reducing or removing impediments to human capital accumulation (Chetty et al., 2018; Corak, 2016; Marrero & Rodríguez, 2013). However, the relationship between human capital and income inequality may not be direct as there are channels through which human capital either aggravate or reduce the inequality of pecuniary opportunities as posited by some studies (Acemoglu et al., 2014; Adeleye et al., 2017; Asamoah, 2021; Bahamonde & Trasberg, 2021; Chambers & O'Reilly, 2021; Saha et al., 2021) to mention a few. To this end, institutions provide the enabling environment such as a well-functioning human capital market which increases the gains from education and stimulates uneducated cohorts to accumulate human capital (Acemoglu & Robinson, 2010; Adeleye et al., 2022; Dias & Tebaldi, 2012). Therefore, this study argues that quality institutions are essential to evaluating the extent to which human capital closes the gap between the rich and the poor and that the effect of human capital on income distribution is conditioned on quality institutions. These are gaps in the current literature that this study attempts to fill.

The focus on sub-Saharan Africa (SSA) is germane given the high levels of income inequality. The UNDP (2017) Report confirms that SSA remains as one of the most unequal regions in the world even when its average unweighted Gini declined by 3.4 percentage points between 1991 and 2011. The Report further states that the region inhabits 10 of the 19 most unequal countries globally with seven outlier African countries (mostly located in Southern Africa) driving this inequality. As shown in Fig. 1, extreme levels of Gini Index are evident in South Africa, Zambia, Central African Republic, Eswatini, Namibia and Burkina Faso whereas Nigeria, Mauritius, Seychelles, and Gabon show high inequalities. Though, a negative slope is expected, the visibly positive slope of the curves between the Gini Index, human capital index and institutional quality index necessitates the quest for further scientific investigation of these intrinsic relationships which gives some measure of justification for engaging the study.

The documented evidence on the impact of institutions and human capital on income inequality reveals some lacuna in the literature, which to the best of knowledge, has not been addressed. Hence, this study attempts to make four crucial empirical incursions, to: (1) examine the independent effects of human capital and institutional quality on income inequality; (2) evaluate the interaction effect of human capital and institutional quality on

Fig. 1 Plots of Gini index, human capital index and institutional quality in SSA, 2010–2019. Source: Author's Computations

income inequality; (3) gauge the *conditional* impact of human capital on income inequality; and (4) compare if there are significant differences across the sub-regions. The rest of the paper is structured as follows: Sect. 2 discusses the literature; Sect. 3 outlines the data and empirical model; Sect. 4 discusses the results, and Sect. 5 concludes with policy recommendations.

2 Literature Review

The empirical exposé on the income inequality, human capital and institutions nexus is wide and ranging. This section without claiming to be exhaustive reviews some recent studies and their diverse outcomes attributable to the scope and empirical methods deployed in those studies.

2.1 Income Inequality and Human Capital

Various studies have tested the theoretical exposé of Galor and Moav (2004, 2006) about the role of human capital in contracting or exaggerating income inequality. While some studies conclude that education (mostly used human capital proxy) narrows the inequality gap, others find that it exacerbates inequality. For instance, Doruk et al. (2022) use the ordinary least squares (OLS) approach on a study of Brazil and Panama to find that education reduces income inequality. Similarly, Sethi et al. (2021) deploy the autoregressive distributed lag model (ARDL) on a study of India from 1980 to 2014 to establish that education shows significant inequality-reducing possibilities. In the same vein, Sethi et al. (2021) use the panel regression model on 27 European Union countries from 2000 to 2019 to find a significant negative relationship between education and income inequality. Also, Berisha et al. (2021) engage the fixed effects technique on the United States to find education as a significant negative predictor of income inequality. Using the overlapping-generations general equilibrium model, Kim (2021) uses the Panel Study Income Dynamics (PSID) to establish a negative nexus between education and wealth inequality. On a study of 88 countries from 2002 to 2017, Chu and Hoang (2020) deploy a battery of econometric techniques to conclude that education has significant inequality-reducing potentials. Likewise, Shahabadi et al. (2018) on a study of Islamic countries from 1990 to 2013 use the fixed effects model to find that education reduces income inequality. Lastly, Yang and Qiu (2016) use econometric calibrations on China education system to show that education significantly reduces inequality.

Contrarily, some studies find that income inequality and human capital exert positive nexus. Sawadogo and Semedo (2021) use the finite mixture model on a panel of 28 SSA countries from 2004 to 2016 to conclude that human capital exacerbates income inequality. Also, Saha et al. (2021) deploy the difference generalised method of moments (DGMM) on a study of 21 Asian countries to reveal a significant negative relationship between education and income inequality. With calibrations, Tang and Wang (2021) use the 1993, 2003 and 2013 data on the National Survey of College Graduates to assert that education mismatch widens income inequality. Equally, Alvarado et al. (2021) use the fully modified OLS on a panel study of 75 countries from 1990 to 2016 to show that education widens the inequality gap. In position, Demir et al. (2020) use the pooled OLS and quantile regression to find that education increases inequality on a panel study of 140 countries. On the flipside, Hu (2021) deploys the fixed effects-instrumental variables (FE-IV) technique on China from 1996 to 2018 to reveal that income inequality increases human capital. This outcome supports Asongu et al. (2020) who find that inequality widens inclusive education on a sample of 42 SSA countries from 2004 to 2014.

2.2 Income Inequality and Institutional Quality

Acemoglu and Johnson (2005), Acemoglu and Robinson (2010) and Acemoglu et al. (2014) hypotheses on the inequality-reducing potentials of institutions have been subjected to series of empirical validations with varying outcomes. Depending on the study scope and empirical approach, both positive and negative relationships have emerged. Vu (2022) uses the FE-IV technique to show that political instability reduces income redistribution from a panel of 143 countries from 1996 to 2015. Correspondingly, Asamoah (2021) deploys that dynamic panel threshold on a panel of 76 developed and developing economies from 1995 to 2017 to establish that institutional quality has inequality-reducing attributes. Also, Bahamonde and Trasberg (2021) use the two-stage least squares and the GMM approach on a panel of 126 industrial and developing economies to find that democratic government exerts a reducing effect on income inequality. This is similar to the outcome from Adams and Akobeng (2021) on a sample of 46 African countries from 1948 to 2018. As an outlier, Chia et al. (2022) use the panel vector autoregressive (PVAR) model on a panel of 68 developing countries from 2000 to 2016 to show that transparency has no significant effect on income inequality.

