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Boosting quality education with inclusive human development: empirical evidence from sub-Saharan Africa[1]

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Simplice A. Asongu
Department of Economics, University of South Africa.
P. O. Box 392, UNISA 0003, Pretoria South Africa.
E-mails: asongusimplice@yahoo.com,
asongus@afridev.org

Nicholas M. Odhiambo
Department of Economics, University of South Africa.
P. O. Box 392, UNISA 0003, Pretoria, South Africa.
Emails: odhianm@unisa.ac.za,
nmbaya99@yahoo.com

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Research Department

Boosting quality education with inclusive human development: empirical evidence from sub-Saharan Africa

Simplice A. Asongu & Nicholas M. Odhiambo

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Abstract

This study examines the importance of inclusive human development in promoting education quality in a panel of forty-nine Sub-Saharan African countries for the period 2000-2012. The empirical evidence is based on Ordinary Least Squares (OLS), Fixed Effects (FE) and Quantile Regression (QR) estimations. It is apparent from the OLS and FE findings that inclusive human development has a negative effect on the outcome variable. This negative effect implies that inclusive human development improves education quality. This result should be understood in the light of the fact that the adopted education variable is a negative economic signal given that it is computed as the ratio of pupils to teachers. Therefore, a higher ratio reflects diminishing education quality. From QR, with the exception of the highest quantile, the tendency of inclusive human development in reducing poor quality education is consistent throughout the conditional distribution of poor education quality. Policy implications are discussed.

Introduction

Three main tendencies motivate the positioning of the study on the relevance of boosting quality education with inclusive human development, notably: the poor education quality in Africa; growing non-inclusive development on the continent and gaps in the attendant literature. The three points are expanded in the same order as they are presented.

First, compared to other regions of the world, the quality of education in Africa is poor. Consistent with Antoninis (2017), education systems are decidedly sub-standard in Sub-Saharan Africa (SSA) because of *inter alia*: (i) crumbling infrastructure; (ii) many teachers are ill-prepared and not well equipped for classrooms that are largely over-crowded and (iii) approximately 25% of young people in the sub-region are unable to read while, about 90% of children lack appropriate reading skills. In summary, education standards are slipping in SSA which represents a global education goal risk because schools in the sub-region may not be working to attain the aspirations of Sustainable Development Goal (SDG) 4 of global education.

Second, concerns about the achievement SDG 4 are even more relevant in the light of evidence that most countries in SSA did not achieve most Millennium Development Goals (MDGs) because of exclusive development. Accordingly, in spite of the growth resurgence experienced by the sub-region for over two decades, the number of people living in extreme poverty has been consistently growing (Asongu and Kodila-Tedika 2017). This is a further indication that the fruits of economic prosperity from the growth resurgence have not been tangibly trickling-down to the poorer factions to the population for the alleviation of extreme poverty and investment in human amenities, including health and education facilities. It follows that achievement of SDG 4 in the post-2015 development agenda will depend on economic growth that is sensitive to inequality-adjusted human development. The purpose of the present research is therefore to clarify the policy issue arising by assessing the relevance

of inclusive human development on education quality. Beyond, the policy motivation, the positioning of this research is also motivated by a gap in the extant scholarly literature.

Third, in spite of the challenging policy syndromes discussed in the previous paragraphs, the contemporary SSA-centric literature has failed to assess the nexus between inclusive human development and education quality. This is understandable because, on the one hand, reports on the achievement of MDGs are recent and on the other hand, challenges of SDGs relative to reports on the attainment of MDGs are also recent. In the light of these observations, the contemporary literature on promoting education in Africa has largely focused on, *inter alia*: critical analysis of the quality of education in countries (Mosha 2018); PhD by Publication for enhanced development outcomes (Asongu and Nwachukwu 2018a) and the effectiveness of education intervention programs (Conn 2017).

