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The Effect of Education on Economic Growth in Sub-Saharan African Countries: Do Institutions Matter?

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Abstract: This paper investigates the moderating role of institutional quality on the relationship between education and economic growth in Sub-Saharan Africa (SSA). The study applies the panel ARDL model to data from 18 SSA countries spanning 2000–2020 for its main analysis, along with a battery of diagnostics test to ensure the robustness of the results. The results reveal that the long-term effect of education on economic growth is statistically insignificant, attributing this finding to high rates of education exclusion and low-quality education. Remarkably, the research emphasizes the moderating role of institutional quality, showing the positive effects of education on economic growth when countries demonstrate robust corruption control and political stability. The study contributes to the existing literature by highlighting specific institutional factors influencing the effectiveness of education in driving economic growth, emphasizing the need for a strong institutional framework alongside educational efforts for sustainable development. The findings highlight that robust institutions form a crucial infrastructure that enhances the effectiveness of education in driving productivity and fostering economic growth.

Keywords: education; institution quality; economic growth; SSA

JEL Classification: C23; E02; I25; O43; O55

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1. Introduction

The exploration of how human capital, notably education, influences long-term economic growth has become a pivotal area of inquiry within economic research. Pioneering studies by scholars such as Romer (1986) and Lucas (1988) have emphasized the integral role of human capital in fostering innovation and driving sustained economic growth. Both the theoretical and empirical literature confirm the transformative power of education in enhancing productivity and spurring innovation, although debates persist regarding its effect and magnitude on economic growth in some contexts (Abu Alfoul et al. 2024a; Gholipour et al. 2024; Oyinlola et al. 2021).

Education emerges as a critical factor for eradicating poverty and achieving the Sustainable Development Goals (SDGs) in Sub-Saharan Africa (SSA), a region that has seen a marked increase in primary education access over the last two decades. Despite these advancements, challenges remain, as evidenced by the significant dropout rates at the lower secondary education level (Lewin 2009). The empirical evidence on education's contribution to SSA's economic growth is mixed, with studies indicating both positive (Cooray

2009; Ogundari and Awokuse 2018; Oyinlola et al. 2021) and negative effects, the latter often attributed to the region's struggles with educational quality, including inadequate curricula and insufficient development of cognitive skills (Gyimah-Brempong et al. 2006).

Some scholarship has increasingly emphasized the pivotal role of institutional quality in bolstering economic growth, with robust institutions being linked to improved governance, reduced corruption, and enhanced democratic processes (Acemoglu 2003; Nawaz 2015). These factors, in turn, are posited to directly contribute to the improvement of educational outcomes and cognitive skills through better allocation of resources to education, thereby facilitating regional growth, trade, and foreign investment.

This paper contributes to the empirical literature on education and economic growth by examining the mediating effect of institutional quality on the relationship between education and economic growth in the SSA region. We posit that education's potential to boost economic growth is significantly amplified by high-quality institutions, which are vital for effective education governance, characterized by transparency, accountability, and the efficient implementation of educational policies. The study employs the ARDL model to examine data from 2000 to 2020, revealing that the impact of education on economic growth in SSA is contingent upon the strength of institutional frameworks. The remainder of the paper provides an overview of the literature on education and institutional quality in Section 2, discusses the data and methodology in Sections 3 and 4, presents empirical findings in Section 5, provides policy implications and recommendations in Section 6, and concludes with a summary of findings and future research recommendations in Section 7.

2. Literature Review

In the early 1990s, several micro-level studies indicated that education plays a positive role in economic growth, suggesting that educational quality and technology affect this association. The studies also revealed that the association between education and economic growth varies across different countries according to their levels of wealth (Lucas 1988; Barro 1991; Benhabib and Spiegel 1994). Further, Barro (1991) evaluated that a 1% annual increase in income growth can be achieved by increasing the secondary school enrolment rate from 50% to 100%. In contrast, Pritchett (1999) challenged the notion of a direct relationship between the growth rate and the increase in human capital in MENA countries. According to Pritchett, this weak link could be explained by three factors: firstly, while education contributes to higher private wages, it does not necessarily enhance human capital. Secondly, there has been a noticeable decline in the marginal return to education. Lastly, many countries in the region lack favourable institutional environments that foster the accumulation of human capital, primarily focusing on income-generating activities, which can hinder economic growth.

A study by Aghion and Cohen (2004) revealed a positive correlation between educational attainment, measured by the number of years of schooling, and economic growth. Their research substantiates the notion that an increase in education is conducive to higher economic growth rates. In addition, Krueger and Lindahl (2001) emphasized the significance of education in countries with low levels of educational attainment. The study found a statistically significant and positive relationship between education and economic growth in these contexts. Pradhan (2011) investigated the causal relationship between education and economic growth in India from 1951 to 2001 using correlation error modelling in an empirical survey. The results of this survey confirmed a unidirectional causality from education to economic growth. It was revealed that education, particularly at higher levels, directly contributes to economic growth by producing a more skilled and productive workforce, fostering knowledge creation, idea generation, and technological innovations (Abu-Alfoul 2023).

