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January 2020

A G D I Working Paper

WP/20/077

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Forthcoming: International Social Science Journal

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Abstract

This paper examines the governance-"education quality" nexus in a panel of 49 sub-Saharan African countries over the period 2000-2012. Ordinary Least Squares (OLS) and Quantile regression (QR) are employed as estimation strategies. The following findings are established. First, from the OLS, governance variables are negatively correlated with poor education quality. Second, with regards to QR, about half of the governance dynamics are not significantly correlated with poor education quality in the lowest quantile of poor education quality. With the exception of corruption-control, the other governance dynamics are negatively correlated with poor education quality in a non-monotonic pattern.

JEL Classification: I20; I21; O30; O38; O55
Keywords: Education; Governance; Sub-Saharan Africa; Sustainable Development

1. Introduction

This study on the role of governance in quality education in Sub-Saharan Africa (SSA) is motivated by three main factors in scholarly and policy-making circles, notably: the high rate of education exclusion in the region[1]; the relevance of governance in development outcomes and the gaps in the attendant literature.

[1] see http://uis.unesco.org/en/topic/education-africa.

First, the quality of education in SSA has been found to be comparatively low when compared to other regions of the world (see Antoninis 2017). As recently documented by Antoninis (2017), compared to other regions of the world, the educational standards in Africa are far below the global average. This is notably because, *inter alia*: about ninety percent of young people lack reading skills and approximately twenty-five per cent of the youth in the sub-region cannot read properly. According to the narrative, the policy syndrome of low academic standards represents a policy concern in the attainment of Sustainable Development Goal (SDG) 4 of global education[2].

Second, good governance has been documented to be relevant in the achievement of many positive development outcomes notably: external flows such as foreign direct investment and remittances (Ajide and Raheem 2016a, 2016b; Ajide *et al*. 2020), enhancement of social change (Efobi 2015), improved management of the elderly population (Fonchingong 2014) and better allocation of economic resources (Anyanwu and Erhijakpor 2014; Fosu 2015a, 2015b). This research aims to extend this strand of the literature by assessing the importance of governance in quality education. This positioning is also motivated by the gaps in the extant literature.

Third, the extant contemporary literature on boosting education in Africa has focused on *inter alia*: the effectiveness of education intervention schemes (Conn 2017); PhD by Publication as an alternative strategy for increasing the productive value of doctoral dissertations in Africa (Asongu and Nwachukwu 2018a), critical insights into country-specific education quality (Mosha 2018) and the relevance of institutional governance in the management of higher educational systems in SSA (Abugre 2018). Moreover, as covered in Section 2.2, the extant literature on the nexus between governance and education has largely focused on higher education and other world regions (Materu 2007; Coates 2010; Bloom et al. 2005; Henard and Mitterle 2010; Dao 2015; Logli 2016; Yirdaw 2016).

The closest study in the literature to the present research is Abugre (2018). The study has investigated the challenges and development of higher education in SSA. The author uses the University of Ghana as a case study and does a thorough qualitative interview of heads of departments, directors and deans of the university. The purpose of the study is to explore and

[2] Fosu (2013) defines policy syndromes as circumstances that not favorable for economic prosperity, notably: 'administered redistribution', 'state breakdown', 'state controls', and 'suboptimal inter temporal resource allocation'. Asongu (2017) considers a policy syndrome as a gap in knowledge economy while Asongu and Nwachukwu (2017a) define it as growth that is not inclusive. In the same vein, Tchamyou *et al.* (2019a, 2019b) and Tchamyou (2019) qualify inequality as a policy syndrome because it reflects a negative economic signal. Within the framework of this paper, policy syndrome is poor education quality.

identify potential setbacks in infrastructure deficiency and institutional policies in the country. The results reveal that the following are critical factors that are hampering higher education academic development, namely: teaching overloads, congestion of students in academic facilities and the absence of research facilities. The author recommends better governance policies as a means of improving the institutional framework of higher education in the country.

Our research is similar to Abugre (2018) on two main fronts. On the one hand, the "pupil to teacher" ratio used to measure poor educational quality is consistent with one of the factors identified as an impediment to the production value of higher education, notably: congestion of students in academic facilities. On the other hand, we are assessing how government affects the quality of education in the light of the policy recommendation from Abugre (2018). Hence, by exploring the relevance of six governance dynamics in the quality of primary education, the present research is broadly in line with the policy recommendation.

On the distinctive features between our research and Abugre (2018), the following are worthwhile. First, we are focusing on all sub-Saharan African countries as opposed to exclusively limiting the study to a specific country. Hence, our policy implications will have a broader scope. Second, the research is concerned with primary education because this level of education has been documented to be associated with more development externalities when economies are at initial levels of industrialization (Asiedu 2014; Asongu and Nwachukwu 2018b). Third, contrary to the qualitative approach used the Abugre, our empirical strategy is based on Ordinary Least Squares (OLS) and Quantile regression (QR) estimations. The advantages of these techniques are clarified in the methodology section. Accordingly, the QR technique articulates existing levels of education quality or class sizes[3]. Fourth, we are concerned with all dimensions of governance documented in the World Governance Indicators of the World Bank, notably: (i) political governance which is understood as the election and replacement of political leaders (measured with "voice & accountability" and political stability/no violence); (ii) economic governance (proxied by government effectiveness and regulation quality) and understood as the formulation and implementation of policies that deliver public commodities and (iii) institutional governance which is defined as the respect by the State and citizens of institutions that govern interactions between them (appreciated with corruption-control and the rule of law). The conception and definitions of these variables are in accordance with recent governance literature (Andrés et al. 2015; Ajide

[3] Class sizes and existing levels of educational quality are used interchangeably throughout the study.

and Raheem 2016a, 2016b; Asongu and Nwachukwu 2017b). Moreover, it is important to note that, this study is focusing on governance of nation-states instead "governance of organization" as used in Aburgre (2018).