On the inclusive human development front, according to a recent survey by Asongu (2017), Africa-centric contemporary studies have focused on relationships between "inequality-adjusted human development" and a multitude of macroeconomic factors, notably: development assistance, globalization, information technology, knowledge economy, financial development, software piracy, policy harmonization across countries and health worker migration. Other contemporary studies on sustainable development have been oriented towards, *inter alia*: agriculture (Adenle, Azadi, and Manning 2018; Kara, La croix, Rey-Valette, Mathé, and Blancheton 2018), gender equality (Adelakun-Odewale 2018; Efobi, Tanankem, and Asongu 2018); energy (Asongu 2018; Trotter and Abdullah 2018; Kuada and Mensah 2018) and information and communication technology (Afutu-Kotey, Gough, and Owusu 2017; Asongu and Boateng 2018; Bongomin, Ntayi, Munene, and Malinga 2018 ; Gosavi 2018; Hubani and Wiese 2018; Isszhaku Abu, Nkegbe 2018; Minkoua Nzie, Bidogeza, and Ngum 2018; Muthinja and Chipeta 2018; Abor, Amidu, and Issahaku 2018).

Noticeably, the engaged contemporary literature has not investigated the problem statement motivating this study. This research therefore complements the attendant literature by attempting to respond to the following question: does inclusive human development boost quality education in Africa?

We are aware of the risks of doing measurement without an established theoretical underpinning. However, we argue that applied econometrics should not exclusively be motivated by the need to accept or reject existing theories. Accordingly, we are consistent with recent empirical literature in arguing that an empirical analysis that is motivated by sound intuition is a useful scientific activity (Narayan, Mishra, and Narayan 2011). Moreover, such an empirical study could also be useful for theory-building. The potential relationship between education quality and inclusive human development is simple to follow: on the one hand, fruits of economic development are invested in the delivery of public commodities which include facilities for human development and on the other hand, education quality depends on how such fruits of economic development are equitably distributed among the population and attendant sectors of human development.

The rest of the study is structured as follows. A discussion on the data and methodology follows this introduction before the empirical results are presented in the next section. The last section concludes with implications and future research directions.

Data and methodology

Data

The research focuses on a panel of forty-nine sub-Saharan African countries. The data range from the year 2000 to 2012 and are obtained from various sources, namely, the: World Development Indicators of the World Bank and United Nations Development Program

(UNDP). The adopted sample and periodicity are due to constraints in data availability at the time of the study.

The dependent variable of poor education quality is the "pupil-teacher ratio" in primary education. The outcome variable reflects a negative economic signal because increasing levels is an indication of poor quality. Accordingly, a higher pupil-teacher ratio is an indication that more pupils are accommodated by one teacher; hence, denoting lower education quality owing to limited time devoted by the teacher to attend to the needs and deficiencies of each pupil. The conception and measurement of this indicator for poor education quality is consistent with recent African-centric literature on education (Asongu and Nwachukwu 2016a; Asongu and Odhiambo 2018; Tchamyou 2019a).

The study focuses on primary education instead of higher levels of education for two main reasons. On the one hand, there are limited degrees of freedom for corresponding variables in secondary education quality and tertiary education quality. On the other hand, given that we are focusing on the importance of inclusive development in education quality, compared to other levels of education, primary education has been documented to be more associated with socio-economic benefits when countries are at initial stages of industrialisation (Asiedu 2014; Asongu and Nwachukwu 2018b).

The main independent variable of interest is inclusive human development which is proxied by the inequality-adjusted human development index (IHDI). The choice of this indicator is also in accordance with recent African inclusive development literature (Asongu, Efobi, and Beecroft 2015; Asongu and Nwachukwu 2016b). The IHDI is a human development index (HDI) that is adjusted for the prevalence of inequality. The HDI represents the national average of rewards in three areas, notably: (i) knowledge; (ii) decent standards of living and (iii) long life and health. The IHDI adjusts the HDI for inequality by accounting for the distribution of the three underlying rewards across the population.

