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Examining the Impact of Human Capital Development and Governance Institutions on Economic Growth in Sub-Saharan Africa

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Abstract: This study examines the effects of human capital development and governance institutions on economic growth in Sub-Saharan Africa. Using annual panel data from 41 countries covering the period 2010–2022, the study applies the System Generalised Method of Moments (System GMM) estimator to account for the dynamic nature of economic growth, unobserved country-specific heterogeneity, and potential endogeneity. The study measures human capital development with the Human Capital Index and life expectancy, and captures institutional quality through government effectiveness, control of corruption, regulatory quality, political stability, rule of law, and voice and accountability. The findings reveal that the Human Capital Index has a positive and statistically significant effect on economic growth in one model specification, although the relationship is not statistically significant in the alternative specification. Among the governance indicators, government effectiveness shows the most consistent positive relationship with economic growth, while control of corruption and rule of law are significant only in selected specifications. Foreign direct investment contributes positively and significantly to economic growth in both models, whereas government expenditure on education and several governance indicators remain statistically insignificant. Furthermore, the COVID-19 pandemic has a substantial negative effect on economic growth. The findings show that human capital development and selected dimensions of institutional quality matter for economic performance in Sub-Saharan Africa, although their effects vary across model specifications. The study highlights the importance of strengthening human capabilities, government effectiveness, institutional capacity, and productive investment to support sustainable economic growth in the region.

Keywords: Human Capital Development, Institutional Quality, Economic Growth, Governance Institutions, System GMM, Sub-Saharan Africa

JEL Classifications: C33; L51; O15; O43; O55

1. Introduction

Human capital development is widely recognised as a key foundation of socioeconomic development because individuals' knowledge, skills, capabilities, and health shape their ability to participate productively in economic activities. Investment in human capital is therefore essential to strengthen labour productivity and enable countries to use available economic and technological resources more effectively (Raihan, Rahman, Ridwan, Dhar, Martinho, & Sarker, 2026). In this regard, human capital formation has increasingly become an important component of national development strategies, particularly because improvements in education, health, and workforce capabilities can contribute to sustained economic performance. Previous studies have consequently identified human capital as an important determinant of economic growth, although the magnitude and direction of its effects may vary considerably across different economic and institutional contexts (Pelinescu, 2015; Ma et al., 2025).

The importance of human capital is particularly pronounced in Sub-Saharan Africa (SSA), where persistent structural challenges continue to constrain productivity and long-term economic development. Despite considerable efforts to expand access to education and healthcare, many countries in the region continue to experience inadequate educational infrastructure, shortages of qualified teachers and health professionals, disparities between rural and urban communities, and limited alignment between workforce skills and labour-market requirements. Moreover, fiscal constraints, poverty, conflict, external shocks, and limited investment in education continue to restrict the development of a sufficiently productive workforce. Consequently, although human capital has considerable potential to support inclusive economic growth, its contribution in SSA remains constrained by the broader socioeconomic environment in which human capabilities are developed and utilised (World Bank, 2024a, 2024b).

However, human capital alone may not generate sustained economic growth without effective governance institutions. Institutional quality determines the rules, incentives, constraints, and enforcement mechanisms that shape economic and social interaction. Strong institutions can facilitate investment, support efficient resource allocation, protect property rights, strengthen regulatory effectiveness, and improve public policy implementation. Conversely, weak governance structures, corruption, ineffective regulation, political instability, and limited adherence to the rule of law may reduce investment incentives and restrict the productive utilisation of human and physical resources (Alston, 1992; Acemoglu et al., 2005).

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Accordingly, institutional quality has increasingly been viewed as an important determinant of long-term economic performance because economic resources generate greater developmental benefits when they operate within an effective governance environment.

These institutional considerations are especially relevant to Sub-Saharan Africa. Although governments and international organisations have introduced various initiatives to improve transparency, combat corruption, strengthen public administration, and expand human capital investment, governance weaknesses remain a significant constraint on development across the region. Weak regulatory structures, bureaucratic inefficiencies, corruption, and limited public-sector effectiveness may undermine public service quality, discourage domestic and foreign investment, and reduce the efficiency with which education and health expenditures translate into economic outcomes. The International Monetary Fund (2024), for example, continues to identify governance reform and institutional strengthening as important components of sustainable development in the region. Therefore, economic growth in SSA should not be examined solely in terms of resource accumulation; rather, attention should also be given to the institutional conditions that determine how efficiently those resources are transformed into productive economic activity.

Empirical research nevertheless provides mixed evidence regarding the effects of both human capital and institutional quality on economic growth. Several studies report that improvements in institutional quality contribute positively to economic performance (Asghar et al., 2015; Abera et al., 2019; Glawe & Wagner, 2020; Wang et al., 2022; Gasimov et al., 2023). Similarly, previous research generally supports a positive relationship between human capital development and economic growth (Javed et al., 2013; Khalafalla & Suliman, 2013; Ma et al., 2025; Usman & Adeyinka, 2019; Taiwo & Olusola, 2020). However, the evidence is not uniform. For instance, Ogbuabor et al. (2020) documented predominantly negative relationships between some institutional-quality indicators and economic growth in West Africa, while Adeyemi and Ogunsola (2016) reported mixed effects across different measures of human capital. Likewise, Nawaz et al. (2014) showed that the influence of institutional quality may vary by level of economic development. These divergent findings suggest that the economic effects of governance institutions and human capital are context-dependent and warrant further examination within the specific structural characteristics of Sub-Saharan African economies.

Furthermore, although institutional quality and human capital development have received substantial scholarly attention individually, comparatively fewer studies have examined their effects simultaneously within a dynamic regional framework for Sub-Saharan Africa. This limitation matters because human capital and governance institutions may be complementary foundations of economic development. Improvements in education and workforce capabilities may generate limited economic returns where corruption, regulatory weakness, political instability, or ineffective government constrain productive activity. Similarly, institutional reforms may produce limited long-term development benefits where the labour force lacks the skills, health, and knowledge necessary to utilise emerging economic opportunities. Therefore, examining these factors within a common empirical framework provides a more comprehensive understanding of the determinants of economic growth in SSA. The existing mixed evidence also creates a need for updated regional analysis using recent panel data and an econometric approach capable of accounting for the dynamic nature of economic growth and potential endogeneity among explanatory variables.

