Does Human Capital Development Reduce Poverty in Sub-Saharan African: New Insights from Driscoll-Kraay Standard Errors Approach

Abe Magai[1]*, Babalola Sikiru Jimoh[2]

[1]Department of Economics, Federal University wukari, Wukari, Taraba state, Nigeria

2Department of Economics, Modibbo Adama University, Yola, Adamawa State, Nigeria

***Corresponding Author**

DOI: https://doi.org/10.68050/JAMS.2026.491

Received: 15 Sept 2026; Accepted: 16 Sept 2026; Published: 22 September 2026

ABSTRACT

Despite years of economic liberalisation, global integration, and regional reforms, poverty remains one of the greatest challenges in Sub-Saharan countries. With countries in the region accounting for more than half of the world's extremely poor, understanding human capital development's role in tackling poverty is increasingly crucial. Hence, this study aims to investigate whether human capital development reduces poverty in Sub-Saharan Africa using yearly data spanning 2000-2024 for 30 countries. Two indices of human capital development were constructed from six variables using the principal component analysis (PCA). To address potential bias associated with omitted variables, the empirical model incorporates several important variables, including foreign direct investment, rule of law, economic growth, population, exchange rate, and employment. The Driscoll-Kraay standard errors estimator was employed to perform the data analysis. The findings show that broad-based human capital development reduces poverty significantly, but secondary-based human capital development significantly increases poverty. Economic growth, foreign direct investment, employment, and exchange rate have a significant negative effect on poverty. In contrast, population has a significant positive influence on poverty. Similarly, the effect of the rule of law on poverty is positive; however, it is not statistically significant. The findings are robust to a robustness check. It is thus concluded that human capital development is indispensable for tackling poverty in Sub-Saharan Africa; however, its effectiveness depends on policy coherence, robust institutional support, and human development quality. Enhancing the inflow of foreign investment, effective population management, job promotion creation, improving governance, and strengthening health and education systems are necessary for optimising the human capital development effectiveness in addressing poverty in Sub-Saharan Africa.

Keywords: Human capital development, Poverty reduction, Principal Component Analysis (PCA), Foreign Direct Investment (FDI), Sub-Saharan Africa (SSA), Driscoll-Kraay Standard Errors

INTRODUCTION

In Sub-Saharan Africa, poverty has consistently remained one of the biggest impediments to development, despite several regional integrations, economic reforms and increasing globalisation over decades. Over the years, the region has recorded the highest rates of poverty, with high inequality and low living standards (Becker et al., 2023; World Inequality Database, 2023; Jobarteh, 2023; Nyandoro & Timotenda, 2024). Becker et al. (2023) observed that countries in Sub-Saharan Africa are the worst hit by poverty, with about 130,000 people on average in every country moving into extreme poverty each year. According to Baah and Lakner (2023), 35% of the sub-Saharan African population lives in extreme poverty. About 60% of the world's extreme poor are in Sub-Saharan Africa (Ochi, 2023). This evidence suggests that countries in sub-Saharan Africa will potentially not realise the No. 1 sustainable development goal of the United Nations. This goal aims to reduce and eventually eliminate poverty in all its forms everywhere by 2030 (United Nations, 2025).

Reducing and eventually eradicating poverty is given the highest priority in the sustainable development that countries target to realise by 2030.

As debates on development shift increasingly towards long-run human welfare improvements and inclusive growth, human capital development has emerged as an essential strategy for poverty reduction. Human capital is human beings' inseparable aspects that are economically productive (Stein & Sridhar, 2019). They include education, health, knowledge, and skills that improve individuals' productive capacity, enhance their outcomes in the labour market, and widen their opportunities for generating income. Human capital development is the process of enhancing individuals' health, knowledge, abilities, and skills (Goshit & Zumba, 2025). For countries in sub-Saharan Africa, where economic volatility, unemployment and weak institutions remain high and persistent, developing human capital is necessary for breaking the poverty cycle and strengthening sustainable growth and development.

In theory, developing human capital through investing in human capital should translate into increased employability and higher productivity of the capital. Empirical evidence supports this assertion, revealing that better health outcomes and higher educational attainment reduce poverty at the household and national levels significantly (Gounder & Xing, 2012; Arsani et al., 2020; O'Donnell, 2024). However, the human capital development benefit in Sub-Saharan Africa in terms of poverty reduction seems unrealised, as poverty has remained high in the region. Hence, an understanding of whether human capital development decreases poverty in SSA countries is essential. Despite the many studies on the relationship between human capital development and poverty, empirical evidence focusing on SSA remains fragmented, with more studies focusing on growth outcomes rather than poverty. Besides, the joint effect of macroeconomic variables like foreign direct investment, economic growth, employment, and exchange on human capital development and the poverty relationship is not documented in the extant literature. Furthermore, accounting for the rule of law in the relationship between human capital development and poverty in the context of SSA countries has remained unexplored.

This study, therefore, aims to establish whether human capital development reduces poverty in SSA countries, accounting for rule of law, employment, exchange rate, foreign direct investment, and economic growth. By employing a robust econometric technique, this study offers novel insights into the nexus between human capital development and poverty. Insights from this study offer development practitioners and policymakers evidence-based guidance for reducing poverty through human capital development.

The remainder of the study is structured as follows. Section 2 presents the theoretical underpinning. An empirical review is presented in Section 3. Section 4 is the methodology. Section 5 is results and discussion, while Section 6 is conclusion and recommendations.

THEORETICAL UNDERPINNINGS

Human capital theory

Gary Becker in 1962 and Jacob Mincer in 1981 proposed the human capital theory, highlighting how education and health enhance productivity and efficiency of workers and their general well-being by boosting their cognitive abilities and equipping them with the favourable health status necessary for them to thrive in their workplaces and businesses, even in difficult situations. These skills, educational qualifications and favourable health status enable them to secure well-paid employment, thus decreasing unemployment and consequently poverty (Tsaurai, 2018). Moyo et al. (2022) state that poverty is self-reinforcing and leads to unhealthy behaviours, while strong human capital development is supported by favourable health conditions. The initial concept of human capital can be traced back to Adam Smith in the 18th century, who distinguished between skilled and unskilled workers. Skilled workers, due to their investment in education and training and health, have far better opportunities to be gainfully employed and earn higher income and have higher chances of escaping the trap of poverty, while the unskilled workers may remain trapped in low-paying, informal employment, perpetuating the cycle of poverty. This contemporary theory gained prominence through the works of Gary Becker, along with Jacob Mincer and Theodore Shultz.

Human capital theory provides a framework suitable for understanding. Schultz (1961) proposed that individuals who invest in their education and health enhance their human capital. Examples of such investments encompass spending on education, on-the-job training, healthcare, and nutrition. These expenditures boost future productive capacity and increase their future earning capacity while reducing current consumption. Nevertheless, the accumulation of human capital occurs only during periods when gross investment surpasses depreciation over time, influenced by levels of intensity in usage or inactivity. Education and health are viewed as productive investments in individuals, investments that supporters of human capital theory argue are as valuable, or even more so, than investments in physical capital. Scholars of human capital have demonstrated that foundational literacy boosts the productivity of employees in low-skill jobs, while their favourable health status influences their ability to work and access significant economic opportunities. They further argue that training involving logical or analytical thinking, or offering specialised and technical knowledge, enhances the marginal productivity of individuals in high-skilled professional roles. It has been established that workers with a higher level of education and favourable health status increase the human capital within society, which in turn drives enhanced national productivity and a reduction in poverty. Human capital theory suggests that strengthening human capital development – for example, by improving education and skills, health, and nutrition – can result in higher earnings and better living standards, which will eventually lower poverty levels.