The findings of Creel and Poilon (2008), in a study in Europe, provided evidence of human capital and public investment in driving economic growth in Europe. Al-Yousif (2008) conducted an analysis to explore the relationship between education spending, serving as a proxy for human capital, and economic growth in six GCC countries during the period of 1977–2004. The empirical results obtained varied across countries and measures of human capital, highlighting the nuanced nature and interpretation of the relationship. Additionally, Barro and Lee (2013) argued that education lies at the core of the economic growth process. Their study focused on examining the implications of human capital levels on economic growth. Through the application of fixed effects and random effects approaches, they established that the rate of return on education amounts to 20%, and the global economy continues to grow at a steady rate of 2% per annum. However, the study found a negative return for primary education, while the returns were higher for secondary and higher levels of education.

Recently, Wang and Liu (2016) have suggested a panel data model discussing the effect of education on economic growth, using the final education data of 55 countries and regions from 1960 to 2009. The results gained specified that educational human capital and economic growth showed a significant positive correlation in all developed countries and developing countries, while primary education and secondary education did not have a significant positive effect on economic growth, whereas higher education had a significant positive effect on economic growth. Hanif and Arshed (2016) used three variables in panel data education of SAARC countries collected from 1960 to 2013 to view whether higher education has a better marginal effect on the growth of these countries. The empirical results showed that tertiary education enrolment has the highest effect on growth compared to primary and secondary education enrolment.

Corruption, the rule of law, and other governance indicators have all been the focus of numerous studies that analyse their effects on economic growth (Kpodar and Andrianaivo 2011; Vu 2011; Khatatbeh 2019). Countries with effective law enforcement and a low rate of corruption are more likely to experience robust economic growth. Mauro (1996) conducted a groundbreaking analysis of the effect corruption had on economic growth in 70 countries between 1980 and 1983. He found a negative effect of corruption on economic growth. Based on the results of Mauro, policies to fight corruption can be considered beneficial to growth:

> "A country that improves its standing on the corruption indicator, say, 6 to 8, (0 being the most corrupt, 10 the least) will experience a 4-percentage point increase in its investment rate and a 0.5 percentage point increase in its annual GDP growth rate". (Mauro 1996, pp. 11–14)

The effects of bad government (like political instability and corruption) on GDP have been the focus of many empirical studies. Corruption hinders progress in the economy in a number of ways. It stunts economic expansion by shifting government spending priorities and through directing investment to the interests of corrupt politicians (Mauro 1996). Corruption has been shown to have a negative effect on economic growth by numerous studies, including those by La Porta et al. (1999), Aidt et al. (2008), and Pellegrini and Gerlagh (2004). Moreover, research by Campos and Nugent (1999) shows that good governance promotes economic growth. Kaufmann et al. (1999a, 1999b) cite studies that show how crucial good governance is for economic expansion. However, some other studies suggest that governance quality has an insignificant effect on economic growth. For instance, Sachs et al. (2004) state that the focus on governance reforms in African countries is misplaced due to their lack of relevance to GDP growth.

Numerous studies support the idea that a country's economic and political freedom is crucial to economic growth (Moosa et al. 2024; Khatatbeh and Abu-Alfoul 2024; Miletzki and Broten 2017; Owens 1987; Sen 1999). Using dynamic panel data (GMM) from 1960 to 2004, Aisen and Veiga (2013) analysed the effect of political instability on economic growth in 169 nations. Their research shows that political instability is associated with low economic growth. Moreover, the findings indicate that political instability retards

the development of both physical and human capital. Low levels of democracy are also associated with slower economic growth, according to their analysis.

Furthermore, other studies have shown that democratic governments tend to have higher rates of economic growth. Using panel data (3SLS) estimates from 1970 to 1989 for 65 industrial and developing countries, Tavares and Wacziarg (2001) looked into the effect of democracy on economic growth. The research shows that increased levels of democracy positively affect economic growth, especially by enhancing human capital and reducing income inequality (Khatatbeh and Moosa 2022). This suggests that democracy has a marginally beneficial effect on economic expansion. These results align with Barro's (1996) study, which examined information from 100 countries between 1960 and 1990. The findings show that high human capital, small government consumption, and free markets all contribute to economic growth. If these factors and the initial level of real per capita GDP are controlled, it is found that democracy has a slightly negative effect on economic growth. This finding indicates a nonlinear relationship, where more democracy boosts economic growth under conditions of low political freedom but reduces economic growth under conditions of moderate political freedom.

3. Data Sources

This paper uses balanced panel data[1] over 21 years (2000–2020) for 18 SSA countries[2]. These countries were selected based on the availability of key data for the period 2000–2020. They vary significantly in terms of their economic structure, governance quality, and educational systems, which provides a rich dataset for examining the relationship between education, institutional quality, and economic growth.