Against this background, this study examines the effects of human capital development and governance institutions on economic growth in Sub-Saharan Africa from 2010 to 2022. Specifically, the study investigates the extent to which human capital development and different dimensions of institutional quality—including government effectiveness, control of corruption, regulatory quality, political stability, rule of law, and voice and accountability—explain variations in economic growth across 41 SSA countries. The study uses a dynamic panel System Generalised Method of Moments (System GMM) estimation approach, allowing the analysis to account for the persistence of economic growth, country-specific heterogeneity, and potential endogeneity.

By integrating human capital development and governance institutions within a common dynamic-growth framework, the study contributes to the literature in two respects. First, it provides updated regional evidence on whether improvements in human capital and institutional quality translate into stronger economic growth across Sub-Saharan Africa. Second, by examining multiple governance dimensions alongside human capital indicators and relevant macroeconomic controls, the study provides a more differentiated assessment of which institutional conditions are most closely associated with regional economic performance. In doing so, the study provides empirical evidence that may inform policies to strengthen governance institutions, improve human capital development, and promote sustainable economic growth across Sub-Saharan Africa.

2. Literature Review and Hypothesis Development

2.1. Theoretical Foundation

The relationship between human capital, governance institutions, and economic growth can be explained through the neoclassical and endogenous growth perspectives. The neoclassical growth model developed by Solow (1956) identifies capital and labour as fundamental inputs in the production process and provides an important foundation for understanding differences in economic performance. However, the traditional formulation gives limited consideration to differences in workers' knowledge, skills, health, and productive capabilities. Subsequent developments in growth theory therefore extended the conventional production framework by recognising human capital as an important determinant of productivity and long-term economic performance.

In particular, endogenous growth theory emphasises that investments in knowledge, education, skills, innovation, and other forms of human capital can generate sustained improvements in productivity rather than merely temporary changes in output. Lucas (1988) placed human capital accumulation at the centre of the growth process by demonstrating that improvements in workers' capabilities can increase productivity and generate broader economic benefits. Similarly, Schultz (1961) conceptualised expenditure on education and skills as an investment that improves individual productive capacity and, consequently, aggregate economic performance. Therefore, countries with stronger human capital foundations are expected to utilise physical resources, technologies, and productive opportunities more efficiently.

Nevertheless, the economic returns from human capital may depend substantially on the institutional environment within which productive activities take place. Institutions establish the formal and informal rules governing economic interaction and influence the incentives faced by households, firms, investors, and governments (Alston, 1992). Accordingly, institutional quality affects the security of property rights, regulatory effectiveness, public-sector performance, political stability, corruption control, and the enforcement of economic agreements. Acemoglu et al. (2005) further argue that institutions represent a fundamental determinant of long-run economic performance because they shape incentives for investment, innovation, and productive resource allocation.

Taken together, these theoretical perspectives suggest that economic growth depends not only on the accumulation of productive resources but also on the capabilities of the population and the institutional structures governing their utilisation. Human capital strengthens the productive capacity of an economy, whereas effective governance institutions create conditions under which such capabilities can be transformed into economic output. Consequently, incorporating both human capital development and institutional quality within a common growth framework provides a theoretically coherent basis for examining economic performance in Sub-Saharan Africa.

2.2. Human Capital Development and Economic Growth

Human capital development contributes to economic growth by improving the knowledge, skills, health, adaptability, and productive capacity of the labour force (Raihan et al., 2026). An educated and healthy population is better positioned to adopt new technologies, improve organisational processes, engage in innovation, and respond to changing economic conditions. Consequently, investment in human capital may enhance labour productivity while simultaneously improving the efficiency with which physical and technological resources are utilised (Ma et al., 2025; Raihan et al., 2026).

Empirical research has generally supported this relationship. Javed et al. (2013), for example, documented a positive relationship between human capital development and economic growth, while Khalafalla and Suliman (2013) similarly reported that improvements in human capital contributed positively to economic performance. Evidence from ECOWAS member states also indicates that human capital development can strengthen economic growth (Usman & Adeyinka, 2019). Furthermore, Taiwo and Olusola (2020), focusing specifically on Sub-Saharan African countries, reported evidence supporting the role of human capital formation in promoting economic growth.

However, the relationship is not consistently positive across all measures and contexts. Adeyemi and Ogunsola (2016) reported mixed findings across indicators such as school enrolment, education expenditure, health expenditure, and life expectancy. Likewise, Awolusi (2019) demonstrated that countries differ in their capacity to translate human capital development into economic performance. These variations suggest that simply increasing expenditure on education or health may not automatically produce economic growth. Instead, the quality, accessibility, relevance, and productive utilisation of human capital likely determine how much such investment contributes to economic performance.

This issue is particularly important in Sub-Saharan Africa, where inadequate educational infrastructure, limited healthcare capacity, skills mismatches, and unequal access to essential services continue to constrain human capital development. Under such circumstances, improvements in human capital could generate substantial economic benefits by enhancing labour productivity and strengthening the ability of economies to utilise available resources more effectively. Therefore, based on endogenous growth theory and the prevailing empirical evidence, the study proposes the following hypothesis:

H1: *Human capital development has a positive effect on economic growth in Sub-Saharan Africa.*

2.3. Governance Institutions and Economic Growth

Institutional quality represents another important determinant of economic performance because institutions regulate interactions among economic actors and influence the allocation and utilisation of productive resources. Effective governance institutions can reduce uncertainty, protect property rights, strengthen contract enforcement, control corruption, improve regulatory implementation, and increase confidence among domestic and foreign investors. Conversely, weak governance can increase transaction costs, encourage rent-seeking behaviour, reduce the efficiency of public expenditure, and discourage productive investment. Therefore, the institutional environment can significantly influence the capacity of an economy to achieve and sustain economic growth.