Human Capability Approach

Economist Amartya Sen created the capability approach, which provides a more comprehensive view of human progress and well-being. This method holds that people's well-being should be evaluated based on their capacity to operate and produce worthwhile results in different spheres of life, in addition to their material circumstances (Sen, 1999). The capability approach emphasises people's freedoms or capacities to pursue the kind of life they value. In this perspective, human capital development is seen as a way to increase people's capacity and flexibility to lead satisfying lives. It is believed that education, healthcare, and skill development are crucial for empowering people to reach their full potential, which can result in better livelihoods and a decrease in poverty. The capability approach emphasises the importance of empowering individuals to make choices and participate in decision-making processes, recognising that poverty is not merely a lack of income but also a deprivation of opportunities and freedoms (Sen, 1999). By promoting human capital development, the capability approach aligns with the goal of enhancing individuals' capabilities and expanding their opportunities, ultimately contributing to poverty reduction. These theoretical underpinnings provide a foundation for understanding the significance of human capital development in addressing poverty levels in selected African countries. The capability approach stresses the wider aspects of freedom and well-being, while human capital theory emphasises the financial advantages of investing in healthcare, education, and skill development. A thorough grasp of how human capital development can increase people's capacities, boost their economic results, and reduce poverty in African contexts can be achieved by including these theoretical stances.

EMPIRICAL REVIEW

Economic Growth and Poverty

Maniraguha et al (2025) investigated how economic growth translates into poverty reduction in 31 Sub-Saharan Africa from 2000 to 2021 employing the techniques of Non-linear Autoregressive Distributed lagged and Panel Smooth Threshold Regression models. Findings indicate that there is negative effect of GDP growth on poverty in the long run. Also confirmed is the existence of an export baseline, beyond which GDP growth begins to have a significant impact on poverty levels. This export baseline stands at 22.2%. Also identified were two regimes: one, before reaching the export baseline, annual GDP growth has a positive effect on the poverty level, whereas after surpassing the baseline, it negatively impacts the poverty level.

Mogess et al (2023), using system Generalized Method of Moments (GMM) estimator analyzed the relationship between economic growth and poverty reduction in 27 SSA countries for the period 2010 – 2018. Their study revealed that economic growth is related to poverty reduction. Passed levels of poverty had a

severe impact on the current poverty status in the region. Additionally, although intangible measures and income measures of poverty revealed similar results (showing a decrease in poverty), non-financial poverty, especially destitution data, suggested that SSA countries are even poorer than previously discovered. Barak (2022) examined the impact of income inequality, per capita renewable and per capita non-renewable energy consumption, per capita income on poverty reduction in Brazil, Russia, India, China and South Africa (BRICS), employing panel Autoregressive Distributed Lag (ARDL) model for the analysis, the study unveiled that an increase in growth decreases poverty

To measure the impact of economic growth and urbanization on poverty reduction in Vietnam, and verify whether economic growth and urbanization will help reduce poverty rates, Nguyen et al (2020), applying logistic regression models with fixed effects and logistic regression models with random effects confirmed a negative and significant effect of growth on poverty rates. Ngubane et al (2023) studied the nexus among economic growth, unemployment and poverty in South Africa using non-linear ARDL model based on quarterly data available for the period 2000Q1 to 2021Q4. The findings of the study supported the idea that economic growth reduces poverty in the long-run. The asymmetric evidence also confirmed that negative shocks of economic growth reduce the poverty rate. Sehrawat and Giri (2018) examined the influence of financial development, economic growth and income inequality on poverty in India from 1970 to 2015 using ARDL bounds testing procedure. One of their key findings among others was that there is a long-run relationship between economic growth and poverty. Results demonstrated that economic growth help in poverty reduction in India.

FDI and poverty

Ucal (2014) assessed the relationship between foreign direct investment (FDI) and poverty at the macro-pathway in selected developing countries comprising of 26 member countries from United Nations Conference on Trade and Development (UNCTAD), drawing data from 1990-2009. The study employed the panel data technique of random effects and found a negative relationship between FDI and poverty and the model clearly revealed that FDI reduces poverty in the selected developing countries during the period under study. Ogunniyi and Igberi (2014) empirically analyzed the relationship between FDI and poverty in Nigeria using data for the period 1980 to 2012. The findings from the Ordinary Least Squares (OLS) and Error Correction (ECM) estimators showed that FDI has a positive but insignificant impact on real per capita income and hence does have the potential of reducing poverty in the country.

Similarly, Tsaurai (2018), explored the impact of FDI on poverty reduction efforts in 16 Southern and Western African countries using panel fixed effects models. The findings suggest that the interaction between FDI and natural resources reduced poverty levels in the countries studied. Tsaurai (2023) examined the influence of FDI on poverty alleviation in BRICS nations using Panel methods of econometric estimation, namely pooled OLS, fixed effects and fully modified OLS (FMOLS). The results from all the models suggest that Poverty alleviation triggered by FDI was achieved in BRICS. Quinonez et al (2018) used the panel of Latin American Countries for the period 2000-2014 to examine the effect of FDI on poverty. Findings suggest that FDI is not significantly associated with the reduction of poverty in Latin America. Anetor et al (2020) analyzed the effects of FDI, trade, and foreign aid on poverty reduction in 26 Sub Saharan African countries. Using Feasible Generalized Least Square (FGLS) technique to analyze data from 1990 to 2017. The results showed that FDI and foreign aid have a negative effect on poverty reduction in the countries studied. However, these results suggest that the level of FDI required to alleviate poverty has not been reached, and foreign aid have not been properly channeled.

Population and Poverty

In an attempt to examine the impacts of population explosion, misery index, access to adequate sanitation and improved water supply, economic development and electricity consumption on poverty SDG for 20 Sub-Saharan African countries, Nwani and Osuji (2020) employed annual panel secondary data and panel ordinary least squares model, their analysis revealed population growth significantly reduce poverty. Furthermore, causation was also established between population growth and poverty. Zaman et al (2023) set out to unravel

the intricate relationship among increasing poverty rates, population, unemployment and quality of life in selected 18 in Sub-Saharan African countries, made us of the novel panel quantile autoregressive distributed lag method (PQARDL) developed by Chishti and Retish (2023) to address the intricate econometric relationship. The findings indicate that population growth significantly discourages poverty across African economies in the short and long run thus, making population growth an important determining factor of poverty among others in the sub region.

In another study, Putri et al (2025), assessed the relationship between the Islamic Human Development Index (I-HDI), Unemployment, Population Growth, and their impact on Poverty in G20 countries for the period 2010 to 2021. The panel fixed effect regression model results revealed that population growth does not significantly affect the poverty rate, suggesting that demographic changes alone are not adequate to explain changes in poverty across the G20 countries. In a similar analysis for Puapa, Yosmaliza and Suryantoro (2022) analyzed the specific effects of economic growth, the Human Development Index (HDI), and population size on poverty levels. Their empirical evidence established a negative relationship between population rates and poverty in Papua Province during the period 2012-2017.

Ojo (2021), in a bit to demonstrate the consequences of rapid population growth on Poverty in Africa, investigated the link between population growth and poverty rates and found that rapid population growth significantly increased poverty in most developing countries of Africa. Langoday and Man (2024) conducted a study to analyze the relationship between population growth and poverty in Indonesia for the period 2013-2023. The panel ordinary least squares results revealed that population has a significant negative influence on poverty in Indonesia during the period under study. Wu et al (2024), examined how social factors such as health, education, population growth etc. affect poverty in some selected developing countries. System and difference GMM and data for the period 1997-2016 were utilized for the analysis. The results indicated that population growth has no significant impact on poverty.