The countries in our study include a mix of low and middle-income economies, with varying levels of secondary school enrolment, governance effectiveness, and economic growth rates. For instance, a country such as Mauritius tends to have relatively high institutional quality scores and better educational outcomes compared to others like Niger or Chad, where governance indicators and educational enrolment rates are lower. This variation allows us to capture how differences in governance and education influence economic growth across the region. Data on the annual GDP growth rate and secondary school enrolment as a percentage of gross were obtained from the World Development Indicators (WDI). This paper uses data on the six different institutional indicators followed by Kaufmann et al. (2011) from the Euromonitor International (2018) database: control of corruption, government effectiveness, voice and accountability, regulatory quality, rule of law, and political stability and absence of violence. Data on gross fixed capital formation as a percentage of GDP, trade openness as a percentage of GDP, and the unemployment rate as a percentage of total labour forces are taken from the WDI and Euromonitor International databases. Table 1 provides a statistical description of the variables used in this paper.

In this paper, secondary school enrolment is used as a measure of educational human capital across the SSA countries. Due to a lack of data regarding the quality of educational human capital in the SSA region, this paper proposes that good institutions[3] and governance influence effective education delivery and performance. To consider the role of institutions, this paper employs six institutional indicators derived from Kaufmann et al. (2011) to construct an institutional index.[4] The institutional indicators are scaled from 2.5 to −2.5, with higher scores indicating better institutional quality and lower scores indicating poorer institutional quality.

Table 1. Descriptive statistics of the variables.

Variables	Mean	Max	Min	Std. Dev.	Description
GDP growth (GDPG)	4.708526	33.62937	−12.6738	3.697785	Annual growth rate of GDP.
School enrollment (EDU)	39.85742	109.4441	6.19735	24.26254	Secondary school enrolment as a percentage of gross.
Unemployment rate (UEM)	8.866061	35.268	0.317	9.003046	Unemployment, total (% of total labour force) (modelled ILO estimate).
Trade openness (TRA)	69.97308	175.798	19.1008	34.2447	Trade openness as a percentage of GDP.
Fixed capital formation (GFCF)	21.81556	60.01827	2.781138	8.809513	Gross fixed capital formation as a percentage of GDP.
Control of corruption (CC)	−0.5143	0.8	−1.5	0.565477	Perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption.
Government effectiveness (GE)	−0.5716	1.1	−1.6	0.582227	Perceptions of the quality of public services, the civil/public service quality and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
Political stability and absence of violence (PV)	−0.5588	1.1	−2.7	0.842125	Perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. Political stability and continuity allow educators to complete pedagogical programmes and prioritize professional concerns.
Rule of law (RL)	−0.5418	1.1	−1.6	0.599638	Perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Regulatory quality (RQ)	−0.4681	1.1	−1.6	0.540128	Perceptions of the government's ability to formulate and implement sound policies and regulations that permit and promote private sector development.
Voice and accountability (VA)	−0.4827	1	−1.8	0.729617	Perceptions of the extent to which a country's citizens can participate in selecting their government, freedom of expression, freedom of association, and a free media.
Average institutional index (INS)	−0.5229	0.866667	−1.65	0.58413	Average of the six institutional indicators.

4. Research Methodology

The purpose of this paper is to examine the effect of education on economic growth and whether institutional quality is an important factor in this relationship for SSA countries, using annual data from 2000 to 2020 and the ARDL model. Introduced by Pesaran and Smith (1995), Pesaran et al. (1999), and Pesaran et al. (2001), the ARDL model is a robust econometric tool widely utilized for analysing the dynamic relationships in panel data. It allows for the inclusion of both stationary (I(0)) and non-stationary (I(1)) variables without necessitating prior testing for unit roots. This feature makes it suitable for various applications, including economic growth, institutional variables, and monetary policy analysis. Studies have shown that ARDL models tend to provide more accurate forecasts than comparable traditional methods (Zheng et al. 2019). Several authors include the education variables in their study models to investigate the effect of education on economic growth (Abu Alfoul et al. 2024a; Odit et al. 2010; and Solaki 2013, among others). In addition, numerous authors include the institutional quality indicators in their studies to analyse the effects on economic growth (for example, Abu Alfoul et al. 2024b; Gholipour and Farzanegan 2018; Kpodar and Andrianaivo 2011; Vu 2011, among others). The general specification is estimated as follows:

$$GDPG_{i,t} = \alpha + \beta_{1i}EDU_{i,t} + \beta_{2i}INS_{i,t} + \beta_{3i}(EDU_{i,t} * INS_{i,t}) + \beta_{4i}GFCF_{i,t} + \beta_{5i}TRA_{i,t} + \beta_{6i}UEM_{i,t} + u_{i,t} \quad (1)$$

where GDPG refers to the gross domestic product growth rate, EDU is the secondary school enrolment, INS is the institutional quality that includes six institutional indicators, GFCF is the gross fixed capital formation, TRA is the trade openness, and UEM is the unemployment rate. $u_{i,t}$ is the error term, where i indicates countries and t indicates time. It should be noted that we add the governance indicators in the regression one by one (Busse and Hefeker 2007) to increase the degrees of freedom and avoid the multicollinearity problem.

5. Results

5.1. Panel Unit Root and Cointegration Tests

5.1.1. Panel Unit Root Test

A panel unit root test is applied to test the stationarity of the variables and to avoid the problem of spurious regression, which gives non-economic, unreal, and vague explanations. In our study, the panel unit root test is based on LLC and IPS. The previous tests—LLC and IPS—proposed by Levin et al. (2002) and Im et al. (2003) should demonstrate that N < T, and the LLC test requires a strongly balanced panel as well to apply this test. Table 2 presents the various panel unit root tests.