In the light of the above, the research question this study aims to answer is the following: how does governance affect education quality in sub-Saharan Africa? The connection between governance and education quality is intuitively sound because, building on the aforementioned conceptions and definitions of governance dynamics, poor governance quality is very likely to affect the ability of government to provide good quality education. For instances: (i) unsound political governance that is characterized by political instability, violence and absence of "voice and accountability" can reduce the quality of education; (ii) given that education quality is a public good, it is natural to expect economic governance to affect it and (iii) the absence of impunity and high levels of corruption can also influence the ability of government to deliver this public good of quality education. The intuitions underlying these theoretical relationships are sound and logical. Moreover, the positive nexus between governance and education is consistent with the attendant literature (Stasavage 2005a, 2005b; Mani and Mukand 2007; Harding and Stasavage 2014; Kosack 2012; Croke et al. 2016; Larreguy and Marshall 2017; Harding 2019). Hence, while we are conscious of the risks of doing measurement without an established theoretical framework, we also strongly argue that applied econometrics that is motivated by sound intuition is a useful scientific activity. Hence, the research is consistent with a strand of empirical literature which argues that applied econometrics should not be exclusively limited to the acceptance and rejection of existing theoretical frameworks (Costantini and Lupi 2005; Narayan *et al*. 2011; Asongu and Nwachukwu 2016a). This is essentially because theory-building empirical exercises are also worthwhile in scholarly and policy circles.

The rest of the study is structured as follows. Section 2 focuses on the data and methodology, while Section 3 presents and discusses the empirical results. Section 4 concludes with implications and future research directions.

2. Historical perspective, governance and educational quality

2.1 Historical perspective

The historical perspective on education in Africa mainly builds on Fourie (2016). According to the narrative, many countries in Africa are currently characterized by low levels of education. For example, Fourie (2016) maintains that the average literacy rate in Sub-Saharan Africa is 62%, which is lower than the world's average of 84%. These literacy rates are

respectively, 31%, 42%, 56%, 89%, 92% and 94% in Mali, Sierra Leone, Cote d'Ivoire, Namibia, Zimbabwe and Equatorial Guinea. In order to understand the reasons behind the comparatively poor performance of African countries in education, a chronology of historical insights is presented in two main strands, notably, the influence of colonizers and independence. Learning in Africa was largely influenced by the colonizers Fourie (2016). A notable influence pertains to the effect of the discoveries of Livingstone related to the interior of Africa, which helped some European nations to colonize African countries and use them to their benefit. Moreover, according to the narrative, the project of colonization in the early 20th century had both favorable and unfavorable consequences on Africa's education. With respect to the influence of independence, it is worthwhile to emphasize that after the Second World War, as colonizers from Europe started to notice that their legitimization and principles had fundamentally changed in terms of colonial governance, they quickly realized that they could no longer hold power for long. In most African countries, independence from colonizers occurred largely between the 1950s and 1960s. Formal educational structures progressed significantly in the post-independence era because of the need to train locals who could be administrators and drive economic development (Fourie, 2016). It follows that there was a kind of revolution in the aftermath of independence because new political leaders largely invested in providing qualified teachers and building new schools. Hence, literacy rates massively increased after independence.

2.2 Governance and educational quality

To the best of our knowledge, the extant literature pertaining to the nexus between governance and education has largely focused on higher education. Moreover, a substantial bulk of the attendant literature has not been oriented towards Africa (Materu 2007; Coates 2010; Bloom et al. 2005; Henard and Mitterle 2010; Dao 2015; Logli 2016; Yirdaw 2016).

Coates (2010) provides insights into defining and monitoring academic standards in higher education institutions in Australia. According to the author, it is relevant to engage quality-focused leadership with governments, regulatory agencies as well as with other actors who are tasked with monitoring education quality. Standards of monitoring and the ability to meet requirements of accreditation exert some influence on boosting education quality in institutions and academic excellence centres.

Materu (2007) in an earlier study had assessed the issues surrounding equality in institutions of higher learning in Africa and established that the dichotomy pertaining to political pressure on the part of the government to increase access to institutions and the aim

of institutions to increase standards of learning, have led to a favorable culture of educational quality in higher institutions of the continent. These characteristics of educational quality entail, *inter alia*: retention of human capital, enhanced transparency and improved accountability in relation to quality assurance. Moreover, the author identified good governance as a fundamental driver of the quality of higher education in the continent. The assertion is consistent with Henard and Mitterle (2010) who have also established that governance is vital for the progress and sustainability of quality education in higher institutions of learning in Africa. In essence, the effect of political interference and regulation represents a considerable challenge to higher education, especially within the framework of the economically marginalized and politically dynamic African continent. These reflections are broadly consistent with an earlier position by Bloom et al. (2005) who elicited the existing paradox underpinning the legislation of education in Africa. According to the author, policies that are highly centralized limit the autonomy of universities and by extension politicize them, which ultimately subvert the experience of learning in reaction to objectives of political nature.

Within a country-oriented perspective, the documented relevance of governance in driving education quality is consistent with Yirdaw (2016) on a study in Ethiopia. The author identifies leadership and governance factors in Ethiopia's private educational institutions to conclude that the attendant institutions are constantly poised in a challenging environment (of underfunding, poor infrastructure, lack of qualified teachers, *inter alia*) to balance stakeholder requirements with the demands of the government. Moreover, the researcher also showed that the majority of educational leaders are of the opinion that addressing education quality can be improved by more effective governance. Recommendations provided by the author urge policy makers, leaders of higher education institutions and regulators to, *inter alia* provide: adequate infrastructure, more equitable regulation, better qualified instructors and proper enforcement of education quality in higher institutions of learning.

Dao (2015) investigate the principal issues of reform pertaining to governance, insurance quality and finance in higher education in Vietnam. The author concludes that reforms at the university are slow and setbacks both at national and institutional levels are limiting the quality of education in the country. The conclusions of Dao (2015) are broadly consistent with Logli (2015) from the perspective of higher education in Indonesia.

3. Data and methodology

3.1 Data

The study is based on a panel of 49 countries in SSA using data for the period 2000-2012 from various sources, notably: World Governance Indicators and World Development Indicators of the World Bank. The sample and periodicity are constrained by data availability at the time of the study.