Seven main control variables are adopted in the conditioning information set, notably: four non-dummy and three dummy variables. The non-dummy variables are remittances, foreign direct investment (FDI) inflows, foreign aid and internet penetration, while the dummy variables are low income, English common law and political stability within the framework of conflict-affected countries. The dummy variables are expected to increase the quality of primary education. As for the non-dummy variables, it is anticipated that: (i) low income countries are positively associated with poor education quality compared to their high income counterparts; (ii) English common law countries are negatively linked with poor education quality compared to their French civil law counterparts and (iii) sustained conflicts and political strife can decrease the capacity of governments to deliver quality primary education to the population. The dummy variables are consistent with recent inclusive development literature (Mlachila, Tapsoba, and Tapsoba 2017; Asongu and le Roux 2017) and arguments for their expected signs are as follows.

First, low income countries naturally have fewer resources with which to address the education quality needs of the population. This is essentially because financial resources are needed to recruit and pay more workers in order to decrease the "pupil-teacher ratio". Second, English common law countries in Africa have been established to be more associated with higher human development (Asongu and Nwachukwu 2018c), especially in terms of education (Agbor 2015) when compared with their French civil law counterparts. The segmentation by legal origin is from La Porta, Lopez-de-Silanes, and Shleifer (2008: 289) while the categorisation of nations by income levels is in line with the World Bank's classification of income groups[2]. Consistent with Asongu, Nwachukwu, and Pyke (2019), politically-unstable countries represent those that have witnessed significant political strife, violence and instability for at least half of the investigated periodicity.

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[2] 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.

As concerns the non-dummy variables, they have been documented to enhance conditions for economic prosperity that are relevant for the improvement of general wellbeing, including education (Gyimah-Brempong and Asiedu 2015; Sun and He 2014; Asongu and Tchamyou 2017; Tchamyou 2017). For instance: (i) Gyimah-Brempong and Asiedu (2015) have established that remittances positively affect education and human capital formation; (ii) Sun and He (2014) have concluded that foreign direct investment promotes human capital; (iii) foreign aid has also been documented to promote primary education and lifelong learning in Africa (Asongu and Tchamyou 2017) and (iv) information and communication technology is a fundamental driver of knowledge economy and learning in Africa (Tchamyou 2017). 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.

Methodology

Three estimation techniques are adopted in order to control for various heterogeneity in the data, notably: (i) baseline Ordinary Least Squares (OLS) with control for some common time invariant variables; (ii) Fixed effects (FE) to control for country-specific heterogeneity and (iii) Quantile regressions to control for initial levels of poor quality education and time invariant variables which further account for the unobserved heterogeneity. The use of a multitude of estimation strategies in order increase the robustness of the findings is consistent with recent literature (Asongu, Nwachukwu, and Aziz 2018).

Ordinary Least Squares and Fixed Effects regressions

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

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

where $Ed_{i,t}$ is the education quality of country i in period t; α is a constant, W is the vector of determinants which include inclusive human development and the seven control variables (remittances, FDI inflows, foreign aid, internet, low income, English common law and conflicts) and $\varepsilon_{i,t}$ is the error term.

The corresponding panel fixed effects specification is as follows:

$$Ed_{i,t} = \partial + \sum_{j=1}^{8} \theta_j W_{j,i,t} + \eta_i + \varepsilon_{i,t} \qquad (2)$$

where $Ed_{i,t}$ is the education quality of country i in period t; ∂ is a constant, W is the vector of determinants which include inclusive human development and the seven control variables (remittances, FDI inflows, foreign aid, internet, low income, English common law and conflicts), η_i is the country-specific effects and $\varepsilon_{i,t}$ is the error term. Eq (2) is based on HAC standard errors with control for country-specific effects.

Quantile regressions

The previous estimation approaches are based on mean values of education quality. Whereas such mean values are relevant for policy implications, they nonetheless motivate blanket policies that could not be totally effective when education quality varies from one country to another. In order to address the concern of cross-country differences in education quality, the study complements the approaches based on mean values with Quantile regressions (QR).