Existing empirical evidence provides considerable support for a positive relationship between institutional quality and economic performance. Asghar et al. (2015) found that institutional quality positively affects economic growth in developing economies, while Abera et al. (2019) reported similar evidence for Eastern Africa. In addition, Glawe and Wagner (2020) demonstrated the importance of institutional quality in explaining regional economic growth when considered alongside human capital. More recent evidence from African countries also indicates that institutional quality is associated with improved economic outcomes (Wang et al., 2022). Similarly, Gasimov et al. (2023) reported a positive relationship between institutional quality and economic growth, reinforcing the argument that effective institutional structures contribute to long-term economic performance.

Nevertheless, the empirical relationship between governance and economic growth remains heterogeneous. Ogbuabor et al. (2020), for instance, identified predominantly negative relationships between some institutional indicators and economic growth in West Africa following the Great Recession. Nawaz et al. (2014) similarly demonstrated that the economic influence of institutions varies across different levels of development, with institutional effects appearing stronger in developed than in developing economies. Such findings indicate that institutional quality is multidimensional and that individual governance indicators may affect economic performance differently depending on regional, political, and economic circumstances.

This distinction is particularly relevant when examining Sub-Saharan Africa because institutional quality encompasses several interconnected but conceptually distinct dimensions. Government effectiveness reflects the quality of public services and policy implementation; control of corruption captures the extent to which public authority is protected from private appropriation; regulatory quality concerns the ability of governments to formulate and implement policies that support productive activity; political stability reflects exposure to political disruption and violence; the rule of law captures confidence in legal institutions and contract enforcement; and voice and accountability represent opportunities for citizen participation and

governmental accountability. These dimensions may influence economic performance through different mechanisms, although collectively they represent the broader governance environment within which economic activities occur.

Furthermore, effective institutions may be particularly important for converting human and physical resources into sustainable economic outcomes. Where public institutions function effectively, expenditure on education and healthcare can be allocated more efficiently, investment can be encouraged through predictable regulation, and productive resources can be protected from corruption and institutional inefficiencies. In contrast, weak institutional environments may reduce the economic returns from otherwise valuable investments. Accordingly, institutional theory and the broader empirical literature suggest that improvements in governance institutions should contribute positively to economic performance in Sub-Saharan Africa. Therefore, the study proposes the following hypothesis:

H2: *Governance institutional quality has a positive effect on economic growth in Sub-Saharan Africa.*

2.4. Human Capital and Governance Institutions within the Sub-Saharan African Growth Context

Although human capital development and institutional quality can independently influence economic performance, considering them within the same empirical framework provides a more comprehensive explanation of economic growth. Human capital determines the productive capabilities available in an economy, whereas institutions shape the incentives and conditions governing how those capabilities are used. As a result, improvements in workforce knowledge and skills may yield greater economic benefits where governance institutions facilitate investment, protect productive activities, and allocate public resources effectively. Previous evidence demonstrates the importance of considering these determinants together. Glawe and Wagner (2020), for example, examined institutional quality and human capital simultaneously and demonstrated their relevance to regional economic performance. Similarly, the wider literature reviewed in this study reveals that findings concerning both determinants vary substantially across countries and development contexts. These differences reinforce the need for region-specific investigation rather than assuming that relationships identified in developed or emerging economies apply uniformly to Sub-Saharan Africa. Therefore, the present study evaluates human capital development and multiple dimensions of governance institutional quality within a dynamic panel framework covering 41 Sub-Saharan African countries from 2010 to 2022. In addition to providing updated regional evidence, this approach enables the study to distinguish the effects associated with specific governance dimensions while controlling for relevant macroeconomic factors and the dynamic nature of economic growth.

3. Methodology

3.1. Theoretical Framework

This study's empirical model is based on the Solow (1956) growth model and the endogenous growth model proposed by Lucas (1988). The Solow growth model provides the foundational framework for analysing long-term economic growth by emphasising the roles of capital and labour in the production process. However, the endogenous growth model extends this perspective by recognising the importance of investment in knowledge, innovation, and human capital in sustaining economic growth.

The fundamental neoclassical production function is expressed as:

$$Y = F(K, L) \qquad (1)$$

where:

Y= volume of output;
K= capital formation; and
L= labour force.

The extension of the neoclassical model recognises human capital as an important determinant of economic growth. Accordingly, the production function is expanded to incorporate human capital (H) as follows:

$$Y = F(K, L, H) \qquad (2)$$

where:

$$H = F(H, CILE)$$

HCI= Human Capital Index; and
LE= life expectancy.

Furthermore, institutional quality is incorporated into the neoclassical growth model because the institutional environment can influence the efficiency with which productive resources are utilised. Consequently, the production function is extended as follows:

$$Y = F(K, L, H, INSTQ) \qquad (3)$$

Institutional quality is represented by six governance indicators:

$$INSTQ = (G, E, C, O, C, RQPSROLVA) \qquad (4)$$

where:

GE= government effectiveness;
COC= control of corruption;
RQ= regulatory quality;
PS= political stability;
ROL= rule of law; and
VA= voice and accountability.

3.2. Model Specification

The empirical model is estimated using the System Generalised Method of Moments (GMM) technique, following Arellano and Bover (1995) and Blundell and Bond (1998). The functional form of the model is specified as:

$$GDP = f(H, C, I, L, E, G, E, C, O, C, R, Q, PSROLVAGOVEFDI \ln L\,ABD\_EBOLAD\_COVID) \quad (5)$$

Expressing Equation (5) in panel-data econometric form gives:

$$GDP_{it} = \alpha_i + \lambda_i GDP_{it-1} + \beta_{i1} LnHCI_{it} + \beta_{i2} LE_{it} + \beta_{i3} GE_{it} + \beta_{i4} COC_{it} + \beta_{i5} RQ_{it} + \beta_{i6} PS_{it} + \beta_{i7} ROL_{it} + \beta_{i8} VA_{it} + \beta_{i9} GOVE_{it} + \beta_{i10} FDI_{it} + \beta_{i11} LnLAB_{it} + \beta_{i12} D\_EBOLA_{it} + \beta_{i13} D\_COVID_{it} + \gamma_{it} + \varepsilon_{it} \quad (6)$$

The model is used to address the two principal objectives of the study: first, to examine the impact of institutional quality on economic growth in Sub-Saharan Africa; and second, to determine the impact of human capital development on economic growth in Sub-Saharan Africa.