The outcome indicator is poor education quality, which is measured with the "pupil-teacher ratio" in primary education. This dependent variable is a negative economic signal given that a higher ratio of the variable is a reflection of poor education quality. This is essentially because a lower ratio reflects better education quality since fewer pupils are instructed by the same teacher. Hence, it offers the teacher the opportunity to allocate more time for the imparting of knowledge to these pupils. This indicator of education quality has been used in recent literature on education in Africa (Asongu and Nwachukwu 2016b; Tchamyou 2020; Asongu and Odhiambo 2019a).

In addition to the motivation for adopting a measurement of primary education provided in the introduction (i.e. the need to depart from the study of Abugre and articulate primary education which is more associated with development externalities when countries are at initial levels of industrialization), the corresponding indicators from tertiary and secondary education quality are characterized by limited degrees of freedom.

Consistent with insights from the introduction, all the governance dynamics provided by the World Governance Indicators of the World Bank are used in this analysis. These dynamics entail: (i) political governance (measured with "voice & accountability" and political governance/no violence) and defined as the election and replacement of political leaders in a country; (ii) economic governance (proxied by government effectiveness and regulation quality), which is understood as the formulation and implementation of policies that deliver public commodities in a country and (iii) institutional governance (measured with corruption-control and the rule of law), defined as the respect by the State and citizens of institutions that govern interactions between them. These conceptions and definitions are consistent with recent governance literature in Africa (Asongu and Nwachukwu 2016c). It is important to note that the study uses all the six governance indicators provided by the World Governance Indicators of the World Bank because to the best our knowledge these are the most widely used governance indicators in the literature. Moreover, the intuition for the connection between the six governance indicators and education quality is discussed in the introduction.

In order to account for variable omission basis, seven control variables are adopted in accordance with education literature (Asiedu 2014; Asongu and Odhiambo 2019b). These include three dummy and four non-dummy variables. The non-dummy variables are: foreign direct investment (FDI), internet penetration, trade openness and Gross Domestic Product (GDP) per capita. These variables are expected to provide enabling conditions for quality education. The dummy variables are: low income, English common law and conflict-affected countries. The research anticipates that low income and conflict-affected countries are negatively related to quality education compared to respectively, higher income and conflict-free countries. Accordingly, high-income countries are associated with more resources with which to provide more quality education to their citizens. Moreover, the presence of conflicts limits the avenues by which resources can be mobilised and allocated efficiently to improve education quality. In the light of the extant literature, compared to French civil law countries, English common law countries have been established to be more associated with better levels of education (Agbor 2015) and human development (Asongu and Nwachukwu 2018c).

The categorisation of countries by legal origins is in accordance with La Porta *et al.* (2008, 289) whereas the segmentation of countries by income levels is in line with the World Bank's classification of income groups[4]. In accordance with Asongu *et al.*(2019), conflict-affected countries are those that have experienced civil conflicts for at least half of the periodicity being investigated.

With respect to non-dummy variables, they have been established to enhance conditions for economic development and the wellbeing of citizens, including education (Sun and He 2014; Tchamyou 2017; Asongu and Tchamyou 2019). For instances:

(i) According to Sun and He (2014), foreign direct investment improves human capital. Accordingly, foreign investment is accompanied by requirements for more domestic human capital in terms of quality and quantity in order to meet demands in human resources relevant in the implementation and management of attendant foreign investment projects. This could constraint the domestic educational system to reduce the "pupil-teacher ratio" in view of providing higher quality education.

(ii) Information technology such as the internet is a fundamental determinant of knowledge economy and learning in Africa (Tchamyou 2017). Electricity supply is not considered in the

[4]There are four main World Bank income groups: (i) high income, $12,276 or more; (ii) upper middle income, $3,976-$12,275; (iii) lower middle income, $1,006-$3,975 and (iv) low income, $1,005 or less.

study. It is assumed that internet penetration is also associated with electricity supply because the latter is needed for the former to work properly.

(iii) Trade openness has been documented to affect education and lifelong learning (Asongu and Tchamyou 2019). Consistent with the narrative on foreign investment above, more exchanges in imports and exports of goods and services evidently have some incidence on human capital related to the underlying trade transactions. Owing to competition associated with trade openness, direct and indirect constraints can be exerted on the quality of human resources such that the education systems are improved to take on board more teachers in order to improve education quality by means of decreasing the "pupil-teacher ratio".

(iv) The wealth of nations naturally should affect education standards because rich countries have more resources with which to improve education facilities (Asongu and Tchamyou 2020).

The definitions and sources of the variables are provided in Appendix 1, whereas the summary statistics is disclosed in Appendix 2. The correlation matrix is provided in Appendix 3.

3.2 Methodology

Two empirical strategies are adopted in this study. They include: (i) baseline Ordinary Least Squares (OLS) and (ii) Quantile regressions. The OLS and QR approaches are also tailored to account for the unobserved heterogeneity in terms of the dummy control variables. The employment of these estimation approaches for a given problem statement in order to provide more robust results is consistent with recent literature (Asongu *et al*. 2018).

3.2.1 Ordinary Least Squares

The OLS specification with Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors is presented below:

$$Ed_{i,t} = \alpha + \sum_{j=1}^{8} \delta_j W_{j,i,t} + \varepsilon_{i,t} \quad (1)$$

where $Ed_{i,t}$ is the poor education quality of country i in period t; α is a constant, W is the vector of determinants which includes governance dynamics (i.e. political, economic and institutional) and the seven control variables (FDI, internet penetration, trade openness and GDP per capita, low income, English common law and conflicts) and $\varepsilon_{i,t}$ the error term .

