Institutional Quality and Education Quality in Developing Countries: Effects and Transmission Channels

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Abstract

The main objective of this study is to analyze the effect of institutional quality on education quality in developing countries. The literature review explores the channels through which institutional quality transits to affect education quality. The empirical analyses cover a sample of 82 developing countries. The main results obtained using ordinary least squares and two-stage least squares estimators show that institutional quality has a positive effect on student achievement and school completion, and a negative effect on educational failure. Concerning the role of transmission channels, the results show that a deterioration in institutional quality, characterized in particular by the presence of corruption, political instability, or the deterioration of government effectiveness, reduces the effectiveness of public spending on education and the quality of teaching through unethical behavior of teachers and the recruitment of untrained or less trained persons to carry out teaching tasks.

Keywords Education quality · Institutional quality · Public spending · Quality of teaching · Primary education

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Introduction

The positioning of this research on the effect of institutional quality on education quality in developing countries is motivated by three main reasons: the need to improve education quality in developing countries, the importance of institutional quality in educational outcomes, and the literature gap on the effect of institutional quality on education quality.

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Firstly, education is a fundamental tool for development, and its importance is perceived at both the individual and global levels. At the individual level, it is generally demonstrated that people with a good education are less likely to live in poverty (Hannum & Buchmann, 2005) and have more autonomy and good decision-making capacity (Sen, 1999). At the global level, research emphasizes that education is positively associated with innovation, human and technological development, and higher economic growth (Danquah & Amankwah-Amoah, 2017; Pelinescu, 2015). In this framework, Nelson and Phelps (1966) assume that if a country devotes more resources to education and thus increases its human capital stock, this will increase the growth rate of the economy. Azariadis and Drazen (1990) follow the same line by highlighting the importance of education for economic development. They argue that if developed countries are ahead in economic growth and development, it is because successive generations have made large investments in human capital.

However, education indicators show that developing countries have low scores. According to UNESCO (2015), the primary net enrolment rate which is about 78% in Sub-Saharan Africa and 87% in the Arab countries is below the world average (90%). Asian countries have on average a net enrolment rate estimated at 94%. As for the transition rate from one cycle to another, it remains low, while the dropout and repetition rates remain high despite the improvements recorded since 2000 (UNESCO, 2015). While the quantitative aspect of education remains a challenge, it is increasingly recognized that children can go to school and out of school without acquiring sufficient knowledge. The high rates of illiteracy and school dropout in developing countries raise the issue of the quality of education. The observation is that school attendance does not guarantee better human capital formation, as many students complete their schooling without having the knowledge and skills prescribed in the curriculum (Michaelowa, 2001; Raymond, 1968). A study carried out by the Educational Systems Analysis Program of the Conference of Ministers of Education of Countries using French as a Common Language (PASEC) in ten African countries in 2014 on students' achievement in French and mathematics shows that at the end of the primary cycle, nearly 60% of students have not reached the sufficient threshold of skills required in these two subjects. The poorest performances are recorded in Chad and Niger, while Senegal, Burkina Faso, Burundi, Benin, Cameroon, and Côte d'Ivoire perform better in terms of required skills.

Secondly, the role of institutional quality is still widely explored. A substantial literature argues that good institutions create an enabling environment for economic, political, social, and cultural development, while poor institutions generally hinder development (Butkiewicz & Yanikkaya, 2006; Glaeser et al., 2004). In recent decades, many developing countries have experienced enormous problems related to the quality of their institutions, which have not fostered their substantial development. Among these problems are political instability, corruption, and deterioration of government effectiveness. With regard to political instability, there are still, to date, countries in situations of civil war, armed conflict, etc. However, social or military unrest reduces the possibility of a country's development (Aisen & Veiga, 2013; Roe & Siegel, 2011). In addition to instability, several developing countries are threatened by corruption, whose harmful effects on development have been the subject of an abundant literature. Cieślik and Goczek