However, quite a few studies found that institutions exacerbate income inequality. Starting with Saha et al. (2021) who use the DGMM to show that corruption widens inequality on a sample of 21 Asian economies from 1995 to 2015. Also, Keneck-Massil et al. (2021) deploy sequential linear panel data estimator to conclude that corruption exacerbates inequality on a study of 172 countries from 1975 to 2017. Likewise, Chambers and O'Reilly (2021) use the fixed effects approach to reveal that regulations widen inequality in the United States from 1997 to 2015. Similarly, Kammas and Sarantides (2019) engage a several analytical methods on a sample of 174 countries from 1960 to 2013 to reveal that dictatorial regimes worsen income distribution. Meniago and Asongu (2018) use the GMM method to establish that political instability exaggerates inequality from a sample of 48 SSA countries from 1996 to 2014. Other studies who found that corruption widens the inequality gap are Adeleye et al. (2017) on a panel of 42 SSA countries from 1996 to 2015, Perera and Lee (2013) on a sample of 9 developing countries from 1985 to 2009, Kar and Saha (2012) on a panel of 19 Asian countries from 1995 to 2008, and Andrés and Ramlogan-Dobson (2011) on a panel of 19 Latin American countries from 1982 to 2002.

2.3 Novelty and Gap

Primarily, this current study diverges from previous studies from two perspectives: (i) the existing literature examines only the direct effect of human capital and institutional quality on income inequality but this current study deviates by exploring if the inequality gap contracts when human capital is interacted with institutional quality; and (ii) the empirical approach is improved to offer robustness to the analysis using the unconditional quantile regression technique developed by Firpo et al. (2007) to examine the impact of human capital and institutional quality on the conditional distribution of income inequality which differs from the conditional mean regressions carried out by prior studies. To the best of knowledge, this paper is the first to examine whether institutional quality is key to inducing the role of human capital in reducing income inequality in SSA regions using the quantile regression. These are gaps in the literature and novelty of this study.

3 Data and Methodology

3.1 Scope, Data and Sources

The study uses an unbalanced panel data sample of 46 SSA countries[1] from 2010 to 2019. In line with the literature, the variables used are: Gini coefficient—proxy for income inequality ranges between 0 (equality) and 100 (extreme inequality)—is the dependent

[1] **SSA (46):** Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Congo, Dem. Rep., Congo, Rep., Cote d'Ivoire, Equatorial Guinea, Eritrea,, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

variable obtained from UNU-WIDER (2021). The main explanatory variable is the human capital index which quantifies the health and education productivity of individuals. The data is sourced from Feenstra et al. (2015) Penn World Table10.0. The second explanatory and moderation variable is an index of institutional quality created using Principal Component Analysis (PCA) from six individual governance indicators of World Bank (2020b). The study controls for per capita GDP sourced from UNU-WIDER (2021) because increase in per capita income is expected to reduce the inequality gap (Adeleye et al., 2020; Fosu, 2017; Marrero & Rodríguez, 2013). Other control variables sourced from World Bank (2020a) are: unemployment rate which is expected to aggravate inequality (Adeleye & Jamal, 2020); total natural resources is expected to equilibrate the income distribution (Kim & Lin, 2017; Langnel et al., 2021), and domestic credit to the private sector (% of GDP) which follows from the finance-inequality protagonists that an efficient financial market is inequality-reducing (Adeleye, 2021; Demirgüç-Kunt & Levine, 2009; Greenwood & Jovanovic, 1990; Levine, 2004). For robustness checks, three education indicators sourced from World Bank (2020a) —primary, secondary, and tertiary school enrolments are used.

3.2 Empirical Model

The empirical model draws from two theoretical underpinnings—the Galor and Moav (2004, 2006) conjecture that human capital plays an important role in determining generational inequality and the Acemoglu and Johnson (2005), Acemoglu and Robinson (2010) and Acemoglu et al. (2014) hypotheses that quality institutions are essential ingredients in the drive towards reducing income inequality. Given this, the baseline model specifies the Gini index (measure of income inequality) as a function of human capital, institutional quality, and a set of control variables:

$$\ln Gini_{it} = \delta_0 + \delta_1 \ln HCI_{it} + \delta_2 \mathrm{IQI}_{it} + \vartheta \boldsymbol{K}'_{it} + a_i + \varphi_t + e_{it} \tag{1}$$

Equation (1) addresses the first objective where, ln = natural logarithm; *Gini* = proxy for income inequality; *HCI* = human capital index; *IQI* = institutional quality index; $\boldsymbol{K}'$ = vector of control variables; δ_j and ϑ = parameters to be estimated, *i,* countries, 1, 2…, *N; t,* time, 1, 2…., *T*, a_i = region fixed effects; φ_t = time dummies; and e_{it} = error term. The two-way error component model is specified to recognise the distinct heterogeneities among the countries in the panel. Given that the level of economic development across these countries differ, it becomes imperative control for the unobserved fixed affects. To address the second objective which is to evaluate the interaction effect, Equation (1) is modified to include the interaction of human capital and institutional quality. That is,

$$\ln Gini_{it} = \eta_0 + \eta_1 \ln HCI_{it} + \eta_2 \mathrm{IQ}_{it} + \theta(\ln HCI_{it} * \mathrm{IQ}_{it}) + \omega \boldsymbol{X}'_{it} + \phi_i + \vartheta_t + v_{it} \tag{2}$$

where θ weighs the interaction effect of *HC* and *IQ* on *Gini* such that the *conditional* effect of human capital on income inequality is evaluated as:

$$\frac{\partial \ln \mathrm{Gini}}{\partial \ln \mathrm{HCI}} = \eta_1 + \theta \mathrm{IQI} \tag{3}$$

