Human Capital and Inclusive Growth in sub-Saharan Africa: A Panel System GMM approach

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Abstract

In recent decades, scholarly focus has shifted toward understanding the macroeconomic effects of human capital development on economic growth. Although human capital development is widely recognized as a catalyst for growth, studies on its relationship with inclusive growth in sub-Saharan Africa (SSA) remain scarce and contradictory, largely due to the inadequacy of GDP growth as a measure of inclusiveness. This study examines the relationship between human capital input and output factors and inclusive growth in 32 SSA countries from 1999 to 2021. Using a panel system generalized method of moments (GMM) estimation, the results indicate that government health spending adversely affects inclusive growth in SSA, suggesting that inadequate public health expenditure is significantly associated with the region's low output growth, high unemployment, and rising inequality. Furthermore, human capital output factors, specifically primary and secondary school enrolment and infant mortality, also exert a negative effect on inclusive growth. These findings provide further empirical validation for the deficiencies in the region's human capital development programmes. The study concludes by underscoring the need for governments to increase investment in and improve access to quality education and healthcare to address inequality and promote growth and employment. It also emphasizes the importance of implementing labour market reforms to foster holistic development in SSA.

Keywords: Human capital input and output, output per worker, equality, income growth, employment, inclusive growth index.

1. Introduction

For many decades, scholars have claimed that human capital is the most important source of productivity in any country (Campbell, 2017). The variations in socioeconomic development among nations can be attributed to the quality and quantity of human capital (Nwambuko, 2019). Human capital development encompasses the skills, education, capacity, and attributes of the workforce that influence their productivity and earning potential. It goes beyond measuring intellectual capacity and focuses on improving individuals' productivity (Campbell, 2021). Higher education, technical or on-the-job training, and health are among the qualities that contribute to productivity (Matthew, 2011). Investments in quality education, healthcare, job creation, and skills development enhance the abilities of the labour force, leading to greater economic output and higher individual incomes (Campbell,2021). While increased investment in human capital raises the long-term level of productivity, which, in turn, affects the rate of growth (Korkmaz & Korkmaz, 2017).

The efficiency and quality of human capital is a vital prerequisite for long-term inclusive and sustainable growth (Campbell, 2021). The relationship between growth and equity has gained renewed attention, emphasizing the need to consider equity and distribution alongside economic growth (OECD, 2016). To achieve equity, economic opportunities must be created and accessible to all members of society, allowing them to participate in and benefit from growth (Okowa & Vincent, 2019; Oluwadamilola, Akinyemi & Adediran, 2018). For any growth to be inclusive, it has to focus on productive employment, productivity improvement, and the creation of new job opportunities (Campbell, 2021).

Nevertheless, inclusive growth creates economic opportunities that are available to all, and its sustainability relies on high labour productivity combined with equal opportunities across economic, social, and institutional dimensions (OECD, 2016; Okowa & Vincent, 2019). Also, inclusive growth provides gainful employment for individuals that are made possible through education and skill development (Campbell, 2021). The impact of human capital on growth is manifested through increased labour efficiency and productivity, producing a skilled

workforce capable of driving sustainable economic growth (Campbell & Aderinto, 2020). Consequently, the provision of education and healthcare infrastructure is a key driver for achieving inclusive growth, reducing unemployment, inequality, and increasing labour productivity, thereby contributing to economic inclusion (Campbell, 2021).

The provision of education and healthcare infrastructure affects inclusive growth by creating higher employment opportunities, reducing income inequality, and promoting wealth distribution. It not only contributes to skills development but also through labour market activation and intermediation that integrate vulnerable groups, thereby driving inclusive growth (Campbell & Aderinto, 2020). According to the African Development Bank, investing in education and healthcare infrastructure can lead to output growth and job creation (African Development Bank, 2023). Improvements in human capital development also enable the creation of better jobs with higher wages and improved working conditions, contributing to inclusive growth, human well-being, social equity, and shared economic opportunities (Campbell, 2021).

Empirical evidence suggests that education impacts labour market outcomes, including wages and earnings, employment/unemployment rates, worker productivity/GDP per worker, hours worked nature of work, worker's health, and fringe benefits (Campbell & Aderinto, 2020). These elements are essential for achieving inclusive growth as they emphasize equality in access to essential social services and contribute to human capital development (Campbell, 2021).

Also, safety nets, social protection, and the provision of public and social goods are also important components of inclusive growth. All these elements enhance productivity, and therefore, improving education and health levels should be prioritized in conjunction with efforts to directly enhance economic growth (Mamoloko, Rangongo & Ngwakwe, 2019). The fundamental link between human capital and inclusive growth lies in the active participation of skilled individuals in the labour market (Campbell, 2017). While education and training are crucial, it is equally important for these skilled individuals to actively engage in productive sectors of the economy. It is only a productive labour force that can contribute and benefit from the development

process of the economy. Inclusive growth entails ensuring everyone participates in growth process in terms of decision making for organizing the growth progression as well in participating in the growth itself (Campbell, 2021). To a large extent, economic growth in recent times is seen as a necessary and not sufficient condition for a country's ability to improve the welfare of its population because growth pattern that not accompanied by improvement in human capital development lead ultimately to non-inclusive growth process (Campbell, 2021; OECD, 2016). A narrow focus on growth and a failure to consider its wider ramifications can have far-reaching consequences (OECD, 2016). This has in turn put the importance of growth in perspective.

Against this backdrop, the main objective of this paper is to investigate the effects of human capital development on inclusive growth in some selected sub-Saharan African countries. The study contributes to the existing literature by its the measurement of inclusive growth while combining monetary (income) and non-monetary (jobs) benefits from economic growth and aggregates them across individuals with different characteristics (Bernard & Edward, 2022). The same indicator has been used by several scholars to capture inclusive growth (Khan et al., 2016). It models not only monetary and fiscal determinants but also structural policies to foster equitable growth, we add equality and adopt an ad hoc weighting scheme for the construction of the composite index of inclusive growth. Also, this study deviates from others by employing system Generalized Method of Moments (GMM) estimator to the study of selected SSA countries as against most studies that have used different panel estimators in relation to the study of human capital development and economic growth in the sub-region.