Consistent with the attendant literature (Koenker and Bassett 1978; Tchamyou and Asongu 2018; Asongu and Odhiambo 2019), the QR approach accounts for existing levels of

education quality by clearly articulating countries with low, intermediate and high levels of education quality. Accordingly, this QR is used in empirical literature in order to improve the policy relevance of estimations based on means values of the outcome variable (Okada and Samreth 2012; Asongu 2013). Furthermore, in accordance with Hao and Naiman (2007) and Koenker (2005), the QR technique is different from the linear regressions from a multitude of angles, notably, it: (i) determines conditional quantiles (versus conditional mean); is based on sufficient data (versus an OLS technique which can be used on small data); follows an agnostic distribution (versus the normality assumption); 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).

The θth quantile estimator of education quality is obtained by solving for the following optimization problem, which is presented without subscripts in Eq. (3) for the purpose of simplicity and readability.

$$\min_{\beta \in R^k}\left[\sum_{i \in \{i:y_i \geq x_i'\beta\}} \theta |y_i - x_i'\beta| + \sum_{i \in \{i:y_i < x_i'\beta\}} (1-\theta)|y_i - x_i'\beta|\right], \tag{3}$$

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 25th or 75th quantiles (with θ=0.25 or 0.75, respectively) are estimated by approximately weighing the residuals. The conditional quantile of education quality or y_i given x_i is:

$$Q_y(\theta / x_i) = x_i'\beta_\theta , \tag{4}$$

where unique slope parameters are estimated for each θth 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 education quality. For Eq. (4), the dependent variable

y_i is education quality whereas x_i contains: a constant term, inclusive human development, remittances, FDI inflows, foreign aid, internet, low income, English common law and conflicts.

In the light of the above, separate regression equations for the QR and OLS for the research question being investigated are as follows.

$$Ed_{i,t} = \sigma_0 + \sigma_1 X_{i,t} + \varepsilon_{i,t} \tag{5}$$

$$Ed_{i,t} = \sigma_0^{(p)} + \sigma_1^{(p)} \sigma_1 X_{i,t} + \varepsilon_{i,t}^{(p)} \tag{6}$$

The OLS and QR respectively in Equation (5) and Equation (6) above focus on the role of inclusive human development on education quality, where, $Ed_{i,t}$ is education quality for country i in period t, σ_0 is a constant, X entails inclusive human development and other control variables (remittances, FDI inflows, foreign aid, internet, low income, English common law and conflicts), and $\varepsilon_{i,t}$ is the error term.

Empirical results

This section presents the empirical findings. While Table 1 presents OLS and FE results, Table 2 discloses the findings of QR. The specifications in Table 1 are such that variables in the conditioning information set are increased from the left-hand side to the right-hand side. Hence, the first specifications pertaining to the OLS and FE regressions are univariate. It is apparent from the findings that inclusive human development has a negative effect on the outcome variable. This negative effect implies that inclusive human development improves education quality. This finding is consistent across specifications and the involvement of more variables in the conditioning information set. When interpreting the findings, it is relevant to note that education quality is a negative economic signal because increasing levels denote diminishing levels of education quality. As clarified in the data

section, this is essentially because an increasing ratio of the outcome variable or number of "pupils per teacher" reflects a decreasing ability of teachers to allocate more time for imparting knowledge to their pupils.

Most of the significant control variables have the expected signs. Accordingly, the significant non-dummy variables have expected negative signs, which imply that they increase education quality. As for the dummy variables, the only significant estimate (i.e. low income countries) has the expected positive sign because compared to high income countries, low income countries are associated with lower levels of education quality.