(2018) and Tanzi and Davoodi (1998) argue that corruption is an obstacle to development by retarding growth and investment. Corruption affects all sectors and layers of the economy and is one of the main causes of Africa's development gap (Reinikka & Svensson, 2006). In addition to these aspects, developing countries still need to make a lot of progress to improve their institutional quality. On average, they have the lowest performances on indicators of institutional quality. For example, in the area of government effectiveness, statistics from Worldwide Governance Indicators show that less than 50% of developing countries register a positive score on the government effectiveness index each year. A similar trend is observed with other indicators of institutional quality, notably voice and accountability, rule of law, and regulatory quality. Given this situation, it is possible that institutional quality can affect education quality in developing countries.

Thirdly, an important literature has been developed on the factors that explain education quality and the studies distinguish three groups of factors, namely factors related to the education system, factors related to the socio-economic environment of learners, and institutional factors. With regard to factors related to the education system, Raymond (1968) analyzes a set of elements that affect the quality of education. These are teachers' salaries (1), the number of students per teacher (2), the percentage of teachers who teach in more than one subject area (3), the number of library books exceeding the norm (4), and adjusted current expenditure per student (5). Increases in factors 1, 4, and 5 contribute to improving education quality while increases in factors 2 and 3 negatively affect education quality. After Raymond (1968), several authors have focused on the problematic of the education quality. Hanushek and Rivkin (2007) point out that the best way to improve education quality would be to reduce barriers to teachers' careers and to link remuneration and professional advancement more closely to teachers' ability to improve students' performance. Bourdon and Nkengne (2007) emphasize the competence of teachers by highlighting that the shortage of trained teachers in developing countries regularly leads to the recruitment of untrained or poorly trained individuals who serve as education volunteers, temporary teachers, or parent teachers. Other researchers have focused on class size and interaction between teachers and students as an important aspect of good education and school success (Koc & Celik, 2015; Lavy, 2002). When the number of students per teacher is low, the teacher can spend more time with each student, monitor each student's progress, and provide more individualized teachings (Angrist & Lavy, 1999; Case & Deaton, 1999). Other authors point out that pedagogy (Walstad & Becker, 2010) and teacher absenteeism (Kremer et al., 2005; Miller et al., 2008) affect education quality. Recently, the impact of COVID-19 and response measures has revealed many challenges that must be addressed in schools in developing countries. In order to minimize the infection of the COVID-19, social distance and other efforts have been implemented. To keep schools open, many schools around the world have switched to online teaching. But this practice has not been as successful as expected in schools in developing countries due to the lack of an online teaching culture in many schools, the lack of qualified teachers to deliver online

courses, and the lack of appropriate facilities for online teaching for both teachers and students.

Factors related to the socio-economic environment of students justify the impact of the family environment on students' educational performance. Indeed, each student comes to school with a background, relative to his family environment, which influences his aptitudes (language, reasoning, etc.) and attitudes (motivation and others) necessary for school learning. These are the mother tongue, parents' average income, their level of education, and their professional activity (Davis-Kean, 2005; Ferreira et al., 2011). For example, an educated parent is better placed to assess the investment in human capital that will increase his or her child's future income level (Ludeke et al., 2021). In addition, in many developing countries, students are taught in a language that is not their mother tongue. This phenomenon is due to the fact that many of these countries were colonies of developed countries and their education systems inherit that of the settler country (Glewwe & Kremer, 2006).

Regarding institutional factors, the authors explain that education quality depends on the quality of institutions. The latter can affect the inputs of education, the education system, or even the education process. Gallego (2010) argues that public spending on education is explained by political participation. Other authors such as Sokoloff and Engerman (2000) and Inman and Rubinfeld (1997) have analyzed the role of decentralization on the supply of social services such as education. Mingat and Tan (1998) highlight the significant role of institutional quality on the determinants of education quality and argue that African education systems suffer not so much from a lack of resources as from their misuse.

