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GOVERNANCE AS A MODERATOR OF THE EDUCATION-GROWTH NEXUS: EVIDENCE FROM AFRICAN ECONOMIES

Imane BOUNAHR
Hassan II University of Casablanca Morocco,
Faculty of Legal, Economic and Social Sciences -Mohammedia
(imanebounahr03@gmail.com)

Younes EL KHATTAB
Hassan II University of Casablanca Morocco,
Faculty of Legal, Economic and Social Sciences- Mohammedia
(elkhattab.younes1983@gmail.com)

Abstract:
Education is widely recognized as a cornerstone of economic development, enhancing human capital, fostering innovation, and boosting productivity. Likewise, governance, characterized by institutional effectiveness, transparency, and anti-corruption measures, plays a crucial role in the successful implementation of educational and economic policies. However, the extent to which governance moderates the impact of education on economic growth remains underexplored, particularly in developing countries with varying institutional dynamics. This study examines the moderating role of governance in the education-growth relationship through an econometric analysis of panel data from seven African countries (Morocco, Tunisia, Egypt, South Africa, Kenya, Ghana, and Rwanda) spanning 1996 to 2023. Using the Robust Weighted Least Squares (RWLS) method, the findings reveal that education, measured by average years of schooling, has a direct but limited positive effect on economic growth due to persistent challenges in education quality. However, governance, proxied by government effectiveness, significantly amplifies this impact, indicating that strong institutions enhance the alignment between educational outcomes and labor market needs. These findings underscore the necessity of integrated public policies that combine educational investment with institutional reforms to maximize the economic benefits of education in developing economies.

Keywords: education; governance; economic growth; human capital; RWLS method.

JEL classification: I25; O43; H11; C23; P16.

Introduction

In recent decades, international organizations such as the World Bank, the United Nations, and the Organization for Economic Co-operation and Development (OECD) have increasingly emphasized the pivotal role of good governance in fostering economic development. Governance is broadly defined as the set of traditions, institutions, and processes by which authority in a country is exercised, including the capacity of governments to formulate and implement policies effectively, the respect for the rule of law, and mechanisms ensuring transparency and accountability (Kaufmann and al., 1999). According to (North, 1991), strong institutions play a fundamental role in reducing transaction costs and fostering economic efficiency, while (Acemoglu & Robinson, 2013) argue that inclusive institutions are key drivers of long-term economic prosperity.

In Africa, where many economies grapple with weak institutional frameworks, governance plays a crucial role in shaping the effectiveness of public policies, optimizing investments, and ultimately driving sustainable growth. Among these investments, education stands out as a fundamental pillar of economic transformation, contributing to human capital development, productivity gains, and innovation (Barro, 1991; Hanushek & Woessmann, 2008). However, the extent to which governance conditions influence the impact of education on economic growth remains insufficiently explored.

The economic literature has traditionally centered on drivers of growth such as physical and human capital accumulation, foreign direct investment (FDI), trade, and labor market dynamics. Yet, the institutional environment in which these factors operate has gained prominence in recent debates on development economics. A growing body of research reveals the decisive role of governance in shaping economic outcomes. (Grindle, 2004) argues that strong institutions are essential for poverty alleviation and long-term development, while (Kaufmann and al., 1999) demonstrate that governance quality significantly enhances economic performance. Similarly, (Easterly & Levine, 2003) establish a positive correlation between governance and income levels, and (Jalilian and al., 2007) provide empirical evidence of the substantial impact of institutional quality on the growth trajectories of developing economies.

Despite the increasing recognition of governance as a determinant of economic performance, limited attention has been given to its role in moderating the relationship between education and growth. This gap is particularly relevant in Africa, where the persistent challenges of education quality and accessibility are compounded by governance deficiencies. In contexts characterized by institutional weakness, inefficiencies in public administration, and corruption, the potential benefits of education on economic growth may be constrained (Pritchett, 2001). Conversely, when governance is strong, mechanisms such as effective public sector management, the rule of law, and anti-corruption policies can enhance the alignment between educational investments and labor market needs, thereby amplifying the economic returns of education. Research by (Fayissa & Nsiah, 2013) underscores the significant disparities in economic performance across African countries, attributing part of these differences to variations in governance quality. These findings suggest that governance is not merely an external condition for economic growth but an active moderator that shapes the effectiveness of human capital investments.

This study seeks to address a critical question: *To what extent does governance moderate the impact of education on economic growth in African economies?* By examining the interaction between education and governance, this research aims to bridge the existing gap in the literature. Using panel data from selected African countries and leveraging the Worldwide Governance Indicators (WGI), the study explores how governance dimensions, particularly government effectiveness, condition the contribution of education to economic performance. The findings aim to inform policymakers on how institutional reforms can complement educational investments to foster sustainable and inclusive economic growth in Africa.

The remainder of this paper is structured as follows. The first section presents the conceptual framework, followed by a literature review that develops the theoretical foundation and research hypotheses. The second section outlines the empirical strategy, including data sources and methodological approach. Finally, the third section discusses the estimation results and their implications for policy and future research.

1. Conceptual framework

Governance and education are two fundamental pillars that interact to shape a nation's economic trajectory. While education enhances human capital and drives productivity, the effectiveness of this process depends on governance quality. Strong governance ensures that education translates into economic growth by fostering efficient policies, resource allocation, and institutional stability. Conversely, weak governance can hinder this transformation, leading to inefficiencies, corruption, and educational inequalities. This study examines governance as a moderating factor in the education-growth relationship, arguing that governance quality determines the extent to which education contributes to economic development in African economies. This conceptual framework explores (1) governance as a multidimensional concept, (2) education's role in governance and growth, and (3) the moderating effects of governance on the education-growth nexus.

1.1. Governance as a multidimensional concept

Governance is a complex and multidimensional construct that defines how authority is exercised in managing a country's economic and social affairs. It encompasses a set of institutional mechanisms, including property rights enforcement, transparency, accountability, and regulatory efficiency, which are crucial for economic development (Acemoglu & Robinson, 2013; North, 1991). According to (Schneider, 1999), governance refers to the exercise of authority or control to manage a country's affairs and resources, emphasizing its functional and administrative dimensions. According to the United Nations Development Programme (UNDP), good governance is characterized by the principles of rule of law, participation, transparency, efficiency, accountability, and equity, all of which influence how public policies, including those in education, are formulated and implemented. Similarly, the United States Agency for International Development (USAID, 2002) emphasizes the role of governance structures in ensuring equitable access to opportunities and effective policy execution. (Yoshihiro Saito, 2021) further highlights that good governance is a crucial mechanism for fostering sustainable peace through the development of strong and inclusive institutions. Governance can be categorized into several dimensions relevant to education and economic growth:

- ✓ **Institutional governance**: The efficiency of administrative and educational structures.
- ✓ **Participatory governance**: The involvement of key stakeholders (teachers, students, parents, and civil society).
- ✓ **Regulatory governance**: The establishment of legislative and normative frameworks overseeing the education system.
- ✓ **Financial governance**: The transparent and effective management of financial resources in education.

