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Human Capital Development and Poverty in Nigeria: Moderation Analysis of Institutional Quality

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ABSTRACT

The impact of human capital on poverty continues to be a controversial subject. This underscores the importance of institutions in human capital development as countries grapple with achieving sustainable development. Thus, the purpose of this study is to contribute to this discussion by examining the role of institutions in the poverty reduction effect of human capital in Nigeria between the periods of 1996-2024. First, a theoretical nexus was developed on the link between institutions, human capital and poverty. Second, at the empirical level, institutional quality index (IQI) was constructed from the six institutional indicators using the Principal Component Analysis, based on the fact that it is difficult to determine which of these indicators is most relevant for an empirical study. Secondly, a descriptive analysis was conducted to ascertain the state of institution, human capital and poverty in Nigeria. Finally, ARDL estimation method was used to study the role of institutions in the poverty-human capital relationship. The empirical results revealed that in Nigeria, first, unconditionally, human capital and institutions are potent tools for poverty alleviation. Second, compelling evidence from the interactive analysis revealed that institutional quality counteracted the significant effect of human capital on poverty. This means that the significant effect of human capital on poverty is not in isolation of institutional quality. In conclusion, the benefits of human capital in fostering poverty reduction may remain elusive if there is no improvement in Nigeria's weak institutional fabric. On this basis, this study calls for an enhanced institutional fabric and proactive investments in human capital in Nigeria.

Keywords: Poverty Headcount, Human Capital Development, Institutional Quality, Nigeria

JEL Classification: C30, H11, J24, O15, O55, P46

Introduction

Human capital plays a pivotal role in fostering shared prosperity in both developing and advanced economies. There is a growing scholarly idea that the disparities between advanced and developing countries stem from human capital investment [1]. Also, theoretically, human capital which consists of the knowledge and skills acquired through investment in training and education impacts shared prosperity [2]. This shows that in developing economies, investments in human capital can reduce poverty. According to, the effect of human capital can manifest in several ways [3]. First, for a given level of technical progress, human capital development can accelerate productivity and raise income levels [2]. Second, given the level of technological advancement, research and development, and new inventions/ innovations, human capital development can stimulate growth and productivity [4]. Third, human capital development can stand as resilience to socioeconomic shocks, and promotes the wellbeing of the masses [5].

Despite the numerous studies on the relationship between human capital development and poverty, there is striking gap in human capital development across Africa compared with other regions of the World [6]. This suggests that the benefits associated with human capital development may not be sufficiently strong to accelerate productivity, raises income levels as well as reduce poverty across Africa, particularly, Nigeria. This emphasizes the necessity of investigating the moderating function of institutional quality in relationship between human capital development and poverty reduction in Nigeria.

Nigeria has implemented various policies such as social safety nets, education and skills development programme, healthcare access, agricultural development, gender empowerment, infrastructure development, microfinance and small business support, and inclusive economic policies to address poverty and inequality [7,8]. These policies aimed to improve overall well-being of the people. However, despite these policies, the

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scourge of poverty still persists in the Nigeria. For instance, data from the United Nations Development Programme (UNDP) 2023 Global Multidimensional Poverty Index (MPI) shows that Nigeria is home to half of the world's poor. Specifically, it shows that out of the 1.1 billion multidimensional poor people in the globe, Nigeria is home to 534 million of the number [9]. With the global poverty line set at $1.90 per person per day, Nigeria houses the majority of the world's impoverished [10]. Similarly, at 2015, Nigeria ranked among the highest wealth inequality level in Africa. South Africa (84.0), Botswana (81.7), Namibia (81.6), and Nigeria (81.4) are the nations with the highest wealth Gini indexes [11]. On this note, it is argued that, in Africa, where accessibility of quality education and training is costly, effective governance (institutional quality) could have a crucial influence on poverty reduction [12,13]. Our position follows, who argued that governance is important for multidimensional human development, shared prosperity, and social progress. This is also supported by evidence from, that good governance promotes equal access to higher education, skill development, quality healthcare, and equal opportunities for human development [14]. In fact, among others, argued that a country's quality of institutions has the potential to affect its quality of human capital as well as economic growth [1]. Therefore, the development of human capital and, how it affects poverty may be dependent on the quality of institutions. In this regards, it is argued that quality institutions oversee investment in human capital, investment in technology, innovation, the creation of stable jobs, and effective systems that checkmate corrupt tendencies to ensure the acceleration of productivity, as well as poverty reduction [15]. Specifically, a high level of corruption control in a country will promote investment in education as well as human capital accumulation. This is because funds meant for investment in education would have been judiciously used for societal gains [15]. The reverse would be the case for a country characterized by a low quality of the institution. In a country with high level of corruption, investment in education will be misappropriated. Therefore, institutional quality can be seen as a critical enabler of poverty reduction, particularly in context characterized by high cost of quality education and training.

Most empirical studies in Nigeria focused on the one-on-one relationship between institutional quality, human capital development, and poverty reduction, a clear research gap remains regarding how institutional quality interacts with human capital development to reduce poverty [16-19]. Specifically, studies exploring how institutional quality interacts with human capital to influence poverty in Nigeria are scarce. The exploration of the combined effects of human capital and institutional quality on poverty in Nigeria have not been given much attention. Thus, this study contributes to the existing research by examining the direct and indirect effects of human capital development on Poverty in Nigeria. This study examines whether institutional quality (governance) moderates human capital to influence poverty in Nigeria.

The rest of the study is divided as follows. Section 2 is focused on literature review on the link between human capital, institutional quality, and poverty; and Section 3 outlines the data and method of analysis. Section 4 presents results and discussion, while conclusion and policy recommendations are presented in Section 5.