The previous literature, although extensive and important, does not provide sufficient evidence to improve education quality in developing countries. The present study follows the studies that examine the role of institutional quality on education quality. But it differs for at least two reasons: first, previous studies have often focused on only one, or two, dimension of institutional quality. Taking into account a larger set of dimensions could help to better explain the role of institutional quality on education quality. Second, this study focuses on transmission channels in order to highlight the direct and indirect effects of institutional quality on education quality. This analysis of transmission channels is a major contribution of this research because, to the best of our knowledge, no study has yet empirically analyzed the mediating factors of the effect of institutional quality on education quality. Taking these orientations into account, this study provides answers to the following questions: what is the effect of institutional quality on education quality in developing countries? What are the channels through which institutional quality affects education quality in developing countries?

After this introduction, the rest of the paper is organized as follows: "Institutional Quality and Quality Education: Literature Review" presents the literature review. "Data and Methodology" shows the methodology of the empirical analysis. "Empirical results" discusses the results of the analysis, and "Conclusion" concludes the paper with a focus on policy recommendations.

Institutional Quality and Quality Education: Literature Review

This section has three points. The first two points explain how institutional quality can affect education quality. These are the presentation of the direct effect that institutional quality can have on education quality on the one hand, and the channels through which the effects of institutional quality on education quality can be transmitted on the other. The third point is devoted to explaining the concept of education quality.

Direct Effect of Institutional Quality on Quality Education

The quality of institutions can have direct effects on education quality. The literature points out that corruption, which is one of the dimensions of institutional quality, reduces the value of diplomas from the education system considered corrupt. Its effect can be seen in the production and distribution of textbooks, the organization of examinations, the recruitment of teachers, and the awarding of scholarships. Gupta et al. (2001) analyze the effect of corruption on the provision of public education services from a panel of 128 developed and developing countries. They find that indicators of educational progress, such as expulsion rates, failure rates in primary school, and illiteracy rates, are positively and significantly correlated with the level of corruption. In addition to corruption, political instability disrupts the functioning of school activities (Nir & Kafle, 2013). It is likely to lead to the destruction of school infrastructure, the closure of schools, large population displacements, and the deprivation of students from enrolling in school. The United Nations reports that the proportion of out-of-school children in conflict-affected countries has increased from 30 in 1999 to 36% in 2012 (United Nations, 2015).

Based on the previous literature, the first hypothesis of this study is formulated as follows: "Improving institutional quality has a positive effect on education quality."

Institutional Quality and Education Quality: the Role of Transmissions Channel

Previous literature allows to identify two channels through which institutional quality can transit to affect education quality. These are public spending on education and the quality of teaching.

The first channel concerns public spending on education. In fact, public spending on education plays an important role in the quality and quantity of education by promoting the supply of educational inputs, i.e., the construction of schools, the recruitment and training of teachers, and the provision of teaching and learning materials to schools. However, the volume and productivity of this public spending on education can be affected by institutional quality. Gallego (2010) analyzes the role of democracy and political decentralization on educational outcomes and shows that the degree of democratization has a positive effect on the development of primary education, while political decentralization has a positive and significant impact on more advanced levels of schooling. Sokoloff and Engerman (2000)

and Inman and Rubinfeld (1997) point out that less centralized governments tend to provide their populations with better quality education. However, this idea is not entirely shared by other researchers who argue that decentralization can create inefficient educational provision in the absence of checks and balances at the local level, as it may allow local elites to concentrate power in their hands and block the provision of public goods or channel spending to their members or supporters (Bardhan, 2002; Gennaioli & Rainer, 2007; Kremer et al., 2003).