3.2.2 Quantile regressions

The OLS technique discussed in the previous section is characterized by the shortcoming of focusing on mean values of poor education quality. However, the effect of governance on poor education quality may be contingent on initial levels of poor education quality such that the effect of governance dynamics varies across countries with low, intermediate and high levels of poor education quality. In order to remedy the concern, the QR approach is used (Okada and Samreth 2012; Asongu 2013; Koenker and Bassett 1978; Tchamyou and Asongu 2018). Moreover, consistent with Koenker (2005) and Hao and Naiman (2007), the QR approach distinguishes itself from linear regressions in many ways, notably, it: (i) is based on conditional quantiles (against the conditional mean); requires sufficient data (against the OLS approach which can accommodate a smaller dataset); is consistent with an agnostic distribution (against a normal distribution); is computationally more intensive (versus a linear technique which is computationally less intensive) and is robust to the control of outliers (versus sensitivity to outliers). Accordingly, nonlinear regressions have been substantially documented to improve the policy relevance of studies (Shin *et al*. 2014; Sadik-Zada *et al*. 2019a, 2019b; Sadik-Zada 2020; Sadik-Zada and Ferrari 2020; Niklas and Sadik-Zada 2019; Sadik-Zada and Loewenstein 2020).

The θ^{th} quantile estimator of poor education quality is obtained by solving for the following optimization problem, which is presented in Eq. (2) without subscripts for the purpose of readability and simplicity.

$$\min_{\beta \in R^k} \left[\sum_{i \in \{i: y_i \geq x_{i'}\beta\}} \theta \left| y_i - x_{i'}\beta \right| + \sum_{i \in \{i: y_i < x_{i'}\beta\}} (1-\theta) \left| y_i - x_{i'}\beta \right| \right], \qquad (2)$$

where $\theta \in (0,1)$. As opposed to OLS which is based on the minimization of the sum of squared residuals, with QR, it is the weighted sum of absolute deviations that is minimized. For example, the 25$^{\text{th}}$ or 75$^{\text{th}}$ quantiles (with θ=0.25 or 0.75, respectively) are estimated by approximately weighing the residuals. The conditional quantile of poor quality of education or y_i given x_i is:

$$Q_y(\theta / x_i) = x_{i'}\beta_\theta \quad , \qquad (3)$$

where unique slope parameters are estimated for each θ^{th} specific quantile. This formulation is analogous to $E(y / x) = x_{i'}\beta$ in the OLS slope where parameters are examined only at the mean of the conditional distribution of poor education quality. For Eq. (3), the outcome

variable y_i is the poor quality of education whereas x_i contains: a constant term, governance dynamics, FDI inflows, foreign aid, internet, low income, English common law and conflicts.

Consistent with Asongu and Odhiambo (2019c), in the light of the above, separate regression equations of the QR and OLS for the research question being investigated are as follows.

$$Ed_{i,t} = \sigma_0 + \sigma_1 X_{i,t} + \varepsilon_{i,t} \quad (4)$$

$$Ed_{i,t} = \sigma_0^{(p)} + \sigma_1^{(p)} \sigma_1 X_{i,t} + \varepsilon_{i,t}^{(p)} \quad (5)$$

The OLS and QR respectively in Equation (4) and Equation (5) above focus on the role of governance dynamics on the poor quality of education, where, $Ed_{i,t}$ is the poor quality of education in country i in period t, σ_0 is a constant, X entails governance dynamics and other control variables (FDI, internet penetration, trade openness, GDP per capita, low income, English common law and conflicts) and $\varepsilon_{i,t}$ is the error term.

4. Empirical results

The empirical findings are presented in this section. Whereas the OLS findings are disclosed in Table 1, results from QR are presented in Table 2 and Table 3. When interpreting the findings, it is worthwhile to note that a positive relationship with the outcome variable indicates a negative nexus with the quality of education whereas a negative relationship with on the outcome variable reflects a positive nexus with on the quality of education. This is essentially because education quality is conceived and measured as a negative economic signal. Hence, an increasing "pupils teacher ratio" is indicative of diminishing education quality since *ceteris paribus*; teachers need to allocate more time to the teaching and attending to pupils being taught.

The following findings can be established from Table 1. (i) All governance variables are positively related with education quality, with the following order of increasing magnitude: political stability, the rule of law, regulation quality, "voice & accountability", government effectiveness and corruption-control. (ii) The significant control variables have the expected signs.

In order to assess whether the differences in magnitude are significant in the light of concerns from in the attendant literature (Gelman and Stern 2006), following Van Beer and Zand (2014) a standard one-tailed z test is used to compare the estimated governance coefficients in the corresponding specifications. Building on Clogg et al. (1995) and Paternoster et al. (1998), the relevant z-statistics is calculated as in Equation (6):

$$Z = \frac{|b_1 - b_2|}{\sqrt{\sigma_{b_1}^2 + \sigma_{b_2}^2}} \quad (6)$$

where b_1 and b_2 are the estimated coefficients associated with the two sub-samples, and σ_{b1} and σ_{b2} are the standard errors. The findings provided in Appendix 4 and Appendix 5 show that the estimate of political stability is significantly different from the other governance estimates at the 1% and 5% significance levels.

Table 1: Ordinary Least Squares

	Dependent variable: Poor Education Quality (Pupil teacher ratio in primary education)					
	Political Governance		Economic Governance		Institutional Governance	
Constant	**49.577*** (0.000)**	**45.851*** (0.000)**	**45.803*** (0.000)**	**46.546*** (0.000)**	**46.711*** (0.000)**	**47.227*** (0.000)**
Political Stability	**-1.609** (0.040)**	---	---	---	---	---
Voice & Accountability	---	**-4.818*** (0.000)**	---	---	---	---
Government Effectiveness	---	---	**-5.296*** (0.000)**	---	---	---
Regulation Quality	---	---	---	**-4.483*** (0.000)**	---	---
Rule of Law	---	---	---	---	**-4.292*** (0.000)**	---
Corruption-Control	---	---	---	---	---	**-5.841*** (0.000)**
Foreign Direct Investment	-0.022 (0.797)	-0.039 (0.626)	-0.074 (0.411)	-0.057 (0.507)	-0.059 (0.499)	-0.067 (0.451)
Internet Penetration	**-0.082*** (0.000)**	**-0.065*** (0.000)**	**-0.067*** (0.000)**	**-0.075*** (0.000)**	**-0.071*** (0.000)**	**-0.066*** (0.000)**
Trade Openness	**-0.088*** (0.000)**	**-0.098*** (0.000)**	**-0.093*** (0.000)**	**-0.093*** (0.000)**	**-0.087*** (0.000)**	**-0.096*** (0.000)**
GDP per Capita growth	0.251 (0.141)	**0.332* (0.056)**	**0.331* (0.066)**	0.281 (0.114)	0.282 (0.116)	0.263 (0.120)
Low Income	**4.436*** (0.000)**	**6.569*** (0.000)**	**4.838*** (0.000)**	**5.513*** (0.000)**	**4.868*** (0.000)**	**3.926*** (0.001)**
English Common law	0.089 (0.943)	1.356 (0.273)	1.603 (0.190)	1.422 (0.246)	1.008 (0.430)	0.957 (0.443)
Conflicts	**4.294** (0.020)**	**3.678** (0.035)**	**4.477** (0.012)**	**4.809*** (0.000)**	**3.933** (0.032)**	**4.881*** (0.007)**
R^2	0.367	0.400	0.391	0.383	0.382	0.399
Fisher	**40.21***	**51.04***	**48.14***	**45.29***	**48.11***	**47.70***
Observations	386	386	386	386	386	386