Literature Review

Conceptual Framework

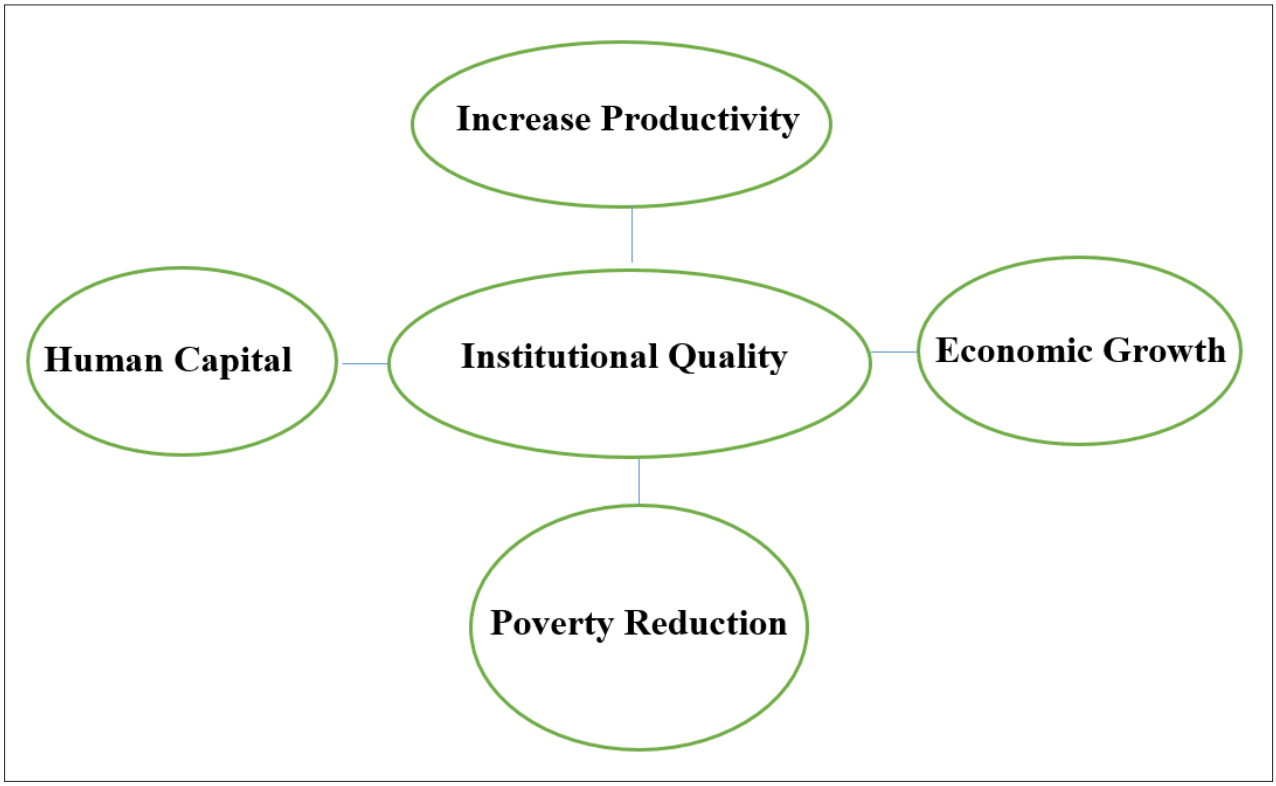


Figure 1: Link Between Human Capital, Institutional Quality and Poverty Reduction. Culled from [20]

Figure 1 shows that institution variable (institutional quality) at the centre is an intervening mechanism for the smooth running of the economic system. Hence a high level of institutional quality in a country will promote investment in education, health, training, as well as human capital accumulation. The rise in human capital accumulation would lead to increase in aggregate productivities causing economic growth which would lead to a rise in the share of labour in the economy through factor price effects, and this would consequently leads to poverty reduction.

Human Capital Development

Human capital development has been defined by various scholars in different ways. Defined human capital development as an improvement in qualities possessed by individuals which brings about increase in productivity level and/or financial output [21]. It also refers to any investment in workers that increase his/her economic value or productivity [22]. The development of human capital takes the form of investment in education, personnel training, skill development, investment in health, and some other factors [22]. To, human capital development is seen as the essential creative and/or productive abilities of individuals such as skills, knowledge, and among that stimulates productivity [23,24]. According to, human capital development or human capability is enhanced through investments in education, health, trainings, and other skill acquisitions [25]. In this study therefore, human capital development is defined as any investment in individual capabilities either by government or private organization that have the tendency to increase the individual's economic value, as well as productivity.

Poverty

The concept of poverty does not have a consensus definition; however, what is certain is that, when analyzing the concept of poverty, three main approaches can be identified namely; poverty as deprivation, poverty as exclusion and poverty as dissatisfaction [26]. 1). poverty as deprivation- the poor are seen as those that are deprived of basic necessities of life. This concept is known as absolute poverty. In line with this concept, World Bank (2017) sees poverty as a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health services, shelter, education and information. 2). poverty as exclusion- the poor are considered as those that are excluded because of lack of resources from what is considered the usual way of life in the society. This concept is known as relative poverty. 3). poverty as dissatisfaction- the poor are seen as those who feel that their income levels do not allow them to get access to what they consider as the minimum living standards. This concept is known as income-based poverty. In line with the third perspective, defined income-based poverty as the condition where individuals lack the financial resources to satisfy their basic needs and/or a minimum standard of living [27]. This approach views the poor as those who do not have enough income or consumption to meet a minimum threshold [28]. This criterion is the theoretical basis for international poverty measures such as the poverty line. In this study, the income-based poverty is adopted. Hence, to measure poverty, this study look at those that are below a minimum threshold (poverty line).