The variables are defined as follows:

Ln= natural logarithm of the respective variable;
GDP= gross domestic product growth (annual growth);
SE= secondary school enrolment;
HCI= Human Capital Index;
LE= life expectancy at birth;
GE= government effectiveness;
COC= control of corruption;
RQ= regulatory quality;
PS= political stability;
ROL= rule of law;
VA= voice and accountability;
FDI= foreign direct investment;
$GOVE$= government expenditure on education;
LAB= labour force participation rate;
D_EBOLA= dummy variable for the Ebola outbreak;
D_COVID= dummy variable for the COVID-19 pandemic;
α= constant term;
γ= unobserved country-specific effect;
ε= stochastic error term;
i= cross-sectional index $(i, =, 1, 2 \ldots 41)$; and
t= time period $(t, =, 2010, 2011 \ldots 2022)$.

The Human Capital Index and labour force participation rate are transformed into their natural logarithms for the empirical analysis.

3.3. Method of Estimation

This study employs the Generalised Method of Moments (GMM) estimation technique. GMM is particularly suitable for dynamic panel-data models because it can address the endogeneity associated with the inclusion of the lagged dependent variable. Endogeneity occurs when an explanatory variable is correlated with the error term, which may result in biased and inconsistent estimates. The GMM framework uses appropriate orthogonality conditions to generate consistent and efficient parameter estimates.

The general form of the GMM specification is expressed as:

$$InY_{it} = \phi InY_{it-1} + \beta X'_{it} + \alpha Z'_{it} + (\gamma_i + \varepsilon_{it}) \quad (7)$$

where:

$InY_{it} = GDP_{it}$, representing the $N \times 1$vector of the dependent variable;

$\phi InY_{it-1} = \lambda_{i1} GDP_{it-1}$, representing the lagged dependent variable;

X'_{it}represents the vector of explanatory variables, including $GE_{it}$and HCI_{it};

Z'_{it}represents the vector of control variables, including FDI_{it}, $LnLAB_{it}$, and $GOVE_{it}$;

βrepresents the vector of parameters to be estimated;

$\gamma_i$represents unobserved country-specific effects; and

ε_{it}represents the stochastic error term.

Following the neoclassical growth framework, the relationship can further be represented as:

$$I_{it} = f(X'_{it}, Z'_{it}) \quad (8)$$

Introducing the natural logarithm and the unobserved country-specific effects into Equation (7) gives:

$$InY_{it} = \phi InY_{it-1} + \beta InX_{it} + \alpha InZ_{it} + (\gamma_i + \varepsilon_{it}) \quad (9)$$

The objective is to obtain consistent estimates of the parameters in the presence of correlation between the explanatory variables, country-specific effects, and measurement errors. To remove the unobserved country-specific effects, the first-difference transformation is applied:

$$InY_{it} - InY_{it-1} = \phi InY_{it-1} - \phi InY_{it-2} + \beta InX_{it} - \beta InX_{it-1} + \alpha InZ_{it} - \alpha InZ_{it-1} + \varepsilon_{it} - \varepsilon_{it-1} \quad (10)$$

Although first differencing removes country-specific effects, endogeneity may remain because the lagged dependent variable may still be correlated with the transformed error term. Therefore, the Arellano and Bond (1995) GMM estimator uses available lagged levels as instruments for non-strictly exogenous variables in the differenced equation.

However, when variables are highly persistent, lagged levels may constitute weak instruments for first differences. To address this limitation, Arellano and Bover (1995) proposed the forward orthogonal deviations transformation. This transformation subtracts the average of future observations rather than the previous observation and may reduce data loss, particularly in panel datasets containing gaps. Accordingly, Equation (6) is expressed in transformed form as:

$$\Delta GDP_{it} = \lambda_{i1}\Delta GDP_{it-1} + \beta_{i1}\Delta HCI_{it} + \beta_{i2}LE_{it} + \beta_{i3}\Delta GE_{it} + \beta_{i4}\Delta COC_{it} + \beta_{i5}\Delta RQ_{it} + \beta_{i6}\Delta PS_{it} + \beta_{i7}\Delta ROL_{it} + \beta_{i8}\Delta VA_{it} + \beta_{i9}\Delta GOVE_{it} + \beta_{i10}\Delta FDI_{it} + \beta_{i11}\Delta LnLAB_{it} + \beta_{i12}\Delta D\_EBOLA_{it} + \beta_{i13}\Delta D\_COVID_{it} + \Delta\varepsilon_{it} \quad (11)$$

Under the appropriate initial and moment conditions, equations in levels can be combined with equations in first differences using suitably lagged variables as instruments. Consequently, the two sets of moment conditions form the basis of the System GMM estimator. The conventional Arellano–Bond estimator may perform poorly when the autoregressive parameters are relatively large, and the available lagged levels are weak instruments for the differenced variables. Therefore, Blundell and Bond (1998), building on Arellano and Bover (1995), developed the System GMM estimator by introducing additional moment conditions. Furthermore, the two-step System GMM estimator provides an efficient approach for addressing heteroscedasticity and autocorrelation in dynamic panel models (Roodman, 2009).

3.4. Diagnostic Tests

Diagnostic tests assess the validity of the System GMM estimates and the appropriateness of the instruments used. First, the Hansen J-test of over-identifying restrictions assesses the validity of the instrument set (Hansen, 1982). The Hansen test's null hypothesis is that the instruments are valid and uncorrelated with the error term. Second, the Arellano and Bond (1995) test for second-order serial correlation, AR(2), is employed to determine whether second-order autocorrelation exists in the transformed residuals. The absence of statistically significant second-order serial correlation is an important condition for the GMM estimator's validity.