Weak governance, characterized by corruption, policy instability, and inefficient public service delivery, undermines education's role in economic growth. In contrast, strong governance enhances human capital formation, ensuring that investments in education yield long-term economic benefits.

1.2. Education as a strategic driver of governance and growth

Education plays a dual role: it is both a determinant of governance quality and a key driver of economic growth. Empirical studies demonstrate that countries with stronger education systems tend to have better governance structures, as education fosters civic participation, reduces corruption, and strengthens institutional capacity (Hanushek & Woessmann, 2015; Kaufmann and al., 1999). Governance in the education sector influences:

- ✓ **Access and equity**: Good governance reduces educational disparities, particularly for marginalized groups.
- ✓ **Teaching quality**: Strong institutions ensure effective teacher training, curriculum reforms, and rigorous performance monitoring.
- ✓ **Sustainability**: Governance frameworks aligned with long-term development strategies ensure that education contributes to economic resilience.
- ✓ **Innovation**: A well-governed education system fosters innovation, equipping individuals with skills for the knowledge economy.

However, governance failures, such as political instability, resource mismanagement, and corruption, can undermine these benefits, leading to inefficiencies in the education sector and reducing its impact on economic growth.

1.3. Governance as a moderator of the education-growth nexus

The interaction between governance, education, and economic growth is bidirectional: while good governance strengthens education systems, quality education reinforces governance by enhancing institutional effectiveness. Empirical evidence suggests that governance quality determines the strength of the education-growth link, particularly in developing economies where institutional weaknesses often limit human capital accumulation (Barro, 1991). However, the moderating role of governance in the education-growth relationship is often overlooked. Governance moderates the impact of education on economic growth through several channels:

Resource allocation efficiency: In well-governed economies, public spending on education leads to higher returns in terms of productivity and economic performance. In poorly governed systems, these investments often suffer from leakages, inefficiencies, and mismanagement.

Institutional stability: Political and policy stability ensure that educational reforms are sustained over time, maximizing their contribution to growth. Weak governance leads to inconsistent policies that disrupt human capital accumulation.

Accountability and performance monitoring: Strong governance fosters accountability in educational institutions, ensuring that learning outcomes translate into labor market productivity.

Corruption control: High levels of corruption in education governance reduce funding efficiency and limit economic mobility, preventing education from acting as a true driver of growth.

1.4. Components of the Worldwide Governance Indicators (WGI) and their role in education and economic growth

The Worldwide Governance Indicators (WGI), developed by the World Bank, provide a multidimensional framework for assessing governance quality in more than 200 countries (Banque mondiale, 1996). These indicators capture political, economic, and institutional dimensions of governance, which are crucial in shaping education policies and economic growth trajectories.

Voice and accountability: This indicator measures the extent to which citizens can participate in selecting their government while benefiting from freedom of expression, association, and access to independent media. Strong democratic institutions promote transparent education policies, inclusive decision-making, and accountability in public spending on education (Kaufmann and al., 2010).

Political stability and absence of violence: Political stability reduces the risk of policy discontinuity, ensuring that long-term educational reforms can be effectively implemented (Acemoglu & Robinson, 2013). Countries facing instability often experience disruptions in schooling, lower educational investments, and brain drain, which in turn hinder human capital accumulation.

Government effectiveness: This indicator assesses the quality of public services, the independence of the civil service, and the implementation of effective policies. High government effectiveness fosters efficient education systems, improves teacher training and curriculum development, and strengthens institutional support for research and innovation.

Regulatory quality: The ability of governments to develop and enforce pro-growth regulations influences education sector investments and labor market alignment. Weak regulatory frameworks often lead to poorly designed education policies, misallocation of resources, and barriers to private sector engagement in education (Hanushek & Woessmann, 2015).

Rule of law: The rule of law ensures contract enforcement, property rights protection, and judicial efficiency, which are critical for education sector stability. Countries with weak rule of law face inequitable access to education, lack of enforcement of educational quality standards, and increased informal sector employment, reducing the returns to education.

Control of corruption: Corruption diverts education funding, weakens institutional accountability, and leads to inefficiencies in resource allocation (Mauro, 1995). High corruption levels discourage foreign investment in education, distort scholarship and funding distribution, and limit equal opportunities for learning and skills development.

2. Literature review and hypotheses development

2.1. Theoretical literature

The existing literature underscores governance as a fundamental driver of economic development. However, its role in moderating the education-growth relationship is still insufficiently studied, particularly in African economies where weak institutions, corruption, and inefficient public resource management frequently hinder education's potential to foster economic growth. While some African countries have achieved high enrollment rates, deficiencies in education quality, curriculum relevance, and institutional effectiveness often reduce its overall impact on development (Hanushek & Woessmann, 2012).

Theoretical models such as the (Solow, 1956) growth model and the new growth theories (Lucas, 1988; P. Romer, 1989) provide useful frameworks for analyzing economic growth. However, these models often overlook institutional quality as a key determinant, limiting their ability to explain cross-country disparities (D. Romer, 2001). While the accumulation of human capital, physical capital, and technological progress is central to growth (Acemoglu, 2009), alternative perspectives, such as those of (Hall & Jones, 1999), emphasize the role of institutions and governance in shaping economic performance.

- **Governance as a moderator in the education-growth nexus**

Introduced in the 1990s, the concept of governance has become central to understanding long-term growth mechanisms (Perkins and al., 2006). Governance, defined as the institutions and processes through which authority is exercised (Kaufmann and al., 2010), consists of six key dimensions: political stability, voice and accountability, government effectiveness, regulatory quality, control of corruption, and rule of law. These factors directly shape the effectiveness of education systems, particularly in developing economies where governance weaknesses often reduce the economic returns to human capital investments. Two mechanisms explain governance's moderating role in the education-growth nexus:

- ✓ Institutional quality and policy consistency: Strong governance establishes stable institutions that ensure long-term investment in education, align curricula with labor market needs, and improve resource allocation (Rodrik & Subramanian, 2003).

- ✓ Investment climate and human capital development: Good governance fosters a business-friendly environment, attracting investments that complement education-driven productivity gains, while weak governance leads to policy instability, limiting education's growth-enhancing effects.