Note, η_1 is expected to be negative and if θ is negative (positive), it implies that the interaction of *IQI* enhances (distorts) the "good" effect of *HCI* on *Gini* which satisfies our

Table 1 Summary statistics and pairwise correlation analysis. Source: Author's Computations

Variable	GINI	HCI	IQI	PRY	SEC	TER	PC	DC	UNEM	TNR
Summary statistics										
Obs	459	359	459	226	253	288	459	413	449	451
Mean	56.116	1.863	−0.962	79.915	50.02	10.899	5217.668	23.243	7.754	10.462
Std. Dev	5.792	0.46	1.859	14.081	22.378	8.245	6358.595	23.721	6.635	9.46
Min	35.541	1.166	−4.245	38.389	13.042	0.716	751.66	3.724	0.32	0.001
Max	72.877	3.007	3.759	98.841	109.444	44.392	36,671.36	140.541	27.04	56.039
Pairwise correlation analysis										
lnGINI	1.000									
lnHCI	0.11**	1.000								
IQI	0.032	0.435***	1.000							
lnPRY	0.166**	0.488***	0.548***	1.000						
lnSEC	0.015	0.765***	0.567***	0.496***	1.000					
lnTER	0.025	0.621***	0.490***	0.496***	0.738***	1.000				
lnPC	−0.086*	0.666***	0.477***	0.193***	0.694***	0.658***	1.000			
lnDC	0.096*	0.344***	0.671***	0.435***	0.633***	0.585***	0.425***	1.000		
lnUNEM	0.215***	0.464***	0.271***	0.078	0.592***	0.464***	0.630***	0.314***	1.000	
lnTNR	0.218***	−0.348***	−0.678***	−0.397***	−0.600***	−0.484***	−0.465***	−0.605***	−0.192***	1.000
Cross-sectional dependence										
Statistic	1.995**	67.005***	−0.96	0.722***	16.892***	23.407***	38.668***	14.725***	12.991***	36.212***

ln natural logarithm; *GINI* Gini index; *HC* human capital index; *IQI* institutional quality index; *PRY* primary school enrolment; *SEC* secondary school enrolment; *TER* tertiary school enrolment; *PC* real GDP per capita; *DC* domestic credit; *UNEM* unemployment rate; *TNR* total natural resources

$^{***}p<0.01$, $^{**}p<0.05$, $^{*}p<0.1$

third objective. But if $\eta_1 > 0$ and θ is negative (positive), it implies that the interaction of *IQI* reduces (worsens) the "bad" effect of *HCI* on inequality. Lastly, to satisfy the fourth objective, the full sample is divided into four sub-samples (Central, East, Southern, and West Africa) and Eqs. (1, 2, and 3) are estimated.

3.3 Summary Statistics, Pairwise Correlation and Cross-sectional Dependence

Using the raw values, the upper panel of Table 1 shows the historical properties of the variables. With emphasis on the variables of interest, the average Gini index is 56.12 with a standard deviation of 5.79 which indicates wide deviation from the sample mean. South Africa consistently showed high inequality index ranging between 66.65 and 72.88 from 2010 to 2018 while Nigeria constantly shows the lowest inequality index of between 35.54 in 2019 and 43.35 in 2010. The mean human capital index is 1.86 and the standard deviation of 0.46 shows that most countries hover around the sample average. Lastly, the average institutional quality index is -0.96 and the standard deviation of 1.86 shows dispersion from the sample mean.

The middle panel details the pairwise correlation analysis using the natural logarithm of all the variables except for IQI. At the 1% and 5% significant levels, HCI, PRY, UNEM, and TNR exhibit positive and significant association with the Gini Index whereas PC shows a significant negative association at the 10% level. Since the close proximities of these countries may cause the cross-sections to be dependent, the Pesaran (2015) cross-sectional dependence test is performed and the statistically significant results displayed in the lowest panel of Table 2 provide sufficient evidence on the presence of cross-sectional dependence in the data.

3.4 Estimation Procedure

Given the presence of cross-sectional dependence, Eqs. (1 and 2) are estimated with the Driscoll and Kraay (1998) panel spatial correlation consistent (PSCC) technique. This technique permits both pooled OLS/Weighted Least Squares[2] and fixed effects (within) regressions to compute the standard errors. The approach further controls for heteroscedasticity and autocorrelation and (Cameron & Trivedi, 2005; Hoechle, 2006). However, because the PSCC approach performs a mean regression it neglects the differing impact of variables across the range of income inequality. In other words, the impact of human capital and institutional quality may vary depending on where the countries are on the inequality distribution which PSCC typically ignores. To this end, the unconditional quantile regression (UQR) procedure of Firpo et al. (2007) is deployed as it addresses this limitation whilst retaining the methodological advantages of quantile regressions. The UQR allows the estimation of the changing structure of income inequality at different points with the explanatory variables across the 10th, 25th, 50th, 75th and 90th quantiles.

[2] Weighted least squares.

Table 2 PSCC Results for the full and sub-samples (dependent variable: Gini index, log). Source: Author's Computations