2. Literature Review

2.1 Conceptual review

Inclusive growth has gained increasing prominence in recent years. The concept originated in the work of economists debating the importance of not just growth itself but of the shape and distribution of growth across a population. While inclusive growth means many different things to different people, it can be broadly defined as 'a concern with both the pace *and* pattern of growth (Lee, 2018). Where previous approaches to economic development had prioritized any growth,

inclusive growth asks new questions about which people and places stand to benefit from growth as well as which people or places are excluded from the benefits of growth (GovScot, 2022).

A variety of approaches have emerged with emphases on different aspects of the inclusive growth. Narrower concepts stress outcomes (e.g., growth plus equity) and are easier to measure and monitor. Wider concepts are multi-dimensional and hence more ambitious in scope: they stress improved opportunities for achieving better outcomes; they differentiate between processes and outcomes, and they widen outcomes to include non-income aspects (social goods and safety nets) (AFDB, 2016). An implicit risk is that an overambitious notion of inclusive growth becomes both meaningless and impractical if it comes close to advocating 'everything for everyone (AFDB, 2016).

However, there is broad agreement that inclusive growth is growth for 'the benefit of most', but ambiguities and disagreements abound beyond this general idea. Taking a somewhat narrow approach, for instance, inclusive growth can be characterized as 'growth plus declining income disparities'. In this formulation, inclusive growth stretches the Pro-Poor-Growth (PPG) approach by adopting a wider notion of who constitutes the poor. This definition, it must be noted, excludes non-income considerations and, therefore, lends itself much more easily to measurement (World Bank, 2014).

At another opposite extreme, inclusive growth is also sometimes loosely referred to as 'growth that benefits everyone. In this perhaps its broadest sense the concept seems to imply that growth should 'benefit all stripes of society, including the poor, the near-poor, the middle income groups, and even the rich (World Bank, 2014). This is equally problematic and highlights the fact that it is not just who is to benefit from growth, but the extent and distribution of such benefits are important considerations and should not be overlooked (Campbell, 2017). Inclusive growth is only about redistributing resources but also about 'raising the pace of growth and enlarging the size of the economy while the economy of wellbeing specifically highlights the need for putting people at the centre of policy and moving away from an attitude of 'grow first, redistribute and clean up later' towards a growth model that is equitable and sustainable from the outset(OECD, 2019). In doing so, an inclusive

growth model positions the wellbeing of people and planet as a core concern of economic development, rather than an afterthought.

2.2 Inclusive growth approach

The inclusive growth analysis tries to identify ways to strengthen the productive resources and capacity of the individual on the labour supply side as well as ways to open up new opportunities for productive employment on the labour demand side (Adedeji, 2018). Education and health determine the qualitative supply of labour and the prospects of the poor to seize opportunities in the economy in the longer term. Theoretically, education is expected to support individuals with knowledge and skills to engage in the production process, add to that high quality of education determines the extent to which individuals can contribute to productivity and get high incomes and thereby share in economic growth (Akinbode et al. 2021).

Health is also important dimension of human capital development, and the health status of individuals can be a constraint to productive employment. The high prevalence of disease affects income growth negatively because it undermines the stock of available labour, its productivity and limits incentives for investments for future consumption (physical as well as human capital investments). Thus, poor health care provision, many of the infected individuals without access to healthcare and medications may be unable to continue working productively. However, poor quality and low levels of education and high prevalence of disease undermine the ability of the poor to seize economic opportunities hampers growth, especially inclusive growth (Campbell, 2017). The notion of inclusive growth is aimed at ensuring that the fruits of growth be shared to specifically eliminate poverty and eradicate income inequality.

The inclusive growth approach takes a longer-term perspective. This is necessary because of the emphasis on improving the productive capacity of individuals and creating a conducive environment for employment rather than on income redistribution as a means of increasing incomes for excluded groups. Due to this longer-term perspective, there is an explicit focus on structural transformation and internal migration in the IG analytics framework. In developing countries, a significant part of growth is generated through reallocation

of labour from low-productivity to high-productivity sectors (Wang et al., 2021).

With this longer-term perspective, it is important to recognize the time lag between reforms and outcomes. A good example is the lag between the time when investments in education are made and the time when returns from improved labour skills are collected (Raheem, Isah, &Adedeji, 2018). This implies that the analysis must identify future constraints to growth that may not be binding today, but that may need to be addressed today in order to ensure sustainable and inclusive growth. In short, IG analytics is about policies that should be implemented in the short term but for sustainable IG in the future (Raheem, Isah, &Adedeji, 2018). The goal is to identify a bundle of binding constraints rather than the binding constraint and then sequence these constraints to enhance prospects for high, sustained inclusive growth in a country over a period of time.

2.3 Empirical review

One of the crucial drivers of growth that have received more consensuses among the researchers and policymakers is human capital. Studies show that human capital explains the disparities in growth and its inclusiveness between developed and developing countries (Oyinlola, Adedeji & Onitekun, 2021). Thus, skills and knowledge accumulation equip the workforce to contribute significantly to the growth process. Moreover, human capital influences growth and inclusiveness in two ways: First, human capital accumulation is viewed as an exogenous factor that facilitates productivity at the given level of technical progress. Second, human capital amplifies growth through innovation and technical progress. Hence high human capital accumulation result or facilitate productivity and growth (Oyinlola, Adedeji & Onitekun, 2021).