In the African context, governance failures, such as frequent policy reversals, elite capture, and inefficient public spending, often prevent education from translating into sustained economic growth. Without effective institutions, even well-educated workforces struggle to contribute to growth due to low job creation, skills mismatches, and brain drain.

- **Corruption and education's impact on growth**

Corruption, defined as the misuse of public power for private gain, has mixed effects on economic growth (Andvig & Moene, 1990). While some argue that corruption can, in specific contexts, reduce bureaucratic inefficiencies, the overwhelming evidence suggests it raises transaction costs, weakens institutional trust, and reduces education quality by diverting public funds (Aidt, 2009). In many African countries, corruption within education systems leads to:

- Misallocation of resources, where public education budgets are siphoned into private hands.
- Lower teacher quality, as bribes influence hiring decisions over merit.
- Weakened accountability, preventing reforms that could enhance education's contribution to growth.

Without structural reforms, anti-corruption measures remain ineffective (Tanzi, 1998). Strong institutions, competitive public sector wages, and strict legal enforcement are essential in mitigating corruption and ensuring that education spending translates into growth-enhancing investments.

- **Political stability and the education-growth relationship**

Political stability, defined as the absence of major disruptions in governance, is a key determinant of economic growth (Alesina and al., 1992). A stable government fosters policy consistency**,** long-term planning, and investor confidence, all of which are essential

for sustaining human capital investments. Conversely, political instability leads to frequent shifts in education policies, discouraging investment in long-term educational improvements (Feng, 1997). For instance, African countries experiencing frequent leadership changes or political unrest often see:

- ✓ Interrupted education policies, reducing long-term planning effectiveness.
- ✓ Inconsistent funding, undermining school infrastructure and teacher training.
- ✓ Weakened investor confidence, limiting job opportunities for skilled graduates.

Thus, the stability of governance plays a crucial role in determining whether education investments yield substantial economic returns.

- **Democracy, governance, and human capital development**

Democracy, characterized by public participation in governance, also influences education's impact on growth. Competing perspectives exist:

- ✓ The conflict perspective argues that authoritarian regimes can implement rapid economic reforms without institutional constraints (Sirowy & Inkeles, 1990).
- ✓ The compatibility perspective, however**,** suggests that democracy fosters transparency, accountability, and long-term policy stability, which enhances education's contribution to growth (Feng, 1997).

2.2. Empirical literature

Governance plays a crucial role in shaping both economic and educational outcomes. Since the 1990s, empirical research has primarily explored the negative effects of weak governance on economic growth, rather than its function as a moderating factor in the education-growth relationship. While it is well established that governance influences economic performance and human capital formation, the extent to which governance strengthens or weakens the impact of education on growth remains underexplored. Governance influences economic growth through multiple channels, including institutional stability, policy effectiveness, and investment climate. (Feng, 1997), using a three-stage least squares estimation on data from 96 countries (1960–1980), found that democracy indirectly promotes economic growth by reducing the probability of political instability and regime changes. His findings suggest that economic growth reinforces

democratic stability by increasing the likelihood of ruling party continuity. This interaction emphasizes the dynamic relationship between governance structures and long-term economic performance.

(Mauro, 1995) provided empirical evidence that corruption distorts public spending, particularly in education and healthcare, leading to suboptimal resource allocation and weaker human capital formation. Corruption reduces the efficiency of government expenditures, diverting funds toward non-productive uses that undermine economic growth. Similarly, (Everhart and al., 2009) found that corruption has a more detrimental effect on private investment than public investment, suggesting that institutional weaknesses disproportionately discourage entrepreneurial activity and capital formation. Governance quality also determines how foreign investment and technology spillovers contribute to economic growth. (Keefer, 2006) emphasized that weak institutions limit the benefits of FDI and technology diffusion, particularly in developing economies. His study showed that in countries with weak rule of law and high corruption, FDI inflows fail to translate into sustained economic expansion due to inefficiencies in contract enforcement, property rights, and public service delivery.

Governance significantly affects education accessibility, quality, and efficiency, making it a critical determinant of human capital formation. (Baum & Lake, 2003) analyzed the impact of democracy on human capital development over a 30-year panel dataset covering 128 countries. Their findings indicate that democratic governance increases school enrollment rates and life expectancy, enhancing productivity and skill acquisition. They emphasized that secondary education equips individuals with critical cognitive and technical skills necessary for industrial economies, leading to higher returns on investment in human capital.

Corruption and weak governance also undermine education systems. (Dridi, 2014) found that high corruption levels significantly lower school enrollment rates, estimating a 10% decline in enrollment for each unit increase in corruption indices. This suggests that governance failures reduce both the accessibility and efficiency of education systems. In addition, in a study on the impact of corruption in Lebanon, (Farida & Ahmadi-Esfahani, 2008) demonstrated that corruption reduces economic efficiency by lowering human

capital productivity and weakening the effectiveness of public expenditures. This, in turn, leads to decreased investment and diminishes the positive effects that, in the absence of corruption, would have contributed to economic growth.

Further research by (Al-Samarrai, 2009) demonstrated how governance deficiencies in the education sector perpetuate inequalities. He found that education budgets are often manipulated for political gains rather than equitable distribution, leading to unequal access to schooling for marginalized populations. His study of budgetary allocations demonstrated that conditional cash transfer programs, which aim to support vulnerable children, fail in weak institutional settings due to mismanagement and lack of accountability mechanisms. In addition, (Siddique and al., 2016) examined the effects of governance and institutions on education and poverty in South Asian Association for Regional Cooperation (SAARC) countries, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka, and Afghanistan, over the period from 1996 to 2012. Their findings indicate that strong institutions, measured by indicators such as law and order, positively influence education both directly and through various channels. To enhance education quality, they recommended strengthening institutional governance to ensure more effective public policies and expenditures. Additionally, they identified poor governance, poverty, illiteracy, and low education quality as major challenges faced by developing economies.

In a study of 88 developing countries, (Duerrenberger & Warning, 2018) examined the relationship between public education funding and expected schooling duration. They found that in low-corruption environments, increased public investment extends schooling duration. However, in highly corrupt settings, the opposite effect occurs, as misallocation of resources reduces the efficiency of public spending. This underscores the role of governance in determining the effectiveness of education policies.

While previous studies emphasize the direct effects of governance on growth and education, fewer have explicitly analyzed its role as a moderating factor in the education-growth relationship. (Khan, 2007) proposed a framework distinguishing between market-enhancing governance (which fosters competition, property rights, and contract enforcement) and growth-enhancing governance (which focuses on policy stability,

investment incentives, and industrial development). His research suggested that the effectiveness of education policies depends on governance structures, in poorly governed countries; the growth benefits of education are significantly weaker.