*, **, ***: significance levels of 10%, 5% and 1%, respectively. GDP: Gross Domestic Product. Low income: Low income countries. English: English common law countries. Conflict: Conflict-affected countries.

Table 2: Quantile regressions for political and economic governance

Dependent variable: Poor Education Quality (Pupil teacher ratio in primary education)

Panel A: Political Governance

	Political Stability					Voice & Accountability				
	Q.10	Q.25	Q.50	Q.75	Q.90	Q.10	Q.25	Q.50	Q.75	Q.90
Constant	**33.651*** **	**42.910*** **	**49.297*** **	**52.601*** **	**66.298*** **	**30.748*** **	**38.899*** **	**44.742**/ **	**49.729*** **	**60.167*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Political Stability	**-1.962***	**-3.463*** **	**-2.202****	-1.187	**-4.939***	---	---	---	---	---
	(0.063)	**(0.000)**	**(0.022)**	(0.408)	**(0.046)**					
Voice & Accountability	---	---	---	---	---	**-3.831*** **	**-5.084*** **	**-5.814*** **	**-4.051****	-4.218
						(0.000)	**(0.000)**	**(0.000)**	**(0.013)**	(0.229)
Foreign Direct Investment	-0.002	-0.038	-0.145	0.220	0.283	-0.001	-0.048	-0.099	0.235	0.162
	(0.982)	(0.573)	(0.145)	(0.140)	(0.293)	(0.985)	(0.533)	(0.297)	(0.104)	(0.604)
Internet Penetration	**-0.058*** **	**-0.054*** **	**-0.067*** **	**-0.076*** **	**-0.111*** **	**-0.039*** **	**-0.043*** **	**-0.042*** **	**-0.065*** **	**-0.083****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.026)**
Trade Openness	-0.045	**-0.082*** **	**-0.090*** **	**-0.082*** **	**-0.106***	**-0.057*** **	**-0.091*** **	**-0.125*** **	**-0.104*** **	**-0.111***
	(0.049)	**(0.000)**	**(0.000)**	**(0.008)**	**(0.057)**	**(0.003)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.084)**
GDP per Capita growth	-0.090	**-0.191***	0.220	0.244	**0.753***	0.022	0.158	**0.330****	**0.401***	0.886
	(0.610)	**(0.080)**	(0.172)	(0.310)	**(0.084)**	(0.887)	(0.209)	**(0.034)**	**(0.089)**	(0.083)
Low Income	**4.454*** **	**1.890***	1.923	**4.370****	**7.620***	**6.250*** **	**4.351*** **	**4.878*** **	**6.956*** **	**8.961***
	(0.006)	**(0.058)**	(0.192)	**(0.047)**	**(0.055)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.002)**	**(0.063)**
English Common law	0.256	**-1.622***	1.071	3.027	-3.453	**3.061****	0.794	3.163**	2.750	1.582
	(0.870)	**(0.095)**	(0.456)	(0.158)	(0.371)	**(0.030)**	(.0456)	(0.024)	(0.197)	(0.731)
Conflicts	0.286	-1.111	2.332	**9.619*** **	**17.529*** **	0.025	1.399	**3.969****	**7.932*** **	8.565
	(0.893)	(0.401)	(0.233)	**(0.001)**	**(0.001)**	(0.988)	(0.320)	**(0.023)**	**(0.003)**	(0.133)
Pseudo R^2	0.319	0.286	0.242	0.206	0.196	0.335	0.309	0.272	0.223	0.196
Observations	386	386	386	386	386	386	386	386	386	386