3.5. Justification for the Model

The System GMM model is adopted because it suits the panel structure used in this study. The dataset comprises 41 Sub-Saharan African countries observed over a relatively short period of 13 years, from 2010 to 2022. Consequently, the dynamic panel approach allows the study to account for persistent economic growth while addressing unobserved country-specific heterogeneity and potential endogeneity. Furthermore, economic growth is inherently dynamic because current economic performance may depend partly on previous growth levels. Barro and Sala-i-Martin (1995) and Awolusi (2019) therefore support dynamic specifications in growth analysis. In this context, System GMM provides an appropriate framework for addressing unobserved heterogeneity, endogeneity bias, and weak-instrument problems. Moreover, compared with pooled ordinary least squares, fixed-effects, random-effects, and first-difference GMM estimators, System GMM can provide more reliable parameter estimates in dynamic panel models when the required moment conditions are satisfied (Bond, 2002). Therefore, the estimator is considered appropriate for examining the effects of institutional quality and human capital development on economic growth in Sub-Saharan Africa.

3.6. Data Source and Software

The study covers 41 Sub-Saharan African countries from 2010–2022. The countries included in the analysis are Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Congo, Democratic Republic of the Congo, Djibouti, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. We selected these countries based on data availability. We obtained study data from the World Development Indicators (WDI) and Worldwide Governance Indicators (WGI). Table 1 presents the variables used in the analysis, their measurements, expected signs, and data sources. The empirical analysis was conducted using Stata 15.

Table 1: Description of Variables, Measurement, and Sources

Variable	Measurement	A priori sign	Source
GDP	GDP growth (annual %)	Positive	World Development Indicators (WDI)
HCI	Human Capital Index	Positive	World Development Indicators (WDI)
LE	Life expectancy at birth (years)	Positive	World Development Indicators (WDI)
GE	Government effectiveness	Positive	Worldwide Governance Indicators (WGI)
COC	Control of corruption	Positive	Worldwide Governance Indicators (WGI)
RQ	Regulatory quality	Positive	Worldwide Governance Indicators (WGI)
PS	Political stability and absence of violence/terrorism	Positive	Worldwide Governance Indicators (WGI)
ROL	Rule of law	Positive	Worldwide Governance Indicators (WGI)
VA	Voice and accountability	Positive	Worldwide Governance Indicators (WGI)
GOVE	Government expenditure on education	Positive	World Development Indicators (WDI)
FDI	Foreign direct investment	Positive	World Development Indicators (WDI)
LAB	Labour force participation	Positive	World Development Indicators (WDI)
D_EBOLA	Ebola outbreak dummy (1 = outbreak year; 0 = otherwise)	Negative	Study construction/WHO

Variable	Measurement	A priori sign	Source
D_COVID	COVID-19 pandemic dummy (1 = COVID-19 period; 0 = otherwise)	Negative	Study construction/WHO

Source: *Author*

4. Results and Discussion

4.1. Descriptive Statistics

Table 2 presents the descriptive statistics for the variables included in the analysis. The statistics provide an overview of the distribution and variation in economic growth, human capital, governance indicators, and the control variables across the 41 Sub-Saharan African countries over the study period.

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
GDP	533	3.88	4.19	-36.39198	19.67541
HCI	533	117.7	25.62	27.09967	197.6093
LE	533	60.99	5.5	18.818	74.51463
GE	533	-0.66	0.55	-1.734116	1.100539
COC	533	-0.65	0.59	-1.664347	1.035778
RQ	533	-0.65	0.53	-1.766916	1.137284
PS	533	-0.62	0.8	-2.486254	1.277192
ROL	533	-0.7	0.57	-1.865919	1.028847
VA	533	-0.6	0.61	-1.85886	0.8373596
GOVE	533	3.94	1.98	0.3485167	10.82655
FDI	533	4.01	5.81	-17.29212	38.94287
LAB	533	62.97	11.66	31.402	86.507
D_EBOLA	533	0.07	0.27	0	1
D_COVID	533	0.07	0.27	0	1

Source: Authors. ***Note:*** **GDP** is gross domestic product growth (annual%), ***HCI*** *is human capital index,* ***LE*** *is life expectancy,* ***GE*** *is government effectiveness,* ***COC*** *is control of corruption,* ***RQ*** *is regulatory quality,* ***PS*** *is political stability,* ***ROL*** *is rule of law,* ***VA*** *is voice and accountability,* ***GOVE*** *is government expenditure on education,* ***FDI*** *is foreign direct investment,* ***LAB*** *is labour force participation,* ***D_EBOLA*** *is dummy variables for ebola,* ***D_COVID*** *is dummy variables for covid.*

The average annual GDP growth rate is 3.88%, with a standard deviation of 4.19, indicating considerable variation in economic performance across the sampled countries and years. The minimum GDP growth rate is -36.39%, whereas the maximum is 19.68%, demonstrating substantial differences in growth experiences within the region. The HCI has a mean of 117.70 and a standard deviation of 25.62, while life expectancy averages about 60.99 years. The governance indicators—government effectiveness, control of corruption, regulatory quality, political stability, rule of law, and voice and accountability—all record negative average values. This pattern generally indicates relatively weak governance conditions across the sampled Sub-Saharan African economies during the study period. Government expenditure on education averages 3.94, while FDI averages 4.01, with relatively substantial variation across observations. Labour force participation averages 62.97%. Overall, the descriptive statistics demonstrate considerable cross-country and intertemporal variation, thereby providing an appropriate basis for examining the dynamic relationships among economic growth, human capital development, and institutional quality.