Institutional Quality

The interest on institutional quality has been particularly influenced by the work of and later by [29,30]. As defined by, institutions are manmade rules that are imposed to guide and evaluate the attitude and behavior of people and also to determine the level of their interaction to ascertain the degree of commitment to the growth and development of the society [29]. In their view, see quality institutions as those that provide secure property rights for broad cross-section of the society with some degree of equality of opportunity so that those with good investment opportunities can take advantage of them. That is, institutions provide the structural framework for social, economic, and political interactions [31]. This is in line with which asserted that institutional quality variables such as rule of law, property rights, corruption, and bureaucratic quality influence macroeconomic performance [32]. According to, institutions exert influence on physical and human capital, investment, technical changes, which in turn lead to an increase in the growth of an economy as well as shared prosperity [33]. This implies that institutional quality affects the standard of human development, especially poverty. For instance, adherence to the rule of law, property right, zero tolerance to corruption, political stability and accountability will promote investment in education, health, training and efficient government expenditure, which in turn enhance human capital development (human capital accumulation). The improvement in human capital development (human capital accumulation) would lead to increase in productivity causing economic growth which would lead to a rise in income, and this would consequently leads to improved well-being (poverty reduction). In light of this, this study defines institutions as a framework that guides economic, social and political interactions conducive for sustainable development. Thus, this study assumes that the institutional quality of a country affects its economic and social conditions.

Theoretical Review

In economic literature, many theories were developed that examine the relationship between human capital and economic growth. However, reviewing such theories is significant to analyze the impact of human capital and poverty in Nigeria. Amongst the theories are [29,34-37].

Developed a growth model which is considered as the core framework that accounts for economic growth. The model focuses on exogenous factors such as physical capital, labour and technology, as determinants of growth [34]. However, this growth model never captured the influence of human capital and governance (institutional quality) in growth process. To bridge this gap, stressed the importance of human capital in the process of growth, while emphasized on the role of governance [29,2]. But before presented their augmented neoclassical Solow model, had emphasized on the role of human capital to the process of economic growth [2,38-40,4].

Presented an augmented neoclassical Solow model to incorporate human capital in the economic growth process [2]. They recognize the role of human capital accumulation or investment, physical capital, technological progress and innovation as the significant factors that explain the nature of per capita income or shared prosperity. Also, drawing from neoclassical economic theory, incorporates the political, economic, and social organization of an economy as factors that promote growth/shared prosperity. In addition, asserted that sustained economic growth or shared prosperity is achieved through efficient institutional quality

[29,41]. Efficient institutional quality stimulates human capital development by providing an enabling and conducive environment for education, training, and innovation, which in turn enhance productivity, growth and reduce poverty. For instance, in an economy with a robust legal system, zero tolerance to corruption and property rights protection, will promote investment in education as well as human capital accumulation. This is because funds meant for investment in education would have been judiciously used for societal gains [15]. Also, there is high tendency of attracting foreign investors and creating employment opportunities that require highly skilled labourers. The reverse would be the case for a country characterized by a low quality of institution. In a country with high level of corruption, there will be misappropriation of funds meant for investment in education.

The theory of human capital, pioneered by posits that education, training, knowledge, skills, and health enhance productivity, income, and economic growth [35,36,37]. The theory asserts that investment in human capital is a critical factor to higher productivity, innovation, and overall economic prosperity. The core of this theory is that investment in human capital leads to increased productivity, which drives economic prosperity. Also, in this theory, many scholars have advocated for efficient institutional quality in promoting human capital in the growth process [29]. Robust institutional frameworks are enablers to investments in human capital. Efficient institutional quality stimulates human capital development by providing an enabling and conducive environment for education, training, and innovation, which in turn enhance growth and reduce poverty. Some scholars have linked growth to investment in human capital through institutional [42].

Institutional quality is a critical moderating factor in the relationship between human capital development and poverty. Theories underscore that a countries that possess a higher level of institutional quality are more capable of enhancing human capital. The improved human capacity brings about higher productivity and overall economic prosperity. Quality institution provides an enabling environment for human capital investment. For instance, efficient legal system, zero tolerance to corruption and property rights protection, will promote investment in education. This is because funds meant for investment in education would have been judiciously used for societal gains [15]. Also, there is high tendency of attracting foreign investors and creating employment opportunities which will increase income/shared prosperity.

The interplay between institutional quality and human capital development is essential for addressing poverty in Nigeria. Human capital development provides individuals with the necessary knowledge and skills to improve productivity and growth, while efficient institutions ensure transparency and enabling environment, which are essential for human capital development. Hence, poverty can be significantly reduced by initiative that integrate human capital with institutional quality. Emphasizing the importance of institutional quality in human capital development-poverty relationship, this study offers a comprehensive framework for comprehending the intricate dynamics of poverty alleviation in Nigeria.

Empirical Review

Empirical research on poverty in Africa demonstrates a multifaceted relationship between institutional quality and human capital development looked at the link between financial development, human capital, and inclusive growth using fixed effects model and panel data of 19 sub-Saharan African countries from 1999 to 2014 [3,43-45]. The result showed that human capital positively influence Sub-Saharan African inclusive growth. This contradicts that found a negative impact of human capital on growth [43,44]. On country specific, between 1990 and 2016, looking at the relationship between human capital development and poverty reduction in Nigeria using a completely modified Least Squares and Granger causality test [19]. The results revealed that Primary school enrolment, secondary school enrolment and public healthcare investment reduced poverty considerably, while private healthcare spending has an insignificant impact on poverty levels. Similarly, examined how human capital could reduce poverty in Nigeria using linear regression model based on OLS and Johansen cointegration approaches for the period, 1986 -2012[46]. The study revealed that poverty reduction and human capital enhancement (primary, secondary, and tertiary school enrolment) have very close association. This is in line with studies, which established that there is a strong positive correlation between poverty and human capital [47,48]. In a related study, assessed how human capital enhancement could reduce poverty in Sub-Sahara Africa (SSA) using OLS model and panel data obtained from 48 SSA countries before 2011[49]. The result revealed that human capital enhancement reduced poverty in SSA.