Panel B: Economic Governance

	Government Effectiveness					Regulation Quality				
	Q.10	Q.25	Q.50	Q.75	Q.90	Q.10	Q.25	Q.50	Q.75	Q.90
Constant	**33.247*** **	**36.732*** **	**44.494*** **	**49.790*** **	**53.388*** **	**35.106*** **	**37.756*** **	**46.642*** **	**49.456*** **	**57.262*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Government Effectiveness	-1.992	**-5.741*** **	**-6.704*** **	**-5.892*** **	**-12.247*** **	---	---	---	---	---
	(0.164)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**					
Regulation Quality	---	---	---	---	---	-1.174	**-4.798*** **	**-4.454*** **	**-7.343*** **	**-9.277****
						(0.339)	**(0.000)**	**(0.001)**	**(0.000)**	**(0.011)**
Foreign Direct Investment	-0.012	**-0.225*** **	**-0.199***	**0.290***	-0.024	0.008	-0.125	**-0.183***	**0.259***	0.158
	(0.902)	**(0.003)**	**(0.050)**	**(0.072)**	(0.915)	(0.920)	(.0.161)	**(0.071)**	**(0.070)**	(0.552)
Internet Penetration	**-0.059*** **	**-0.048*** **	**-0.042*** **	-0.058	**-0.067****	**-0.065*** **	**-0.064*** **	**-0.059*** **	**-0.058*** **	**-0.079*** **
	(0.000)	**(0.000)**	**(0.000)**	(0.002)	**(0.014)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.009)**
Trade Openness	**-0.054*** **	**-0.073*** **	**-0.110*** **	**-0.119*** **	-0.064	**-0.065*** **	**-0.072*** **	**-0.108*** **	**-0.130*** **	**-0.120****
	(0.009)	**(0.000)**	**(0.000)**	**(0.000)**	(0.166))	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.027)**
GDP per Capita growth	-0.024	0.127	**0.335****	0.358	**0.809****	-0.061	-0.013	**0.374****	0.328	0.673
	(0.881)	(0.296)	**(0.040)**	(0.169)	**(0.029)**	(0.671)	(0.923)	**(0.022)**	(0.152)	(0.117)
Low Income	**4.952*** **	**4.668*** **	**3.480****	**4.831****	2.670	**5.000*** **	**4.809*** **	**3.578****	**5.231****	0.673
	(0.001)	**(0.000)**	**(0.018)**	**(0.039)**	(0.423)	**(0.000)**	**(0.000)**	**(0.018)**	**(0.03)**	(0.117)
English Common law	0.720	**2.719****	**3.559****	**3.986***	2.869	-0.304	1.976	**3.625****	**4.794****	6.372
	(0.638)	**(0.016)**	**(0.018)**	**(0.097)**	(0.400)	(0.821)	(0.139)	**(0.018)**	**(0.025**	(0.107)
Conflicts	1.671	0.824	2.405	**8.038*** **	**10.629*** **	1.417	1.851	2.572	**9.234*** **	4.801
	(0.359)	(0.539)	(0.179)	(0.005)	(0.009)	(0.732)	(0.240)	(0.151)	**(0.000)**	(0.230)
Pseudo R^2	0.320	0.294	0.255	0.220	0.216	0.314	0.274	0.248	0.227	0.215
Observations	386	386	386	386	386	386	386	386	386	386

*, **, ***: significance levels of 10%, 5% and 1%, respectively. GDP: Gross Domestic Product. Lower quantiles (e.g., Q 0.1) signify nations where poor education quality is least. Low income: Low income countries. English: English common law countries. Conflict: Conflict-affected countries.

The following findings can be established for Tables 2-3. Panel A of Table 2 shows findings for political governance, whereas Panel B discloses results of economic governance. In the interpretation of the results, a note should be taken of the fact that since we have a negative signal as the outcome variable, the lowest quantile (i.e. Q 0.10) reflects countries with the highest education quality whereas the highest quantile (i.e. Q 0.90) denotes countries the least education quality. First, with the exception of the 75th (90th) quantile, political stability (Voice & accountability) consistently have a positive relationship with education quality in a non-

monotonic pattern throughout the conditional distribution of education quality. Second, economic governance (i.e. government effectiveness and regulation quality) and the rule of law, consistently have a positive correlation with education quality, with the exception of the lowest quantile in which the nexus is not significant. The pattern is also non-monotonic. Third, corruption-control consistently has a positive nexus with the quality of education with a monotonic pattern throughout the conditional distribution of poor education quality. Accordingly, the negative responsiveness of poor education quality to corruption-control increases as poor education quality increases. In other words, given that the 90th quantile is actually the lowest level of education quality, corruption-control has the biggest effects when poor equality education is highest. Fourth, most of the significant control variables have the expected signs.

Table 3: Quantile regressions for institutional governance

	Dependent variable: Poor Education Quality (Pupil teacher ratio in primary education)									
	Rule of Law					Corruption-Control				
	Q.10	Q.25	Q.50	Q.75	Q.90	Q.10	Q.25	Q.50	Q.75	Q.90
Constant	**35.106*** (0.000)**	**37.756*** (0.000)**	**46.642*** (0.000)**	**49.456*** (0.000)**	**57.262*** (0.000)**	**36.104*** (0.000)**	**40.466*** (0.000)**	**43.996*** (0.000)**	**52.639*** (0.000)**	**64.449*** (0.000)**
Rule of Law	-1.174 (0.339)	**-4.798*** (0.000)**	**-4.454*** (0.001)**	**-7.343*** (0.000)**	**-9.277** (0.011)**	---	---	---	---	---
Corruption-Control	---	---	---	---	---	**-2.510* (0.091)**	**-6.204*** (0.000)**	**-7.456*** (0.000)**	**-8.709*** (0.000)**	**-10.643*** (0.005)**
Foreign Direct Investment	0.008 (0.920)	-0.125 (0.161)	**-0.183* (0.071)**	**0.259* (0.070)**	0.158 (0.552)	-0.031 (0.776)	**-0.159** (0.016)**	**-0.197** (0.033)**	**0.343*** (0.000)**	0.190 (0.495)
Internet Penetration	**-0.065*** (0.000)**	**-0.064*** (0.000)**	**-0.059*** (0.000)**	**-0.058*** (0.000)**	**-0.079*** (0.009)**	**-0.061*** (0.000)**	**-0.047*** (0.000)**	**-0.043*** (0.000)**	**-0.055*** (0.000)**	**-0.062* (0.057)**
Trade Openness	**-0.065*** (0.000)**	**-0.072*** (0.000)**	**-0.108*** (0.000)**	**-0.130*** (0.000)**	**-0.120** (0.027)**	**-0.069*** (0.002)**	**-0.079*** (0.000)**	**-0.096*** (0.000)**	**-0.139*** (0.000)**	**-0.161*** (0.005)**
GDP per Capita growth	0.061 (0.671)	-0.013 (0.923)	**0.374** (0.022)**	0.328 (0.152)	0.673 (0.117)	-0.026 (0.880)	-0.027 (0.795)	0.191 (0.198)	0.311 (0.140)	0.492 (0.272)
Low Income	**5.000*** (0.000)**	**4.809*** (0.000)**	**3.578** (0.018)**	**5.231** (0.013)**	6.372 (0.107)	**3.775** (0.018)**	**1.742* (0.072)**	**2.789** (0.040)**	0.765 (0.690)	1.745 (0.669)
English Common law	-0.304 (0.821)	1.976 (0.139)	**3.625** (0.018)**	**4.794** (0.025)**	4.801 (0.230)	0.525 (0.738)	1.041 (0.273)	**3.263** (0.015)**	**4.358** (0.021)**	2.272 (0.572)
Conflicts	1.417 (0.372)	1.851 (0.240)	0.151 (2.572)	**9.234*** (0.000)**	**9.245* (0.050)**	0.895 (0.639)	**1.923* (0.097)**	**4.628*** (0.005)**	**6.771*** (0.003)**	**10.974** (0.025)**
Pseudo R^2	0.314	0.274	0.248	0.227	0.215	0.326	0.308	0.275	0.230	0.209
Observations	386	386	386	386	386	386	386	386	386	386

*, **, ***: significance levels of 10%, 5% and 1%, respectively. GDP: Gross Domestic Product. Lower quantiles (e.g., Q 0.1) signify nations where poor education quality is least. Low income: Low income countries. English: English common law countries. Conflict: Conflict-affected countries.