Human capital Development and Poverty

On human capital development and poverty, Ahmad et al (2018) investigated the effect of human capital and governance on poverty. For this purpose, the study considered 44 developing countries. Panel data on these countries were collected for the time span of 2004 to 2017 and GMM was utilized for the estimation. The results suggested that human capital contributed significantly to contain poverty in the countries selected. Tsauri (2022) analyzed the impact of human capital development on poverty in Central and Eastern European Countries (CEECs) using dynamic generalized methods of moments (GMM), fixed effects, random effects, and pooled OLS with panel data ranging from 2008 to 2019. The findings revealed that human capital development helped to reduce poverty in CEECs for the period under study.

In a similar study conducted for the underdeveloped regions of Indonesia, Wau (2022), analyzed the impact of human capital, public investment and economic growth on poverty. Panel data were collected and analyzed using ECM panel model. Findings from the study showed that human capital contributed significantly to reduce poverty in the regions. This resulted highlighted the study's hypothesis that changes in human capital is associated with changes in poverty level. Moyo et al (2022) examined the effect of human capital formation on poverty in the Eastern Cape Province. The study investigated the short and long run relationship between the variables using the Pooled Mean Group estimator. The results revealed the presence of a short and long run relationship between the variables and also established a significant negative effect of human capital on poverty. Adekoya (2018) conducted a study to investigate the causal relationship between human capital development explicitly measured by health and education and its impact on poverty measured by per capita income in Nigeria over the period 1995-2017. The study utilized Granger causality test through a vector ECM, to determine whether the elements of education and health have any precedence or effect(s) on per capita income in Nigeria. The results suggest that there exists a positive long-run relationship between government expenditure on health and gross enrolment rate on the per capita income of Nigeria, while a negative long-run relationship exists between government expenditure on education, infant mortality rate, life expectancy and literacy rate on the per capita income of Nigeria.

In another study, De Silva and Sumarto (2014), argued that both health and education capital provide a fairly good account of cross-district variation in poverty at the sub-national levels in Indonesia. Using panel fixed effects model and system GMM, their study demonstrated that human capital development significantly accounted for reduction in the levels of poverty in regions under study for the period 2002-2017. In a similar study, Olopade et al (2019), conducted a study to investigate the interactive relationship between human capital components and poverty reduction in Organization of Petroleum Exporting Countries (OPEC) member countries. Utilizing panel fully modified OLS of 12 member countries of OPEC, the study confirmed that human capital components have a negative and significant effect on poverty.

Exchange Rate and Poverty

Several studies have been conducted to determine the relationship between exchange rate and poverty. For example, Nasution et al (2022) conducted a study to determine how monetary policy instruments affect poverty levels in Association of Southeastern Asian Nations (ASEAN). Employing secondary data and panel ARDL model, the estimation results found that exchange rate positively affect poverty rates in the countries under study. Farhani et al (2023) analyzed the asymmetric effect of real exchange rate changes on poverty through the remittances channel and informal sector channel in the three countries of Algeria, Tunisia and the Maghreb over the period 1980-2018. To do so, the study applied panel non-linear ARDL to the data and the results indicated that real exchange rate had large positive effect on poverty through the remittance channel. Karimi and Heshmati (2021) examined the asymmetric impact of exchange rate onpoverty in Iran. The study combines time series models with threshold modeling approaches, and using non-linear ARDL. The findings revealed that long term exchange rate impacts on poverty in Iran. In the short run, with a period of delay, exchange rate fluctuations increase poverty in Iran.

Apergis (2015) conducted a similar study for China using a non-linear ARDL model. Result obtained revealed that real exchange rate depreciation increased poverty in China during the period under study. Hamad and Al-kuraity (2025) sought to determine how exchange rate volatility affect poverty levels in Algeria. The study employed secondary data and ARDL model technique to estimate the data and it was found that poverty and the exchange rate are directly associated, meaning that fluctuations in the exchange rate affect the poverty level. Exchange rates have a direct impact on poverty levels because fluctuations in the exchange rate are likely to affect poverty levels because a decrease in the value of the local currency relative to the dollar causes poverty to spread, and an increase causes poverty to reduce. Chukwuk and Uduh (2024) conducted a thorough search of the literature to investigate the problem of exchange rate volatility and how it impacts on poverty in Nigeria. They utilized qualitative and exploratory methodology and found overwhelming evidences to support the hypothesis that fluctuations in exchange rate have significant impacts on poverty in Nigeria.

Employment and Poverty

On the link between employment and poverty, several studies have been conducted. Dursun and Ogunleye (2016), for example, conducted a study to examine the interplay of employment, economic growth and poverty in West African countries using panel country level data from 1991 – 2010. They made use of the panel dynamic OLS and fully modified OLS models to estimate the relationship. Their findings revealed that employment has no significant influence on poverty in the West African countries studied. Vaalavuo and Sirnio (2022) analyzed the effect on gaining employment on poverty in 30 European Union (EU) countries for the period 2010 to 2017. Using panel fixed effects model to estimate the relationship, they found that Overall, gaining employment increased the chances of exiting poverty by approximately 30 percentage points when other factors and unobserved heterogeneity were controlled for. Hande (2023), used primary data to examine the relationship between employment and poverty in India. The study employed the Two-variable regression model to estimate the relationship and found that an increase in employment reduces poverty and decrease in employment increases poverty and concluded that employment and poverty has an inverse relationship.

Kuldasheva et al (2023) analyzed the impact of education and employment in both the rural and urban areas of the country of Uzbekistan. They employed probit model for the data analysis. Their findings indicate that employment significantly contributes to poverty reduction in both the rural and urban areas. Arif et al (2025)

used OLS estimation technique to empirically investigate the effect of employment on multi-dimensional poverty (MPI) of Rawalpindi district of Pakistan. They reported that employment status is significant and negatively associated with the poverty of households. The community sector is showing negative and significant results. Overall, the results show that employment and poverty have an inverse relation. Yerrabati (2022), investigated the poverty reducing effect of vulnerable employment for 65 developing countries. Using secondary data over the period 1995 to 2019 and dynamic panel data analysis, findings revealed that vulnerable employment reduces $1.90 a day poverty marginally and has no effect on poverty at a higher threshold.

Rule of Law and Poverty

On the relationship between the rule of law and its impact on poverty, Sonora (2019) conducted a study to examine this relationship for Latin American countries drawing from an unbalanced panel data over the period 1995 – 2014. Using feasible GLS panel methods, the study found that all the four indicators of the rule of law as identified by the study (security of the populace, check on government, protection of property rights and low or absence of corruption) have a significant negative impact on poverty in Latin American countries. In his work, Olaoye (2021), examined the link between poverty reduction and economic growth through the channel of institutional quality using correlation analysis, granger-causality as well as the ARDL model. The findings revealed that rule of law (one of the indicators of institutional quality) has a significant positive relationship with poverty in Nigeria over the period 1990-2019.

Fagbemi et al (2020) analysed the nexus between quality of institutions and poverty in Nigeria over the period 1984-2017. Their analysis is based on three measures of institutional quality: bureaucratic quality, democratic accountability and rule of law. Using Dynamic OLS, Canonical Cointegrating Regression and VCM techniques, their results suggest among others, that rule of law has a significant negative influence on poverty. Additionally, findings demonstrated that poverty and weak institutions are interrelated and complementary in the country. Overall, the results suggest that widespread poverty in Nigeria is as a result of the inability of public institutions to function properly or underlying governance practices. In a similar study, Olawale et al (2023), using fully modified OLS and causality test examined the relationship between poverty, institutional quality, and economic growth in Nigeria from 1996 to 2018. Rule of law and corruption control were used to measure institutional quality. The results established that rule of law had a significant positive effect on poverty. They argued that this result could be attributed to the biased judicial system in the country.