Variables	Full sample		Central Africa		East Africa		Southern Africa		West Africa	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
lnPC	−0.0816***	−0.0842***	−0.0335	−0.136***	0.0359***	0.0313***	−0.0170	0.0207	−0.0626***	−0.0653***
	(−16.89)	(−19.62)	(−0.668)	(−5.220)	(3.949)	(4.226)	(−0.881)	(1.508)	(−11.69)	(−12.09)
lnDC	0.0595***	0.0637***	0.186***	0.124***	0.00868	0.0123**	0.0568**	0.0232	0.0859***	0.0881***
	(35.85)	(39.55)	(28.00)	(7.921)	(1.307)	(2.463)	(3.410)	(1.526)	(10.62)	(9.790)
lnUNEM	0.0132*	0.00871	−0.0474	0.137***	0.0310***	0.0325***	−0.138	−0.0420	−0.00113	0.000498
	(1.993)	(1.418)	(−1.260)	(6.183)	(3.531)	(3.421)	(−1.541)	(−0.688)	(−0.0875)	(0.0400)
lnTNR	0.0288***	0.0239***	0.0571***	−0.0185**	0.0598***	0.0560***	0.0247**	0.0206**	−0.0129***	−0.0160***
	(9.632)	(8.313)	(6.412)	(−2.768)	(35.72)	(25.43)	(4.069)	(3.978)	(−3.465)	(−3.465)
lnHC	0.0520***	0.0224	−0.178*	−0.869***	0.0558	0.0256	0.215**	0.308***	−0.00851	0.00903
	(3.996)	(1.561)	(−2.438)	(−9.750)	(1.672)	(0.920)	(3.972)	(9.436)	(−0.630)	(0.465)
IQI	0.0239***	0.0557***	−0.0197	0.205***	0.0170***	0.0327***	−0.0426**	0.0642**	0.0656***	0.0441**
	(5.972)	(24.30)	(−0.534)	(11.35)	(9.321)	(5.928)	(−3.860)	(4.598)	(5.545)	(2.322)
lnHC*IQI		−0.0458***		−0.298***		−0.0230***		−0.120***		0.0341*
		(−15.23)		(−7.894)		(−3.483)		(−12.93)		(1.902)
East Africa	−0.0944***	−0.117***								
	(−15.79)	(−32.62)								
Southern Africa	0.0246**	0.0253**								
	(2.250)	(2.326)								
West Africa	−0.133***	−0.152***								
	(−11.76)	(−13.98)								
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	328	328	54	54	104	104	44	44	126	126
R-squared	0.465	0.484	0.820	0.907	0.875	0.881	0.911	0.967	0.504	0.506
Countries	35	35	6	6	11	11	5	5	13	13
F-Statistic	18,199	118,285	443.5	5001	4303	6217	1535	4543	1169	4869

ln natural logarithm; *GINI* Gini index; *HC* human capital index; *IQI* institutional quality index; *PRY* primary school enrolment; *SEC* secondary school enrolment; *TER* tertiary school enrolment; *PC* real GDP per capita; *DC* domestic credit; *UNEM* unemployment rate; *TNR* total natural resources

***$p<0.01$, **$p<0.05$, *$p<0.1$; *t*-statistics in ().

4 Results and Discussions

Table 2 presents the results from the PSCC technique with the odd-numbered columns displaying results from Equation [1] while those from Equation [2] are displayed in the even-numbered columns. Starting with the control variables, *PC* significantly reduces inequality in the full sample and West Africa while it widens inequality in East Africa. That income closes the inequality gap supports Chambers and O'Reilly (2021), Adams and Akobeng (2021) and Destek et al. (2020) whereas the exacerbating effect of income is documented by Scripcar and Ciobanu (2021), and Bahamonde and Trasberg (2021). *DC* increases inequality across all the models except East Africa which provides support that finance can influence tenacious inequality (Benczúr & Kvedaras, 2020; Keneck-Massil et al., 2021; Sethi et al., 2021). As expected, *UNEM* widens inequality in the full sample and East Africa supporting previous studies on the "bad" effect of unemployment on widening income between the rich and poor (Britt, 1997; Doyle et al., 1999). Also, *TNR* has a "bad" effect on inequality across all the models except West Africa supporting the extant literature (Alvarado et al., 2021; Sebri & Dachraoui, 2021) while the "good" effect of natural resources aligns with Berisha et al. (2021) and Kim et al. (2020). From the regional intercepts, the results indicate that relative to Central Africa (base region[3]), income inequality is lower in East and West Africa but higher in Southern Africa.

The findings on the variables of interest are mixed across the models. *HC* widens inequality in the full sample and Southern Africa but closes the inequality gap in Central Africa. The "bad" effect of human capital supports Sawadogo and Semedo (2021), Saha et al. (2021), and Alvarado et al. (2021) while the "good" effect of human capital is evidenced in Doruk et al. (2022), Shahabadi et al. (2018), and Yang and Qiu (2016). Similarly, *IQI* also widens inequality in the full sample, East and West Africa but reduces inequality gap in Southern Africa. Intuitionalists documented the role of institutions in reducing inequality (Adams & Akobeng, 2021; Asamoah, 2021; Bahamonde & Trasberg, 2021) or aggravating inequality (Adeleye et al., 2017; Chong & Gradstein, 2007; Perera & Lee, 2013). As shown in columns [2], [4], [6], and [8], the interaction of human capital and institutional quality equalizes income distribution in the full sample, Central, East, and Southern Africa. These findings support the conjecture that institutional quality is relevant to inducing the effect of human capital in closing income inequality gap. The negative and statistically significant coefficient of the interaction term indicates that the interaction effect reduces inequality by −0.05%, −0.29%, −0.02%, and −0.12%, respectively. Contrarily, a positive interaction effect is observed in West Africa suggesting that inequality widens. This outcome is unsurprising since weakened institutions may erode gains from human capital which may perpetuate inequality. Following Brambor et al. (2006), the coefficient of interaction term may not fully capture the conditional effect of human capital on income inequality. Hence, to provide sufficient evidence, Table 3 shows the behaviour of human capital on income inequality at various points of institutional quality[4] which are thereafter graphically captured in Fig. 2.

[3] Central Africa is used as the base region because it shows the lowest average Gini Index (54.008) for the coverage period relative to others. See Appendix Table 1A for the sub-regions' Summary Statistics.

[4] The actual range of institutional quality index is between -4.245 and 3.725 (See Table 1).