Human capital is a people centered strategy of development. It is basically that investment in human capital enhances the productivity and creative capabilities beings equality which can be harnessed to achieve higher and more sustainable levels of human welfare and welling (Becker, 1964). Thus, the quality of knowledge acquired and its availability put to work enhance productivity (Becker, 1964). This implies that knowledge acquired can also improve skills, while the

greater confidence and know-how inculcated can generate more productive employment with positive effects on overall development. For any economy, the transition to an inclusive growth will depend on the specific of the human capital and on its relative level of development. While sustaining a positive transition to inclusive growth will involve the need for people to be empowered via education and training, thus equipping them with the necessary skill and knowledge they need, thereby increasing productivity.

Little empirical evidence on the relationship between human capital development and inclusive growth has been provided. According to Campbell (2017) on enhancement of human capabilities, this serves as one of the key drivers of inclusive growth. The study shows that human capital is essential to inclusive growth through the driver of productivity. With a good level of education, human resources can improve their quality of life through a process of education, training, and development that increase productivity, which guarantees sufficient income and well-being to increase the achievement of inclusive growth (Oyinlola & Adedeji, 2019). This is in line with the studies of some scholars that increasing education will increase productivity and promote inclusive economic growth (AFDB, 2020). Based on this premises, education has a positive impact on-inclusive growth. Similarly study on how human development can translate to inclusive growth was investigated. In another study conducted, to examine the impact of healthcare on inclusive growth based on the Fixed Effect Estimator. Tella & Alimi (2016) found that financing of healthcare had a greater impact on inclusive growth in 14 African countries between 1995 and 2012. However, population growth tends to destabilize any agenda toward inclusive growth.

Oluwadamilola, Akinyemi, and Adediran (2018) examine the impact of education and human capital (quantity and quality of education) on inclusive growth using the ARDL modelling approach with annual time series data. The study concluded that education quantity primary and secondary school enrolment) has a positive impact on inclusive growth in both short run and over long run, Index of Human Capital per Person, has a positive significant effect over the long run. The inability to address educational issues may hinder the achievement of inclusive growth. This will further exacerbate the socio-economic problems such

as unemployment, poverty, inequality amongst others. Relying on dataset for 18 SSA countries for the period 1995–2013, Raheem, Isah, & Adedeji (2018) conducted on components of human capital and inclusive growth. The study found that augmenting health expenditure with natural resources makes the growth process more inclusive. In addition, education expenditure plays significant role in the growth inclusiveness in SSA region.

Oyinlola and Adedeji (2019) investigate the relationship between human capital and inclusive growth using panel data from 22 SSA countries. The findings show that human capital positively influences inclusive growth in SSA region. In a related study where the role of human capital and innovation on inclusive growth was investigated in sub-Saharan Africa using fixed-effects model, the study explored the direct impact of human capital and innovation measures on inclusive growth. The findings from the baseline model show that all variable of human capital exert a positive impact on inclusive growth but only school enrolment is not significant. More so, the empirical results show that different measures of human capital propel inclusive growth as the quality measures (total factor productivity and index of human capital) have significant impact (Oyinlola, Adedeji & Onitekun, 2021).

In addition to the nexus between human capital and inclusive economic growth, empirical evidence of the impact of unemployment, education, and poverty on inclusive growth in the period from 2015 to 2018 was obtained using the panel data model. The results of the analysis show that unemployment has significant negative effect on inclusive growth, education, which is afflicted by the total number of attendances of community schools at all levels of primary, secondary and upper school, has a significant positive effect on integrative growth and poverty. This suggests that development related to education and the reduction of unemployment will help to achieve inclusive growth (Andrian, 2020). On other words it can be said that an increase in human capital and wide education enrolment will lead to an increase in labour productivity and inclusive economic growth (Mamdouh, Abdelmoula & Abdelsalam, 2022).

3. Methodology

3.1. Data

This study employs panel data set that covers twenty- three years from 1999 to 2021. Panel data analysis provides comprehensive tools to examine how relationship between variables change dynamically and check the dynamics of adjustment (Khan et al., 2016). Panel data contains information on the same cross section units of thirty two (32) SSA countries. The spread of the period covers the era of global economic recession where productivity growth has declined which led the rising inequality that reflects dampened income growth of many workers in many sub-Saharan African (SSA) Countries. These data will be sourced majorly from World Bank indicators, International Labour Organization (ILOSTAT), United Nation Population Division, Department of Economic and Social Affairs.

3.2. Theoretical framework and model specification

This research study hinges on Anand, Mishra and Peiris's (AMP) inclusive growth frame work adopted by Baruwa (2022) which lays emphasis on the pace and distribution on economic growth. Thus, for an economy to effectively and efficiently sustain its economic growth in reducing poverty, such growth needs to be inclusive (Campbell, 2021). Inclusiveness entails fairness, equity, market protection and transition of employment which is a vital ingredient of any successful growth strategy (OECD, 2019). The Anand, Mishra, and Peiris's (AMP) inclusive growth framework integrate equity and growth by using a utilitarian social welfare function drawn from consumer choice literature, as inclusive growth relies on two factors: (a) income growth; (b) income distribution.

AMP inclusive growth framework decomposes income and substitution effect into growth and distribution components. The framework outline two underlying properties of social welfare function to capture the following features: (a) it is increasing in its argument (to capture the dimension of growth); and (b) its suits the transfer property i.e. an income transfer from poor people to rich people curtails the function value which capture the distributional dimension.

Following previous studies, the AMP inclusive growth framework employs a simple form of social mobility function through the computation of an index from the area under the mobility curve so as to capture the magnitude of income distribution changes.

The variation is proposed as income equity index and mathematically derived as:

$$\varpi = \frac{\bar{y}^*}{\bar{y}} \tag{1}$$

For a society that is completely equitable, $\varpi = 1$. It therefore indicates that as ϖ moves closer to one (a greater value), it means higher income equality. Reorganizing equation (1), it is:

$$\bar{y}^* = \varpi \cdot \bar{y} \tag{2}$$

For an economy to witness inclusive growth, it needs an increasing $\bar{y}^*$ and this can be attained by; (a) a rise in $\bar{y}$ i.e. increasing average income via growth; (b) a rise equity index of income (ϖ) by improving equity; or (c) the combination of increasing $\bar{y}$ and ϖ i.e. a mix of (a) and (b).