In contrast, looked at the effect of institutional quality on human capital development in Nigeria using OLS for the period, 1990-2024[50]. The results revealed that institutional quality has a diminishing effect on human capital development in Nigeria. In addition, scholars such as revealed the negative impact of institutional quality on human development [51,52,53]. They recognized low institutional quality as an obstacle to human capital development. This result is in line with [54]. For instance, highlighted the significant link between corruption and human capital in developing countries, emphasizing the necessity of addressing corruption to promote human capital development [55,56]. Also, looked at the impact of institutional quality on human capital development in Nigeria using ARDL technique for the period, 1990-2022, and concluded that effective institutions enhance the quality of human capital [22].

conducted analysis of the impact of governance on inclusive growth using system generalized method of moments (GMM) and panel data of 42 African countries from 1990-2020 and found that good governance positively amplifies inclusive growth [57]. This is in line with that examined 23 African countries from 2000-2020 using GMM [58]. Similarly, looked at the impact of human capital and governance on inclusive growth using the two-step system generalized method of moments (SYS-GMM) estimation technique and panel data of 43 African countries from 2005 to 2020. Also the study looked at how governance influence the relationship between human capital and inclusive growth through the interaction of institutional quality and human capital. On the one-on-one relationship between governance, human capital development, and inclusive growth, the study revealed that human capital promotes inclusive growth

in Africa, while governance has a diminishing effect. This is in line with [54]. That is, governance undermines the role of human capital development in inclusive growth. This, the study attributes to Africa's poor economic, political, and institutional governance. This suggests that poor institutional quality does not promotes human capital development. This reemphasizes on the findings of, who established an insignificant relationship between institutional quality and human capital development as a result of poor institutional quality [33]. In the same vein, looked at how human capital development and institutional quality impact on poverty in Sub-Saharan Africa, as well as the moderating role of institutional quality on the effect of human capital development on poverty. In the analysis, the study used Two-Stage Least Squares (2SLS), the Driscoll and Kraay regression and panel data of 29 Sub-Saharan African countries from the year 1996 to 2022[59]. On the one-on-one relationship between human capital development, institutional quality and poverty, the study revealed that human capital and institutional quality (all governance indicators) significantly reduce poverty. This result aligns with who found that effective institutional quality limits the spread of poverty in a country [60]. Contrary to the study revealed that the interaction between education as a component of human capital and governance significantly reduce poverty in the SSA region [3]. This result also contradict [57,58]. These findings imply that the effect of the interaction between human capital and governance on inclusive growth/poverty is conflicting. This gives credence to study country specific conditions-institutions.

In conclusion, the effect of human capital on shared prosperity (poverty alleviation) has remained a debatable issue in the economic literature. A large body of studies support the view that human capital improves standard of living and reduce poverty, while others argued against. This means that the relationship between human capital and shared prosperity/poverty is not universal and may depend on country specific conditions. In such case, human capital may have a limited or even negligible effect on sustainable development if not accompanies with sufficient conditions. Most studies indicate that human capital is a necessary but not sufficient condition for poverty alleviation. Its effectiveness depends on complementary factors such as institutional quality. This underscores the importance of adopting a comprehensive framework that integrates institutional quality to fully assess the poverty reducing (growth enhancing) potential of human capital in Nigeria.

Methodology

Analytical Model

This study is anchored on the Augmented Human capital development theory [2,29,34-37]. These theories posit that increase in shared prosperity requires investments in human capital as well as effective institutions that facilitate the efficient allocation of resources. According to these theories, the critical drivers of shared prosperity include human capital accumulation, physical capital, technological progress, and institutions. Based on these, this study aligns with poverty and inclusive growth studies such as and but with little modification [59,60,3]. For instance, this study modifies model in the area of exogenous variables, while model used inclusive growth, this study uses poverty headcount and varying exogenous variables [59,3]. Thus, the implicit model expresses poverty as a function of human capital development and institutional quality: **Poverty = f (human capital development, institutional quality)**

Hence, in examining the effect of human capital development on poverty, the study expresses poverty as a linear function of a human capital and institutional quality index, and a row vector of control variables. The baseline model is stated as:

$$POV_{it} = \delta_0 + \delta_1 IHC_{it} + \delta_2 IQI_{it} + + \varepsilon_{it} \quad 3.2$$

Where POV is poverty headcount, IHC is index of human capital, IQI is institutional quality index, which is composed of voice and accountability (VA), control of corruption (CC), regulation quality (RQ), the rule of law (RL), government effectiveness (GE) and political stability (PS). Also, ε is an error term. *it* is country *i* at time *t*. δ_0 is the constant parameter. The δ_s are estimates of exogenous variables in the model. The a priori expectations of the variables are negative except inflation. Equation (3.2) tests the hypotheses that human capital and institutional quality impact poverty, while controlling for other variables.