Another important literature has focused on the impact of corruption on public spending on education (Mauro, 1995; Rajkumar & Swaroop, 2008). Mauro (1995) analyzes the relationship between corruption and the components of public spending in 100 countries and shows that the rate of public spending on education is negatively and significantly correlated with the corruption index. Reinikka and Ablo (1998) assert that in the presence of corruption, a government can devote a very large share of its budget to education without good performance. Rajkumar and Swaroop (2008) show from a sample of 57 countries that governance, as measured by the level of corruption and the quality of bureaucracy, undermines the effect of public spending on educational outcomes. Corruption reduces the performance of education spending and neutralizes its impact on educational outcomes.

The second channel through which institutional quality can affect education quality is the quality of teaching. Achieving Education for All or any other policy aimed at increasing access to education, improving its quality, or reducing school inequalities will not be effective if it does not take into account problems such as teacher absenteeism, information leaks before exams, abuse of the teacher-student relationship for private purposes, and embezzlement of school funds. Unethical behavior by teachers is an impediment to improving education quality (Chaudhury et al., 2006; Duflo et al., 2011). Indeed, such practices are frequent when the appointment, assignment, and promotion of teachers are based more on subjective practices (corruption, favoritism, nepotism, political clientelism, etc.) than on the needs for personnel, qualification, or performance of individuals. As a result, the quality of education is suffering. In the same framework, the World Bank (2010) and Reinikka and Svensson (2006) pointed out that one of the main causes of Africa's lag is the poor quality of service delivery resulting from covert corruption.

In addition to the problem of the quality of education generated by the unethical behavior of teachers, the importance of institutional quality on educational outcomes continues to provoke reflection. Several works argue that education quality in a country refers to certain characteristics of teachers because a quality education is first and foremost conducted by teachers with a good academic background, good training, good professional experience, and well paid (Goldhaber & Brewer, 2016; Summers & Wolfe, 1977). The goal of universal primary education, initiated by donors to solve the problem of the high rate of children of official school age who are not in school, has forced several developing countries to put in place new education policies. Achieving this objective has certainly required a sufficient increase in the number of teachers, but also of a certain quality. Thus, because of the importance of the share of teacher salaries in the national budget, African countries in particular have implemented policies aimed at lowering teacher salary costs by reducing initial training requirements and/or developing recruitment programs outside the

civil service. These policies have led to a profound change in the composition and structure of the teaching force, to the extent that these new teachers (less trained/untrained, poorly paid) are now in the majority in many countries. The coexistence of teachers' different statuses in terms of salary and training is responsible for the better school coverage observed in recent years in most developing countries, but contested by some for its misdeeds.

On the basis of the previous literature, the second hypothesis of this research is formulated as follows: public spending on education and the quality of teaching are the mediators of the effect of institutional quality on education quality.

Education Quality: a Concept with Several Dimensions

Although the authors agree that a good quality of education is essential for a country's development, there is not yet a consensus on the definition and measurement of education quality. Coombs (1985) points out that "the quality dimension means much more than education quality as it is usually defined and judged by student performance in traditional terms of curriculum and standards. Education quality also depends on the relevance of what is taught and learned and how this meets the current and future needs of the students concerned, taking into account their particular circumstances and perspectives. It also refers to significant changes in the education system itself, the nature of its inputs (students, teachers, infrastructure, equipment and materials), its objectives, educational and curriculum technologies; and its socio-economic, cultural and political environment." Education quality is as difficult to define as it is to measure. An adequate definition must take into account the results obtained by students. These include a satisfactory level of student achievement in relation to learning goals, low disparities in student achievement, and high completion rates. According to Samoff (2007), an education system is of good quality when the students in it have relatively high scores on standardized acquisition tests. For other authors, quality depends on the importance of the financial and human resources mobilized (well-trained teachers, limited class sizes, abundance of appropriate equipment and materials, etc.). In other words, the higher the resources, the higher the quality of the education system (Belmonte et al., 2020).