Table 2. Panel unit root test.

Unit Root Test		LLS		IPS	
Variable	**Test Specifications**	**Levels**	**First Differences**	**Levels**	**First Differences**
GDPG	Individual effects	−9.125 ***	−22.068 ***	−8.721 ***	−20.611 ***
	Individual effects and trends	−12.282 ***	−14.319 ***	−10.309 ***	−14.87 ***
EDU	Individual effects	1.513	−6.990 ***	4.026	−7.915 ***
	Individual effects and trends	0.006	−6.517 ***	−0.156	−6.783 ***
GOV	Individual effects	−1.904 **	−14.204 ***	−1.473 *	−11.623 ***
	Individual effects and trends	−1.523 *	−9.9 ***	−1.035	−8.929 ***
CC	Individual effects	−1.789 **	−13.114 ***	−0.994	−12.364 ***
	Individual effects and trends	−1.645 **	−10.754 ***	−0.229	−9.887 ***
GE	Individual effects	−4.674 ***	−17.156 ***	−2.832 ***	−14.398 ***
	Individual effects and trends	−5.585 ***	−14.032 ***	−2.714 ***	−12.824 ***
RL	Individual effects	−2.327 ***	−15.989 ***	−0.657	−13.383 ***
	Individual effects and trends	−2.714 ***	−13.627 ***	−0.952	−11.25 ***
RQ	Individual effects	−2.604 ***	−13.869 ***	−1.743 **	−12.694 ***
	Individual effects and trends	−3.002 ***	−11.013 ***	−2.459 ***	−9.939 ***
PV	Individual effects	−3.681 ***	−14.712 ***	−2.209 ***	−12.541 ***
	Individual effects and trends	−3.623 ***	−11.37 ***	−0.711	−9.903 ***
VA	Individual effects	−2.701 ***	−10.281 ***	−3.735 ***	−11.778 ***
	Individual effects and trends	−2.259 **	−6.097 ***	−3.317 ***	−8.076 ***
TRA	Individual effects	−1.674 **	−12.367 ***	−0.295	−11.812 ***
	Individual effects and trends	−3.655 ***	−7.317 ***	−2.731 ***	−8.497 ***
GFCF	Individual effects	−4.777 ***	−14.381 ***	−3.371 ***	−10.759 ***
	Individual effects and trends	−1.975 **	−13.701 ***	0.200	−9.528 ***
UEM	Individual effects	−4.852 ***	−4.882 ***	−0.928	−4.143 ***
	Individual effects and trends	−2.366 **	−4.244 ***	−1.196	−2.021 **

Note 1: GDPG is the annual growth rate of GDP; GOV represents the average of the six institutional indicators; VA is the voice and accountability; PV is the political stability and absence of violence; GE is the government effectiveness; RQ is the regulatory quality; RL is the rule of law; CC is the control of corruption; GFCF is the gross fixed capital formation as a percentage of GDP; EDU is the secondary school enrolment as a percentage of gross; TRDAE represents the trade openness as a percentage of GDP; UEM is the unemployment rate. Note 2: The test values are significant at * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. LLC and IPS correspond to the test results of Levin et al. (2002) and Im et al. (2003), respectively.

Table 2 illustrates that most variables are stationary at level, except the (EDU) which is stationary at the first difference. In conclusion, the LLC and IPS test results show that (EDU) is non-stationary at level, which leads us to verify whether the variable of interest (EDU) becomes stationary at the first difference in order. The results of the LLC and IPS tests showed that all variables are stationary at the first difference. It may be seen from the table that all the variables are stationary at the first difference. Due to the mixed results on the unit root test, the panel ARDL model is more appropriate for this study. In this case, the next step is to test whether there is a long-run equilibrium relationship between these variables by applying the Cointegration test.

5.1.2. Panel Cointegration Test

In this research, a panel cointegration test was employed, utilizing methodologies developed by Pedroni (1999) and Kao (1999), to investigate the long-term relationships among the studied variables. The underlying hypothesis for both the Pedroni and Kao tests posits the absence of cointegration among the variables under examination. The rationale for applying a panel cointegration test stems from the mixed outcomes derived from the unit root test, coupled with the objective to examine the presence of long-run relationships between the variables of interest.

The results of the panel cointegration test, based on Pedroni's statistics, are shown in Table 3. It may be seen that the cointegration between the variables is significant at the 1% level. Hence, the null hypothesis of non-cointegration may be rejected. These results strongly support the existence of long-run equilibrium relations among economic growth, education, institutional quality indicators, the interaction between education and institutional quality indicators, gross fixed capital formation, trade openness, and unemployment rate. The Kao (1999) tests showed that the null hypothesis of a no-cointegration relationship was rejected. That is to say, the existence of cointegration in the sample panel is confirmed.