(Klomp & de Haan, 2013) analyzed governance, democracy, and human capital across more than 100 countries and found that governance quality enhances the returns on human capital investment. They identified two key channels:

- ✓ Basic human capital formation is fostered by democratic stability and governance transparency, which increase school enrollment and literacy rates.
- ✓ Advanced human capital accumulation (e.g., tertiary education and R&D investments) benefits from strong institutional frameworks, where policy consistency and financial accountability ensure sustained educational improvements.

(Beyene, 2022) investigates the impact of governance quality on economic growth across 22 selected Sub-Saharan African countries from 2002 to 2020. The findings reveal that improvements in governance have a significantly positive effect on GDP growth, emphasizing the crucial role of anti-corruption measures and enhanced government efficiency in fostering sustainable economic development.

In contrast, weak governance diminishes the economic benefits of education, as poor policy implementation and corruption erode the quality of education and its contribution to productivity growth. A more critical perspective is offered by (Acemoglu and al., 2005), who argue that the impact of education on democracy and institutional development disappears when controlling for within-country variations. They found that while education and democracy are correlated across countries, their relationship is weaker when analyzed within individual nations. Similarly, (Dahlum & Knutsen, 2017) found that while democracy increases school enrollment, it does not necessarily improve education quality, reinforcing the idea that governance effectiveness determines the extent to which education translates into economic growth.

(Guèye, 2021) examine the long-term effects of public education expenditure, taxation, and corruption on per capita economic growth in 10 West African countries from 2004 to 2020, using panel data econometric models. The results reveal a positive and significant relationship between public education expenditure (with a five-year lag) and per capita

economic growth. Specifically, a 1% increase in public education spending is associated with an average 0.42% rise in the economic growth rate. While governments in West Africa strive to achieve universal education goals, expanding access requires increased public spending. However, according to the Ricardian equivalence perspective, financing education through taxation and public debt negatively impacts economic growth. Furthermore, corruption significantly hampers economic expansion by reducing tax revenues, thereby weakening the effectiveness of public education financing efforts. Lastly, among various education indicators, only higher education enrollment exerts a substantial long-term effect on growth. This finding is particularly relevant given the increasing shift toward a service-based economy in the region, where the informal sector plays a dominant yet underreported role in GDP calculations.

(Lagdiri & Ouazzani Touhami, 2023) explore the combined impact of the student-teacher ratio and governance effectiveness on economic growth in Morocco between 1996 and 2021 using the Autoregressive Distributed Lag (ARDL) model. The findings indicate that education quality has a long-term positive and significant effect on economic growth, with a one-student reduction per teacher leading to a 0.4% increase in per capita GDP. However, governance effectiveness exhibits a negative impact, decreasing per capita GDP by 13.4%. The interaction between the student-teacher ratio and governance effectiveness amplifies the influence of the former while reinforcing the negative impact of the latter on economic growth. Notably, the combined effect of institutional quality and education demonstrates a significant positive outcome, leading to a 5.3% increase in per capita GDP. These results suggest that even in weaker institutional environments, cognitive skills developed in a setting with lower student teacher ratios continue to yield substantial economic benefits. The study underscores the critical need to improve governance efficiency in Morocco to enhance the country's long-term growth prospects.

2.3. Hypothesis development

Extensive literature confirms that good governance enhances economic performance and improves educational outcomes. However, the extent to which governance moderates the impact of education on economic growth remains underexplored, particularly in African economies.

This study addresses this gap by investigating whether strong institutions amplify the economic benefits of education or whether weak governance hinders education's contribution to growth. Empirical studies suggest that while human capital is a key driver of economic development, its effectiveness depends on the institutional environment:

In weak governance settings, inefficient education spending, corruption, and mismanagement of resources may prevent education from translating into productivity gains. In strong governance environments, education policies are better implemented, ensuring higher returns to human capital investment through improved labor market outcomes and innovation.

Thus, we formulate the following hypothesis:

H1: Governance positively moderates the relationship between education and economic growth, reinforcing the effect of education on economic development.

This hypothesis aligns with new growth theories, which emphasize the interaction between institutional quality and human capital in shaping long-term economic trajectories.

3. Research design and method

3.1. Description of variables and data sources

To empirically test the hypothesis, we carefully select variables that capture key determinants of economic growth while ensuring alignment with prior research.

- **Dependent variable**
  - **Gross Domestic Product per Capita (GDP per capita):** The primary measure of economic performance and living standards. It reflects the combined impact of structural factors, including human capital and governance, on growth. GDP per capita is widely used in growth models to assess economic well-being and productivity. Its selection allows for a direct evaluation of how governance influences the effectiveness of education in driving economic expansion.

- **Main explanatory variable**
  - **Average Years of Schooling (SCO):** Represents the accumulated human capital stock by measuring the duration of formal education received by individuals aged 25 and older. Data are sourced from UNDP and the World Bank. This indicator is a well-established proxy for human capital in economic growth models. It reflects both educational access and investment, making it a suitable measure for analyzing the role of education in development.

- **Moderating variable**
  - **Government Effectiveness (GE):** Measures the quality of public service delivery, policy implementation, and institutional efficiency, which directly shapes the impact of education on economic outcomes. Governance affects how education policies are designed and implemented. A higher GE score indicates better institutional capacity to convert educational investments into economic productivity. Empirical studies highlight the role of governance in reducing inefficiencies, improving accountability, and enhancing labor market integration.

- **Control variables**

To isolate the specific effects of education and governance on economic growth, we incorporate the following control variables, each justified based on its role in influencing economic performance:

- **Trade Openness (TR_OP):** Measures economic integration, which facilitates technology transfer, foreign direct investment (FDI), and knowledge spillovers. Data sourced from the World Bank. Open economies often experience higher productivity gains due to access to foreign expertise and markets.
- **Gross Fixed Capital Formation (GFCF):** Represents physical investment in infrastructure, machinery, and equipment, key drivers of economic expansion. Data sourced from the World Bank. Capital investment complements human capital in fostering growth, making it a crucial control variable.

- **Inflation Rate (INF):** Indicator of macroeconomic stability, as high inflation erodes purchasing power and deters investment. Data sourced from the World Bank. Macroeconomic volatility can influence the returns on education and governance effectiveness.
- **Human Development Index (HDI):** A composite measure of health, education, and living standards. Data sourced from UNDP and the World Bank. HDI provides a broader perspective on human capital beyond education alone, accounting for social factors that may interact with governance.