As the previous noted that human capital development influence growth inclusiveness via income growth channel with the assumption of equal wealth distribution, the study employed Cobb-Douglas production as an input factor while integrating wealth distribution. Mathematically, the equation is specified as:

$$\bar{y} = \beta_0 + \alpha k + \theta h + \delta lb \quad [\text{Note: } \ln A = \phi_0,\ (1-\alpha-\beta) = \theta\ ] \tag{3}$$

Equation (3) is further specified as:

$$\bar{y}^* = \beta_0 + \alpha k + \theta h + \delta lb \tag{4}$$

Where $\bar{y}^*$ depict inclusive growth. Based on the functional form of equation (4), in mathematical form including the time and country specific effect, it is therefore specified as:

$$\bar{y}^*_{i,t} = \beta_0 + \alpha k_{i,t} + \theta h_{i,t} + \delta lb_{i,t} \tag{5}$$

In the above theoretical equation, it shows that human capital development factors influences inclusive growth based on the level income growth and wealth distribution.

The model is stated as follows:

$$incg_{i,t} = \lambda_0 + \lambda_1 gfcf_{i,t} + \lambda_2 hcd_{i,t} + \Phi ctv_{i,t} + \mu_{i,t} \quad (6)$$

Where: *incg* is inclusive growth, *gfcf* represents gross fixed capital formation, *hcd* represents the vector of human capital development which consist of input factor of human capital development such as government expenditure on education, government expenditure on health as well as output factors of human capital development (such as primary school enrolment, secondary school enrolment, life expectancy, infant mortality), and *ctv* is the vector of control variables which include employment rate, interest rate spread, inflation rate and trade openness measured by total trade to GDP. The stochastic term is represented by μ; t denotes time and $\lambda_0, \lambda_{1-2}, \Phi$ are parameters.

3.3 Construction of composite index of inclusive growth

This study employs the principal component analysis (PCA) to generate a composite measure of inclusive growth. The metrics utilized to measure inclusive growth in this study are economic growth, income equality, and employment rates. The PCA results are presented in Table 3.3.1. This estimator is utilized to reduce highly connected series into smaller sets of unrelated series called "Principal Components" while preserving the original information in the datasets. Moreover, the approach has a higher likelihood of avoiding excessive correlation among the many indicators of inclusive growth. Principal component analysis is a statistical technique used to analyze observed series or variables by reducing them to a smaller number of interpretable components. These components represent the majority of the variability in the observed variables (Pan, Bosch, & Ma, 2017).

Table 1: Principal component analysis for inclusive growth

Inclusive Growth Index						
Principal Components	**Component Matrix**			**Proportion**	**Cumulative Proportion**	**Eigen value**
	Growth	**Equality**	**Employment**			
First PC	0.6087	-0.4706	0.6388	0.4475	0.4475	1.3426
Second PC	0.4386	0.8705	0.2233	0.3103	0.7579	0.9310
Third PC	-0.6611	0.1443	0.7363	0.2421	1.0000	0.7264

Note: PC - principal component.

Source: Authors' computation (2023).

The study applies the Kaiser and Jolliffe criterion to determine the common factors and calculates the eigenvalues for each component (Ajide et al., 2022). Having eigenvalues greater than 1 indicates that a significant amount of dispersion in the major component is preserved by each component. The results of the primary components are presented in Table 3.6.1. The inclusive growth index, derived from the three primary components of inclusive growth, accounts for approximately 44.75% of the overall variation in the distinct data, with an eigenvalue of 1.3426.

4. Results and Discussion

4.1 Descriptive statistics

Table 2 provides the extent of variance explained by the models, the standard deviation reports the rate at which these variables deviate from their individual mean values, almost all of the variables have low deviation rate in varying magnitude from their mean values, as their standard deviation values are lower than average values.

Table 2: Summary statistics

Variable	Mean	Std. Dev.	Max	Min	Kurtosis	Skewness
Outcome Variables						
GDP per capita (annual growth %)	1.535	4.331	18.015	-22.383	9.261	-1.295
Income Equality	0.554	0.719	0.352	0.079	2.348	-0.124
Employment Rate (%)	60.319	11.288	85.866	36.850	2.426	0.343
Inclusive Growth Index	2.959	0.833	7.000	1.500	4.659	0.666
Main Explanatory Variables						
Gov. Exp. on Education (% of GDP)	3.844	2.037	10.679	0.018	4.085	0.992
Gov. Exp. on Health (% of GDP)	5.131	2.203	20.413	2.321	16.113	2.702
Primary School Enrolment (%)	103.683	20.567	156.445	48.356	2.905	0.150
Secondary School Enrolment (%)	47.301	22.995	99.904	9.632	2.383	0.576
Life Expectancy (years)	60.143	6.207	76.593	47.129	3.341	0.657
Infant Mortality Rate (per 1,000)	54.928	23.161	118.000	12.200	2.552	0.171
Gross Fixed Capital Formation (% of GDP)	22.404	9.023	60.058	4.563	5.237	1.213
Controlling Variables						
Interest Rate Spread (%)	7.396	9.985	49.343	-3.602	7.718	1.859
Inflation Rate (%)	8.322	32.912	557.202	-3.233	228.930	14.415
Trade Openness (% of GDP)	63.806	23.738	129.779	16.352	2.858	0.723

Note: Observation is 354
Source: Authors' computation (2023).