5.2. Panel ARDL Results

The results of the panel ARDL model are presented in Table 4. The results showed an insignificant long-run effect of education on economic growth in SSA countries. Our study results may be due to the SSA region having the highest rates of education exclusion. According to a recent UNESCO report,[5] almost 60% of youth between the ages of 15 and 17 are not in school. Also, the SSA region is suffering from low education quality (Sifuna and Sawamura 2010). In addition, some studies have shown that the negative effect of education on economic growth is mainly due to the low institutional quality, with less expenditure being allocated to education (Mauro 1996; Tanzi and Davoodi 2001).

The governance indicators show a contradictory effect on economic growth. Some indicators demonstrate positive and significant relationships with economic growth (see columns 1–7 of Table 4). For example, the coefficients of RL, RQ, and VA are positive and show a consistent significant association with GDPG (columns 4, 5, and 7 of Table 4). This shows that only the RL, RQ, and VA indicators can boost economic growth in the SSA region. Hence, the inconsistent empirical results of governance quality indicators confirm that the governance indicators do not explain economic growth in isolation. These findings are consistent with those of Glaeser et al. (2004) and Méon and Sekkat (2008), which stated that the role of quality of governance in economic growth is insignificant or negative in developing countries. Growth diagnostics in Brazil and the Dominican Republic, which were conducted by Hausmann et al. (2008), presented varied results. They showed that reforming some governance quality indicators in isolation would not necessarily lead to economic growth in Brazil. They also found that the Dominican Republic's low governance quality contributes to economic growth.

Our findings of the RL, RQ, and VA indicators support the World Bank (2019) report. It proposes that the SSA region reform its legal and judicial systems to promote the rule of law and transparency to boost economic growth. The report also states that economic

growth depends on government effectiveness in implementing policies that attract new investors. Investors want secure and predictable investments and business practices.

Regarding the moderating effect of quality of governance indicators on the association between education and economic growth, our results, as far as the interaction terms between CC and education are concerned, show a positive effect of this interaction on economic growth. Countries with less corruption observe stronger economic growth, better infrastructure, and a good level of education (Khatatbeh and Moosa 2023). In other words, a country with effective corruption control will benefit more from education, which, in turn, leads to an increase in productivity and then economic growth (Hallak and Poisson 2005; Abu Alfoul et al. 2022a; Abu Alfoul et al. 2022; Abu-Alfoul 2016). This result is in line with (Hallak and Poisson 2005, p. 2), who suggest "that illegal payments for school entrance and other hidden costs help explain low school enrollment and dropout rates in developing countries; and that bribes and payoffs in teacher recruitment and promotion tend to lower the quality of public school teachers". This result supports the view that "Corruption is a major drain on the effective use of resources for education and should be drastically curbed" (Drafting Committee of the World Education Forum, Dakar, April 2000).

We also found a positive and significant interaction effect of PV and education on economic growth, consistent with the results of Nir and Kafle (2013), which demonstrated that political stability is an important factor for education system, which fosters the continuity that seems to be essential to enable professional considerations to dominate educational processes and allow educators to conduct pedagogical programmes from start to finish. Furthermore, our results indicate that a greater degree of political instability leads to an increase in the risk of investing in the country in all sectors, especially in its education sector. This result is confirmed by Meso et al. (2006), who revealed that countries that suffer from political instability and witness a high level of conflict usually suffer from imbalances in the infrastructure, which leads to a reduction in the effectiveness of education.

Valuable insights can be gathered from the interaction between education and institutional quality on economic growth in SSA countries. First, all the models show that the interaction between education and institutional quality is statistically significant, which implies that the marginal effect of education on economic growth relies on the level of institutions. For instance, if a country has a good institution (institutions = 1 and 2), the marginal effect of education on economic growth is positive. At the institution level of 1, a 1 unit increase in education leads to an increase in economic growth by 0.045 units. To sum up, countries with strong institutions are more capable of employing human capital in the economy. This result is supported by Chang (2011), who argues that strong institutions can promote economic activities.

When we turn our attention to the effect of control variables on economic growth, the coefficients for GFCF, TRDAE, and UEM have the expected positive and significant signs in most estimations. This means that capital accumulation increases economic growth in SSA countries. Moreover, greater trade openness (TRDAE) contributes to increasing economic growth. On the other hand, increasing the unemployment rate (UEM) decreases economic growth. These results are consistent with empirical and theoretical studies (Barro 1991, 1996; Romer 1986; Sala-i-Martin 1997a; Sala-i-Martin 1997b; Yanikkaya 2003, among others).

Gutmann and Voigt (2018) from the University of Hamburg's Institute of Law and Economics examined the rule of law as well as law enforcement. The results showed that institutions matter for long-term development. For instance, Helgoe et al. (2016) studied the rule of law in Afghanistan. Politics there emphasized tribal fealty (respect for elders). Professors give students information, not questions. This dominant pedagogy does not teach advanced thinking skills. Researchers find that poor thinking skills hinder justice sector capacity building and positive reform. Thus, eldership-based rule of law development programmes promote reform by including thinking skills lessons in curricula.

Table 3. Panel cointegration results.