METHODOLOGY

Data and data description

The study used yearly data covering 2000-2024 for 30 sub-Saharan African countries. Table 1 presents the countries covered in this study. Data availability on the key variables informed the choice of the period covered. Key variables are poverty and human capital development. Following Goshit and Zumba (2025), indexes for human capital development were generated from six variables, including life expectancy, government health expenditure, primary school enrolment, government education expenditure, and secondary and tertiary school enrolment rates, using principal component analysis (PCA). To address potential omitted variable bias, economic growth, rule of law, exchange rate, foreign direct investment, and population were included in the model. The variables were selected based on the extant literature. Employment is expected to reduce poverty by providing people with income. The exchange rate's impact on poverty remains inconclusive (Elbadawi, 2015; Nasution et al., 2022). The legal framework's importance in laying down accountability and governance frameworks, clarifying private and public entities' responsibilities, and refining states' long-term and budgetary commitment and countries' capacity to formulate, adopt and enforce laws in patient areas is crucial to poverty reduction (Food and Agriculture Organisation of the United Nations, 2020). Foreign direct investment is expected to reduce unemployment by boosting the financial sector and creating more jobs. Table 2 presents a description of all the variables.

Table 1: List of Countries

Angola	Ethiopia	Mozambique
Benin	Ghana	Niger
Botswana	Guinea	Nigeria
Burundi	Kenya	Rwanda
Burkina Faso	Lesotho	Sawo Tome and Principe
Cabo Verde	Madagascar	Senegal
Cameroon	Malawi	South Africa
Central African Republic	Mali	Tanzania
Chad	Mauritania	Togo
Eswatini	Mauritius	Uganda

Source: Author's computation (2026)

Table 2: Variables Description and Data Sources

Variable	Description	Source
Poverty	Poverty headcount ratio at $3.00/day (2021 PPP) as a percent at of population	World Bank
Human capital development	- Life expectancy at birth, total (years)	World Bank
	- School enrollment, primary (% gross)	
	- School enrollment, secondary (% gross)	
	- School enrollment, tertiary (% gross)	
	- Domestic general government health expenditure (% of GDP)	
	- Government expenditure on education, total (% of GDP)	
Economic growth	GDP per capita (constant LCU)	World Bank
Exchange rate	Official average dollar/local currency exchange rate	World Bank
Rule of law	Rule of Law: Estimate	World Bank
ForeignDirect Investment	Foreign direct investment (net inflows as a percentage of GDP)	World Bank
Population	Total population	World Bank
Employment	Total Employment to population ratio (percentage) (modeled ILO estimate)	World Bank

Source: Author's computation (2026)

Table 3 presents the Eigenvalues for the PCA. The Eigenvalues of components 1 and 2 are greater than 1, suggesting that they account for more variance in the human capital development variables than only one standardised variable. The first component accounted for 46.16%, while the second component explained 20.29% of the total variance. To better capture human capital development, components 1 and 2 were used as **indices** for human capital development, since they explain about 66.46% variance.

Table 3: Eigenvalues

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.7698	1.55225	0.4616	0.4616

Comp2	1.21754	0.260756	0.2029	0.6646
Comp3	0.956788	0.467739	0.1595	0.8240
Comp4	0.489049	0.176978	0.0815	0.9055
Comp5	0.312071	0.0573177	0.0520	0.9575
Comp6	0.254753	.	0.0425	1.0000

Source: Author's computation using Stata 17 (2026)

Testing for cross-sectional dependence in econometric analysis involving panel data is essential. Cross-sectional dependence in panel data potentially biases research findings. Hence, to ensure that cross-sectional dependence is not present in the analysis output, the estimates were subjected to the Pesaran (2004) cross-sectional dependence test. Equation 1 expresses the cross-sectional dependence test formula.

$$CSD = \sqrt{\frac{2T}{N(N-1)N}\left(\sum_{K=1}^{K=1}\sum_{M=j+1}^{N} \hat{Corr}_{i.t}\right)} \qquad (1)$$

In equation 1, $\hat{Corr}_{i.t}$ denotes pairwise correlation. The null hypothesis of this test is that individual units are not interdependent. Hence, the null hypothesis must not be accepted if there is no cross-sectional dependence.

Model and Estimation Technique

The study investigates the effect of human capital development on poverty in Sub-Saharan African countries. To eliminate the possibility of omitted variable bias, several variables are included in the model. Equation 2 expresses poverty as a function of the regressors used.

$$\text{pov}_{it} = f(hcd_{it}, egr_{it}, pop_{it}, fdi_{it}, emp_{it}, rol_{it}, exr_{it}) \qquad (2)$$

Expressing equation 2 in econometrics form gives equation 3

$$\ln\text{pov}_{it} = \lambda_{it} + \gamma_1 hcd1_{it} + \gamma_2 hcd2_{it} + \gamma_3 \ln egr_{it} + \gamma_4 \ln pop_{it} + \gamma_5 fdi_{it} + \gamma_6 emp_{it} + \gamma_7 \ln pop_{it} + \gamma_8 \ln exr_{it} + e_{it} \qquad (3)$$

Where $\ln pov_{it}$, $hcd1_{it}$, $hcd2_{it}$, $\ln egr_{it}$, $\ln pop_{it}$, fdi_{it}, $\ln emp_{it}$, rol_{it} and $\ln exr_{it}$, respectively represent the natural log of poverty, human capital development 1, human capital development 2, the natural log of economic growth, the natural log of population, foreign direct investment, the natural log of employment, the rule of law, and the natural log of the exchange rate for the country i, at time t. In the equation, e_{it} is the error is the effort error term for country i at time t. λ_{it} is the slope of the model, and γ_i are the regressors' parameters.

To ensure robustness of the result, Equation 3 was estimated using several techniques, including pooled OLS, random effects, fixed effects, Driscoll-Kraay standard error estimation, and the Panels Corrected Standard Errors (PCSEs) estimator. The pooled OLS, Random Effects, Fixed Effects, and Driscoll-Kraay standard error estimation were used for the baseline estimation, while the PCSEs estimator was used to verify the robustness of the findings. These estimators benefit research involving panel data. For instance, the fixed-effects estimator corrects for individual time-invariant non-observable factors' impact by employing, hence addressing, any biases related to omitted variables which affect estimates' accuracy (Wooldridge, 2015). Besides, it addresses the serial correlation problems that result from permanent heterogeneity and addresses the problem of correlation caused by endogenous behaviour, which potentially biases output. The model control for measured or unmeasured characteristics (Allison 2009; Wooldridge 2010). The random effects technique retains variables that do not change over time and uses between-unit and within-unit variation, which gives it more statistical power. Allison (2009) observed that the estimator is able to estimate the impact of any variables that

do not change within clusters. One benefit of the pooled OLS estimator is that it produces efficient estimates, especially when unobserved heterogeneity is absent in the data.

The Driscoll-Kraay standard errors technique addresses autocorrelation, heteroskedasticity, and serial dependence in analysis involving panel data. Hoechle (2007) posits that the estimator is suitable for cross-sectional dependence when observed. According to Driscoll and Kraay (1998), the approach eliminates the heterogeneity bias effect by accounting for constant variations across cross-sections. Besides, it produces robust estimates when the number of periods is less than the number of cross-sections (Beck & Katz, 1995).

RESULT AND DISCUSSION

Table 4 presents the descriptive statistics of all the variables. The variables' mean values are lower than the respective maximum values but higher than their respective minimum values. It suggests that all the variables are consistent. The standard deviation values reveal that employment, with a standard deviation value of 0.2964, exhibits the least variability, while foreign direct investment, whose standard deviation value is 5.3984, exhibits the greatest variability. Each variable has complete observations, suggesting that the panel used is strongly balanced.