Specifically, in the case of Inclusive growth index which is the dependent variable, we found that its maximum value is 7.0000 whereas the minimum is as low as 1.5000 with a mean of 2.9598 which is closer to the minimum than the maximum. The claim is strongly confirmed by standard deviation since it is closer to the mean. This result substantially supports extant a priori expectations about poor economic structure in Sub Saharan African countries in which a significant number of people living in poverty. Meanwhile, three components of Inclusive growth index used in this study such as GDP per capita (annual growth), income equality and employment rate indicate the general standard of living in the region. As shown in Table 4.1, GDP per capita (annual growth), income equality and employment rate have their mean values at1.5349, 0.5544 and 60.3194 respectively. The values reveal the poor economic structure in Sub Saharan African countries. It is therefore presumed that a good economic structure creates equal opportunities for all across economic,

social, and institutional dimensions. The average value of life expectancy and infant mortality rate are 60.14263 and 54.9279 respectively. This shows that average living age of the people in sub-Saharan Africa is 60.14years. Notwithstanding, the maximum for the region lies at 76.59 while the minimum is 47.13, This implies that longer life expectancies often mean a more diverse workforce and different age group bring various perspectives and skills to the workplace, fostering creativity, boosting productivity and driving economic growth. Furthermore, infant mortality under the age of 5 years (per 1,000 live births) has the moderate mean value of 54.93. This shows that the region has a relatively moderate rate of infant mortality.

Again, it is noted that the result for the specific input factor of human capital development such as government expenditure on education and government expenditure on health follow a similar trend as inclusive growth index with their mean also closer to the minimum. The mean values for government expenditure on education and government expenditure on health are 3.8439 and 5.1314 respectively which are closer to their minimum of 0.0178 and 2.3205 whereas their maximum values are 10.6786 and 20.4134. A quick look at the comparative value of its standard deviation (2.0368 and 2.2025) indicates that it is not too far from the mean. For these results, the relatively low value of the standard deviations for these series shows that there is only a small amount of deviation in the actual data from their mean value. Hence in relative terms, these variables are fundamentally low in their contributions to human capital development. Among the other specific factors of outputs of human capital development, the mean value of primary school enrolment rate lies at 103.68. Similarly, the mean of secondary school enrolment is 47.30% thus indicating that a large percent of the people in the region are primary education certificate holders. However, the average stock of physical capital measured by gross fixed capital formation (22.4036) is low compared to what is obtainable in other regions.

For control variables, the mean values of interest rate spread, and inflation rate measured by annual growth rate of consumer price index are 7.40% and 8.32% correspondingly. These control variables have their minimum values to be -3.60% and -3.23% whereas the maximum values are 49.34% and 557.20% respectively for interest rate spread,

and inflation rate measured by annual growth rate of consumer price index. In addition, the table further depicts the trade openness proxy by total trade as ratio of GDP at an average rate of 63.81%.

Moreover, almost all the variables have asymmetrical distribution (skewed rightward), while GDP per capita (annual growth) and income equality are negatively skewed distributed (skewed leftward). The Kurtosis identified 3.0 suggesting the normal distribution. The Kurtosis of income equality, employment rate, primary school enrollment, secondary school enrolment, infant mortality rate and trade openness (% of GDP) are less than 3 which indicate variables are platykurtic in distribution implying that the variables has thinner tails and not normally distributed while GDP per capita (annual growth), inclusive growth index, government expenditure on education, government expenditure on health, life expectancy, gross fixed capital formation, interest rate spread and inflation rate (consumer prices) are greater than 3 which indicate that the distribution of these variables are leptokurtic. That is, the distribution has heavier tails and is normally distributed.

4.2 Correlation analyses

The results of the correlation analyses presented under different tables show that correlation coefficients between different pairs of variables are low and below the acceptable threshold. This indicated that there is no possibility of multicollinearity in the model to be estimated.

Table 3: Correlation matrix (input factor)

	INCG	**GDPPCG**	**EQ**	**ER**	**GEE**	**GEHI**	**GFCF**	**IRS**	**INF**
GDPPCG	0.817	1.000							
EQ	0.098	0.019	1.000						
ER	0.136	0.006	0.038	1.000					
GEE	0.075	0.034	0.251	0.204	1.000				
GEHI	0.017	0.035	0.125	0.215	0.320	1.000			
GFCF	0.064	0.084	0.141	0.017	0.202	0.082	1.000		
IRS	0.065	0.039	0.063	0.267	0.195	0.097	0.079	1.000	
INF	0.052	0.138	0.015	0.081	0.027	0.097	0.019	0.349	1.000
TO	0.066	0.079	0.119	0.225	0.404	0.091	0.461	0.176	0.102

Note: INCG-Inclusive Growth Index; GDPPCG- GDP Per Capita Growth; EQ-Income Equality; ER – Employment Rate; GEE- Government Expenditure on

Education; GEHI- Government Expenditure on Health; GFCF- Gross Fixed Capital Formation; IRS-Interest Rate Spread; INF- Inflation Rate and TO- Trade Openness
Source: Authors' computation (2023).

According to results in Table 3, all the input factors of human capital development have positive relationship with inclusive growth components. Specifically, there is a weak positive correlation between government expenditure on education (GEE) and inclusive growth (INCG) (0.075). This implies that an increase in education spending may have a slightly positive impact on inclusive growth, as education can be a driver of economic and social development. The positive correlation (0.034) between government expenditure on education and GDP per capita growth is weak, indicating that these two variables are not strongly related. Theoretically, education spending often contributes to economic growth, but it appears to be a minor factor in this case. The positive correlation (0.251) between government expenditure on education and income equality suggests a moderate relationship. This suggests that, higher education spending may contribute to reducing income inequality by improving access to quality education. The results also show that the positive correlation of 0.204 indicates a moderate relationship between government expenditure on education and the employment rate. This implies that increased education spending may lead to improved employment opportunities through a more skilled workforce.