By including these variables, we ensure a comprehensive model that accounts for alternative growth determinants while isolating the moderating effect of governance on the education-growth relationship.

3.2. Justification of sample selection and study period

This study employs a panel dataset covering seven African countries, Morocco, Tunisia, Egypt, South Africa, Kenya, Ghana, and Rwanda, over the period 1996 to 2023. While these countries exhibit diversity in their educational systems, economic structures, and governance frameworks, their selection is both intentional and methodologically justified. In econometric analysis, homogeneity within the sample is generally preferred to ensure comparability and minimize estimation biases. However, selecting countries with diverse governance and educational structures enhances the study by capturing a broader spectrum of dynamics between education, governance, and economic growth, leading to richer and more generalizable insights.

Despite their differences, these countries share fundamental similarities in institutional reforms, policy priorities, and educational strategies. All have demonstrated a strong commitment to human capital development and governance modernization, aligning their policies with continental and international frameworks such as Agenda 2063 (African Union, 2015), the Continental Education Strategy for Africa (CESA 16-25), the Millennium Development Goals (MDGs), and the Sustainable Development Goals (SDGs). Over the past decades, they have implemented significant reforms aimed at

improving education quality, expanding access, and strengthening governance mechanisms. This commitment is further reinforced by policies that enhance education quality, with a particular focus on STEM fields and digital learning initiatives such as the One Laptop per Child program (African Union, 2016). Examples include education decentralization in Kenya, Ghana, and South Africa, public-private partnerships in Morocco and Tunisia, and the expansion of digital and technical education in Rwanda and Egypt. These shared policy commitments ensure that, despite structural differences, the selected countries remain comparable in terms of governance-education interactions. Additionally, the sample provides a balanced representation of Africa's regional diversity, covering North Africa (Morocco, Tunisia, and Egypt), East Africa (Kenya, Rwanda), West Africa (Ghana), and Southern Africa (South Africa). This regional diversity allows the study to examine how different educational policies and governance frameworks influence economic growth in varied socioeconomic and institutional contexts. At the same time, all these countries recognize education as a key driver of economic transformation and have actively participated in continental initiatives aimed at strengthening education systems and governance structures (UNESCO, 2023). The inclusion of both Francophone and Anglophone countries further enables comparative insights into policy effectiveness across linguistic and administrative traditions.

Beyond policy convergence, the selected countries share a common trajectory of institutional transformations since the late 1990s, including governance reforms that have shaped education systems and economic trajectories. Their political and economic landscapes, although distinct, have been shaped by similar historical dynamics such as post-colonial governance restructuring, economic liberalization, and regional integration efforts. Moreover, all selected countries provide consistent and comparable governance and education indicators, particularly from the Worldwide Governance Indicators (WGI), UNESCO, and national statistical agencies. Ensuring data availability and reliability was a key criterion in the country selection process, as it strengthens the robustness of the empirical analysis.

The study period, spanning from 1996 to 2023, was carefully selected to capture major educational and governance reforms undertaken across the continent. This timeframe

encompasses key international development agendas, including the Millennium Development Goals (MDGs) (United Nations, 2000) and the subsequent Sustainable Development Goals (SDGs) (United Nations, 2015), both of which emphasized education and governance as fundamental components of economic progress. Additionally, the choice of this period ensures the availability of consistent and reliable data, particularly from the Worldwide Governance Indicators (WGI), which provides a structured framework for assessing governance quality since 1996.

Beyond data availability, this period is particularly relevant for analyzing Africa's socioeconomic transformations. Over these decades, many African nations have undergone structural adjustments, political transitions, and economic policy shifts that have significantly influenced education systems and governance institutions. By encompassing these key developments, the study offers valuable insights into the evolving interplay between education, governance, and economic growth, contributing to ongoing policy discussions on how to optimize education investments through more effective governance mechanisms.

3.3. Empirical model and estimation methodology

To examine the moderating role of governance in the relationship between education and economic growth, this study adopts the Cobb-Douglas production function, a widely recognized framework for analyzing the impact of structural factors on economic performance. This model allows for the simultaneous estimation of the direct effects of education and governance on growth, as well as their interactive influence.

The empirical specification of the model is as follows:

$$\mathbf{Y_{it}=\alpha+\beta_1 Education_{it}+\beta_2\ Governance_{it}+\beta_3(Education_{it}\times\ Governance_{it})+\gamma Z_{it}+\epsilon_{it}}$$

Where:

- $\mathbf{Y_{it}}$ represents the gross domestic product per capita (GDP) in country *i* at time *t*.
- $\mathbf{Education_{it}}$ measures education, proxied by the average years of schooling for adults aged 25 and older (SCO).
- $\mathbf{Governance_{it}}$ is captured through the Government Effectiveness (GE) indicator, which reflects the quality of public policy implementation.

- $\mathbf{Z_{it}}$ denotes a vector of control variables, including trade openness (TR_OP), gross fixed capital formation (GFCF), inflation rate (INF), and the Human Development Index (HDI).
- $\boldsymbol{\epsilon_{it}}$ is the error term.

To estimate this model, we employ the **Robust Weighted Least Squares (RWLS)** method, which is particularly well suited for addressing econometric challenges in macroeconomic panel data analysis. The choice of RWLS is justified based on the following considerations:

- **Handling heteroscedasticity**: Macroeconomic panel datasets often exhibit heteroscedasticity due to structural differences across countries. RWLS accounts for this issue by giving more weight to observations with lower variance, thereby improving efficiency and reducing biased estimations.
- **Mitigating the influence of outliers**: Economic data frequently contain extreme values, particularly in developing economies undergoing structural reforms or crises. RWLS enhances robustness by minimizing the impact of influential observations that could distort results.
- **Improving model stability and interpretation**: Given the diversity of the sampled countries, RWLS provides a more reliable framework to assess the moderating role of governance in the education-growth nexus, ensuring that results remain valid across different institutional contexts.

This methodological approach strengthens the empirical foundation of the study, ensuring that the estimated effects are not driven by data irregularities but rather reflect the true dynamics between governance, education, and economic growth.