Table 4: Summary Statistics

Variable	Mean	Std. dev.	Min	Max	Obs
Lpov	3.7011	0.8867	-0.6931	4.4931	750
Pc1	-2.71e-09	1.6643	-4.3780	4.6522	750
Pc2	-1.16e-10	1.1034	-3.3769	4.7386	750
Lexr	5.1007	2.0656	-0.6071	9.1659	750
Lgdpp	7.0140	0.8590	5.5326	9.3612	750
Rol	-0.5570	0.58565	-1.8510	1.0240	750
Lpop	16.1761	1.5163	11.8777	19.2652	750
Fidi	3.5888	5.3984	-11.1917	46.2752	750
Lemp	4.0864	0.2964	2.9900	4.4525	750

Source: Author's computation using Stata 17 (2026)

Table 5 reports the results of correlations among the variables. Assessing correlations between the variables is necessary to ensure that there is no serious serial dependence between the explanatory variables. The presence of a problematic correlation between explanatory variables potentially biases the estimates, leading to inaccurate conclusions (Goshit & Zumba, 2025). There is no evidence of strong serial correlations between the explanatory variables. A correlation coefficient of 0.8 or higher potentially indicates a strong correlation. All correlation coefficients between our explanatory variables are lower than 0.8. Interestingly, the correlation coefficient between human capital development indexes is zero, suggesting the absence of correlation between the variables.

Table 5: Correlation matrix

	lpov	Pc1	Pc2	Lexr	Lgdpp	Rol	Lpop	Fdi	lemp
Lpov	1.0000								
Pc1	-0.5129	1.0000							
Pc2	0.5234	0.0000	1.0000						
Lexr	0.0310	-0.2516	-0.1485	1.0000					
Lgdp	-0.6720	0.6799	-0.2576	-0.1928	1.0000				
Rol	-0.4251	0.7021	-0.0850	-0.4122	0.5516	1.0000			

Lpop	0.3809	-0.4149	-0.1823	0.0634	-0.2702	-0.3221	1.0000		
Fdi	-0.0518	0.0442	0.0332	-0.1001	-0.0516	-0.0129	-0.1734	1.0000	
Lemp	0.3947	-0.4676	-0.0757	-0.0804	-0.4472	-0.2638	0.6942	-0.1803	1.0000

Source: Author's computation using Stata 17 (2026)

All the variables were subjected to stationarity test to ascertain their stationarity status. The Hadri (2000), Levin et al. (2002), and Im et al. (2003) unit root tests were employed to perform the stationarity test. Table 6 presents the unit root test results. While the Hadri (2000) test tests the null hypothesis that all panels are trend stationary, the null hypothesis of Levin et al. (2002) and Im et al. (2003) is that the panels contain unit roots. This suggests that in the case of the Hadri (2000) test, a series is only stationary if the null hypothesis is not rejected, but the null hypothesis must not be accepted in the case of Levin et al. (2002) and Im et al. (2003) for a series to be stationary.

Table 6: Unit Root Test Result

	IPS (Z-t-bar)		LLC		Hadri	
ln*pov*	1.6233	-14.4713***	-2.1294**	-11.0192***	64.1577***	-1.2674
PC1	-1.7149	-15.5146***	-5.4668***	-11.7162***	70.3719***	-2.7184
PC2	-1.8311**	-15.1718***	-4.0037***	-14.1399***	53.5949***	-3.4606
ln*exr*	2.8879	-10.7809***	-0.8361	-10.6839***	72.4327***	2.9369***
ln*gdp*	1.3306	-11.3474***	-4.5625***	-8.0659***	73.0686***	6.1875***
Rol	-3.7880***	-16.2795***	-2.1031**	-7.6287***	52.3323***	-1.5211
ln*pop*	1.5105	13.1692***	-12.5930***	-3.0645***	82.1274***	31.8854***
Fdi	-7.5493***	-16.6788***	-4.9663***	-12.9139***	17.9904***	-4.3862
ln*emp*	4.2102	-9.8620***	-1.5561*	-10.2240***	67.5856***	-0.2206

Note: *, **, and *** indicate H_0 rejection at 10%, 5%, and 1% significance level respectively.

Source: Author's computation using Stata 17 (2026)

The outcome of the Pesaran (2004) cross-sectional dependence test is presented in Table 7. There is cross-sectional dependence evidence among the majority of the variables in the panel. In particular, all the variables, except the rule of law, which shows no evidence of cross-sectional dependence, record strong statistically significant cross-sectional dependence statistics. Given the presence of cross-sectional dependence in most of the variables, the second-generation cointegration test technique was employed to test for the presence or otherwise of a long-run relationship between the dependent and independent variables. Specifically, the Westerlund (2007) cointegration test was employed to assess the presence or not of a long-run relationship between the dependent and independent variables, since it accounts for cross-sectional dependencies appropriately.

Table 7: Cross-sectional Dependence Test Result

Variable	Statistic	Corr	Abs
Lnpov	42.79***	0.410	0.663
Pc1	71.30***	0.684	0.744
Pc2	42.72***	0.410	0.538
Lnpop	101.00***	0.976	0.976
Lnexr	56.62***	0.543	0.576
Lnemp	14.60***	0.140	0.508
Fdi	2.86***	0.027	0.229
Rol	-1.06	-0.010	0.396
Lngdp	61.17***	0.587	0.741

Note: *** indicates statistically significant at 5%

Source: Author's computation using Stata 17 (2026)

The cointegration test result is presented in Table 8. The p-values of the Gt, Ga, and Pa statistics suggest rejection of the test' null hypothesis (no cointegration). However, the robust p-value of the Pt statistic indicates non-rejection of the null hypothesis of the test at any significant level since it is greater than 0.1. These outcomes indicate the presence of a long-run relation for the majority of the countries, accounting for cross-sectional dependence.

Table 8: Coinintegration Test Result

Statistic	Value	z-value
Gt	-2.778**	-0.746
Ga	-9.800**	3.439
Pt	-13.051	-0.049
Pa	-10.089**	0.806

Note: *** indicates statistically significant at 5%

Source: Author's computation using Stata 17 (2026)

First, the model was estimated with pooled OLS, Random, and Fixed effects estimators. Table 9 presents the result. The outcomes from the random and fixed effects were subjected to the Hausman test to choose the efficient estimator. The Hausman test result suggests that the null hypothesis that the random effects estimator is consistent and preferred is not true, since the p-value of the test statistic is statistically significant. That is, the fixed effects estimator is consistently efficient and therefore preferred. To avoid reporting spurious results, the estimates from the fixed effects estimates were subjected to the Pesaran (2004) cross-sectional dependence test, and the result is in Table 9. The outcome suggests strong evidence of cross-sectional dependence. That is, the null hypothesis that the residuals of the estimated model are not correlated was rejected. The residuals of the estimates from the fixed effects estimator are serially independent, since there is sufficient evidence to reject the test's null hypothesis at 10%. The coefficient of correlation between two residuals is 1.949, on average**.** Thus**,** the Driscoll-Kraay standard errors estimator was employed to estimate our model. This model is robust to all forms of temporal and cross-sectional dependence (Hoechle, 2007). Hence, the findings from this study are based on estimates from the Driscoll-Kraay standard errors estimator. Table 10 reports the results from the Driscoll-Kraay standard errors estimator.