One consistent finding that stands out is the importance of corruption-control in fighting poor education quality. This is essentially because, from OLS, corruption-control has the highest negative relationship, and from QR, the negative correlation of corruption-control increases with increasing levels of poor education quality. The relative importance of corruption-control compared to other governance dynamics is consistent with recent African contemporary literature, notably, in: fighting software piracy (Asongu and Andrés 2013); battling conflicts and crimes (Asongu and Kodila-Tedika 2016) and stifling capital flight

(Asongu and Nwachukwu 2017c). It is worthwhile the further discuss why corruption-control is the best mechanism compared to other governance dynamics.

There are two main explanations as to why corruption-control is the most effective governance weapon in fighting poor education quality, notably: (i) a "conceptual" elucidation and (ii) the pragmatism of corruption-control in governance as a final phase (last resort or end game). First, within the conceptual framework, other dimensions of governance are not as important as the rate at which public power and commodities are prevented from being diverted for private gain (i.e. corruption-control) when it comes to improving education quality. In essence, this dimension of corruption-control in governance is more relevant than: (i) the degree by which citizens in a country can participate in the decision making processes of political nature (i.e. voice & accountability); (ii) the stability of government in relation to terrorism and political violence (i.e. political stability/no violence); (iii) the capacity of government to take action in implementing measures that uphold the credibility of the government (i.e. government effectiveness); (iv) the ability of the government to formulate and put in place sound measures that boost participation in the private sector (i.e. regulation quality); and (v) the presence a legal system (which entails property rights) and contract enforcement (i.e. the rule of law).

Second, corruption-control is the most effective governance mechanism in boosting education quality because it is like the last resort or end game in the process of boosting education standards. For instance, leaders could be elected into office by democratic standards (at times through vote-buying and -rigging), measures for boosting education may be voted into law by the legislature, the executive branch of government can formulate and implement policies in the light of the legislative measure, but if those implementing policies are corrupt, they can divert the allocated funds for private gains. Even at the level of the judiciary, judges need to be incorruptible in order for corrupt officials to go without impunity.

In summary, it is only when corruption has been substantially mitigated that, *inter alia*: (i)good and credible leaders be voted into office, (ii) genuine laws voted by the legislature and implemented by the executive, (iii) corrupt officials caught siphoning funds allocated to improve education quality brought to face justice and (iv) the judiciary impartially sentencing corrupt officials to terms of jail in order to deter other corrupt officials from siphoning funds meant for boosting quality education.

5. Concluding implications and future research directions

This paper has examined the relevance of good governance in decreasing poor quality education in a panel of 49 sub-Saharan African countries over the period 2000-2012. Ordinary Least Squares (OLS) and Quantile regression (QR) have been employed as estimation strategies. Two factors are worthwhile in the interpretation of results. On the one hand, the proxy for education quality (i.e. "pupil-teacher ratio") is a negative signal such that higher ratios denote education of poorer quality. On the other hand, in the QR, the lowest quantile (i.e. Q 0.10) reflects countries with the highest education quality whereas the highest quantile (i.e. Q .90) denotes countries the least education quality. The following findings have been established. First, from the OLS, governance variables are positively related to education quality, with the following order of increasing magnitude: political stability, the rule of law, regulation quality, "voice & accountability", government effectiveness and corruption-control. Second, with regards to QR: (i) with the exception of the 75^{th} (90^{th}) quantile, political stability (voice & accountability) consistently has a negative relationship with poor education quality with non-monotonic patterns throughout the conditional distribution of poor education quality. (ii) Economic governance (i.e. government effectiveness and regulation quality) and the rule of law, consistently has negative relationship with poor education quality, with the exception of the lowest quantile in which the nexus is not significant. The pattern is also non-monotonic. (iii) Corruption-control consistently is negatively linked to poor quality education with a monotonic pattern throughout the conditional distribution of poor education quality. Implications for policy are discussed in terms of the absence of significant results in the lowest quantiles and corruption-control as the most effective governance tool in promoting quality education in the light of the SDGs.

First, the absence of significant findings between governance and poor education quality in some quantiles is an indication that governance mechanisms are a necessary but not a sufficient condition for promoting education quality when initial levels of poor education quality are least. It follows that in modeling the importance of governance in the promoting of education quality, blanket policies (as established from OLS findings) may not be effective unless these policies are contingent on initial levels of poor education quality and by extension, tailored differently across countries with low, intermediate and high levels of poor education quality.

Second, the relative importance of corruption-control in promoting quality education has been established at two levels. On the one hand, from the OLS regressions, corruption-

control has the highest magnitude on education quality. On the other hand, given that the 90th quantile is actually the lowest levels of education quality, corruption-control has the biggest effects when poor equality education is highest. As a policy implication, for the same levels of corruption-control, *ceteris paribus*, the potential effect in reducing poor education quality will be consistently higher in countries where initial levels of education quality are low. Hence, in the post-2015 development era, in order to promote quality education for the achievement of Sustainable Development Goal (SDG) 4 on global quality education for all, policy makers should improve governance standards with particular emphasis on the importance of corruption-control as the most important governance weapon in achieving global quality primary education.