In summary, most definitions highlight three axes of analysis of education quality which are educational inputs, the education process, and educational outcomes. Each factor of the input-process-output model allows to assess education quality. However, authors such as Lockheed and Hanushek (1988), Mortimore and Stone (1991), and Stephens (1991) argue that an important indicator of education quality is the value added by schooling, i.e., the measurement of outcomes. This present study follows the definitions related to educational outcomes. These outcomes can firstly be those obtained in the classroom (school evaluation), but also in harmonized tests at the local or national level, such as official competitions and exams where all students in a locality or country are submitted to the same tests. But this measure has limitations because there may be political interference in the admission criteria and organizational problems which may be, for example, the leakage of tests and the level of the tests which may not always reflect the curriculum of the

class level. Secondly, it can also be the international standard tests (Altinok et al., 2014; Michaelowa, 2001). The advantage of international standard tests is that they are organized on the basis of the curricula and allow comparisons of student levels between countries. These tests have now become a compass for education policies in developing and even developed countries (Altinok et al., 2014). The limitation of these tests is that they very often consider students who are enrolled and ignore children of school age who do not go to school. These indicators can be completed by others such as the primary school completion rate.

Several researchers have used educational attainment as educational outcomes (Barro & Lee, 2001). The value added of this indicator is that students who receive a good education are more likely to stay in school. Rajkumar and Swaroop (2008) use the school failure rates as a proxy for educational attainment to measure education outcomes. Michaelowa (2001) uses students' scores on international tests of skills and knowledge to measure education quality. In order to have a broader analysis of education quality, this work adopts students' scores on international tests of skills and knowledge, school completion, and school failure as indicators to measure education quality.

Data and Methodology

Data and Descriptive Statistics

The data used in this study covers a sample of 82 developing countries. These data are taken from the World Bank databases, from the UNESCO databases, and from the datasets of LaPorta et al. (1999), Ashraf and Galor (2013), and Altinok et al. (2014). The number of countries is determined by the availability of data. Table 11 in Appendix 1 presents the definition and specific source of each variable. In reference to Easterly (2007) and Churchill and Smyth (2017), institutional quality is measured by the average of six governance quality indicators, which are control of corruption, voice and accountability, rule of law, government effectiveness, regulatory quality, and political stability. Several variables from the UNESCO data have important missing observations over time. Therefore, each variable is measured by the average of its observations for the 2000–2017 period.

Table 1 presents the results of the descriptive statistic. The average students' scores on the harmonized test of skills and knowledge are 394 for all developing countries in the sample and ranges from 305 to 537. According to the methodology used to collect data on this variable, the minimum score is 300 and the maximum score is 625. Thus, the average score in developing countries is closer to the minimum score. In addition to this indicator for measuring educational quality, school failure, as measured by the repetition rates in primary school, has an average value of 8.21%. The primary completion rate is 69.87%. With regard to educational inputs, Table 1 shows that the average share of public spending in GDP devoted to primary education is 1.62% and the percentage of trained teachers is 82.81.

In comparative terms, Sub-Saharan Africa (SSA) has the lowest educational performance despite the fact that the proportion of public spending devoted to primary

Table 1 Descriptive statistics

Variable	Developing countries			Sub-Saharan Africa			Others developing countries		
	Obs	Mean	Std. Dev	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
Literacy	82	72.379	24.007	37	56.722	23.320	45	85.251	15.507
Achievement	74	69.873	24.230	34	50.288	18.958	40	86.521	13.273
School failure	79	8.219	7.455	35	13.186	7.924	44	4.268	3.889
GDP per capita	82	8711.3	12780	37	3942.2	4639	45	12632.5	15754.9
Income inequality	78	41.997	7.526	37	44.162	6.924	41	40.043	7.593
Institutional quality	82	−0.453	0.531	37	−0.590	0.572	45	−0.340	0.473
Public expenditure	81	1.615	0.714	37	1.843	0.826	44	1.424	0.543
Harmonized test scores	78	394.04	49.998	36	371.750	43.482	42	413.143	47.651
Students-teacher ratio	80	45.099	32.281	37	62.921	36.940	43	29.764	16.428
Trained teachers	75	82.819	17.360	35	77.754	19.391	40	87.251	14.173
Urbanization	82	47.617	21.081	37	38.217	16.828	45	55.346	21.237