Pedroni Cointegration Test														
	GOV		**CC**		**GE**		**RL**		**RQ**		**PV**		**VA**	
Statistics	**With Trend**	**No Trend**	**With Trend**	**No Trend**	**With Trend**	**No Trend**	**With Trend**	**No Trend**	**With Trend**	**No Trend**	**With Trend**	**No Trend**	**With Trend**	**No Trend**
Within Dimension														
Panel v-Stat	−3.065	−1.432	−3.618	−2.143	−1.758	−0.575	−3.092	−1.454	−2.138	−0.063	−3.075	−1.281	−3.109	−1.386
Panel P-Stat.	3.803	1.803	3.937	2.287	3.674	2.175	3.601	2.192	3.395	1.900	2.926	1.640	3.824	1.786
Panel PP-Stat.	−18.97 *	−9.190 *	−19.693 *	−8.343 *	−20.221 *	−7.920 *	−16.435 *	−9.477 *	−16.829 *	−13.139 *	−16.002 *	−9.953 *	−13.535 *	−9.452 *
Panel ADF-stat.	−4.863 *	−7.891 *	−9.234 *	−5.977 *	−5.127 *	−4.960 *	−4.933 *	−7.071 *	−8.058 *	−7.862 *	−10.099 *	−8.435 *	−6.235 *	−5.690 *
Between Dimension														
Group P-Stat.	4.506	2.478	5.122	2.888	4.885	2.792	4.802	2.579	4.546	2.733	4.572	2.383	4.815	2.684
Group PP-Stat.	−34.323 *	−15.577 *	−26.706	−16.314 *	−27.39 *	−17.460 *	−35.609 *	−27.648 *	−27.671 *	−28.740 *	−29.145 *	−15.644 *	−27.870 *	−17.572 *
Group ADF-Stat.	−8.447 *	−11.201 *	−12.75	−12.769 *	−6.505 *	−9.079 *	−9.701 *	−13.451 *	−9.529 *	−12.392 *	−8.857 *	−12.179 *	−9.684 *	−11.237 *
Kao Residual Cointegration Test														
ADF	−3.885 *		−3.734 *		−3.916 *		−3.417 *		−3.677 *		−3.633 *		−3.928 *	

Note 1: GDPG is the annual growth rate of GDP; GOV represents the average of the six institutional indicators; VA is the voice and accountability; PV is the political stability and absence of violence; GE is the government effectiveness; RQ is the regulatory quality; RL is the rule of law; CC is the control of corruption; GFCF is the gross fixed capital formation as a percentage of GDP; EDU is the secondary school enrolment as a percentage of gross; TRDAE represents the trade openness as a percentage of GDP; UEM is the unemployment rate. Note 2: The lag selection criterion in this model is Akaike's information criterion (AIC). Note 3: The test values are significant at * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Panel ARDL results.

	Dependent Variable GDPG						
Variables	**INS (1)**	**CC (2)**	**GE (3)**	**RL (4)**	**RQ (5)**	**PV (6)**	**VA (7)**
Long-run coefficients:							
$EDU_{i,t}$	−0.010	0.050	−0.076	−0.032	−0.050	−0.078	0.015
	(−0.517)	(−0.708)	(−0.467)	(−0.840)	(−6.208)	(−0.612)	(0.864)
$INS_{i,t}$	2.072 **	−0.639	0.166	1.884 ***	2.506 ***	−0.302	1.418 **
	(2.270)	(−1.502)	(0.320)	(2.566)	(5.886)	(−0.819)	(1.968)
$INS_{i,t}$*$EDU_{i,t}$	0.055 **	0.021 ***	0.025 ***	0.041 **	0.046 ***	0.018 ***	0.039 ***
	(2.534)	(3.253)	(3.257)	(2.080)	(9.642)	(2.654)	(2.695)
$GFCF_{i,t}$	0.055 **	0.006	0.078 ***	0.035 *	0.192 ***	0.033 *	−0.043
	(2.235)	(0.361)	(4.437)	(1.789)	(10.313)	(1.786)	(−1.580)
$TRDAE_{i,t}$	0.076 ***	0.026 ***	0.033 ***	0.095 ***	−0.050 ***	0.079 ***	0.079 ***
	(5.619)	(3.930)	(3.655)	(7.614)	(−7.505)	(6.861)	(4.866)
$UEM_{i,t}$	−0.787 ***	−0.617 ***	0.022	−0.931 ***	0.238 ***	−0.995 ***	−0.798 ***
	(−8.228)	(−9.643)	(0.303)	(−8.939)	(5.177)	(−11.069)	(−6.804)
Short-run coefficients:							
Error correction term	−0.892 ***	−1.002 ***	−0.920 ***	−0.964 ***	−0.920 ***	−0.905 ***	−0.834 ***
	(−7.202)	(−3.994)	(−6.057)	(−5.324)	(−5.229)	(−5.198)	(−6.680)
Observations	324	324	324	324	324	324	324
Number of lags	(1, 1, 1, 1, 1, 1)	(3, 1, 1, 1, 1, 1)	(2, 1, 1, 1, 1, 1)	(2, 1, 1, 1, 1, 1)	(2, 1, 1, 1, 1, 1)	(2 1, 1, 1, 1, 1)	(1, 1, 1, 1, 1, 1)

t-statistics are in parentheses. Note 1: GDPG is the annual growth rate of GDP; INS represent the average of the six institutional indicators; VA is the voice and accountability; PV is the political stability and absence of violence; GE is the government effectiveness; RQ is the regulatory quality; RL is the rule of law; CC is the control of corruption; GFCF is the gross fixed capital formation as a percentage of GDP; EDU is the secondary school enrolment as a percentage of gross; TRDAE represents the trade openness as a percentage of GDP; UEM is the unemployment rate. Note 2: The lag selection criterion in this model is Akaike's information criterion (AIC). Note 3: The test values are significant at * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Green (1997), who examined the changing relationships between public education and nations in Europe, America, and Asia, argues that national educational systems are exposed to globalization, and their ability to adapt depends on a country's political stability: the more stable, the faster the adaptation. In politically unstable countries, educational rights are not fully enforced (Caddell 2007), and education and infrastructure suffer (Ong'ayo 2008).