Table 3 Conditional marginal effect of human capital on income inequality. Source: Author's Computations

IQI	Full Sample		Central Africa		East Africa		Southern Africa		West Africa	
	Coefficient	*t*-Stat	Coefficient	*t*-Stat	Coefficient	*t*-Stat	Coefficient	*t*-Stat	Coefficient	*t*-Stat
−4	0.206***	4.69	0.324***	3.34	0.118***	3.32	0.428***	9.64		
−3	0.159***	4.55	0.025	0.43	0.095***	3.06	0.308***	8.6	−0.093	−0.71
−2	0.114***	3.97	−0.273***	−6.34	0.072**	2.49	0.188***	5.84	−0.059	−0.71
−1	0.068***	2.59	−0.571***	−8.65	0.0486*	1.65	0.068*	1.93	−0.025	−0.53
0	0.022	0.77	−0.869***	−8.27	0.026	0.78	−0.052	−1.21	0.009	0.16
1	−0.023	−0.65	−1.167***	−7.88	0.003	0.07	−0.172***	−3.18	0.043	0.44
2	−0.069	−1.55			−0.020	−0.46			0.077	0.53
3	−0.115**	−2.1			−0.043	−0.83			0.111	0.56
4	−0.161**	−2.46			−0.067	−1.1				

IQI institutional quality index

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

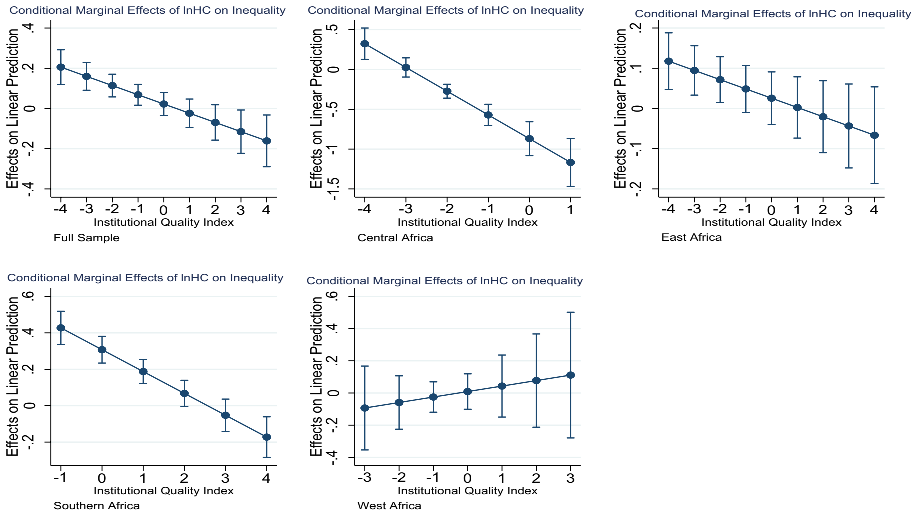

Fig. 2 Conditional margin plots of human capital index on Gini index. Source: Author's Computations

Though, not across all the points of IQI, a noticeable pattern from the plot of the full sample is the reducing effect of impact of human capital on income inequality as institutional quality improves. The downward trend of the plot within the 95% confidence interval shows that institutional quality enhances the reducing-effect of human capital on income inequality. This pattern is observed for all the regions except West Africa where human capital shows no significant conditional effect. These are novel contributions to the literature as it suggests that institutional quality may possess some inequality-reducing potentials.

For robustness checks, primary, secondary, and tertiary school enrolments rates are substituted for human capital and the composite results are displayed in Table 4. While the results across the regions are mixed, consistent findings from the full sample reveal that school enrolments and institutional quality exacerbate inequality. However, the interaction effect is significant and negative at the tertiary enrolment model. This somewhat suggests that tertiary education exerts a contractionary effect on income inequality when quality institutions are accounted for.

Lastly, the non-normal distribution of the Gini index is accounted for, and the results are shown in Table 5. From the human capital model, the equalising interaction effect is statistically significant at lower quantiles of 0.10, 0.25, and 0.50 while it widens inequality at the 90th quantile. For primary and tertiary school enrolments, the negative and significant interaction effect is evident at the 75th and 90th quantiles while for secondary school enrolment rate, the negative and significant interaction effect is evident only at the 75th quantile. Several inferences are made from these. The findings on HCI and school enrolments support the hypothesis conjecture that investment in human capital will have a reducing effect on income inequality (Chu & Hoang, 2020; Doruk et al., 2022; Sylwester, 2000, 2002).

It further substantiates the human capital-inequality path as one of the ways to stemming the scourge of income inequality. In other words, increase in human capital and more efficient institutions will cause a narrowing of the income inequality gap. This is a novel contribution to the literature and aligns with expectations supporting the results shown in Table 2.

Table 4 School enrolments, institutions and Gini index, PSCC results. Source: Author's Computations

Variables	Primary school enrolment									
	Full Sample		Central Africa		East Africa		Southern Africa		West Africa	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
lnPC	−0.00941	−0.00616	−0.0142	−0.00140	−0.0195	−0.00541	−0.00258	−0.00677	−0.0344	−0.00471
	(−0.614)	(−0.351)	(−1.320)	(−0.111)	(−0.433)	(−0.135)	(−0.161)	(−0.558)	(−1.142)	(−0.176)
lnDC	0.0115	0.0112	−0.0446	−0.0115	−0.0125	−0.00185	0.0491	0.0351*	0.0271**	0.0318**
	(0.789)	(0.793)	(−1.075)	(−0.294)	(−0.517)	(−0.0894)	(1.581)	(2.166)	(2.213)	(2.140)
lnUNEM	0.0214***	0.0217***	0.0257	0.0139	0.0823***	0.0744***	−0.0272	0.146	0.00346	−0.00603
	(3.570)	(3.732)	(1.513)	(0.931)	(5.299)	(5.472)	(−0.164)	(1.915)	(0.208)	(−0.397)
lnTNR	0.0363***	0.0357***	−0.0304	−0.0112	0.0436***	0.0437***	0.0166	−0.00883	0.0241***	0.0117**
	(6.055)	(6.152)	(−1.740)	(−0.793)	(3.295)	(3.743)	(0.734)	(−1.522)	(5.676)	(2.598)
lnPRY	0.111***	0.0811***	−0.104	−1.031***	0.244**	−0.0587	−0.567***	−0.859***	0.149***	−0.0283
	(3.212)	(2.786)	(−1.261)	(−8.365)	(2.663)	(−0.409)	(−5.414)	(−9.506)	(4.482)	(−0.456)
IQI	0.0135***	0.0873	−0.00144	1.599***	0.0196**	0.385**	−0.00861	−1.714***	0.0316***	0.683***
	(3.126)	(1.627)	(−0.128)	(9.104)	(2.444)	(2.513)	(−0.586)	(−8.671)	(4.503)	(4.535)
lnPRY*IQI		−0.0168		−0.343***		−0.0817**		0.384***		−0.149***
		(−1.285)		(−9.311)		(−2.327)		(8.537)		(−4.257)
East Africa	−0.0585***	−0.0568***								
	(−3.186)	(−2.855)								
Southern Africa	0.0151	0.0126								
	(0.886)	(0.748)								
West Africa	−0.0824***	−0.0848***								
	(−4.692)	(−4.991)								
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	196	196	47	47	54	54	23	23	95	95
R-squared	0.517	0.518	0.236	0.443	0.890	0.904	0.834	0.947	0.319	0.388
Countries	40	40	9	9	13	13	5	5	16	16