Obs. means observations and *Std. Dev.* means standard deviation

Source: authors' calculations

education is higher in this context compared to other developing countries (Table 1). Similarly, institutional quality is lower in Sub-Saharan Africa than the average for developing countries as a whole. In analyzing the effect of corruption on the efficiency of public spending on education, Reinikka and Ablo (1998) argue that in the presence of corruption, a government can devote a very large share of its budget to education without good performance. Table 1 also shows that the proportion of trained teachers in primary schools is lower in SSA countries than in other developing countries.

Correlation analysis indicates a positive and significant correlation between public spending on education and the students' scores on the international test of skills and knowledge (Table 2). A correlation between public spending on education and school completion rate is positive but non-significant. It is also observed that the correlation between public spending on education and school failure is negative and significant. The analysis of the correlation between the proportion of trained teachers and indicators of education quality on the one hand, and between the quality of

Table 2 Correlation matrix

	I	II	III	IV	V	VI
Public spending on education (I)	1.000					
Trained teachers (II)	0.068	1.000				
Institutional quality (III)	−0.225	0.460**	1.000			
Harmonized Test Scores (IV)	0.205*	0.271**	0.270**	1.000		
School completion (V)	0.133	0.229*	0.330***	0.514***	1.000	
School failure (VI)	−0.439***	−0.165	−0.177	−0.519***	−0.570***	1.000

*** $p<0.01$; ** $p<0.05$; * $p<0.1$

institutions and indicators of education quality on the other, provided results similar to those presented above. However, with respect to the latter results, the correlations with school completion are significant, whereas those with school failure are not significant. The correlation coefficient between institutional quality and the proportion of trained teachers is positive and significant; however, the correlation between institutional quality and public expenditure on education is negative and non-significant.

Figure 1a–c present the scatter plot between institutional quality and educational outcomes. Analysis of these figures suggests that institutional quality has a positive effect on education quality.

Econometric Modeling

The approach of this study is to estimate a cross-sectional model of educational outcomes while trying to account for the various determinants of students' performance in school as exhaustively as possible. Referring to Rajkumar and Swaroop (2008), the econometric model of the educational outcomes of students at the primary level is formulated as follows:

$$\ln EQ_i = \alpha_0 + \alpha_1 \ln gdp_i + \alpha_2 \ln pex_i + \alpha_3 I_i + S_i A + \alpha_4 F_i + X_i B + \varepsilon_i \qquad (1)$$

where EQ_i is the indicator of education quality in the country i. Education quality is measured in this work by the school completion rate (*compl*), the school failure rates (*failure*), and students' scores on international tests of skills and knowledge (*tis*). Explanatory variables are selected in reference to existing literature (Michaelowa, 2001; Rajkumar & Swaroop, 2008; Raymond, 1968). *gpd* is GDP per capita at purchasing power parity; *pex* measures public spending on education as a percentage of GDP. *S* is the vector of factors related to the institution and the education system. These are the pupil-teacher ratio (*str*) and the proportion of trained teachers among primary school teachers (*tt*). *F* symbolizes the factor related to the socio-economic environment of students. It is measured by the adult literacy rate (*lit*). *X* is the vector of country-specific factors. These are the urbanization rate (*urb*) and income inequality (*gini*). ε is an error term. Regional dummies are used to account for regional fixed effects.