Table 1: Ordinary Least and Fixed Effects Regressions

	Dependent variable: Poor Education Quality (Pupil teacher ratio in primary education)									
	Ordinary Least Squares (OLS) Regressions					Fixed Effects (FE) Regressions				
Constant	79.609*** (0.000)	74.897*** (0.000)	76.483*** (0.000)	67.569*** (0.000)	65.790*** (0.000)	59.480*** (0.000)	58.656*** (0.000)	57.183*** (0.000)	56.989*** (0.000)	54.4281*** (0.000)
IHDI	-76.091*** (0.000)	-66.727*** (0.000)	-67.035*** (0.000)	-45.268*** (0.000)	-45.907*** (0.000)	-30.973*** (0.002)	-35.188*** (0.001)	-31.011*** (0.004)	-30.7579*** (0.005)	-23.502* (0.063)
Remittances	---	-0.164** (0.014)	-0.134** (0.022)	-0.133** (0.018)	-0.159*** (0.008)	---	0.270*** (0.001)	0.285*** (0.000)	0.290*** (0.000)	0.285*** (0.000)
FDI Inflows	---	---	-0.329*** (0.001)	-0.297*** (0.004)	-0.280*** (0.009)	---	---	-0.091 0.070)	-0.098* (0.060)	-0.108** (0.045)
Foreign Aid	---	---	---	0.077 (0.548)	0.080 (0.530)	---	---	---	0.012 (0.694)	0.007 (0.825)
Internet	---	---	---	-0.044*** (0.000)	-0.042*** (0.000)	---	---	---	---	-0.012 (0.134)
Low Income	---	---	---	---	3.261** (0.011)	---	---	---	---	---
English	---	---	---	---	0.121 (0.926)	---	---	---	---	---
Conflicts	---	---	---	---	-0.418 (0.832)	---	---	---	---	---
R²	0.282	0.283	0.314	0.344	0.358	---	---	---	---	---
Within R²	---	---	---	---	---	0.031	0.080	0.092	0.094	0.113
Fisher	161.09***	69.56***	50.60***	68.22***	48.66***	9.65***	11.02***	8.46***	6.45***	6.20***
Observations	346	292	290	283	283	346	292	290	288	283

*, **, ***: significance levels of 10%, 5% and 1%, respectively. OLS: Ordinary Least Squares. R² for OLS and Within R² for FE regressions. IHDI: Inequality-Adjusted Human Development. FDI: Foreign Direct investment. Low income: Low income countries. English: English common law countries. Conflict: Conflict-affected countries.

In Table 2, the QR results show estimates with and without fixed dummy effects on the right-hand side and left-hand side, respectively. In the interpretation of the results, it is relevant to note that the lowest quantile (i.e. Q.10) indicates countries where poor education quality is least while the highest quantile (i.e. Q.90) denotes countries where poor education quality is highest. From the findings, with the exception of the highest quantile in which the effect of inclusive human development is not significant, the established negative effect of inclusive human development on poor education quality is consistent throughout the

conditional distribution of inclusive human development. The fact that the effect in the highest quantile is not significantly negative is an indication that in countries where poor education quality is highest, inclusive human development is a necessary but not a sufficient condition for reducing poor education quality. Most of the significant control variables have the expected signs.