Table 9: Pooled OLS, Fixed and Random Effects Result

Variable	OLS	RE	FE
Pc1	-0.0769***	-0.0561***	-0.0361**

	(0.0186)	(0.0146)	(0.0149)
PC2	-0.3811*** (0.0186)	0.0341* (0.0183)	0.0122 (0.0182)
Lexr	-0.0150 (0.0104)	0.0287 (0.0216)	0.0747*** (0.0248)
Lgdpp	-0.4186*** (0.0329)	-0.6293*** (0.0594)	-0.5678*** (0.0662)
Rol	0.0297 (0.0478)	0.1691*** (0.0420)	0.1680*** (0.0415)
Lpop	0.1996*** (0.0175)	-0.1052** (0.0446)	-0.4159*** (0.0704)
Fdi	-0.0061* (0.0035)	0.0004 (0.0018)	0.0008 (0.0018)
Lemp	-0.1779* (0.4640)	0.3639** (0.1443)	0.1833 (0.1530)
Constant	4.2507*** (0.2850)	8.2133*** (0.9721)	13.3715*** (1.3411)
Obs.	750	750	750
Crosse-sections	30	30	30
Hausman (χ^2)		53.16***	
Cross-sectional dependence			1.949

Note: *, **, and ***, respectively denote significant at 10%, 5%, and 1%.

Source: Author's computation using Stata 17 (2026)

Table 10: Driscoll-Kraay Standard Errors and PCSEs Result

	Driscoll_Kraay		PCSEs	
Variable	Coefficient	Std. error	Coefficient	Std. error
Pc1	-0.0769***	0.0134	-0.0769***	0.0147
PC2	0.3811***	0.0259	0.3813***	0.023
Lexr	-0.0150*	0.0080	-0.0150***	0.0056
Lgdpp	-0.4186***	0.0150	-0.4186***	0.0145
Rol	0.0297	0.312	0.0297	0.0324
Lpop	0.1996***	0.0142	0.1996***	0.0112
Fdi	-0.0061*	0.0029	-0.0061***	0.0021
Lemp	-0.1779***	0.0637	-0.1779***	0.0476
Constant	4.2507***	0.3181	4.2507***	0.277
Obs.	750		750	
Crosse-sections	30		30	
R^2	0.6938		0.6938	

Note: *, **, and ***, respectively denote significant at 10%, 5%, and 1%.

Source: Author's computation using Stata 17 (2026)

The influence of the primary component of human capital development on poverty is negative and statistically significant. The coefficient of this variable is -0.0769 and significant at the 1% level, indicating that, other things being constant, a unit improvement in broad-based human capital development reduces poverty by 0.0769%. That is, broad-based human capital development is necessary for achieving success in tackling poverty in sub-Saharan Africa. The finding validates De Silva and Sumarto (2014), Olopade et al. (2019), and

Tsauri (2022), who show that human capital development reduces poverty. The secondary human capital development dimension exerts a positive, statistically significant influence on poverty. All else constant, an increase in the secondary human capital dimension by 1 unit raises poverty by 0.3811%. This positive, statistically significant effect potentially suggests that inefficient aspects of unstructured human capital development are strongly associated with increased levels of poverty. Some previous studies documented findings similar to this. For instance, Ahmad et al. (2018) provides evidence indicating that human capital development increases poverty significantly.

The coefficient of employment is -0.1779 and statistically significant, suggesting that a 1% increase in employment translates into a 0.1779% reduction in poverty. That is, employment creation is essential for achieving the goal of poverty reduction. This finding lends credence to findings presented by early studies. For instance, Vaalavuo and Sirnio (2022), Yerrabati (2022), Hande (2023), and Kuldasheva et al. (2023) presented evidence showing that employment significantly reduces poverty. The effect of foreign direct investment on poverty is negative and statistically significant. The finding suggests that attracting foreign direct investment as a strategy for addressing poverty yields positive outcomes. All else constant, the estimates indicate that a unit increase in foreign investment is associated with a 0.0061% fall in poverty. A similar finding is observed in other studies, such as Ucal (2014), Anetor et al. (2020), and Anetor et al. (2020).

The coefficient on exchange rate is -0.0150 and statistically significant at 10%, indicating that the rate at which the local currency of a Sub-saharan country is exchanged for a unit of other currencies is an important determinant of poverty. Specifically, a reduction in the value of the local currency against other currencies significantly reduces poverty. Ceteris paribus, a 1% weakening of the local currency against other currencies reduces poverty by -0.0150%. The finding contradicts that presented by Apergis (2015), Nasution et al. (2022), and Hamad and Al-kuraity (2025), which indicates that exchange rate depreciation exacerbates poverty. The impact of economic growth on poverty is negative and statistically significant at 1% level. The coefficient of this variable is -0.4186, suggesting that, holding other things constant, a 1% increase in economic growth is equivalent to a 0.4186 reduction in poverty. The implication of this finding is that improvements in economic growth are requisite for combating poverty in Sub-Saharan African countries. Similar results were reported by some studies. For instance, Nguyen et al. (2020), Barak (2022), Mogess et al. (2023), and Maniraguha et al. (2025) reported evidence revealing that economic growth translates into a significant reduction in poverty.

The coefficient on population is 0.1996 and significant at 1%, which means that a rise in population by 1% is equivalent to a rise in poverty by 0.1996%, ceteris paribus. This finding suggests that population significantly worsens poverty; hence, an increase in population significantly undermines poverty. This finding does not lend credence to the findings reported by some earlier studies. Studies such as Nwani and Osuji (2020), Zaman et al. (2023), Zaman et al. (2023), and Langoday and Man (2024) presented findings showing that an increase in population dampens poverty significantly. The rule of law's influence on poverty is positive; however, it is not statistically significant at any level. That is, the rule of law is not an important determinant of poverty in Sub-Saharan Africa. All other things being constant, an improvement in the rule of law by 1 unit worsens poverty weakly by 0.0297%. This runs contrary to findings reported by some studies, such as Sonora (2019) and Fagbemi et al. (2020), which indicate that the rule of law significantly reduces poverty. However, the finding supports that of Olawale et al. (2023), which reveals that the rule of law has a direct association with poverty.

A Check for Robustness

To validate the outcome of the Driscoll-Kraay standard errors approach, a check for robustness was implemented. The Panels Corrected Standard Errors estimator was employed to implement the robustness check. Table 10 reports the robustness check result. The estimates from the robustness checks do not deviate significantly from the outcome of the Driscoll-Kraay standard errors technique. Specifically, the robustness checks result shows that the primary component of human capital development reduces poverty significantly; however, the secondary human capital development component significantly increases poverty. Also, the result confirms that economic growth, exchange rate, foreign direct investment, and employment significantly reduce poverty. Furthermore, it confirms that population and rule of law have a positive effect on poverty, with the impact of the former being statistically significant.

CONCLUSION AND RECOMMENDATIONS

This study investigates whether human capital development reduces poverty in 30 sub-Saharan African countries using yearly data from 2000 to 2024. Employing principal component analysis to construct human capital development indices from six variables and the Driscoll-Kraay standard errors estimators, the study provides robust insights into the effect of human capital development on poverty in the context of Sub-Saharan Africa. To address potential problems associated with omitted variable bias, several variables were included in the model. These include economic growth, exchange rate, rule of law, employment, foreign direct investment, and population. The findings of the study indicate that broad-based human capital development reduces poverty significantly. But the secondary component of human capital development has a significant positive impact on poverty, suggesting that inefficient or fragmented human capital development potentially diminishes the welfare of people. This reflects issues such as a weak education system, resource misallocation, an inefficient/weak health system, and low quality of health and education.

Exchange rate, economic growth, foreign direct investment and employment reduce poverty significantly, suggesting that inclusive economic growth, global investment, exchange rate devaluation or depreciation, and opportunities in the labour market are essential for tackling poverty in Sub-Saharan Africa. But population increases poverty significantly, highlighting that population pressure undermines efforts aimed at tackling poverty in sub-Saharan Africa. Though the effect of the rule of law on poverty is positive, it is not statistically significant. This suggests that weak and ineffective institutional environments potentially undermine interventions aimed at addressing poverty. Overall, the evidence from this study highlights that while human capital development remains crucial for tackling poverty in Sub-Saharan African countries, its effectiveness is a function of institutional support, efficiency and its quality. Tackling constraints around the labour market, demographic dynamics, governance, and foreign direct investment inflows is essential for poverty reduction in Sub-Saharan Africa.