Equation 1 does not allow to analyze the indirect effect of institutional quality on education quality. In order to perform such an analysis, it is necessary to introduce an interactive term among the explanatory variables in Eq. 1. We obtain the following Eq. 2:

$$\ln EQ_i = \beta_0 + \beta_1 \ln gdp_i + \beta_2 \ln pex_i + \beta_3 I_i + \lambda I_i * TC_i^j + S_i \theta + \beta_3 F_i + X_i \Omega + \mu_i$$
$$(2)$$

From Eq. (2), TC^j symbolizes the transmission channel. We have identified two mediating factors of the effects of institutional quality on education quality. These are public spending on education and the quality of teaching. The quality of teaching is measured by the proportion of trained teachers. Trained teachers provide good quality teaching unlike untrained or less trained teachers (Bourdon & Nkengne, 2007; Kyriakides et al., 2009).

The direct effect of institutional quality on education quality is measured by β_3 and its net effect through the j channel is given by the following relationship:

$$\frac{\partial EQ}{\partial I} = \beta_3 + \lambda * TC^j \tag{3}$$

The coefficients of Eqs. (1) and (2) can be estimated using the ordinary least squares (OLS) estimator. However, the OLS estimator has limitations when the issue of endogeneity arises. This issue may result from unobservable values or omitted variables that influence the dependent variable and some explanatory variables. The endogeneity issue can also result from causality between two explanatory variables. Thus, to account for this probable endogeneity issue, the two-stage least squares (2SLS) estimator will be used to assess the robustness of the results. This method requires the choice of external instruments. The literature argues that differences in colonization practices in terms of the identity of the settlers or model of colonization have a persistent impact on institutional quality in countries that have been colonized (Acemoglu et al., 2001; LaPorta et al., 1999; Sokoloff & Engerman, 2000). Thus, the origin of the settler will be used as an instrument of institutional quality. A dummy variable will be created for each of the origins of the settlers. Maseland (2018) shows that the duration of colonization, measured by the time between the beginning of colonization and independence, has an effect on institutional quality in the period following independence, but that this effect decreases over time. In summary, we retain the origin of the settler and the duration of colonization as instruments of institutional quality for the regression with 2SLS estimator.

Empirical Results

Baseline Regression Results

Tables 3 and 4 show the results of the regression of Eqs. 1 and 2 with the OLS estimator. The regression results for Eq. 1 are presented in columns 1, 4, and 7 and those for Eq. 2 in other columns of Tables 3 and 4. The Breusch-Pagan/Cook-Weisberg test for heteroskedasticity reveals the absence of the heteroskedasticity issue.

Table 3 shows that the coefficients of public spending on education and the proportion of trained teachers are positive and significant. A variation in public spending on education affects students' educational achievement in the same direction and in the order of 0.07. Michaelowa (2001) finds a similar result in the context of Francophone African countries. He shows that education expenditure per student has a positive effect on education quality. Another important variable in this study is the quality of teaching. The results show that a variation of the proportion of trained teachers has a similar effect on the educational achievement of students of the order of 0.08. These results show the importance of public expenditure and the quality of teaching in the formation of human capital in developing countries.

The coefficient of institutional quality is positive and statistically significant (Table 3). An improvement in institutional quality leads to an improvement in

Table 3 Effect of institutional quality on international test scores, OLS estimator

Variables	International test scores		
	(1)	(2)	(3)
Institutional quality	0.0220*	0.0225*	0.0142*
	(0.0121)	(0.0123)	(0.008)
Public expenditure	0.0743***	0.0135***	0.0645***
	(0.0195)	(0.0010)	(0.0197)
GDP per capita	0.0615**	0.0627**	0.0627**
	(0.0283)	(0.0278)	(0.0295)
Students-teacher ratio	−0.0548*	−0.0563*	−0.0561*
	(0.0311)	(0.0311)	(0.0313)
Trained teachers	0.0824**	0.0783**	0.0843**
	(0.0358)	(0.0354)	(0.0369)
iq_pubexp		0.0406*	
		(0.0223)	
iq_teachtr			0.0370*
			(0.189)
Literacy	0.0990*	0.0992*	0.101*
	(0.0524)	(0.0532)	(0.0526)
Income inequality	−0.119	−0.103	−0.117
	(0.108)	(0.115)	(0.111)
Urbanization	−0.0603*	−0.0589	−0.0632
	(0.0358)	(0.0357)	(0.0397)
Constant	5.525***	5.477***	5.503***
	(0.365)	(0.388)	(0.397)
Net effect	-	0.088	0.045
Regional dummies	Yes	Yes	Yes
Observations	64	64	64
R-squared	0.771	0.774	0.772
Fisher	13.13***	12.08***	11.98***