4. Model estimation and discussion of results

Table 1: Statistical properties of the variables

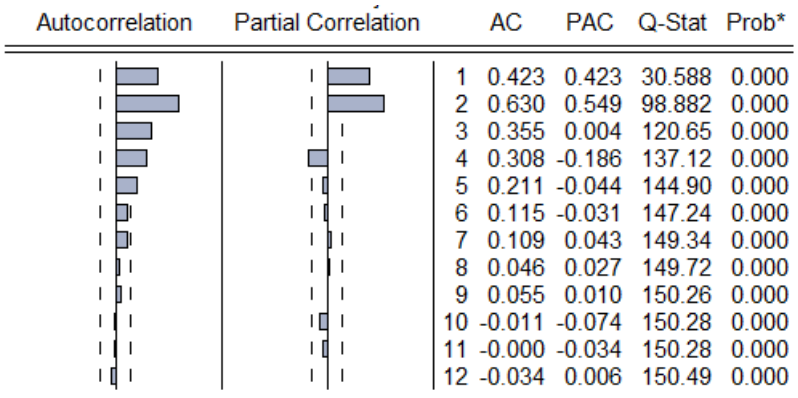
	Mean	***Median***	***St. Deviation***	***Skewness***	***Kurtosis***	***Jarque-Bera***
GDP	2418.322	2108.486	1866.801	1.058082	3.732979	40.9591915***
SCO	6.337513	6.3838778	2.077345	0.140325	2.683833	1.407469
GFCF	1.93×10^{10}	1.17×10^{10}	1.98×10^{10}	1.274790	3.749090	57.66890 ***
INF	7.948029	5.999089	7.704011	2.443836	10.36100	637.6014 ***
TR_OP	47.46518	42.50678	19.64172	0.619521	2.758128	13.01546 ***
HDI	0.596000	0.604000	0.099683	-0.791622	3.614982	22.71831***
GE	-0.169423	-0.195086	0.376871	0.091945	3.558826	2.523659

Note: *, ** and *** indicate significance at the 10%, 5%, and 1% levels respectively.

Source: Authors' calculations using Eviews

Before proceeding with estimation, it is essential to examine the statistical properties of the dataset (Table 1) to ensure reliability and identify potential estimation challenges. The means and medians of most variables are closely aligned, suggesting relatively symmetric distributions. However, GDP per capita exhibits considerable dispersion, with a mean of 2,418.32, a median of 2,108.49, and a high standard deviation of 1,866.80, indicating substantial heterogeneity across the studied economies. Similarly, gross fixed capital formation (GFCF) shows pronounced variability (mean 1.93×10^{10}, standard deviation: 1.98×10^{10}), reflecting economic disparities among countries. Skewness analysis reveals that GDP (1.058) and GFCF (1.274) exhibit moderate positive skewness, indicating a concentration around lower values with some extreme observations. Inflation (2.443) is more heavily skewed, suggesting periods of exceptionally high inflation. In contrast, average years of schooling (SCO: 0.140) and government effectiveness (GE: 0.092) have near-zero skewness, implying relatively symmetric distributions. The kurtosis coefficients further highlight distributional features. GDP (3.73) and GFCF (3.75) are slightly leptokurtic, indicating fatter tails than a normal distribution, while inflation (10.361) exhibits extreme kurtosis, reflecting high volatility. The Jarque-Bera test confirms the non-normality of several variables (GDP, GFCF, INF, TR_OP, and HDI) at the 1% significance level, underscoring the need for robust econometric techniques to account for distributional irregularities. Given these characteristics, RWLS is employed to mitigate biases from non-normality and heteroscedasticity, ensuring more reliable estimation.

Figure 1: Autocorrelation test of squared residuals



			AC	PAC	Q-Stat	Prob*
		1	0.423	0.423	30.588	0.000
		2	0.630	0.549	98.882	0.000
		3	0.355	0.004	120.65	0.000
		4	0.308	-0.186	137.12	0.000
		5	0.211	-0.044	144.90	0.000
		6	0.115	-0.031	147.24	0.000
		7	0.109	0.043	149.34	0.000
		8	0.046	0.027	149.72	0.000
		9	0.055	0.010	150.26	0.000
		10	-0.011	-0.074	150.28	0.000
		11	-0.000	-0.034	150.28	0.000
		12	-0.034	0.006	150.49	0.000

*Probabilities may not be valid for this equation specification.

Source: Authors' calculations using Eviews

The correlogram of squared residuals (Figure 1) indicates heteroscedasticity in the model, with significant autocorrelation coefficients at lag 1 (AC = 0.423) and lag 2 (AC = 0.630). The Ljung-Box Q-statistics further reject the null hypothesis of no autocorrelation (Prob = 0.000), confirming persistence in residual variances**.** This suggests potential ARCH (Autoregressive Conditional Heteroskedasticity) effects, which must be considered in the estimation strategy.

Table 2: Empirical estimation of the effect of education on per capita economic growth with governance as a moderating factor in African countries

Variable	***Coefficient***	***St. Deviation***	***z-Statistic***
C	-2.502071***	0.055265	-45.27374
LOG(GFCF)	0.341968***	0.003261	104.8779
HDI	3.459882***	0.059547	58.10308
INF	-0.016230***	0.000386	-42.02146
TR_OP	0.003839***	0.000165	23.29378
SCO	0.003933**	0.001793	2.192827
SCO×GE	0.066601***	0.001002	66.473496
Observation included	168 after adjustments		
Rw^2	0.931246		
R-squared statistic	161631.4 ***		

Note : *, ** and *** indicate significance at the 10%, 5%, and 1% levels respectively. The function used in the estimation is Welsch for the weighting.

Source: Authors' calculations using Eviews

Table 2 presents the empirical results for the impact of education on per capita economic growth, incorporating governance as a moderating variable. The findings emphasize the fundamental drivers of economic growth and the crucial role of governance in shaping the impact of education. The significantly positive coefficient of LOG(GFCF) (0.3419, z = 104.88) confirms that capital accumulation remains a primary growth engine. This finding aligns with traditional growth theories, underscoring the importance of physical capital investment in sustaining economic expansion. In the African context, where infrastructure deficits remain a persistent challenge, the strong impact of capital formation suggests that sustained investments in infrastructure, industrial capacity, and technological upgrading are essential for long-term growth. However, while capital investment is a necessary condition, its efficiency depends on complementary factors such as governance quality, workforce skills, and financial sector development.

Beyond capital accumulation, the results emphasize the broader role of human development in economic performance. The highly significant coefficient of HDI (3.4598, z = 58.10) indicates that improvements in health, education, and overall well-being contribute substantially to growth. In Africa, where disparities in human development remain prominent, this finding reinforces the need for comprehensive social policies that enhance both educational access and healthcare infrastructure. A well-nourished, healthy, and educated workforce is a key driver of productivity gains and long-term economic resilience.

Macroeconomic stability also proves to be a crucial determinant of growth, as evidenced by the negative coefficient of inflation (-0.0162, z = -42.02). High inflation erodes purchasing power, discourages investment, and creates economic uncertainty, factors that are particularly detrimental in African economies where financial markets are less developed and inflationary pressures can rapidly destabilize growth trajectories. This finding underscores the importance of sound monetary policies, central bank independence, and fiscal discipline to create a stable macroeconomic environment conducive to investment and economic expansion.