In addressing the main objective of this study, we interacted human capital with quality institutions index. The conjecture is that institutional quality represents a channel through which human capital reduces poverty. This hypothesis is tested by including the interaction term **(IQI*IHC)** into Equation (3.3). From Equation (3.3), δ_3 offers two pieces of information. First, the sign of the coefficient indicates if the interaction of both variables increases or reduces poverty. Secondly, the statistical significance of the coefficients, δ_1 and δ_3 are relevant in the computation of the net effect. If δ_1 is not significant and δ_3 is significant, it means that δ_1 is statistically not different from zero. Therefore, the net effect of IHC depends on the weight of δ_3 and the value of IQI. But if δ_1 is significant and δ_3 is not significant, it means there is no interaction effect and the net effect of IQI equates to its marginal effect [61]. Also, if δ_1 is significant and δ_3 is significant, it means that δ_1 is statistically different from zero. This implies that IHC matters, but matters more when there is an efficient IQI. This means that IHC has a baseline impact. Therefore, if IQI is very low, then IHC can actually hurt.

$$POV_{it} = \delta_0 + \delta_1 IHC_{it} + \delta_2 IQI_{it} + \delta_3 (IHC_{it} * IQI_{it}) + X\beta + \varepsilon_{it} \quad 3.3$$

Where POV is poverty headcount, IHC is human capital, IQI is institutional quality index, which is composed of voice and accountability (VA), control of corruption (CC), regulation quality (RQ), the rule of law (RL), government effectiveness (GE) and political stability (PS), HC*IQI is the interaction term for human capital and institutional quality, Where $X\beta$ contains the vector control variables and, their coefficients including inflation (INF),which captures macroeconomic stability, Gross capital formation (GCF), which captures productivity, and GDP growth (GDPG), captures income growth. These vector control variables have been found to have a significant impact on poverty studies [59,62]. Also, is an error term. *it* is country i at time t. δ_0 is the constant parameter. The δ_s are estimates of exogenous variables in the model. The a priori expectations of the variables are negative except inflation.

$$\varepsilon_{it} \sim IN\left(0, \sigma_{it}^2\right) \quad 3.4$$

The stochastic error term ε_{it} is assumed to be independently and normally distributed.

Data and Sources

This study employed a time series data from 1996-2024. This study time period is motivated by data availability. The data for this study were obtained from the World Development Indicators (World Bank), World Governance Indicators (World Bank), World Bank Poverty and Inequality Platform, National Bureau Statistics, Nigeria, Central Bank of Nigeria Statistical Bulletin, International Labour Organization and University of California, Davis, University of Groningen (Penn's World Tables) The dependent variable is the income-based poverty, proxy by poverty headcount. It is the study's primary outcome variable. This is a more quantifiable basis for international poverty measures. It measures the percentage of population living below Nigeria's national poverty line. This measure of poverty looks at those that are below a minimum threshold [59,63]. The key independent variable in this study is human capital, proxy by an index of human capital based on average years of schooling and rate of return to education. This index of human capital is justified because it combines quantitative and qualitative aspects of human capital [64,65]. However, previous studies have widely used secondary or tertiary school enrolment as a measure of human capital development, this captures only the quantitative aspects of human capital [66]. The second independent variable of interest is institutional quality. This institutional quality is captured by six indicators: regulatory quality, government effectiveness, corruption control, political stability, the rule of law, voice, and accountability. In addition, the institutional quality is used as a moderating factor that can affect human capital to enhance poverty reduction. Rather than using the six institutional quality indicators, the study employs an alternative measure of institutional quality computed as an index using principal component analysis (PCA). The institutional quality index (IQI) is constructed from the six institutional quality (governance) indicators mentioned above. Empirically, it is shown that IQI is strongly and positively correlated with all institutions' variables which is an indication that IQI best explains these variables simultaneously [61].

Method of Analysis

This study examines the direct and indirect effects of human capital development on Poverty in Nigeria using time series data and Autoregressive Distributed Lag (ARDL) framework. The study further examines whether institutional quality (governance) moderates human capital to influence poverty in Nigeria. The reason for ARDL approach adoption over other approaches, such as Johansen & Juselius (1990) is because it is relatively more appropriate and efficient for a small sample size (< 100). Secondly, irrespective of whether the underlying variables are I(0) or I(1), or a combination of both, the ARDL approach can still be applied. Also, endogeneity is less of a problem, since each of the underlying variables stands as a single equation [63].

The ARDL Error Correction Model is specified thus 3.5

$$\Delta POV_i = \mu + \sum_{i=1}^{n-1} \beta i \Delta z_{t-1} - \prod \hat{e}_{t-1} - \varepsilon_t$$

Where π is the error correction coefficient or error correction mechanism. In fact, π tells us how much of the adjustment to equilibrium takes place in each period, or the magnitude of the equilibrium error corrected, so as to restore $\Delta POVi$ to equilibrium. ΔZ_{t-1} denotes the K×1 vector of independent variables with fixed lags.

Results and Discussion

The Construction of the Institutional Quality Index (IQI)

The IQI was constructed from the six institutional (governance) indicators using the Principal Component Analysis (PCA). The PCA is justified by the fact that each of these institutional indicators has been used by several scholars as measures of institutional quality, and that there is frequently a significant degree of correlation among them, making it difficult to determine which of these indicators is most relevant for an empirical study. From Table 4.1, IQI is strongly and positively correlated with all institutions' variables which is an indication that IQI best explains these variables simultaneously.

Table 1: Correlation Matrix (IQI and Institutional Variables)

Variables	IQI	CC	GE	PS	RL	RQ	VA
IQI	1.000						
CC	0.817	1.000					
GE	0.901	0.822	1.000				
PS	-0.490	-0.044	-0.304	1.000			
RL	0.872	0.769	0.775	-0.211	1.000		
RQ	0.886	0.769	0.718	-0.387	0.684	1.000	
VA	0.727	0.246	0.527	-0.735	0.562	0.571	1.000

Note: IQI = Institutional Quality Index; CC = Control of Corruption; GE = Government Effectiveness, PS = Political Stability, RL = Rule of law, RQ = Regulatory Quality; and VA = Voice and Accountability.

Source: Authors' Computations.