Table 4 (continued)

Variables	Primary school enrolment									
	Full Sample		Central Africa		East Africa		Southern Africa		West Africa	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
F-Statistic	90,370	690.0	2.584	66.58	118.4	441,903	2665	3107	66.22	3294
Secondary school enrolment										
lnPC	−0.0373***	−0.0370***	0.151***	0.178***	−0.00520	−0.00636*	0.0160	0.0351	−0.0679***	−0.0321
	(−5.521)	(−5.259)	(6.044)	(8.307)	(−0.337)	(−1.960)	(0.218)	(0.726)	(−3.581)	(−1.465)
lnDC	0.0161**	0.0169**	−0.282***	−0.173***	−0.0481**	−0.0122	−0.0595	5.65e−05	0.0431***	0.0535***
	(2.332)	(2.406)	(−14.59)	(−5.074)	(−2.788)	(−0.879)	(−1.488)	(0.00161)	(3.993)	(7.214)
lnUNEM	0.0206***	0.0205***	0.119***	0.0740***	0.0101	0.00793	0.0400	0.222	0.00990	0.00133
	(6.097)	(6.117)	(6.450)	(4.810)	(1.704)	(1.056)	(0.208)	(1.472)	(0.502)	(0.0698)
lnTNR	0.0368***	0.0363***	−0.197***	−0.166***	0.0427***	0.0151**	0.0384	0.0321	0.0324***	0.0178***
	(10.16)	(11.33)	(−16.50)	(−8.316)	(5.040)	(2.982)	(1.261)	(1.147)	(5.429)	(4.406)
lnSEC	0.0157*	0.0134**	−0.145***	0.170*	0.0830***	−0.0115	0.337	0.267	−0.0124	−0.0792**
	(1.889)	(2.274)	(−7.194)	(2.183)	(3.913)	(−1.045)	(1.923)	(1.919)	(−0.748)	(−2.444)
IQI	0.0295***	0.0363*	−0.0414**	−0.460***	0.0263***	0.232***	0.0191	0.799**	0.0636***	0.416***
	(18.44)	(1.714)	(−2.870)	(−5.632)	(16.15)	(6.411)	(0.483)	(4.599)	(11.30)	(3.530)
lnSEC*IQI		−0.00179		0.0945***		−0.0567***		−0.181*		−0.0870***
		(−0.330)		(4.526)		(−5.833)		(−4.205)		(−3.125)
East Africa	−0.0684***	−0.0702***								
	(−4.884)	(−4.930)								
Southern Africa	0.0302	0.0293								
	(1.019)	(0.959)								
West Africa	−0.118***	−0.120***								
	(−7.297)	(−7.306)								
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 4 (continued)

Variables	Primary school enrolment									
	Full Sample		Central Africa		East Africa		Southern Africa		West Africa	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Observations	226	226	36	36	75	75	23	23	92	92
R-squared	0.511	0.511	0.825	0.899	0.858	0.916	0.940	0.964	0.498	0.594
Countries	36	36	7	7	11	11	3	3	15	15
F-Statistic	22,744	111,665	216.6	13,274	69.50	12,811	272.2	413.9	167.7	1762
Tertiary school enrolment										
lnPC	−0.0272*	−0.0233	0.150**	0.130***	0.0131	−0.00113	0.0191*	0.0303	−0.0519**	−0.00257
	(−1.907)	(−1.599)	(2.481)	(3.630)	(1.009)	(−0.0656)	(2.271)	(1.293)	(−2.440)	(−0.0693)
lnDC	0.0192***	0.0231***	−0.230**	−0.0669	−0.0222	0.00511	0.0308**	0.0223	0.0165*	0.0439***
	(3.496)	(3.134)	(−2.719)	(−1.211)	(−0.979)	(0.223)	(2.778)	(1.210)	(1.897)	(3.198)
lnUNEM	0.0161***	0.0108	0.0939**	0.0861***	0.0145***	−0.000104	0.210*	0.196	0.0168	−0.00168
	(3.027)	(1.515)	(3.341)	(3.739)	(3.740)	(−0.0285)	(2.772)	(1.999)	(1.447)	(−0.0803)
lnTNR	0.0344***	0.0273***	−0.166*	−0.117**	0.0364***	0.0157*	0.0125*	0.0134**	0.00756	−0.00562
	(6.090)	(7.132)	(−2.277)	(−3.004)	(4.127)	(1.839)	(2.765)	(2.789)	(1.369)	(−1.528)
lnTER	0.0166***	0.00772***	−0.0390	0.173***	−0.00318	−0.0184***	−0.0148	0.0165	0.0237*	−0.0303**
	(3.882)	(2.818)	(−1.509)	(5.219)	(−0.664)	(−6.319)	(−0.549)	(0.188)	(2.141)	(−2.167)
IQI	0.0158***	0.0384***	−0.0634*	−0.270***	0.0130***	0.0453***	0.0130	0.0393	0.0248***	0.170***
	(13.66)	(3.369)	(−2.038)	(−6.791)	(6.201)	(4.537)	(1.013)	(0.844)	(5.551)	(3.048)
lnTER*IQI		−0.0106*		0.0808***		−0.0190***		−0.0130		−0.0600**
		(−1.996)		(7.932)		(−3.519)		(−0.472)		(−2.708)
East Africa	−0.0351***	−0.0447***								
	(−6.430)	(−7.037)								
Southern Africa	0.0345	0.0437**								
	(1.448)	(2.070)								