The following robustness check was conducted to confirm the validity of our main findings. We employed estimation techniques to assess the robustness of our results. In this study, we adopted the classification proposed by Eicher and Leukert (2009) to differentiate between economic and political institutions. This classification ensures comprehensive coverage across countries and enables accurate comparisons among the various measures used as proxies for institutions. To establish this classification, we utilized institutional indicators that have been widely employed in related research (Kose et al. 2009; Li and Tanna 2019).

Consequently, our analysis examines the influence of economic governance through indicators such as the rule of law and control of corruption. Additionally, we assess the effect of political governance by considering democracy and political stability (Kose et al. 2009; Abu Alfoul et al. 2024a). As previously discussed, numerous studies highlight the significance of institutions in shaping economic growth. In addition to the individual governance indicators included in the main benchmark estimation, this section constructs three composite indices: the institutions' governance index, the political governance index, and the economic governance index. These indices are computed by aggregating the values of their respective individual measures, following the approach utilized in previous studies that employed such aggregated or combined measures of institutions (e.g., Kose et al. 2009; Li and Tanna 2019; Alfoul 2022; Abu Alfoul et al. 2024b). In addition, the individual effects of the governance indicators are shown in Table 4, columns 2–7. Overall, the results for rule of law (RL), political stability and absence of violence (PV), and regulatory quality (RQ) align with the primary findings, while the remaining factors appear insignificant. However, the interaction term between these governance factors and education demonstrates a positive and significant effect for each of the governance indicators. In sum, institutional quality has a positive moderating effect on the relationship between education and economic growth. Recent studies show that strong governance frameworks enhance education's benefits by promoting transparency and reducing corruption (Abad-Segura and González-Zamar 2021; Moosa and Khatatbeh 2023). In Sub-Saharan Africa (SSA), Kpodar and Andrianaivo (2011) showed that where political instability is prevalent, aligning education with institutional reforms is essential for sustainable development. Higher education significantly impacts economic growth, particularly when supported by effective governance (Wang and Liu 2016). Thus, integrating education and institutional improvements is vital for SSA countries to fully leverage education for economic growth.

Table 5 shows the findings of the robustness check. The effect of education on economic growth (see columns 1–3 in Table 5) is found to be insignificant in all of the estimated models, which is consistent with the findings of the main individual measures of governance indicators analyses. The research also reveals that a positive correlation exists between GDPG and the interaction term between all governance classifications (political, economic, and institutional governance) and education. A higher level of institutional indicators will result in increased education levels, leading to greater economic growth in the SSA region. This suggests that creating an effective governance framework is crucial for harnessing the expected economic advantages of education.

Table 5. Robustness check results.

Variables	Dependent Variable GDPG		
	GOV (1)	**POL (2)**	**ECO (3)**
Long-run coefficients:			
$EDU_{i,t}$	−0.052	−0.013	−0.007
	(−0.342)	(−0.674)	(−0.846)
$INS_{i,t}$	0.868 *	0.408 *	0.214 *
	(3.488)	(1.514)	(2.764)
$EDU_{i,t}$*$INS_{i,t}$	0.001 **	0.025 ***	0.028 ***
	(3.324)	(3.509)	(2.716)
$GFCF_{i,t}$	0.120 ***	0.075	0.124 ***
	(5.808)	(1.464)	(5.344)
$TRDAE_{i,t}$	0.072 ***	0.110 ***	0.076 ***
	(8.501)	(8.803)	(5.372)
$UEM_{i,t}$	0.033	−0.895 ***	0.069
	(0.727)	(−9.953)	(0.798)
Short-run coefficients:			
Error correction term	−0.863 ***	−0.796 ***	−0.851 ***
	(−10.249)	(−6.176)	(−9.686)
Observations	360	360	360
Number of lags	(1, 1, 1, 1, 1, 1)	(1, 1, 1, 1, 1, 1)	(1, 1, 1, 1, 1, 1)

t-statistics are in parentheses. Note 1: GDPG is the annual growth rate of GDP; GOV is the summing up of the values of two institutional indicators: government effectiveness and regulatory quality; POL is the summing up of the values of two institutional indicators: voice and accountability and political stability; ECO is the summing up of the values of two institutional indicators: the rule of law and control of corruption; GFCF is the gross fixed capital formation as a percentage of GDP; EDU is the secondary school enrolment as a percentage of gross; TRDAE represents the trade openness as a percentage of GDP; UEM is the unemployment rate. Note 2: The lag selection criterion in this model is Akaike's information criterion (AIC). Note 3: The test values are significant at * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6. Policy Implications and Recommendations