As a measure of sampling adequacy, the Kaiser-Meyer-Olkin (KMO) was conducted which compares partial correlations and correlations between variables. The usage of PCA is justified by a value greater than 0.50. Hence, with a KMO value of 0.683803, PCA's use is also justified. This means that the data was adequate for principal component analysis. See Appendix for the Kaiser-Meyer-Olkin (KMO) test result and the scree plot respectively.

Descriptive Statistics

Table 2 presents the descriptive statistics of the variables used in the study. The table shows an average human capital development of 0.55. Despite this positive value, we observe a low average value of human capital, as evident from the minimum and maximum values. The moderating variable, institutional quality index shows a negative average value with high disparities within the minimum and maximum values. The negative mean value of institutional quality index shows Nigeria's weak institutional fabric. This is in line with [3]. This situation seems to challenge Nigerian government to take concrete actions to significantly improve the overall institution. In addition, the data revealed an average poverty headcount of 3.90 percent with a variation of 0.1 percent over the study period. The minimal discrepancy between the minimum value of 3.8 percent and the maximum value of 4.0 percent imply that the spread of poverty in Nigeria cuts across.

Table 2: Summary Statistics

	POV	IHC	IQI	GDPG	GCF	INF	LBO
Mean	3.896552	0.545589	-3.37E-16	4.479310	2.913361	13.84828	4.038746
Std. Dev	0.059787	0.135788	1.982401	3.866373	0.253365	6.505032	0.113881
Minimum	3.795489	0.307191	-4.216819	-6.400000	2.459589	5.400000	3.876396
Maximum	3.996364	0.758139	2.482898	15.30000	3.303217	33.20000	4.382027
Obs	29	29	29	29	29	29	29

Note: POV = Poverty headcount, IHC = Index of Human capital, IQI = Institutional quality index, GDPG = Gross domestic product growth, GCF = Gross capital formation; INF = Inflation rate, Labour = Employment to population ratio.

Source: Authors' Computations.

Table 3 presents the pairwise correlation matrix. It shows how closely the dependent and regressor variables are related. The results of the correlation matrix show that Index of Human capital (IHC), Institutional quality index (IQI) and inflation (INF) correlate statistically with poverty, while Gross domestic product growth (GDPG), gross fixed capital formation (GFCF) and Employment to population (LBO) do not statistically correlate with poverty ratio. Also, Table 4.3 reveals that all correlation statistics are less than 0.80. This shows no evidence of multicollinearity among the variables under view.

Table 3: Pairwise Correlation Matrix Result (IHC and POV Variables)

Variables	POV	IHC	IQI	GDPG	GCF	INF	LBO
POV	1.000						
IHC	-0.395003 (0.0339)**	1.000					
IQI	-0.662464 (0.0001)***	0.854267 (0.0000)***	1.000				
GDPG	0.016819 (0.9310)	-0.374169 (0.0455)**	-0.454210 (0.0133)**	1.000			
GCF	-0.301948 (0.1114)	0.810654 (0.0000)***	0.660903 (0.0001)*	-0.341845 (0.0695)*	1.000		
INF	0.022923 (0.0125)**	0.283726 (0.1358)	0.095590 (0.6218)	-0.065094 (0.7373)	0.192484 (0.3171)	1.000	
LBO	0.146652 (0.4478)	0.056724 (0.7701)	-0.073383 (0.7052)	0.257828 (0.1769)	-0.045473 (0.8148)	0.547795 (0.0021)**	1.000

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$: POV = Poverty Headcount; IHC = Index of Human Capital; IQI = Institutional Quality Index, GDPG = Gross Domestic Growth Rate, GCF = Gross Capital Formation, INF = Inflation Rate; and LBO = Employment to population Ratio.

Source: Authors' Computations.

Unit Root Test

The unit root test was conducted for the variables as a prerequisite for choosing method of analysis. In this regards, the Augmented Dickey-Fuller (ADF) stationarity test was carried out on the variables. The ADF stationarity test results in Table 4 show that all variables are stationary at order I(1) except GDPG, and INF which are stationary at order I(0). Hence, the long-run relationship among the variables was examined using ARDL bound cointegration test.

Table 4: Unit Root Test Result

Variables	Intercept	
	ADF Levels	ADF 1st Diff
LnPOV	-	
IHC	-	-5.072013*
IQI	-	-4.498666*
GDPG	-2.800747***	
LnGCF	-	-3.984183*
INF	-2.800645***	
LBO	-	-5.487038*
IHC*IQI	-	-4.757210*

Note: *,**,*** denote 1%, 5%,and 10% level of significance.

Source: Author's Computation.

ARDL Cointegration Bounds Test

Having established that all the variables of the study are integrated of order one, I(1) and level, I(0), the bounds test procedure which is based on F-statistic was used to test for the existence of a cointegration relationship among the variables. Table 4.5 presents the results of the cointegration tests of model1, 2, and 3. Since the sample size is small (<100 observations), the study employed the critical bounds values provided by as against the critical values provided by [67,68]. This F-Statistics is compared against the critical bounds values provided by[68]. The results confirm the existence of a long-run relationship between the measures of poverty, and the underlying variables in models 1, 2 and 3 (see Table 4.5). Models 1 captures the relationship between poverty (measured by poverty headcount) and human capital development (measured by index of human capital), while Model 2 captures the relationship between poverty and institutional quality (measured by institutional quality index). Model 3 captures the effect of human capital development and its Interaction with Institutions on poverty. Thus, the hypotheses of no long-run relationships between the underlying variables are rejected. With these outcomes, there is a need to analyze the long-run and short-run dynamic adjustment of the models under the error correction framework.