Future studies can focus on country-specific cases in order to establish more targeted implications. Moreover, it is worthwhile also to consider alternative policy instruments with which to fight poor education quality in the sub-region. While OLS and Quantile regressions which have been employed have led the study to conclude on correlations and relationships as opposed to causality, future studies should also consider alternative estimation techniques that account for temporal dependence in the sampled panel and simultaneity, in order to assess if the findings withstand empirical scrutiny within the framework of causality. For "time series"-oriented studies, Beck (2001) and Beck and Katz (1995) are worth consulting. In these future studies, it would be worthwhile to engage a recently released World Bank dataset on education quality (Altinok et al. 2018) as well as other governance at school measures. Such may require using primary data to provide complementary microeconomic perspectives to the investigated nexuses.

Appendices

Appendix 1: Definitions and sources of variables

Variables	Signs	Definitions	Sources
Education Quality	Educ	Pupil teacher ratio in primary education	WDI
Political Stability	PolS	"Political stability/no violence (estimate): measured as the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional and violent means, including domestic violence and terrorism".	WGI
Voice & Accountability	VA	"Voice and accountability (estimate): measures the extent to which a country's citizens are able to participate in selecting their government and to enjoy freedom of expression, freedom of association and a free media"	WGI
Government Effectiveness	GE	"Government effectiveness (estimate): measures the quality of public services, the quality and degree of independence from political pressures of the civil service, the quality of policy formulation and implementation, and the credibility of governments' commitments to such policies".	WGI
Regulation Quality	RQ	"Regulation quality (estimate): measured as the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development".	WGI
Rule of Law	RL	"Rule of law (estimate): captures 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, the courts, as well as the likelihood of crime and violence"	WGI
Corruption-Control	CC	"Control of corruption (estimate): captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests"	WGI
Foreign Investment	FDI	Foreign Direct Investment Inflows (% of GDP)	WDI
Internet penetration	Internet	Internet subscriptions (per 1000 people)	WDI
Trade Openness	Trade	Exports + Imports of commodities (% of GDP)	WDI
GDP per capita growth	GDPpcg	GDP per capita growth (annual %)	WDI

WDI: World Development Indicators. WGI: World Governance Indicators. GDP: Gross Domestic Product.

Appendix 2: Summary statistics

	Mean	SD	Min	Max	Obs
Education Quality	43.601	14.529	12.466	100.236	444
Political Stability	-0.543	0.956	-3.323	1.192	578
Voice & Accountability	-0.646	0.737	-2.233	0.990	578
Government Effectiveness	-0.771	0.620	-2.450	0.934	577
Regulation Quality	-0.715	0.644	-2.665	0.983	578
Rule of Law	-0.741	0.662	-2.668	1.056	578
Corruption-Control	-0.642	0.591	-1.924	1.249	579
Net Foreign Direct Investment Inflows	5.332	8.737	-6.043	91.007	603
Internet penetration	41.528	64.506	0.059	436.051	566
Trade Openness	78.177	36.138	20.964	209.874	597
GDP per capita growth	2.198	5.987	-49.761	58.363	608

SD: Standard deviation. Min: Minimum. Max: Maximum. Obs: Observations.

Appendix 3: Correlation matrix (uniform sample size: 386)

	Governance variables						Control variables				
Edu	PolS	VA	GE	RQ	RL	CC	FDI	Internet	Trade	GDPpcg	
1.000	-0.373	-0.344	-0.370	-0.272	-0.395	-0.402	-0.106	-0.491	-0.357	0.027	Edu
	1.000	0.666	0.648	0.572	0.792	0.656	0.017	0.375	0.280	0.016	PolS
		1.000	0.777	0.575	0.813	0.644	-0.035	0.392	0.077	0.142	VA
			1.000	0.867	0.893	0.813	-0.096	0.429	0.098	0.144	GE
				1.000	0.801	0.681	-0.104	0.289	0.070	0.084	RQ
					1.000	0.829	-0.062	0.440	0.198	0.082	RL
						1.000	-0.098	0.426	0.058	0.035	CC
							1.000	0.047	0.336	0.165	FDI
								1.000	0.214	0.087	Internet
									1.000	0.080	Trade
										1.000	GDPpcg

Edu: Education Quality. PolS: Political Stability. VA: Voice & Accountability. GE: Government Effectiveness. RQ: Regulation Quality. CC: Corruption-Control. RL: Rule of Law. FDI: Foreign Direct Investment. GDPpcg: GDP per capita growth.

Appendix 4: Testing for differences in estimated coefficients in Table 1 (Stage 1)

	PolS	VA	GE	RQ	RL	CC
Estimates	-1.609	-4.818	-5.296	-4.483	-4.292	-5.841
SE	[0.782]	[0.791]	[1.227]	[1.128]	[1.175]	[1.001]
PolS	---					
VA	3.209/1.112	---				
GE	3.687/1.455	0.478/1.459	---			
RQ	2.874/1.372	0.335/1.377	0.813/1.666	---		
RL	2.683/1.411	0.526/1.416	1.004/1.698	0.191/1.628	---	
CC	4.232/1.270	1.023/1.275	0.545/1.583	1.358/1.508	1.549/1.543	---

SE: Standard Error. PolS: Political Stability. VA: Voice & Accountability. GE: Government Effectiveness. RQ: Regulation Quality. CC: Corruption-Control. RL: Rule of Law. The values from the 5th line are from the numerator and denominator of Equation 6.

Appendix 5: Testing for differences in estimated coefficients in Table 1 (Stage 2)

	PolS	VA	GE	RQ	RL	CC
Estimates	-1.609	-4.818	-5.296	-4.483	-4.292	-5.841
SE	[0.782]	[0.791]	[1.227]	[1.128]	[1.175]	[1.001]
PolS	---					
VA	2.885**	---				
GE	2.534**	0.327	---			
RQ	2.094*	0.243	0.487	---		
RL	1.901*	0.371	0.591	0.117	---	
CC	3.332**	0.802	0.344	0.900	1.003	---

SE: Standard Error. PolS: Political Stability. VA: Voice & Accountability. GE: Government Effectiveness. RQ: Regulation Quality. CC: Corruption-Control. RL: Rule of Law.
* $P< .05$ (one tailed)
** $P< .01$ (one tailed)

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