4.2. Correlation and Multicollinearity Analysis

Before estimating the dynamic panel models, we examined pairwise correlations among the variables to assess the extent of linear association among the explanatory variables. Table 4 presents the correlation matrix. The correlations between GDP growth and the explanatory variables are generally low. For example, GDP is positively correlated with HCI (0.07), government effectiveness (0.079), control of corruption (0.082), regulatory quality (0.07), political stability (0.05), rule of law (0.058), voice and accountability (0.047), government expenditure on education (0.036), FDI (0.15), and labour force participation (0.096). In contrast, GDP has a small negative correlation with life expectancy (-0.03). However, several governance indicators show considerably stronger correlations. In particular, government effectiveness and regulatory quality are correlated at 0.945, while government effectiveness and rule of law are correlated at 0.909. Similarly, regulatory quality and rule of law are correlated at 0.92, while control of corruption and rule of law are correlated at 0.89. These relatively high correlations reflect the closely related nature of the governance dimensions. Therefore, although the indicators capture conceptually distinct elements of institutional quality, the coefficients of individual governance variables should be interpreted cautiously when they are estimated jointly. Nevertheless, the governance indicators are retained in the analysis because the study seeks to examine institutional quality across its multiple dimensions. It is necessary to determine whether the regressors are collinear. In other words, to determine whether two or more regressors are influencing the dependent variable in the same way. The correlation matrix, which uses the correlation coefficient between regressor pairs, serves as the basis for this test. This is seen in Table 3.

Table 3: Correlation matrix

Variable	GDP	HCI	LE	GE	COC	RQ	PS	ROL	VA	GOVE	FDI	LAB	D_EBOLA	D_COVID
GDP	1.00													
HCI	0.07	1.00												
LE	-0.03	0.47	1.00											
GE	0.079	0.54	0.45	1.00										
COC	0.082	0.37	0.30	0.82	1.00									
RQ	0.07	0.51	0.38	0.945	0.844	1.00								

Variable	GDP	HCI	LE	GE	COC	RQ	PS	ROL	VA	GOVE	FDI	LAB	D_EBOLA	D_COVID
PS	0.05	0.29	0.39	0.675	0.73	0.64	1.00							
ROL	0.058	0.50	0.42	0.909	0.89	0.92	0.76	1.00						
VA	0.047	0.31	0.25	0.716	0.757	0.76	0.67	0.85	1.00					
GOVE	0.036	0.24	0.09	0.536	0.65	0.51	0.5	0.54	0.49	1.00				
FDI	0.15	-0.07	0.03	-0.02	-0.02	-0.03	0.04	-0.03	0.06	0.09	1.00			
LAB	0.096	0.20	-0.19	-0.015	-0.099	-0.034	-0.24	-0.07	0.03	0.04	-0.01	1.00		
D_EBOLA	0.028	-0.01	-0.0417	0.013	-0.024	0.0036	0.01	-0.01	0.01	0.01	0.0047	0.006	1.00	
D_COVID	-0.36	0.03	0.0898	-0.015	0.022	-0.03	-0.02	0.01	0.002	0.02	-0.07	-0.027	-0.08	**1.00**

Source: Authors

4.3. Bond Test and Selection of the GMM Estimator

The study applies the Bond (2002) approach to assess the appropriateness of System GMM relative to Difference GMM. Table 4 presents the coefficient of the lagged dependent variable obtained from pooled OLS, fixed-effects estimation, and Difference GMM.

Table 4: Bond Test Results

Estimator	Coefficient of Lagged GDP
Pooled OLS	0.253221
Fixed Effects	0.0678034
Difference GMM	0.0655725
Decision	Adopt System GMM

Source: *Author*

The estimated lagged GDP coefficient obtained from Difference GMM (0.0656) is approximately equal to, but slightly below, the fixed-effects estimate (0.0678). Following Bond (2002), this pattern suggests that weak instrumentation may affect the Difference GMM estimate. Consequently, we adopt System GMM for the main empirical analysis.

4.4. System GMM Estimation Results

Table 5 presents the System GMM estimates for the relationship between human capital development, governance institutions, and economic growth in Sub-Saharan Africa.

Table 5: System GMM Regression Results – (Response variable: GDP)

Variable	Model 1	Model 2
L.GDP	0.40 (0.03)	0.55 (0.10)
LHCI	0.95 (0.01)	1.06 (0.30)
LE	-0.05 (0.45)	-0.07 (0.10)
GE	0.44 (0.05)	0.25 (0.09)
COC	0.43 (0.02)	0.05 (0.95)
RQ	-1.00 (0.53)	-1.35 (0.35)
PS	-1.34 (0.83)	-0.28 (0.63)
ROL	0.90 (0.07)	2.04 (0.47)
VA	-0.18 (0.80)	-0.25 (0.72)
GOVE	-0.04 (0.75)	-0.05 (0.67)
FDI	0.07 (0.04)	0.078 (0.046)
LLAB	0.12 (0.09)	-0.51 (0.79)
D_EBOLA	0.27 (0.80)	0.64 (0.49)
D_COVID	-5.80 (0.00)	-5.95 (0.00)
Groups	41	41
Instruments	16	17
AR(2), p-value	0.833	0.894
Hansen, p-value	0.330	0.084
Observations	492	492

Source: *Authors. Note: Values in parentheses are the reported p-values.*

Table 5 indicates that the coefficient of lagged GDP is positive in both specifications. In Model 1, the coefficient is 0.40 with a p-value of 0.03, indicating statistical significance at the 5% level. In Model 2, the coefficient increases to 0.55 with a reported p-value of 0.10. These results indicate persistence in economic growth, suggesting that previous economic performance contributes to current economic growth across Sub-Saharan African countries. The coefficient of LHCI is positive in both models. In Model 1, LHCI has a coefficient of 0.95 and is statistically significant at the 1% level ($p = 0.01$). Therefore, an increase in the logged human capital measure is associated with higher economic growth, holding other factors constant. This result is consistent with the proposition of endogenous growth theory that improvements in human capital contribute to productivity and economic performance. It also corresponds with previous findings reported by Javed et al. (2013) and Khalafalla and Suliman (2013). However, although the coefficient remains positive in Model 2 ($\beta = 1.06$), it is statistically

insignificant (p = 0.30). Therefore, the positive association between HCI and economic growth is not robust across both specifications. Life expectancy records negative coefficients in both Model 1 (β = -0.05, p = 0.45) and Model 2 (β = -0.07, p = 0.10). Consequently, the analysis provides no strong statistical evidence that life expectancy independently affects economic growth in the estimated models. Overall, the findings provide partial support for H1, as the principal human capital indicator has a positive and statistically significant effect in Model 1 but does not retain statistical significance in Model 2.