Table 4: Correlation analysis (output factor)

	INCG	GDPPCG	EQ	ER	PSE	SSE	LE	IM	GFCF	IRS	INF
GDPPCG	0.819	1									
EQ	0.091	0.026	1								
ER	0.129	0.001	0.043	1							
PSE	0.119	0.075	0.188	0.025	1						
SSE	0.074	0.065	0.200	0.382	0.155	1					
LE	0.076	0.108	0.141	0.222	0.154	0.583	1				
IM	0.125	0.099	0.217	0.321	0.196	0.684	0.825	1			
GFCF	0.051	0.079	0.145	0.015	0.018	0.094	0.213	0.211	1		
IRS	0.062	0.041	0.063	0.278	0.227	0.135	0.031	0.108	0.076	1	
INF	0.054	0.139	0.015	0.082	0.071	0.017	0.113	0.099	0.021	-0.020	1
TO	0.062	0.078	0.117	0.222	0.068	0.435	0.358	-0.346	0.453	0.346	0.054

Note: INCG-Inclusive Growth Index; GDPPCG- GDP Per Capita Growth; EQ-Income Equality; ER – Employment Rate; PSE- Primary School Enrolment; SSE-Secondary School Enrolment; LE- Life Expectancy; IM-Infant Mortality Rate; GFCF-Gross Fixed Capital Formation; IRS-Interest Rate Spread; INF- Inflation Rate and TO- Trade Openness.
Source: Authors' computation (2023).

There is a very weak positive correlation between government expenditure on health infrastructure (GEHI) and inclusive growth index (INCG) (0.017) which suggests almost no meaningful relationship between health infrastructure spending and inclusive growth. The positive correlation (0.035) between health infrastructure spending and GDP per capita growth is weak, indicating a limited connection. Invariably, better healthcare infrastructure can contribute to a healthier and more productive population, but it appears to be a minor factor in this study.

Table 4 depicts the degree of association exists between inclusive growth index and the variables of output factor of human capital development as well as other control variables. The variables consider include gross primary school enrolment rate (PSE), gross secondary school enrolment rate (SSE), life expectancy (LE), infant mortality rate (IM), gross fixed capital formation (GFCF), interest rate spread (IRS), inflation Rate (INF) and trade openness (TO).

In relations to the output factor of human capital development and inclusive growth, primary school enrolment (PSE) and secondary school enrolment (SSE) have varying degrees of relationship (weak to strong) with inclusive growth, GDP per capita growth, income equality and employment rate. However, these output factors of human capita development (primary school enrolment (PSE) and secondary school enrolment) appear to have a significant impact on these indicators suggesting a clear connection, while weaker correlations indicate that other factors may play more substantial roles in influencing these indicators. On other output factors of human capital development, life expectancy (LE) has a weak relationship (0.0762) with inclusive growth. While other factors likely play a more significant role in influencing life expectancy.

4.2 Empirical findings

Table 5 shows the result of system GMM estimation model on the effect of input factors related to human capital (such as government expenditure on education and health) on inclusive growth and its components. On the first lagged inclusive growth and its components, GDP per capita have a negative coefficient of approximately -0.491. This suggests that the previous year's GDP per capita has a negative impact on the current year's GDP per capita growth. However, with p-value of 0.0529 indicating that this relationship is statistically significant at the 10% level. The lagged one of employment rate has a positive coefficient and is highly statistically significant at the 1% significance level. This suggests that the previous year's employment rate strongly influences the current employment rate. The results also show that the lag one of income equality and inclusive growth index have no significant impact on the current level.

Table 5: System GMM results on the effects of input factor of human capital development on the inclusive growth

Variables	**Dependent Variable:** Inclusive growth			
	GDPG per capita (GDPPCG)	**Income Equality (EQU)**	**Employment Rate (EMP)**	**Inclusive Growth Index (INCG)**
GDPPCG(-1)	-0.491043* (0.053)			
EQU(-1)		4.647280 (0.805)		
EMP (-1)			1.099134*** (0.000)	
INCG(-1)				0.281337 (0.729)
GEE	1.773547** (0.025)	0.039861* (0.086)	-0.264589*** (0.004)	0.245451 (0.618)
GEH	-1.420373** (0.013)	-0.030997* (0.086)	-0.067740* (0.0573)	-0.032112* (0.0903)
GFCF	-0.092456*	-0.003764	-0.044976*	0.021448**

	(0.075)	(0.188)	(0.062)	(0.017)
IRS	-0.232806	-0.032144	0.038785	-0.005673
	(0.394)	(0.169)	(0.688)	(0.041)
INFR	-0.076014	-0.004616	0.006815*	0.004407
	(0.036)	(0.714)	(0.077)	(0.781)
TO	0.020552	-0.019142	0.028555***	0.047334
	(0.876)	(0.779)	(0.004)	(0.165)
Constant	6.635671	4.813013	-6.019604	-2.602986
	(0.568)	(0.716)	(0.756)	(0.714)
AR(1)	0.027	0.004	0.042	0.0061
AR(2)	0.375	0.259	0.517	0.255
Hansen J-test	0.4279	0.407	0.260	0.372
Observations	700	700	700	700

Note: ***, ** and * indicate significance at 1%, 5% and 10% respectively.
Source: Authors' computation (2023).

The coefficients of government expenditure on education are positive and significant in GDPG per capita and income equality (IG components). This implies that government expenditure on education positively and significantly influences GDPG per capita and income equality. In magnitude term, a 1% change in government spending on education affect GDPG per capita and income equality by 1.774 and 0.0398 respectively. The coefficients of government expenditure on education and health negatively and significantly affect employment rate. This implies that 1% increase in government expenditure on education and government expenditure on health is associated with a 0.27 and 0.068 decrease in employment rate respectively. The parameter of government expenditure on health in GDPG per capita and income equality exhibit negative effect and statistically significant at the 5% and 10% level. This implies that 1% change in government expenditure on health negatively affect GDPG per capita and income equality by 1.42 and 0.031 respectively. In addition, the parameter of government expenditure on health in inclusive growth index is negative and significance at 10% level. This suggests that a 1% increase in government expenditure on health is associated with decrease of 0.032 in inclusive growth indicating that government health expenditure adversely impact inclusive growth in SSA. Thus, inadequate public

health spending is significantly related with the region's low output growth, high unemployment rate and rising inequality.