Trade openness emerges as another significant growth-enhancing factor, with the positive coefficient of TR_OP (0.0038, z = 23.29) suggesting that integration into global markets facilitates technology transfer, enhances productivity, and fosters economic dynamism. However, the relatively modest impact of trade openness indicates that structural barriers, such as weak industrial bases, inadequate export diversification, and infrastructure bottlenecks, may limit the full benefits of globalization in African economies. To leverage trade liberalization more effectively, targeted policies should focus on enhancing domestic value addition, promoting regional integration, and investing in logistics and transport infrastructure.

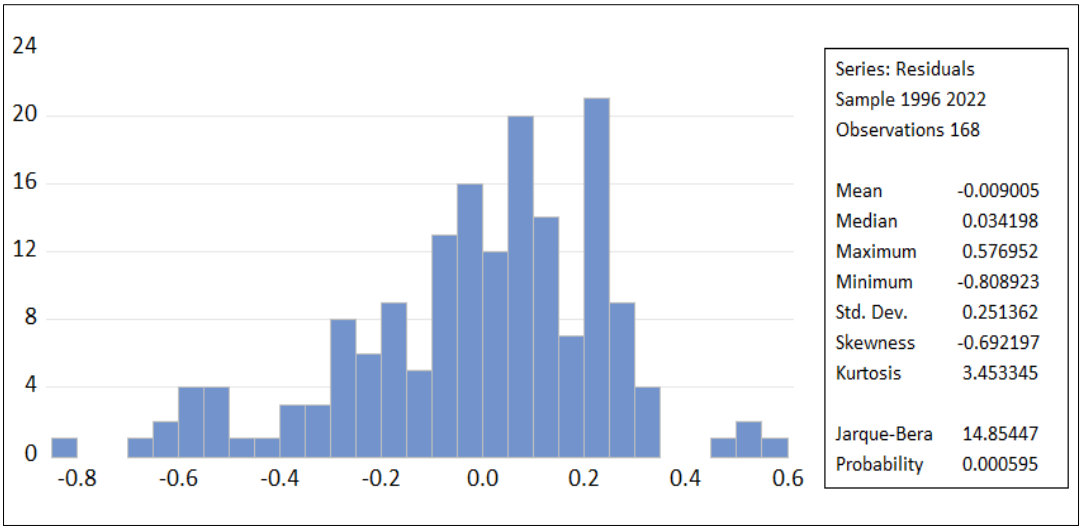
Education itself exerts a direct positive influence on growth, as reflected in the significant coefficient of average years of schooling (SCO: 0.0039, z = 2.19). This supports the widely accepted view that education enhances productivity, innovation, and human capital development. However, the relatively small magnitude of this coefficient raises concerns about the quality of education in African countries. Many education systems in the region struggle with inadequate resources, skill mismatches, and limited alignment with labor market needs. These findings suggest that simply increasing schooling years

is insufficient to drive strong economic growth, what matters most is the effectiveness and relevance of education in equipping individuals with the skills required for a modern, knowledge-driven economy.

Crucially, the interaction term (SCO × EG: 0.0666, z = 66.47) reveals that governance significantly amplifies the economic benefits of education. This suggests that well-functioning institutions enhance the efficiency of human capital investments by improving education quality, reducing inefficiencies, and fostering an environment that allows skilled labor to contribute effectively to economic activities. In the African context, where governance quality varies considerably across countries, this result highlights the need for institutional reforms that strengthen accountability, transparency, and regulatory frameworks. Countries with weak governance structures may struggle to fully capitalize on their educational investments due to inefficiencies, corruption, and bureaucratic obstacles that hinder the transition from education to productive employment.

The overall robustness of the model is confirmed by the high adjusted Rw^2 (0.9312), indicating that the selected variables explain a substantial portion of the variation in economic growth. The strong Rn^2 statistic (161631.4, significant at 1%) further supports the validity of the findings, suggesting that the combination of capital investment, human development, trade openness, education, and governance provides a comprehensive framework for understanding economic performance in the African sample.

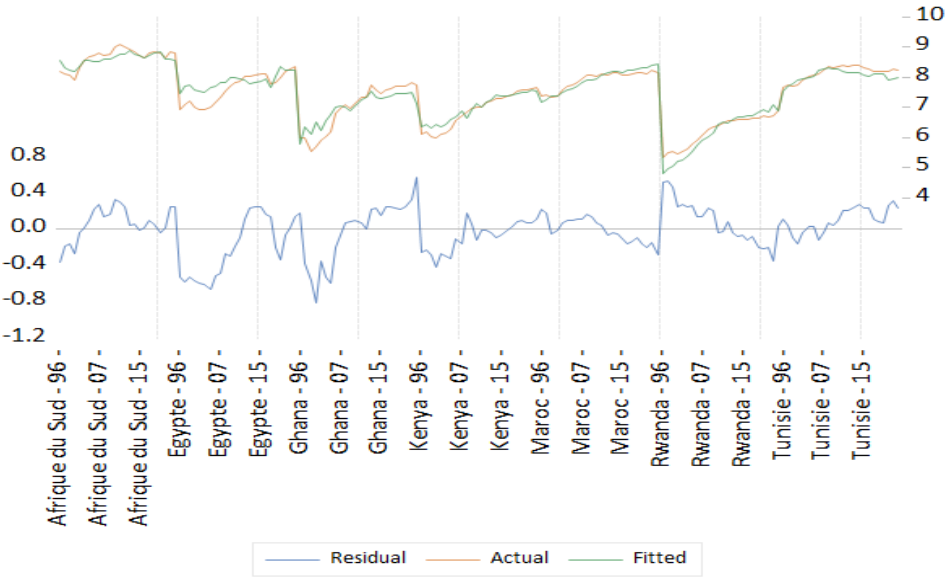
Figure 2 : Distribution of residuals



Source: Authors'

Figure 2 presents the distribution of residuals**,** showing a mean near zero (-0.009) and a slightly positive median (0.034), suggesting no systematic bias. The skewness coefficient (-0.692) indicates mild negative asymmetry, while the kurtosis (3.45) suggests slightly thicker tails than a normal distribution. The Jarque-Bera test (14.85, p = 0.0006) confirms mild non-normality, but given the robust estimation approach, the results remain valid.