The study thus recommends strengthening human capital development in Sub-Saharan Africa. Various governments in sub-Saharan Africa should prioritise investing in holistic human capital development that enhances health and education expenditures and education enrolment. The significant poverty-reducing impact of broad based human capital development indicates that coordinated and broad human capital development produces the most positive outcome in terms of reducing poverty. Also, robust employment generation policies should be promoted in Sub-Saharan Africa. These policies should focus on the expansion of labour-intensive sectors such as services, manufacturing, and agriculture, strengthen vocational and technical training, and promote small business development and indentureship. Leveraging FDI will assist in tackling poverty significantly. There should be robust policies aimed at attracting foreign direct investment in productive sectors, negotiating technology agreements and transfers, and strengthening the link between labour markets and foreign firms. This will potentially strengthen FDI to reduce poverty. Inclusive growth should be promoted through diversification of economies, supporting SMEs and improving access to finance and infrastructure, among others.

Population in Sub-Saharan Africa should be managed properly to prevent it from aggravating poverty. People should be encouraged to have preferred goods and services produced in their own country over those produced in other countries. This will strengthen demand for goods and services and employment, thereby reducing poverty in the countries. Sub-Saharan countries should promote competitive and stable exchange rate policies. Local currency depreciation should not translate into inflationary shocks for goods and services, particularly those that are essential. Institutional frameworks should be strengthened through improving governance, strengthening legal systems, reducing corruption, and enforcing accountability in the delivery of services.

REFERENCE

1. Adekoya, O. D. (2018). Impact of human capital development on poverty alleviation in Nigeria. *International Journal of Economics & Management Sciences*, *7*(4).
2. Ahmad, R., Bashir, F., & Hussain, A. (2018). Human capital, governance and poverty reduction: A panel data analysis. *Review of Economics and Development Studies*, *4*(1), 103-113.

3. Allison, P. D. (2009). *Fixed effects regression models*. Thousand Oaks, CA: Sage
4. Anetor, F. O., Esho, E., & Verhoef, G. (2020). The impact of foreign direct investment, foreign aid and trade on poverty reduction: Evidence from Sub-Saharan African countries. *Cogent bEconomics & Finance*, *8*(1), 1737347.
5. Apergis, N. (2015). Asymmetric real exchange rate pass-through and poverty in China: evidence from a nonlinear model. *Applied economics letters*, *22*(12), 951-954.
6. Arif, H., Hasan, H., & Imran, M. (2025). Impact of employment on multidimensional poverty: A case study of Rawalpindi District in Pakistan. *Pakistan Journal of Economic Studies (PJES)*, *8*(2), 98-115.
7. Baah, S. K., & Lakner, C. (2023). *Fragility and poverty in Sub-Saharan Africa: two sides of the same coin*. World Bank: retrieved November 17, 2025 from https://blogs.worldbank.org/en/opendata/fragility-and-poverty-sub-saharan-africa-two-sides-same-coin.
8. Barak, D. (2022). The impact of income inequality, renewable energy consumption, non- renewable energy consumption and per capita income on poverty: evidence from BRICS economies. *Ekonomika*, *101*(1), 62-83.
9. Beck, N., & Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *American Political Science Review., 89*(3), 634-647.
10. Becker, S., Ortiz-Juarez, E., & Molina, G. G. (2023). *Growth without gains*. United Nations Develoment Programme. https://www.undp.org/blog/growth-without-gains.
11. Chukwuka, E. J., & Uduh, D. M. (2024). Monetary policy and exchange rate stability in Nigeria: A poverty reduction approach for entrepreneurial success. *International Journal of Economics and Financial Management*, *9*(7), 112-125.
12. Dahliah, D., & Nur, A. N. (2021). The influence of unemployment, human development index and gross domestic product on poverty level. *Golden Ratio of Social Science and Education*, *1*(2), 95-108.
13. De Silva, I., & Sumarto, S. (2014). Dynamics of Growth, Poverty and Human Capital: Evidence from Indonesian Sub-National Data. DOI: https://doi.org/10.15304/rge.27.2.5664
14. Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *Review of Economics and Statistics, 80*(4), 549-560.
15. Dursun, G., & Ogunleye, B. (2016). Economic growth, employment and poverty reduction: The case of West African countries. *American Journal of Economics*, *6*(1), 50-60.
16. Elbadawi, I. B. (2015). 9 real exchange rate undervaluation and poverty. in: McKay & Thorbecke (Eds.), *Economic growth & poverty reduction*. Oxford University Press.
17. Fagbemi, F., Oladejo, B., & Adeosun, O. A. (2020). The effectiveness of poverty alleviation policy: Why is the quality of institutions the bane in Nigeria?. *Review of Development and Change*, *25*(2), 215-236.
18. Food and agricultural organization of the United Nations (2020). The role of law in reduction of rural poverty: towards leveraging legal frameworks (FAO Legal Papers No. 105), Rome: FAO.
19. Goshit, G. G., & Zumba, Y. I. (2025). An investigation of the relationship between human capital development and economic growth in Nigeria: A principal component analysis based human capital development index. *Asian Journal of Economics and Empirical Research*, *12*(2), 151-165.
20. Hadri, K. (2000). Testing for unit roots in heterogeneous panel data. *Econometrics Journal, 3*, 148-161.
21. Hamad, G. A. O., & Al-kuraity, E. A. J. (2025). The Impact Of Currency Rate Volatility On
22. Hand O. S., (2023). Examination of the relationship between poverty and employment. *International Journal of Social Science and Humanities Research*, 11(4), 447-455.
23. Hassan, M. U., Khalid, M. W., & Kayani, A. S. (2016). Evaluating the dilemma of inflation, poverty and unemployment. *Bulletin of Business and Economics (BBE)*, *5*(2), 67-82.
24. Hoechle, D. (2007). Robust standard errors for panel regressions with cross-sectional dependence. Available at: The state journal, 7(3), 281-312.
25. Ijaiya, G. T., Ijaiya, M. A., & Bello, R. A. (2011). Economic growth and poverty reduction in Nigeria.
26. Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics, 115*(1), 53-74.
27. Jobarteh, M. (2023). Sub-Saharan Africa. ISS African Futures. https://futures.issafrica.org/geographic/regions/sub-saharan-africa/.