The findings from this study on the effect of education on economic growth in SSA countries, with a specific focus on the mediating role of institutional quality, offer critical perceptions for policy formulation and implementation. Despite the non-significant direct impact of education on economic growth, the interaction between educational attainment and institutional quality highlights the importance of robust governance frameworks in leveraging education for economic development. First, institutional frameworks should be strengthened; governments in SSA should prioritize the development and strengthening of institutional frameworks that enhance transparency, accountability, and efficiency in the education sector. This includes reforming legal and judicial systems to ensure the rule of law and reducing corruption, which hinders educational investment and quality. Second, in terms of enhancing education quality, the efforts to improve the quality of education should be intensified. This involves revising curricula to meet global standards, investing in teacher training, and improving educational infrastructure. Emphasis should be placed on fostering critical thinking, creativity, and problem-solving skills among students to enhance human capital development. Third, political stability should be promoted, which is fundamental for educational and economic development. Policies aimed at maintaining peace and political continuity will create a conducive environment for the implementation of long-term educational programs and economic policies. Fourth, trade openness and investment in physical assets should be encouraged to stimulate economic growth. Policies that create a favourable business environment attract foreign direct investment and promote exports that can complement the efforts in education and institutional reform. Fifth, tackling the high unemployment rates through policies that promote job creation, entrepreneurship, and skills development is crucial. Linking educational programs with market needs can ensure that graduates possess relevant skills for the labour market. Sixth, based on the positive correlation between specific governance indicators (such as rule of law, regulatory

quality, and voice and accountability) and economic growth, targeted governance reforms should be implemented. These reforms should focus on areas that directly impact economic development and educational outcomes.

7. Conclusions

This study investigated the moderating role of institutional indicators on the education and economic growth nexus for 18 countries of the SSA region from 2000 to 2020, using the panel ARDL model. In our study, we used a panel data approach, which allowed us to capture both the cross-country variation and the time series dynamics within the sample. While the diversity of the countries (ranging from low-income countries like Niger to middle-income countries like Mauritius) provided a broad perspective on the education–growth relationship, it also introduced variations that might dilute the effect of education on growth at the aggregate level. The mixed results for the long-run impact of education on economic growth in the full sample could be partly attributed to this diversity. Countries with better institutional quality, higher educational outcomes, and more stable political environments tend to benefit more from educational investments. In contrast, countries with weak institutions and lower-quality education systems may not see the same positive impact. This variation made it challenging to observe a uniform effect of education on economic growth across the entire sample.

To mitigate this, we included interaction terms between education and institutional quality indicators in the model. These interaction terms revealed that education has a more significant and positive effect on economic growth in countries with stronger institutions (e.g., those with better corruption control and political stability). Therefore, the diversity in institutional quality was a key factor in moderating the impact of education on growth. The findings of the research revealed several important insights. Firstly, the long-run effect of education on economic growth in SSA countries was found to be statistically insignificant. This result may be attributed to high rates of education exclusion and low education quality in the region. It aligns with the observation that almost 60% of youth between 15 and 17 years old in SSA are not in school, and the region suffers from low education quality. The study also examined the moderating effect of institutional quality on the relationship between education and economic growth. The interaction terms with institutional quality indicators showed positive effects, showing that in countries with strong corruption control and political stability, education has an enhanced positive effect on economic growth. The study contributes to the existing literature by offering insights into the specific institutional factors influencing the efficacy of education in promoting economic growth. Policymakers in Sub-Saharan Africa (SSA) should emphasize not only enhancing education access and quality but also improving overall governance to optimize the economic benefits of education. Future research may further investigate individual aspects of institutional quality and investigate targeted policy interventions and reforms to augment the positive impact of education on economic growth in the region. Furthermore, comparative country and regional studies would provide a global perspective on the relevance of the SSA findings and potentially enhance the discourse on development strategies tailored to specific countries or regions.

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Notes

[1] A balanced panel refers to a dataset in which all units (in this case, the 18 Sub-Saharan African countries) have observations for each time period within the study's timeframe, which spans from 2000 to 2020. This means that there are no missing data points for any country across all the years.

[2] The countries are Burkina Faso, Burundi, Cameroon, Chad, Eswatini, Ghana, Lesotho, Madagascar, Malawi, Mauritania, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Senegal, South Africa, and Sudan.

[3] The term "good" institutions, as mentioned in the manuscript, refers to institutions that exhibit high-quality governance characteristics, which are critical for supporting economic growth. Specifically, "good" institutions are those that control corruption effectively (control of corruption), whose legal system is effective (rule of law), that provide effective governance (government effectiveness), that maintain political stability and minimize violence (political stability), and that promote regulatory quality (regulatory quality) and freedom of expression (voice and accountability).

[4] The six institutional indicators are control of corruption (CC), government effectiveness (GE), political stability and absence of violence (PV), regulatory quality (RQ), and rule of law (RL).

[5] http://uis.unesco.org/en/topic/education-africa (accessed on 22 September 2024).

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