Table 6: System GMM results on the effects of Output factor of human capital development on the inclusive growth

Variables	Dependent Variable:			
	GDPG per capita (GDPPCG)	**Income Equality (EQU)**	**Employment Rate (EMP)**	**Inclusive Growth Index (INCG)**
GDPPCG(-1)	-0.0035** (0.017)			
EQU(-1)		0.1210* (0.089)		
EMP (-1)			1.0879*** (0.000)	
INCG(-1)				0.1663 (0.6787)
PSE	0.0017** (0.043)	0.0007 (0.496)	-0.0141* (0.074)	-0.0327* (0.066)
SSE	-0.1773 (0.2352)	-0.0022 (0.357)	0.038381 (0.282)	-0.0343** (0.022)
LE	-0.1154 (0.839)	0.0010* (0.078)	-0.0444 (0.778)	0.0484 (0.651)
IMR	-0.1615 (0.041) **	-0.0015* (0.098)	0.0197* (0.062)	-0.0078** (0.025)
GFCF	-0.0310* (0.054)	0.00002*** (0.005)	0.0020* (0.096)	-0.0031 (0.635)
IRS	-0.0426 (0.566)	0.0006* (0.070)	0.0047* (0.087)	0.0023 (0.885)
INFR	-0.6103** (0.047)	0.0014 (0.909)	0.0463 (0.178)	-0.1084* (0.064)
TO	0.2688** (0.036)	0.0008 (0.931)	0.9672** (0.019)	-0.31001 (0.817)
Constant	30.807 (0.099)	0.5066 (0.506)	-4.7389 (0.7433)	5.13026 (0.162)
AR(1)	0.003	0.047	0.050	0.0713
AR(2)	0.9377	1.0000	0.9997	0.6713
Hansen J-test	0.3504	0.6346	0.5896	0.2397
Observations	700	700	700	700

Note: ***, ** and * indicate significance at 1%, 5% and 10% respectively.
Source: Author's computation (2023).

The statistical effect of primary school enrolment on GDP per capita, employment and inclusive growth index was established at 5%, 10% and 10% respectively. The results indicate that for every 1% improvement in primary school enrolment, GDP per capita, increases by 0.017%, while employment and inclusive growth index decreases by 1.41% and 0.33%, respectively. This implies that improvement in primary school enrolment is associated with an increase in GDP per capita. Similar results are evident for secondary school enrolment, which indicate that for every 1% improvement secondary school enrolment, inclusive growth index decreases by 2.2%. This implies that higher secondary school enrolment is associated with lower inclusive growth, which might indicate a trade-off between increased access to secondary education and inclusive growth.

Infant mortality rate has a negative coefficient in GDPG per capita, income equality and inclusive growth with the p-value of 0.041, 0.098and 0.025 respectively. The results indicate that for every 1% increase in infant mortality rate cause GDP per capita, income equality and inclusive growth index decreases by 16.15%, 0.15% and 0.78%, respectively while employment increases by 1.97%. This invariably suggests that a decrease in the infant mortality rate is associated with higher GDPG per capita, income equality and inclusive growth.

Further, gross fixed capital formation has a negative coefficient in GDPG per capita and inclusive growth but is statistically significant at the 10% significance level. There is a statistical effect of 3.10% and 0.031% on GDPG per capita and inclusive growth for every 1% decrease in gross fixed capital formation. While a positive and significant coefficient of gross fixed capital formation in income equality and employment implies that higher investment in fixed capital (GFCF) is associated with higher income equality and employment. For our control variables, we find that interest rate spread foster income equality and employment as a significant driver of capital formation, which in turn promote economic activity, while trade openness is associated with a higher GDPG per capita and employment (Column 1 and 3).

Lastly, post-diagnostic results show that there is no evidence of serial correlation in the estimated models. In confirming the consistency of the GMM estimates, the Hansen test reveals that the instrumental variables are valid.

5. Conclusion

This study empirically examines the relationship human capital development and inclusive growth in Sub-Saharan African (SSA) countries using panel system GMM. The results showed that government expenditure on education had a positive and statistically significant impact on GDPG per capita and income equality. This finding supports the theoretical notion that investments in education have positive effect on income equality by providing individuals with skills and opportunities for higher-paying jobs. Also, the positive effect of government expenditure on education (GEE) on income equality underscores the role of education in decreasing income disparities. While government expenditure on health (GEH) exhibited negative effect on GDPG per capita and income equality, primary school enrolment (PSE) and secondary school enrolment (SSE) exert negative influences on inclusive growth. Thus, investments in human capital development adversely impact inclusive growth in SSA due to inadequate public health spending related with the region's low output growth, high unemployment rate and rising inequality. Policymakers in SSA countries must prioritize investments in education and healthcare to enhance productivity and stimulate economic development. This investment should not only enhance productivity but also contributes to reducing income inequality and fostering inclusive growth.

References

Adedeji, A. (2018). Inclusive growth, human capital development and natural resource rent in SSA. *Economic Change and Restructuring, 51*(1), 29–48. https://doi.org/10.1007/s10644-016-9193-y

African Development Bank. (2016). *Measuring inclusive growth: From theory to applications in North Africa*. Retrieved from https://www.afdb.org

African Development Bank. (2020). *African economic outlook 2020: Developing Africa's workforce for the future*. Abidjan, Côte d'Ivoire: Author.