Table 5: ARDL Cointegration Bound Test

Model	F- Statistics
Model 1: LnPOV = f(GDPG, LnGCF, INF, LBO, IHC)	F- Stat = 9.758*
Critical Value	**Lower Bound Upper Bound**
1% 5% 10%	4.428 6.250 3.202 4.544 2.660 3.838
Model 2: LnPOV= f(GDPG, LnGCF, INF, LBO, IQI)	F- Stat = 7.761*
Critical Value	**Lower Bound Upper Bound**
1% 5% 10%	4.428 6.250 3.202 4.544 2.660 3.838
Model 3: LnPOV= f(GDPG, LnGCF, INF, LBO, IHC, IQI, IHC*IQI)	F- Stat = 12.506*
Critical Value	**Lower Bound Upper Bound**
1% 5% 10%	4.428 6.250 3.202 4.544 2.660 3.838

Notes: * denotes significance at 1% levels. Critical values are obtained from Narayan (2005).

Source: Author's Computation.

ARDL Estimation Results

This section presents the findings on the direct or unconditional effects of human capital and institutional quality on poverty in Nigeria and the indirect or conditional effects of human capital and institutional quality on poverty.

The finding from the individual (the unconditional) effect of human capital and institutional quality on poverty reveals that the human capital had a significant negative unconditional effect on Nigeria's poverty headcount. This shows that human capital

significantly reduces poverty in Nigeria (Column 1). Also, the finding shows that the institutional quality index which is a composite of voice and accountability, government effectiveness, control of corruption, rule of law, political stability, and regulatory quality had a significant negative unconditional effect on Nigeria's poverty headcount (Column 2). These show that human capital and institutional quality significantly reduces poverty in Nigeria (see Column 1 and 2).

In column 1, vector control variables used for the study such as gross domestic product and employment were statistically significant and negative, while gross capital formation and inflation were statistically insignificant and negative. However, the negative appriori sign of inflation is not in line with expectation. Nevertheless, a marginal increase in inflation reduces poverty, albeit statistically insignificant. A rise in inflation rate ought to amplify poverty by diminishing households' savings, and the volume of resources available for domestic investment. Also, a percentage improvement in gross domestic product growth (measure of income), and employment to population ratio (measure of labour employment) will significantly reduce poverty. This aligns with expectation, as a rise in income and labour participation reduce poverty through increase households resources and employment channel. The statistical insignificant effect of gross capital formation (GFCF) across models can be attributed to low and dilapidated capital investment and infrastructures which create an unfavourable business climate that negatively impacts productivity. In column 2, the vector control variables were statistically insignificant, except gross domestic product. However, the vector control variables appear with the right appriori expectation. Nevertheless, a marginal increase in inflation increases poverty, albeit statistically insignificant. The positive sign of inflation is in line with expectation. Overall, the models are robust, as evidenced by the post-estimation tests. However, of key interest of this study is the interactive effect.

In column 3, the findings from the indirect or conditional effects of human capital and institutional quality on poverty reveal that the interaction of institutional quality and human capital amplified poverty in Nigeria. For instance, the interactive term (IHC*IQI) in Column 3 shows a significant statistically positive effect on poverty, while the IHC is statistically insignificant. These results imply that the net effect of IHC depends on the weight of the interactive term, and value of IQI. This implies that the poverty reducing effect of human capital is significantly counteracted by poor institutional quality. Further simulations show a threshold of 0.21. This implies that when institutional quality index reaches 21 percentile rank, the poverty reduction effect of human capital will begin to manifest. With this, the study establishes that weak institutional quality in Nigeria hinders human capital poverty reduction effect. It counteracts the poverty reduction effect of human capital (see Column 1). In column 3, the vector control variables were statistically insignificant, except gross domestic product. However, the vector control variables appear with the right appriori expectation, except inflation. A rise in inflation rate ought to amplify poverty by diminishing households' savings, and the volume of resources available for domestic investment.

Table 6: Effect of Human Capital and its Interaction with Institutions on Poverty Dependent Variables: Poverty Headcount (LnPOV)

Regressors	Model 1	Model 2	Model 3
Long-Run Cointegration Estimates			
Gross Domestic Product Growth (GDPG)	-0.0198*** (0.0839)	-0.0353 (0.0232)**	-0.0303 (0.0635)***
Gross Capital Formation (LnGCF)	-0.0022 (0.6982)	-0.0085 (0.9210)	-0.2325 (0.2342)
Inflation Rate (INF)	-0.0003 (0.9703)	0.00331 (0.4634)	-0.0036 (0.5656)
Employment to Population Ratio (LBO)	-0.0381 (0.0093)*	-0.0012 (0.6932)	-0.0069 (0.1968)
Index of Human Capital (IHC)	-0.7672* (0.0011)		0.2073 (0.4490)
Institutional Quality Index (IQI)		-0.0491 (0.0025)*	-0.5977 (0.0781)***
Interaction Variable (IHC*IQI)			0.3338 (0.0987)***
Constant	7.5657 (0.0000)*	4.1124 (0.0000)*	4.6610 (0.0000)*
Short-Run ECM Estimates			
ECMt-1	-0.1132 (0.0000)*	-0.1660 (0.0000)*	-0.1132 (0.0000)*
Adj. R2	0.7900	0.7530	0.8509
Breusch-Godfrey Serial Correlation LM Test	0.5528 (0.5883)	0.1464 (0.8649)	2.1325 (0.1259)

ARCH Test	1.6456 (0.2158)	0.2413 (0.7875)	0.4066 (0.5295)
Ramsey RESET Test	0.1467 (0.7074)	1.1430 (0.2991)	0.0875 (0.7710)

Note: Coefficients of the variables are derived from various regressions linking poverty to human capital, institutional quality and a set of vector control variables. *, ** denote 1%, and 5% levels of significance. The t-statistics in parentheses. The values are probabilities significant level.