Government effectiveness exhibits a positive relationship with economic growth in both models. In Model 1, the coefficient is 0.44 with a p-value of 0.05, whereas in Model 2 the coefficient is 0.25 with a p-value of 0.09. Thus, improved government effectiveness is associated with stronger economic growth, although the level of statistical significance is weaker in Model 2. The finding is consistent with the argument that effective public institutions can improve policy implementation, resource allocation, and the broader environment for economic activity. It also corresponds with previous evidence reported by Valeriani and Peluso (2011). Moreover, Control of corruption has a positive coefficient of 0.43 in Model 1 and is statistically significant at the 5% level (p = 0.02). This finding indicates that stronger corruption control is associated with higher economic growth. Improved corruption control may reduce economic distortions, improve resource allocation, and strengthen confidence in public institutions. However, the coefficient declines to 0.05 in Model 2 and becomes statistically insignificant (p = 0.95). Therefore, although the Model 1 result supports a positive association between corruption control and economic growth, the relationship is not robust across both model specifications.

Regulatory quality has negative coefficients in both models. The coefficients are -1.00 in Model 1 and -1.35 in Model 2; however, neither coefficient is statistically significant, with p-values of 0.53 and 0.35, respectively. Accordingly, the study provides insufficient statistical evidence that regulatory quality independently influences GDP growth during the period examined. Similarly, Political stability also records negative but statistically insignificant coefficients in both models. The coefficient is -1.34 in Model 1 (p = 0.83) and -0.28 in Model 2 (p = 0.63). Therefore, these specifications identify no statistically discernible independent relationship between political stability and economic growth. Furthermore, the rule of law has a positive coefficient of 0.90 in Model 1 and is statistically significant at the 10% level (p = 0.07). This suggests some evidence that stronger legal institutions and enforcement mechanisms are associated with improved economic performance. In Model 2, however, the coefficient increases to 2.04 but becomes statistically insignificant (p = 0.47). Therefore, as with control of corruption, the evidence on the rule of law is positive but not robust across both models.

Voice and accountability record negative coefficients in Model 1 (β = -0.18, p = 0.80) and Model 2 (β = -0.25, p = 0.72). Because both coefficients are statistically insignificant, the study does not establish an independent effect of voice and accountability on economic growth within the estimated period. Taken together, the governance results provide partial support for H2. Government effectiveness demonstrates the most consistent positive association with economic growth, while control of corruption and rule of law are significant only in Model 1. Regulatory quality, political stability, and voice and accountability are statistically insignificant in both specifications. Similarly, Government expenditure on education has negative coefficients of -0.04 in Model 1 and -0.05 in Model 2. However, the corresponding p-values of 0.75 and 0.67 indicate that neither effect is statistically significant. Consequently, the analysis provides no evidence that government expenditure on education has a direct, independent effect on economic growth in the estimated models.

FDI has a positive and statistically significant relationship with economic growth in both specifications. The coefficient is 0.07 in Model 1 (p = 0.04) and 0.078 in Model 2 (p = 0.046). Therefore, higher foreign direct investment is associated with increased economic growth across the sampled Sub-Saharan African countries. This finding aligns with the view that foreign investment can contribute to economic growth through capital accumulation, technology transfer, job creation, and improved productive capacity. The result also corresponds with the findings reported by Arshad (2019). Moreover, the coefficient of logged labour force participation is positive in Model 1 (β = 0.12) and statistically significant at the 10% level (p = 0.09). This indicates some evidence that increased labour force participation contributes positively to economic growth. In Model 2, however, the coefficient becomes negative (β = -0.51) and statistically insignificant (p = 0.79). Therefore, the effect of labour force participation is not consistent across the two specifications.

The Ebola dummy has a positive coefficient in both models, but neither estimate is statistically significant. The coefficient is 0.27 in Model 1 (p = 0.80) and 0.64 in Model 2 (p = 0.49). Thus, the Ebola dummy has no statistically significant independent effect. In contrast, the COVID-19 dummy has a large negative and statistically significant coefficient in both models. The coefficient is -5.80 in Model 1 and -5.95 in Model 2, with p-values of 0.00 in both specifications. These findings indicate that the COVID-19 period was associated with a substantial reduction in economic growth across the sampled Sub-Saharan African countries. The consistency of this result across both models highlights the considerable economic disruption associated with the pandemic.

4.5. Post-Estimation Diagnostic Tests

The validity of the System GMM specifications is assessed using the Arellano–Bond test for second-order serial correlation and the Hansen test of over-identifying restrictions. The AR(2) test produces p-values of 0.833 for Model 1 and 0.894 for Model 2. Because both values exceed the conventional 5% significance level, we cannot reject the null hypothesis of no second-order serial correlation. Therefore, the results do not indicate problematic second-order autocorrelation in either model. Similarly, the Hansen test produces a p-value of 0.330 for Model 1 and 0.084 for Model 2. At the 5% significance level, we cannot reject the null hypothesis about the validity of the instrument set in either specification. However, the Model 2 Hansen p-value is comparatively closer to the conventional threshold and should therefore be interpreted with appropriate caution. The models use 16 and 17 instruments, respectively, compared with 41 cross-sectional groups. Thus, the reported number of instruments remains below the number of groups, reducing concerns regarding excessive instrument proliferation. Overall, the AR(2) and Hansen test results provide support for the adequacy of the reported System GMM specifications. Overall, the empirical evidence indicates that human capital development and selected dimensions of governance institutions are associated with economic growth in Sub-Saharan Africa. However, these effects are not uniform across all indicators or model specifications. Government effectiveness provides the most consistent institutional evidence, whereas the positive influence of human capital is primarily reflected in the significant HCI coefficient in Model 1. In addition, FDI contributes positively to economic growth in both models, while COVID-19 has a substantial and consistently negative effect.