Table 2: Quantile Regressions

	Dependent variable: Poor Education Quality (Pupil teacher ratio in primary education)									
	Quantile Regressions without Fixed Effects					Quantile Regressions with Fixed Effects				
	Q.10	Q.25	Q.50	Q.75	Q.90	Q.10	Q.25	Q.50	Q.75	Q.90
Constant	53.668***	56.115***	63.368***	68.201***	58.671***	54.452***	61.097***	62.660***	70.036***	47.968***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
IHDI	-42.974***	-41.552***	-47.125***	-49.777***	-3.608	-41.775***	-49.843***	-53.821***	-47.574***	4.583
	(0.000)	(0.000)	(0.000)	(0.003)	(0.856)	(0.000)	(0.000)	(0.000)	(0.006)	(0.788)
Remittances	0.078**	0.057	-0.013	-0.047	-0.222	0.046	0.045	-0.046	-0.101	-0.230*
	(0.044)	(0.433)	(0.876)	(0.709)	(0.148)	(0.310)	(0.478)	(0.592)	(0.456)	(0.090)
FDI Inflows	-0.123**	-0.455***	-0.442***	-0.141	0.106	-0.068	-0.247***	-0.345***	-0.180	-0.005
	(0.033)	(0.000)	(0.001)	(0.449)	(0.638)	(0.310)	(0.009)	(0.007)	(0.362)	(0.977)
Foreign aid	-0.057*	0.158***	0.400***	0.654***	0.623***	-0.060*	-0.047	0.299***	0.483***	0.841***
	(0.074)	(0.009)	(0.000)	(0.000)	(0.000)	(0.099)	(0.357)	(0.000)	(0.000)	(0.000)
Internet penetration	-0.018**	-0.021	-0.034**	-0.033	-0.102***	-0.023***	-0.020*	-0.020	-0.044*	-0.090***
	(0.015)	(0.134)	(0.039)	(0.168)	(0.001)	(0.009)	(0.093)	(0.219)	(0.083)	(0.001)
Low Income	---	---	---	---	---	0.937	1.403	3.801**	0.430	9.003***
						(0.303)	(0.268)	(0.026)	(0.872)	(0.001)
English	---	---	---	---	---	-2.095**	-2.357*	0.862	1.660	-2.300
						(0.020)	(0.059)	(0.607)	(0.528)	(0.380)
Conflicts	---	---	---	---	---	-3.649***	3.144*	2.034	-3.189	3.081
						(0.002)	(0.054)	(0.353)	(0.353)	(0.368)
Pseudo R^2	0.377	0.300	0.241	0.196	0.187	0.400	0.324	0.255	0.205	0.223
Observations	283	283	283	283	283	283	283	283	283	283

*, **, ***: significance levels of 10%, 5% and 1%, respectively. OLS: Ordinary Least Squares. IHDI: Inequality-Adjusted Human Development. FDI: Foreign Direct investment. Lower quantiles (e.g., Q 0.1) signify nations where poor educational quality is least. Low income: Low income countries. English: English common law countries. Conflict: Conflict-affected countries.

In the light of the above findings, it is relevant to note that if inclusive human development can boost the equality of education, it is also logical to infer that the absence of poor quality education is the consequence of the pupil/teacher ratio that is tied to both enrolment and educational resources. Moreover, by extension poor education may also be affected by non-inclusive economic growth. This is essentially because of the evidence of growing exclusive development in the sub-region. On the one hand, approximately half of countries in SSA did not attain the MDG extreme poverty target (Asongu and le Roux 2018). On the other hand, the fact that most countries in the sub-region have a majority of the population still living in extreme poverty is startling because SSA has been enjoying more than two decades of growth

resurgence (Fosu 2015; Tchamyou 2019b; Tchamyou, Erreygers, and Cassimon 2019). Hence, the growing exclusive development in spite of the growth resurgence is evidence that the fruits of economic prosperity are not equitably distributed across the population for *inter alia*: health, social and educational needs.

Conclusion and future research directions

This study has examined the importance of inclusive human development in promoting education quality in a panel of forty-nine Sub-Saharan African countries for the period 2000-2012. The empirical evidence is based on Ordinary Least Squares (OLS), Fixed Effects (FE) and Quantile Regression (QR) estimations. It is apparent from the OLS and FE findings that inclusive human development has a negative effect on the outcome variable. This negative effect implies that inclusive human development improves educational quality. This result should be understood in the light of the fact that the adopted education variable is a negative economic signal given that it is computed as the ratio of pupils to teachers. Therefore, a higher ratio reflects diminishing education quality. From QR, with the exception of the highest quantile, the tendency of inclusive human development in reducing poor quality education is consistent throughout conditional distribution of poor education quality.

The results have implications for challenges to SDGs, the relevance of government effectiveness in quality education and importance of holistic policies that promote quality education in both private and public schools. Accordingly, government effectiveness is essential in promoting quality education. In essence, government effectiveness according to Andrés, Asongu, and Amavilah (2015) is understood as the formulation and implementation of policies that deliver public commodities which include quality primary education (or the accommodation of more pupils by fewer teachers). This is consistent with a recent Global Education Monitoring (GEM) report which has concluded that regulations and standards in

SSA need to be enhanced in order to provide more quality private and public education in the sub-region (Antoninis 2017). The absence of effective standards has led to low learning outcomes and challenges for teachers. According to the World Bank report, most countries in the sub-region lack standards to promote early children education as well as monitoring and enforcing mechanisms of existing standards. Our findings complement the recommendations of the report from the perspective that the formulation and implementation of such standards should clearly articulate the relevance of inclusive human development in quality education.