Table 4 (continued)

Variables	Primary school enrolment									
	Full Sample		Central Africa		East Africa		Southern Africa		West Africa	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
West Africa	−0.0649***	−0.0708***								
	(−7.525)	(−8.881)								
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	254	254	33	33	90	90	32	32	99	99
R-squared	0.459	0.471	0.639	0.863	0.739	0.761	0.970	0.971	0.243	0.369
Countries	41	41	8	8	14	14	5	5	14	14
F-Statistic	13,068	4022	1996	258,893	245.7	705.9	387.6	19,135	158.7	15,183

ln natural logarithm; *GINI* Gini index; *HC* human capital index; *IQI* institutional quality index; *PC* real GDP per capita; *DC* domestic credit; *UNEM* unemployment rate; *TNR* total natural resources; *PRY* primary school enrolment; *SEC* secondary school enrolment; *TER* tertiary school enrolment

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; *t*-statistics in ().

Table 5 Human capital, school enrolments, institutions and Gini index, unconditional quantile regression results. Source: Author's Computations

Variables	Human capital index					Primary education enrolment				
	Q = 0.10	Q = 0.25	Q = 0.50	Q = 0.75	Q = 0.90	Q = 0.10	Q = 0.25	Q = 0.50	Q = 0.75	Q = 0.90
lnPC	−0.123***	−0.151***	−0.0278	−0.00210	−0.0908***	0.00994	−0.00183	−0.00446	0.00691	−0.0161
	(−3.146)	(−5.064)	(−1.482)	(−0.0988)	(−3.242)	(0.552)	(−0.0752)	(−0.310)	(0.324)	(−0.600)
lnDC	0.0169	0.104***	0.0485***	0.0423***	0.0892***	−0.0456**	0.0222	0.00886	−0.00377	0.00134
	(0.773)	(4.148)	(3.333)	(3.687)	(3.332)	(−2.523)	(0.547)	(0.476)	(−0.261)	(0.0608)
lnUNEM	−0.0345	−0.0125	0.00163	0.0368**	0.0574***	0.00795	0.0393*	0.00143	0.0157	0.0326**
	(−1.493)	(−0.517)	(0.169)	(1.972)	(4.001)	(0.418)	(1.899)	(0.133)	(1.091)	(2.554)
lnTNR	0.0277	0.0262**	0.00987*	0.0170**	0.0234**	0.0506***	0.0646***	0.0164**	0.00832	0.00400
	(1.477)	(2.430)	(1.934)	(2.394)	(2.073)	(5.062)	(4.777)	(2.122)	(1.111)	(0.343)
lnHC	0.114*	0.0790	−0.0278	−0.113**	0.225**					
	(1.832)	(1.282)	(−0.551)	(−2.346)	(2.562)					
IQI	0.0567	0.111***	0.0530***	0.0122	−0.0605**	−0.231	−0.263	0.130	0.326**	0.447**
	(1.637)	(3.037)	(3.420)	(0.800)	(−2.520)	(−1.544)	(−0.959)	(0.718)	(2.048)	(2.217)
lnHC*IQI	−0.0505*	−0.117***	−0.0616***	−0.00864	0.0912**					
	(−1.683)	(−2.700)	(−3.441)	(−0.392)	(2.402)					
lnPRY						0.329***	0.363**	0.123	−0.112	−0.257***
						(3.096)	(2.249)	(1.244)	(−1.293)	(−2.798)
lnPRY*IQI						0.0543	0.0646	−0.0275	−0.0716**	−0.0980**
						(1.618)	(1.052)	(−0.668)	(−2.004)	(−2.149)
Constant	1.181	−1.950	4.282	−1.987	4.546	3.280	−26.35*	−23.63*	21.90**	7.904
	(0.140)	(−0.185)	(0.717)	(−0.301)	(0.517)	(0.293)	(−1.861)	(−1.790)	(2.017)	(0.878)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	328	328	328	328	328	196	196	196	196	196
R-squared	0.353	0.236	0.113	0.110	0.178	0.404	0.244	0.211	0.061	0.096
Regions	4	4	4	4	4	4	4	4	4	4
F-Statistic	10.48	5.946	2.455	2.375	4.161	7.463	3.550	2.941	0.712	1.163

Table 5 (continued)

Variables	Secondary education enrolment					Tertiary education enrolment				
	Q = 0.10	Q = 0.25	Q = 0.50	Q = 0.75	Q = 0.90	Q = 0.10	Q = 0.25	Q = 0.50	Q = 0.75	Q = 0.90
lnPC	−0.0308	−0.0610**	0.00138	0.00717	0.0117	−0.0382	−0.0634*	0.000623	0.0291*	0.0209
	(−0.397)	(−2.210)	(0.0994)	(0.520)	(0.461)	(−1.067)	(−1.768)	(0.0554)	(1.838)	(0.750)
lnDC	−0.0415	−0.0173	0.00253	0.0430***	0.0558**	−0.0214	−0.0108	0.0119	0.0184	0.0871***
	(−1.298)	(−0.546)	(0.153)	(3.064)	(2.102)	(−1.568)	(−0.515)	(1.113)	(1.587)	(2.977)
lnUNEM	0.0263	0.0263	−0.00279	0.00302	0.0136	0.0216	0.0215	0.00243	−0.00592	0.000749
	(0.683)	(1.357)	(−0.299)	(0.238)	(0.912)	(0.858)	(0.999)	(0.329)	(−0.550)	(0.0572)
lnTNR	0.0663***	0.0729***	0.0236**	−0.00418	0.0158	0.0546***	0.0279*	0.00300	−0.00328	0.0121
	(3.657)	(5.209)	(2.535)	(−0.834)	(1.020)	(3.809)	(1.906)	(0.491)	(−0.442)	(0.918)
IQI	−0.0236	0.0247	0.0723	0.133***	−0.115	0.0257	0.0781**	0.0370***	0.0352**	0.00499
	(−0.353)	(0.292)	(1.396)	(2.626)	(−1.117)	(1.351)	(2.281)	(2.967)	(2.444)	(0.223)
lnSEC	0.0473	0.172***	−0.00281	−0.0804**	−0.0670					
	(0.957)	(3.071)	(−0.0781)	(−2.437)	(−1.434)					
lnSEC*IQI	0.0160	0.00563	−0.0110	−0.0343***	0.0297					
	(1.062)	(0.262)	(−0.782)	(−2.680)	(1.113)					
lnTER						0.0423	0.0506	−0.00330	−0.0282**	−0.0488**
						(1.445)	(1.633)	(−0.271)	(−2.468)	(−2.578)
lnTER*IQI						−0.00376	−0.0172	−0.0138***	−0.0170**	−0.00432
						(−0.539)	(−1.373)	(−2.609)	(−2.528)	(−0.467)
Constant	−20.04	−24.00	−5.078	−1.239	6.916	−8.489	4.710	10.14*	8.079	17.46*
	(−1.544)	(−1.624)	(−0.608)	(−0.144)	(0.654)	(−0.577)	(0.373)	(1.733)	(1.132)	(1.825)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	226	226	226	226	226	254	254	254	254	254
R-squared	0.350	0.298	0.188	0.115	0.129	0.336	0.201	0.089	0.074	0.163
Regions	4	4	4	4	4	4	4	4	4	4