28. Karimi, M. S., & Heshmati Dayari, E. (2021). Investigating the asymmetric effects of exchange rate on poverty in Iran. *Journal of Development and Capital*, *6*(1), 163-181.
29. Klasen, S., & Lawson, D. (2007). *The impact of population growth on economic growth and poverty reduction in Uganda* (No. 133). Diskussionsbeiträge.
30. Kuldasheva, Z., Qadamboevich, B. S., BALBAA, M. E., & ISMAILOVA, N. (2023). Impact of Education and Employment on Poverty. *Journal of Sustainable Development and Green Technology*, *2*(1).
31. Langoday, T. O., & Man, S. (2024). The role of population growth, education level, labor force participation rate on poverty level in Indonesia. *Journal of Law and Sustainable Development*, *12*(2), e3011-e3011.
32. Levin, A., Lin, C-F., & Chu, C-S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics, 108*, 1-24.
33. Maniraguha, F., Uwilingiye, J., Ndemezo, E., & Ruranga, C. (2025). Economic growth and poverty in sub-Saharan African countries: non-linearity and exports threshold effect. *Journal of Applied Economics*, *28*(1), 2557407.
34. Meo, M. S., Kumar, B., Chughtai, S., Khan, V. J., Dost, M. K. B., & Nisar, Q. A. (2023). Impact of unemployment and governance on poverty in Pakistan: a fresh insight from non-linear ARDL co-integration approach. *Global Business Review*, *24*(5), 1007-1024.
35. Mogess, Y. K., Eshete, Z. S., & Alemaw, A. T. (2023). Economic growth and poverty reduction: Evidence from Sub-Saharan African (SSA) countries. *Poverty & Public Policy*, *15*(2), 251-278.
36. Moyo, C., Mishi, S., & Ncwadi, R. (2022). Human capital development, poverty and income inequality in the Eastern Cape province. *Development Studies Research*, *9*(1), 36-47.
37. Muturi, D. (2023). Impact of foreign direct investment on poverty reduction and economic development. *Development*, *8*(2), 80-89.
38. Nasution, L. N., Rusiadi, A. N., & PUTRI, D. (2022). Impact of monetary policy on poverty levels in five asean countries.
39. Ngubane, M. Z., Mndebele, S., & Kaseeram, I. (2023). Economic growth, unemployment and poverty: Linear and non-linear evidence from South Africa. *Heliyon*, *9*(10).
40. Nguyen, H. T. T., Nguyen, C. V., & Nguyen, C. V. (2020). The effect of economic growth and urbanization on poverty reduction in Vietnam. *Journal of Asian Finance, Economics and Business*, *7*(7), 229-239.
41. Nwani, S. E., & Osuji, E. (2020). Poverty in Sub-Saharan Africa: The dynamics of population, energy consumption and misery index. *International Journal of Management, Economics and Social Sciences (IJMESS)*, *9*(4), 247-270.
42. Nyandoro, M., & Dube, T. (2024). Poverty in Africa since independence. The history of African development. www.aehnetwork.org/textbook/.
43. Ochi, A. (2023). Inequality and the impact of growth on poverty in sub-Saharan Africa: A GMM estimator in a dynamic panel threshold model. *Regional Science Policy & Practice, 15*(6), 1373-1395.
44. Ogunniyi, M. B., & Igberi, C. O. (2014). The impact of foreign direct investment on poverty reduction in Nigeria.
45. Ojo, E (2021). Population Growth and Poverty Nexus In Africa: Analytical Review. *Journal of Humanities and Social Science*, 26 (2), 27-38. www.iosrjournals.org
46. Olaniyi, C. O., & Odhiambo, N. M. (2024). Inflation-poverty causal nexus in sub-Saharan African countries: an asymmetric panel causality approach. *International Trade, Politics and Development*, *8*(1), 34-64.
47. Olanma, O. I. (2024). Nexus among Inflation, Unemployment and Poverty in Nigeria: Empirical Evidence. *Asian Journal of Economics, Business and Accounting*, *24*(10), 1-15.
48. Olaoye, O. O. (2021). Poverty Reduction, Institutions and the Nigerian Economy. *Acta Economica*, *19*(35), 141-160.
49. Olawale, A. M., Kehinde, J. E., Lola, G. K., Agboola, Y. H., Adebayo, O. M., & Modupe, O. (2023). The nexus between economic growth, institutional quality, and poverty in Nigeria. *Journal of Emerging Economies and Islamic Research (JEEIR)*, *11*(3), 94-108.
50. Olopade, B. C., Okodua, H., Oladosun, M., & Asaleye, A. J. (2019). Human capital and poverty reduction in OPEC member-countries. *Heliyon*, *5*(8).

51. Pesaran, M. H. (2004). General diagnostic tests for cross section dependence in panels. CESifo Working Paper Series No. 1229; IZA Discussion Paper No. 1240.
52. Putri, W. M., Santosa, P. B., Zusak, M. B. F., & Mi'raj, D. A. (2025). The Nexus between The Islamic Human Development Index (I-HDI), Unemployment, and Population Growth in Influencing Poverty. *Economica: Jurnal Ekonomi Islam*, *16*(1), 45-61.
53. Quinonez, P., Saenz, J., & Solorzano, J. (2018). Does foreign direct investment reduce poverty? The case of Latin America in the twenty-first century. *Business and Economic Horizons*, *14*(3), 488-500.
54. Sehrawat, M., & Giri, A. K. (2018). The impact of financial development, economic growth, income inequality on poverty: evidence from India. *Empirical Economics*, *55*(4), 1585- 1602.
55. Siyan, P., Adegoriola, A. E., & Adolphus, J. A. (2016). Unemployment and inflation: Implication on poverty level in Nigeria.
56. Sonora, R. (2019). Income Inequality, Poverty, and the Rule of Law: Latin America vs the Rest of the World.
57. Stein, F., & Sridhar, D. (2019). Back to the future? Health and the World Bank's human capital index. *British Medical Journal, 367*, 5706.
58. Taleb, A., & Abu-Nayla, A. H. (2024). Analize Exchange Rate Changes effect on Poverty in Iraq for the Period (2004-2022). *Journal of Economics and Administrative Sciences*, *30*(144), 342-351.
59. Talukdar, S. R. (2012). *The effect of inflation on poverty in developing countries: A panel data analysis* (Doctoral dissertation).
60. Tsaurai, K. (2018). Investigating the impact of foreign direct investment on poverty reduction efforts in Africa. *Revista Galega de Economía*, *27*(2), 139-154.
61. Tsaurai, K. (2022). Human capital development, remittances, and poverty in Central and Eastern European countries: what do the data tell us?. *Comparative Economic Research. Central and Eastern Europe*, *25*(1), 23-38.
62. Tsaurai, K. (2023). Does foreign direct investment affect poverty in BRICS?. *Asian Economic and Financial Review*, *13*(3), 216.
63. Ucal, M. Ş. (2014). Panel data analysis of foreign direct investment and poverty from the perspective of developing countries. *Procedia-Social and Behavioral Sciences*, *109*, 1101-1105.
64. Vaalavuo, M., & Sirniö, O. (2022). Jobs against poverty: a fixed-effects analysis on the link between gaining employment and exiting poverty in Europe. *European Societies*, *24*(4), 431-462.
65. Wang, Q. S., Hua, Y. F., Tao, R., & Moldovan, N. C. (2021). Can health human capital help the Sub-Saharan Africa out of the poverty trap? An ARDL model approach. *Frontiers in Public Health*, *9*, 697826.
66. Wau, T. (2022). Economic growth, human capital, public investment, and poverty in underdeveloped regions in Indonesia. *Jurnal Ekonomi & Studi Pembangunan*, *23*(2), 189-200.
67. Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data (2nd ed.). MIT Press.
68. Wooldridge, J. M. (2015). Introductory econometrics: A modern approach. Cengage Learning.
69. World Inequality Database (2023). What's new about inequality in Sub-Saharan Africa in 2023? https://wid.world/news-article/2023-wid-update-sub-saharan-africa/.
70. Wu, Y., Naqvi, S. M. M. A., & Yasin, I. (2024). Dynamic relationship between social factors and poverty: a panel data analysis of 23 selected developing countries. *Journal of the Knowledge Economy*, *15*(4), 19354-19386.
71. Yerrabati, S. (2022). Does vulnerable employment alleviate poverty in developing countries?. *Economic Modelling*, *116*, 106043.
72. Yosmaliza, I. F., & Suryantoro, A. (2022). Analysis of economic growth, HDI and population Impact on poverty in Papua (2012-2017). *Journal of Applied Economics in Developing Countries*, *7*(2), 92-101.
73. Yusuf, L. A., & Dai, S. I. (2020). The impact of unemployment and human development index on poverty in gorontalo province 2008-2017. *Jambura Equilibrium Journal*, *2*(1).
74. Zaman, U., Onwe, J. C., Jena, P. K., Anyanwu, O. C., Ebeh, J. E., & Fulu, O. (2023). Unraveling the intricate relationship between unemployment, population, and poverty in Sub-Saharan Africa: Does quality of life matter?. *Sustainable Development*, *31*(5), 3