Figure 3: Comparison of observed, fitted, and residual values



Source: Authors'

Figure 3 presents a comparison between observed values (actual), fitted values (fitted), and residuals (residuals) from the econometric model estimated using the RWLS method. The econometric analysis provides critical insights into the predictive accuracy of the model and the role of governance in shaping economic outcomes across the African sample, which includes Morocco, Tunisia, Egypt, South Africa, Kenya, Ghana, and Rwanda. The comparison between observed values (actual), fitted values (fitted), and residuals (errors) allows for an assessment of how well the model explains economic growth in these diverse economies. The results show that in Morocco and Tunisia, the fitted values closely align with the observed values, indicating that the model effectively captures the key determinants of economic growth in these countries. This suggests that capital accumulation, human development, trade openness, education, and governance,

core variables in the model, play a significant role in explaining economic performance. Conversely, in Ghana and Kenya, greater deviations between fitted and actual values indicate that the model does not fully explain economic fluctuations. This could be due to omitted variables, such as sectoral shifts and informal economic activity, or structural differences in their economies, where heavy reliance on commodities and external trade shocks may influence growth dynamics differently than in North African economies.

Residual analysis further supports these findings, showing that residuals are generally centered around zero, suggesting no systematic prediction bias. However, the presence of substantial fluctuations in Kenya and South Africa indicates that key unaccounted-for factors, such as policy changes, governance challenges, or macroeconomic shocks, may be influencing growth in these countries. In Kenya, external factors like global commodity price volatility and political instability could be responsible for these fluctuations, while in South Africa, persistent issues such as labor market rigidities, economic inequality, and governance weaknesses might explain the deviations. These variations highlight potential gaps in the model, suggesting that incorporating additional explanatory variables, such as investment climate indicators or sector-specific growth factors, could improve its predictive accuracy.

One of the most significant findings of this study is the role of governance as a moderating factor in the education-growth relationship. The alignment of fitted and actual values in Morocco and Tunisia suggests that good governance enhances the effectiveness of education in driving economic growth. Effective institutions improve education quality, reduce inefficiencies, and create a favorable business environment that maximizes the economic returns of human capital investment. This aligns with the broader literature emphasizing the role of strong institutions in ensuring that public investments, including those in education, translate into sustainable economic benefits. In contrast, weaker governance structures in Ghana, Kenya, and South Africa may limit the efficiency of education investments, leading to larger residuals and lower predictive accuracy in these economies.

From a policy perspective, these findings highlight the need for tailored economic strategies across different African economies. In countries where the model fits well, such as Morocco and Tunisia, reinforcing governance and education policies could sustain

economic progress by improving the quality and relevance of human capital. However, in countries with greater deviations, such as Kenya, Ghana, and South Africa, addressing structural constraints, including institutional weaknesses, investment bottlenecks, and economic diversification challenges, should be a priority. The results emphasize the importance of governance in amplifying the economic benefits of education while also demonstrating the need to consider country-specific economic and institutional contexts. The study underscores that while education remains a crucial determinant of economic growth, its impact is significantly influenced by the quality of governance and broader macroeconomic conditions, necessitating differentiated policy approaches tailored to the unique challenges and opportunities of each African economy.

Conclusion

As African countries strive for inclusive and sustainable economic growth, education and governance emerge as fundamental pillars of development. While education fosters human capital formation and innovation, its effectiveness is largely contingent on the quality of institutions. This study has explored the interaction between these two factors to better understand their combined influence on economic growth in Africa. The findings confirm that while education, measured by average years of schooling, has a positive but moderate direct effect on growth, its impact is significantly enhanced when governance quality is high. In countries with strong institutions, such as Morocco and Tunisia, the fitted values closely match observed economic growth trends, whereas in economies with weaker governance, such as Ghana and Kenya, discrepancies suggest inefficiencies in translating educational investments into economic gains.

Theoretically, the study reinforces the argument that education alone is not sufficient to drive economic growth; strong governance is a critical enabler that amplifies its impact. By integrating governance as a moderating factor, this study aligns with and extends existing literature on institutional economics and endogenous growth theories. Methodologically, the use of an econometric model incorporating governance as a moderator provides a nuanced understanding of the education-growth nexus. The application of the RWLS method enhances the robustness of the findings, particularly in capturing variations across African economies. Empirically, the results emphasize that institutional reforms are essential to reducing inequalities in educational access, ensuring

effective resource planning, and aligning educational curricula with economic needs. Furthermore, good governance mitigates inefficiencies associated with corruption and fosters an environment conducive to investment in human capital, reinforcing confidence among both national and international stakeholders. This study confirms Hypothesis H1, which posits that governance significantly enhances the impact of education on economic growth. This aligns with findings from (Hanushek & Woessmann, 2008), who emphasize that the quality of education and the effectiveness of institutions play a crucial role in translating educational investments into economic development. Their research emphasizes that countries with better governance frameworks experience higher economic returns to education, reinforcing the argument that institutions shape the effectiveness of human capital accumulation. Similarly, (Acemoglu and al., 2005) argue that institutions determine the extent to which education contributes to economic growth by influencing factors such as policy implementation, resource allocation, and labor market efficiency.

By incorporating governance as a moderating factor, this study extends the literature on the education-growth nexus within the African context. The observed variations across countries further support the idea that governance quality dictates how effectively education contributes to economic performance. Despite its contributions, this research has certain limitations. The use of average years of schooling does not fully capture the quality of education, learning outcomes, or skill acquisition. Future studies should incorporate alternative indicators, such as standardized test scores or labor market absorption rates. Additionally, while the government effectiveness index is a valuable measure, it does not account for all governance dimensions, such as political stability, corruption, or regulatory quality, which may also influence the education-growth relationship. Another limitation stems from data aggregation, as the reliance on national-level data overlooks regional and sectoral disparities within African countries, limiting insights into localized economic dynamics.

The policy implications of this study are clear: African policymakers must prioritize an integrated strategy that combines institutional reforms with targeted educational policies. This includes improving the quality of education, aligning curricula with labor market demands, and strengthening governance frameworks to foster inclusive and sustainable growth.

Future research could explore several avenues. First, incorporating qualitative indicators of education and governance would enable a deeper understanding of their interactions. Second, comparative analyses across African countries could highlight national specificities and best practices. Lastly, examining how education and governance influence different economic sectors could provide more tailored policy recommendations.

This study underscores that education and governance are not merely complementary but inseparable drivers of economic progress in Africa. Strengthening governance frameworks while improving education quality can transform structural challenges into opportunities, accelerating sustainable development and enhancing the region's economic competitiveness. By adopting a holistic and integrated approach, African policymakers can ensure that investments in human capital yield tangible and lasting economic benefits.

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