Table 5 (continued)

Variables	Secondary education enrolment					Tertiary education enrolment				
	Q = 0.10	Q = 0.25	Q = 0.50	Q = 0.75	Q = 0.90	Q = 0.10	Q = 0.25	Q = 0.50	Q = 0.75	Q = 0.90
F-Statistic	6.925	5.474	2.976	1.670	1.908	7.401	3.676	1.437	1.162	2.851

ln natural logarithm; *GINI* Gini index; *HC* human capital index; *IQI* institutional quality index; *PRY* primary school enrolment; *SEC* secondary school enrolment; *TER* tertiary school enrolment; *PC* real GDP per capita; *DC* domestic credit; *UNEM* unemployment rate; *TNR* total natural resources

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; *t*-statistics in ().

5 Conclusion and Policy Recommendations

This study aligns with the 2030 Sustainable Development Goal 10 "*reduce inequality within and among countries*" by investigating whether institutional quality is pertinent to the human capital-inequality nexus. The discourse is probed using an unbalanced sample of 46 SSA countries from 2010 to 2019 and the variables of interest are the Gini index (obtained from the UNU-WIDER), human capital index (obtained from Penn World Tables) and institutional quality index (generated from a Principal Component Analysis). The Driscoll and Kraay (1998) PSCC and Firpo et al. (2007) unconditional regression (UQR) are deployed to explicate the nexus. The UQR estimation strategy provides more reliable results because it considers the heterogeneity and conditional heterogeneity issues that are overlooked. For the most part, the consensus is that (1) human capital and institutional quality widen inequality, (2) the interaction effect is negative, and (3) results across the four regions are mixed. Additionally, the UQR reveals that the interaction effect is mostly negative and significant at upper quantiles. The novel finding of this study is that the interaction of human capital and institutional quality contributes to reducing income inequality.

Policy recommendations are obvious. First is the need to fund education making it affordable and accessible to all. With reference to primary and secondary education, government and stakeholders must make education at these levels available to the citizenry to contract the inequality gap. This is because access to basic education increases economic opportunities. Secondly, institutions must be strengthened to restore the confidence of the people. Though, institutions alone may be ineffective but their interaction with other aspects of the economy and society will help drive down income inequality.

Appendix

See Table 6

Table 6 Summary statistics for sub-regions. Source: Author's Computations

Variable	Central Africa					East Africa				
	Obs	Mean	Std. Dev	Min	Max	Obs	Mean	Std. Dev	Min	Max
GINI	90	54.008	4.788	47.735	65.275	160	55.099	4.956	43.792	66.175
HC	60	1.867	0.42	1.417	2.876	119	1.913	0.479	1.181	2.713
IQI	90	−2.393	1.235	−4.237	0.33	160	−0.968	1.978	−4.245	3.759
PRY	26	76.768	16.881	43.483	94.493	73	83.474	13.683	51.455	98.841
SEC	38	41.907	20.736	15.039	89.338	98	49.726	21.108	23.291	99.904
TER	35	9.321	4.962	2.096	21.066	112	9.768	10.106	0.716	44.392
PC	90	7457.484	8913.126	822.61	36,671.36	160	4770.385	6909.94	751.66	29,223.47
DC	84	13.184	7.685	3.724	38.882	137	23.708	21.273	7.137	106.306
UNEM	90	8.21	5.535	1.59	20.41	150	5.175	4.186	0.6	17.47
TNR	90	20.651	13.061	1.76	56.039	152	7.441	5.801	0.001	26.956
Variable	Southern Africa					West Africa				
GINI	49	63.063	3.132	58.24	72.877	160	57.889	5.842	35.541	65.643
HC	50	2.296	0.418	1.699	2.939	130	1.648	0.331	1.166	3.007
IQI	49	1.258	1.391	−1.019	3.302	160	−0.831	1.382	−3.132	2.754
PRY	26	88.962	4.198	82.524	97.489	101	75.824	13.627	38.389	98.112
SEC	23	78.465	19.058	56.261	109.444	94	46.646	19.915	13.042	96.659
TER	34	19.39	6.428	6.748	30.239	107	9.901	5.483	1.373	24.398
PC	49	9896.529	4745.615	2273.93	17,766.54	160	2972.153	1608.59	1021	7171.84
DC	44	51.558	46.237	13.206	140.541	148	20.104	13.847	3.943	65.742
UNEM	49	22.359	3.3	16.77	27.04	160	5.443	3.109	0.32	12.24
TNR	49	3.195	1.775	0.657	7.22	160	9.825	6.379	0.314	29.185

GINI Gini index; *HC* human capital index; *IQI* institutional quality index; *PRY* primary school enrolment; *SEC* secondary school enrolment; *TER* tertiary school enrolment; *PC* real GDP per capita; *DC* domestic credit; *UNEM* unemployment rate; *TNR* total natural resources

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Declarations

Conflict of interest Author declares no competing interests.

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