This research further argues that sending children to private schools may not solve the issue, because private schools are largely meant for wealthy families and in the long term, if only wealthy children are better educated, it may further exacerbate exclusive development which will further increase poor education quality. For instance, it is anticipated by the World Bank report that by 2021, about 25% of primary school age pupils in SSA will prefer private academic institutions, which is up from approximately 13.5% in 2015 (Antoninis 2017). According to the narrative, the functioning of these private schools is not an indication that the SDG 4 for global quality education will be achieved. Our findings propose that a more general policy of education, driven by inclusive human development or "human development for all", will go a long way to giving both the poor and rich, in private and public schools alike, the quality of education needed to address other economic development challenges of the sub-region.

Future studies can focus on assessing country-specific cases in order to improve room for more targeted policy implications. Accordingly, as more data become available, time series estimations can be considered within the framework of the Autoregressive Distributed Lag (ADL) Model. Moreover, given the SDG challenges in SSA, considering other indicators of inclusive development (such as gender equality) within the empirical framework is worthwhile. Some examples of gender equality indicators from the International Labour

Organization are, the: female labour force participation, female unemployment and female employment rates. A notable caveat to the study is that "education quality" is a multidimensional concept and hence, other metrics should be considered in future studies, notably: access to food nutrition, health care, transportation and teacher preparation. These alternative metrics are available in World Development Indicators of the World Bank.

Related Resources

The World Bank

The World Bank provides information on World Development Indicators. Research and Statistics as well as policy and guidance are also provided by the multilateral development institution. For more information, see https://datacatalog.worldbank.org/dataset/world-development-indicators

The United Nations

The United Nations Development Program also provides statistics and policy guidance on poverty and multidimensional human development indicators. For more on the inequality adjusted human development index used to proxy for inclusive human development, see http://hdr.undp.org/en/content/inequality-adjusted-hdi

The International Labour Organization

The concluding section of the study has suggested other areas for future research. Information on the suggested gender economic inclusion variables are provided by the International Labour Organization, see https://www.ilo.org/global/statistics-and-databases/lang--en/index.htm

Declaration of Conflicting Interests

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Appendices

Appendix 1: Definitions and sources of variables

Variables	Signs	Definitions	Sources
Education Quality	Educ	Pupil teacher ratio in primary education	WDI
Inclusive development	IHDI	Inequality-adjusted human development index	UNDP
Remittances	Remit	Remittances inflows (% of GDP)	WDI
Foreign Investment	FDI	Foreign Direct Investment Inflows (% of GDP)	WDI
Foreign aid	NODA	Net Official Development Assistance (% of GDP)	WDI
Internet penetration	Internet	Internet subscriptions (per 1000 people)	WDI

UNDP: United Nations Development Program. WDI: World Development 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
Inclusive development	0.445	0.115	0.129	0.768	482
Remittances	3.977	8.031	0.000	64.100	434
Net Foreign Direct Investment Inflows	5.332	8.737	-6.043	91.007	603
Foreign aid	11.687	14.193	-0.253	181.187	606
Internet penetration	41.528	64.506	0.059	436.051	566

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

Appendix 3: Correlation Matrix (Uniform sample size: 283)

Edu	IHDI	Remit	FDI	NODA	Internet	IHDI
1.000	-0.533	-0.101	-0.151	0.216	-0.479	Edu
	1.000	-0.017	-0.002	-0.404	0.677	IHDI
		1.000	0.126	-0.057	-0.047	Remit
			1.000	0.343	0.069	FDI
				1.000	-0.186	NODA
					1.000	Internet

Edu : Education quality. IHDI: Inequality-Adjusted Human Development Index. Remit: Remittances.
FDI: Foreign Direct Investment. NODA: Net Official Development Assistance.