Source: Author's Computation

Discussion of Findings

This study yield interesting findings. First, the findings from the individual (unconditional) effect indicate that human capital development in Nigeria reduces poverty. A plausible reason for this is that individual or country's level of innovation, entrepreneurial skills, education, health, and knowledge capital affect poverty. If these capacities are effectively utilize the nation's resources will enable its citizenries to contribute to their country's poverty alleviation trajectories. Indeed, a well-educated and skilled population is more likely to increase the individual's and country's productivity, as well as income, which in turn reduces poverty. This is consistent with the premise of this study. Furthermore, investment in human capital equips the population with the necessary skills which increases overall economic output/income, and reduces poverty. This implies that the significance of human capital for poverty reduction becomes apparent when Nigeria invests in average years of schooling and returns on education. These findings align with previous studies [3,59,69].

Second, the findings from individual (unconditional) effect reveal that institutional quality index significantly and negatively affects poverty in Nigeria. The finding aligns with theoretical premise that effective institutional structures create an environment conducive for social progress or equitable development. This implies that effective governance practices and institutional frameworks promote poverty reduction. Some plausible interpretations of this outcome is premised on prudent management and efficient government capacity. Furthermore, efficient institutions are triggered by voice and accountability, government effectiveness, control of corruption, rule of law, political stability, and regulatory quality, which translates to high social progress, and reduced poverty. Theoretically, institutional quality is believed to stimulate reduce poverty by ensuring robust institutions [1,34]. However, this finding contradicts previous contributions by [3,57,22,59].

Third, evidence from the interactive (interactive effect of human capital and institutional quality dimension) analysis shows that institutional quality counteracted the significant impact of human capital on poverty. This finding aligns with the conceptual understanding that the impact of human capital is not in isolation but is contingent on the quality of institutions. Empirically, this result contradicts, which concluded that institutional quality does not promote poverty reduction effect of human capital in Nigeria [59,54,50]. This is an indication that weak institutions, marked by lack of voice and accountability, government effectiveness, control of corruption, rule of law, political stability, and regulatory quality, impede the significant of human capital in poverty reduction. This implies that the poverty reducing effect of human capital is significantly counteracted by poor institutional quality. This also aligns with which argued that effective institutions enhance the poverty reduction impact of human capital [29,33]. This implies that efficient and effective institutional quality create a conducive environment for education, training, and innovation, which in turn enhance productivity, growth and reduce poverty. This shows that the institutions that ought to translate human capital development opportunities into socio-economic benefits are weak in Nigeria. This underscores the importance of improving the overall institutional quality framework to maximize the poverty-alleviating potential of human capital development. In contexts where the cost of quality education and training is very high, effective institutional mechanisms can act as a buffer.

Conclusion and policy implications

A body of literature has investigated the relationship between human capital and poverty, neglecting the interaction effect of human capital and institutions on poverty. Thus, this study fills this gap by investigating the unconditional and conditional effects of human capital development on poverty in Nigeria, using a time series data spanning 1996-2024. Analytically, the study employed the autoregressive Distributed Lag (ARDL) framework. The study further examines the significant of institutional quality in poverty reduction effect of human capital in Nigeria. The institutional quality index was constructed from the six institutional (governance) indicators using the Principal Component Analysis (PCA).

Based on the analysis, the following findings were established. First, unconditionally, the study shows that human capital is a potent tool for poverty alleviation, as we as institutional quality. Second, the study reveals that in the conditional result, institutional quality counteracted the significant impact of human capital on poverty observed in the unconditional analysis (model). This implies that the poverty reducing effect of human capital is significantly weakened by poor institutional quality. This means that the impact of human capital on poverty is the impact of human capital is not in isolation but is dependent on countries' conditions such as effective quality of institutions. Based on these findings, the study suggests that, to reduce poverty in Nigeria, addressing the issue of weaknesses in institutional structures, and quality education and training are paramount. Policymakers can address institutional weakness by redirecting resources towards enhancing accountability, government effectiveness, control of corruption, rule of law, political stability, and regulatory quality. This policy can enhance institutional quality to reaching the identified threshold, so that individuals are not pushed into poverty due to low institutional quality. This policy can also create a conducive environment for education, training, and innovation, which in turn enhance productivity, growth and reduce poverty, as well as foreign

and private investment, which is essential for job creation, economic growth and general well-being (poverty reduction). Also, policymakers can address these issues through provision of educational interventions such as student loans, student scholarships, vocational training program and infrastructure development, as these have the potential to increase educational enrolment and training, and would significantly contribute to the development of human capital, which in turn can drive poverty reduction [70-73].

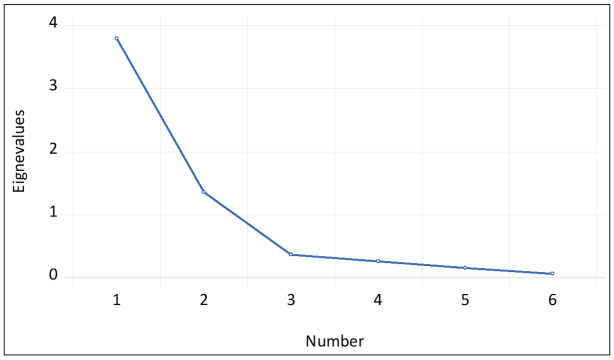
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Scree Plotof Eigenvalues After PCA

Appendix

Kaiser's Measure of Sampling Adequacy

Factor: Untitled

Date: 06/16/26 Time: 04:45

	MSA
CC	0.589661
GE	0.796270
PS	0.643190
RL	0.763260
RQ	0.752293
VA	0.557473
Kaiser's MSA	0.683803

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