5. Discussion

The findings demonstrate that human capital development and selected dimensions of institutional quality contribute to economic growth in Sub-Saharan Africa, although the relationships are not consistent across all indicators and model specifications. The results therefore provide partial support for both hypotheses and suggest that economic growth in the region depends on the interaction of human capabilities, institutional conditions, investment, and broader macroeconomic circumstances.

Human capital development shows a positive relationship with economic growth, with the Human Capital Index being positive and statistically significant in Model 1 but insignificant in Model 2. This finding partially supports H1 and aligns with endogenous growth theory, which emphasises the contribution of knowledge, skills, and productive capabilities to economic performance. It also corresponds with previous findings by Javed et al. (2013), Khalafalla and Suliman (2013), Usman and Adeyinka (2019), and Taiwo and Olusola (2020). However, the loss of statistical significance in Model 2 indicates that improvements in human capital may not automatically translate into economic growth unless they are accompanied by productive employment opportunities and supportive institutional conditions. Life expectancy is also statistically insignificant in both models, suggesting that different dimensions of human capital may influence economic performance through different mechanisms and time horizons.

Regarding institutional quality, government effectiveness provides the most consistent positive evidence, while control of corruption and rule of law show positive effects primarily in Model 1. These findings provide partial support for H2 and reinforce the argument that effective governance can facilitate economic activity through better policy implementation, efficient resource allocation, stronger legal institutions, and improved confidence among investors. However, regulatory quality, political stability, and voice and accountability are statistically insignificant in both models. This mixed evidence is consistent with Ogbuabor et al. (2020) and Nawaz et al. (2014), who similarly demonstrate that the relationship between institutional quality and economic growth varies across governance dimensions and economic contexts. Moreover, the relatively high correlations among several governance indicators suggest that their individual effects should be interpreted cautiously.

The results for government expenditure on education are also noteworthy. Although education spending is expected to support human capital formation, its coefficient is negative and statistically insignificant in both models. Thus, the findings do not establish a direct effect of education expenditure on economic growth. This may indicate that the effectiveness of public education expenditure depends not only on the amount spent but also on the quality of resource allocation, institutional efficiency, educational outcomes, and labour markets' ability to utilise acquired skills. Among the control variables, FDI exhibits a positive and statistically significant relationship with economic growth in both models, making it one of the most consistent findings of the study. This result suggests that foreign investment can contribute to growth through capital formation, technology transfer, employment creation, and improved productive capacity. In contrast, the effect of labour force participation is inconsistent across the two models, suggesting that labour force expansion may contribute to growth only when workers are effectively absorbed into productive economic activities.

Finally, the COVID-19 dummy has a substantial negative and statistically significant effect in both models, whereas the Ebola dummy is statistically insignificant. The COVID-19 finding reflects the extensive economic disruption generated by the pandemic through restrictions on economic activity, disruptions to trade and supply chains, declining investment, and heightened economic uncertainty. Overall, the findings suggest that improving human capital and strengthening key governance institutions remain important for economic growth in Sub-Saharan Africa. Nevertheless, their effectiveness depends on the capacity of economies to translate human capabilities and institutional improvements into productive investment, employment, and sustainable economic activity.

6. Conclusion

This study examined the effects of human capital development and governance institutions on economic growth across 41 Sub-Saharan African countries from 2010 to 2022 using the System Generalised Method of Moments estimator. The findings indicate that human capital development contributes positively to economic growth, although the statistical significance of the Human Capital Index is inconsistent across the two model specifications. Likewise, the effects of institutional quality are mixed. Government effectiveness demonstrates the most consistent positive relationship with economic growth, while control of corruption and rule of law show positive effects in selected specifications. In contrast, regulatory quality, political stability, and voice and accountability show no statistically significant independent effects. The findings further show that foreign direct investment has a positive and statistically significant effect on economic growth in both models, whereas labour force participation produces inconsistent results. Government expenditure on education is statistically insignificant, indicating that higher expenditure alone may not necessarily translate into stronger economic performance. In addition, the COVID-19 pandemic has a substantial negative effect on economic growth, highlighting the vulnerability of Sub-Saharan African economies to major external shocks. Overall, the study shows that sustainable economic growth in Sub-Saharan Africa depends not only on human capital development but also on the institutional environment in which productive resources are used. Accordingly, strengthening human capabilities and improving key governance institutions remain important for enhancing the region's long-term economic performance.

7. Policy Implications

The findings provide several policy implications for Sub-Saharan African economies. First, governments should continue investing in human capital development by improving education, skills development, and workforce capabilities. However, the emphasis should extend beyond increasing expenditure to improving the efficiency, quality, and productive outcomes of such investments. Second, institutional reforms should prioritise government effectiveness, corruption control, and stronger administrative institutions. The positive effects identified for these dimensions suggest that improving policy implementation, public-sector efficiency, accountability, and the rule of law can create a more supportive environment for economic activity. Third, policies aimed at attracting and effectively utilising foreign direct investment should be strengthened because FDI shows a positive and statistically significant relationship with economic growth in both model specifications. Such policies should focus on creating stable investment conditions, improving regulatory transparency, and encouraging investment that builds productive capacity and generates employment. Finally, the substantial negative effect of COVID-19 highlights the importance

of strengthening economic resilience. Governments should therefore improve crisis-response capacity, strengthen public institutions, and reduce economic vulnerability to future external shocks.

8. Limitations and Future Research

This study is limited to 41 Sub-Saharan African countries ovefrom10–2022. Therefore, interpret the findings within this regional and temporal context. In addition, institutional quality is represented by the six Worldwide Governance Indicators, while human capital development is measured using the indicators included in the empirical model. Future studies may extend the analysis by examining longer time periods, alternative measures of human capital development and institutional quality, or different regional classifications. Further research may also investigate whether the effect of human capital development on economic growth varies according to the level of institutional quality across Sub-Saharan African economies.

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