African Development Bank. (2023). *Africa's economic growth to outpace global forecast in 2023-2024 – African Development Bank biannual report*. Abidjan, Côte d'Ivoire: Author.

Ajide, K., Alimi, O., Asongu, S., & Raheem, D. (2022). The role of institutional infrastructures in financial inclusion-growth relations: Evidence from SSA. *International Journal of Finance and Economics, 27*(1), 175-191.

Akinbode, S., Dipeolu, A., Bolarinwa, T., & Olukowi, B. (2021). Effect of health outcome on economic growth in sub-Saharan Africa: A system generalized method of moment approach. *Journal of Economics and Development, 23*(3), 254-266.

Andrian, T. (2020). Unemployment, education, poverty, and inclusive growth: Evidence from provinces in Indonesia. *International Journal of Psychosocial Rehabilitation, 24*(8), 4615-4624.

Baruwa, O. (2022). *Institutional quality, financial development and inclusive growth in Nigeria* (Unpublished doctoral dissertation). Lead City University, Ibadan, Nigeria.

Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. National Bureau of Economic Research.

Bernard, S., & Edward, N. (2022). Financial inclusion and inclusive growth in sub-Saharan Africa. *Cogent Economics & Finance,*

10(1), 2058734. https://doi.org/10.1080/23322039.2022.2058734

Campbell, A. (2017). Inclusive growth and sustainable human development in Nigeria. *Advances in Social Sciences Research Journal, 4*(7), 79-95.

Campbell, A. (2021). *Investment in human capital for inclusive growth: Limitata or illimitata accessum to sustainable development*. Ibadan, Nigeria: Lead City University Press.

Campbell, A., & Aderinto, E. (2020). Human capital development and labour market outcomes in Africa: Evidence from Sub-Saharan African countries. *Journal of Economics and Sustainable Development, 11*(6), 1-11.

Campbell, A., & Okuwa, O. B. (2016). Changing demographics and human capital development: Implications for economic growth in Nigeria. *Archives of Business Research, 4*(2), 161-176.

Gov.Scot. (2022). *Inclusive growth: What does it look like?* Economic Development Directorate. Retrieved from https://www.gov.scot/publications/inclusive-growth-look/

GradesFixer. (2021). *Human resource development*. Retrieved from https://gradesfixer.com

Khan, A., Khan, G., Safdar, S., Munir, S., & Andleeb, Z. (2016). Measurement and determinants of inclusive growth: A case study of Pakistan (1990-2012). *The Pakistan Development Review, 55*(4), 455–466.

Korkmaz, S., & Korkmaz, O. (2017). The relationship between labor productivity and economic growth in OECD countries. *International Journal of Economics and Finance, 9*(5), 71-79.

Lee, N. (2018). Inclusive growth in cities: A sympathetic critique. *Regional Studies, 53*(3), 424–434.

Mamdouh, M., Abdelmoula, A., & Abdelsalam, M. (2022). Education and human capital on inclusive growth in Egypt during period 1990-2020 (Econometrics Study). *Journal of Massif, 11*(2), 1-26.

Mamoloko, F., Rangongo, C., & Ngwakwe, C. (2019). Human capital investment and economic growth: A test of endogenous growth theory in two developing countries. *Acta Universitatis Danubius. Œconomica, 15*(1), 126-142.

Matthew, C. (2011). Human capital investment and economic growth in Nigeria: The role of education and health. *Manager, 14*, 106-122.

Nwambuko, T. (2019). Human resources management and capacity building: A pragmatic approach to sustaining microfinance institutions in Nigeria. In *Conference on Microfinance and Enterprise Development Selected Conference Papers* (pp. 31-35). Benin City, Nigeria.

Okowa, E., & Vincent, D. (2019). Human capital development and labour productivity in Nigeria. *Australian Research Journal of Humanities, Management and Social Sciences, 2*(1), 142-155.

Oluwadamilola, O., Akinyemi, O., & Adediran, O. (2018). Human capital development and inclusive growth: Implications for achieving SDG-4 in Nigeria. *African Population Studies, 32*(1).

Organisation for Economic Co-operation and Development. (2016). *The productivity-inclusiveness nexus*. Meeting of the OECD Council at Ministerial Level. Paris, France: OECD Publishing.

Organisation for Economic Co-operation and Development. (2019). *The economy of well-being*. Remarks by Angel Gurría. Retrieved from https://www.oecd.org

Oyinlola, M. A., & Adedeji, A. A. (2019). Human capital, financial sector development and inclusive growth in sub-Saharan Africa. *Economic Change and Restructuring, 52*(1), 43–66. https://doi.org/10.1007/s10644-017-9217-2

Oyinlola, M. A., Adedeji, A., & Onitekun, O. (2021). Human capital, innovation and inclusive growth in sub-Saharan Africa Region. *Economic Analysis and Policy, 72*, 609-625.

Pan, A., Bosch, D., & Ma, H. (2017). Assessing water poverty in China using holistic and dynamic principal component analysis. *Social Indicators Research, 130*(2), 537-561.

Raheem, I. D., Isah, K. O., & Adedeji, A. A. (2018). Inclusive growth, human capital development and natural resource rent in SSA. *Economic Change and Restructuring, 51*(1), 29–48. https://doi.org/10.1007/s10644-016-9193-y

Tella, S. A., & Alimi, O. Y. (2016). Determinants of inclusive growth in Africa: Role of health and demographic changes. *African Journal of Economic Review, 4*(2), 138–146.

Wang, S., Hua, F., Tao, R., & Moldovan, N. (2021). Can health human capital help the Sub-Saharan Africa out of the poverty trap? An ARDL model approach. *Frontiers in Public Health, 9*, 642.

World Bank. (2014). *The growth report: Strategies for sustained growth and inclusive development*. Washington, DC: The World Bank.

World Bank. (2014). *World development indicators*. Retrieved from http://data.worldbank.org/data-catalog/world-development-indicators