iq_pubexp is the interaction term between institutional quality and public spending on education; *iq_teachtr* is the interaction term between institutional quality and quality of teaching

Standard errors in parentheses ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

educational achievement of around 0.02. Thus, the low education quality in developing countries would be due to the poor institutional quality. This effect of institutional quality on educational achievement can be channeled through public spending on education or through the quality of teaching. In fact, the coefficients of the interaction variables are positive and statistically significant (columns 2 and 3). This means that a deterioration in institutional quality will tend to negatively affect the quality of teaching and the effectiveness of public spending on education. Thus,
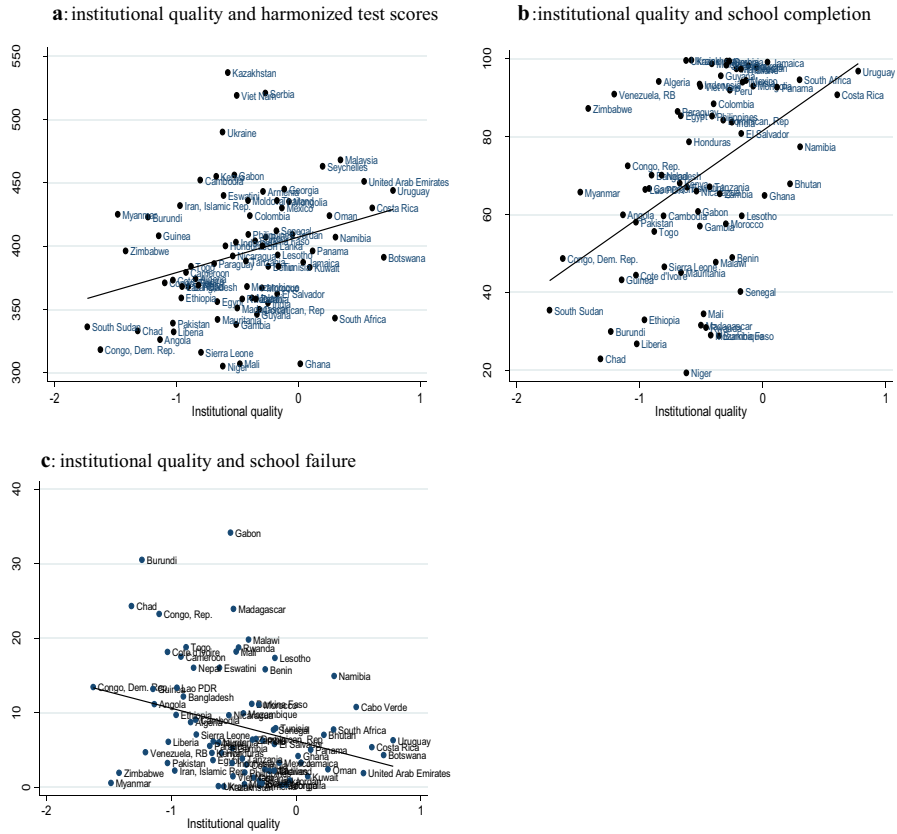
Fig. 1 Scatter plot between institutional quality and educational outcomes in developing countries

these results suggest that a decline in institutional quality undermines the effect of public spending on education quality and deteriorates the quality of teaching.

Following the channel through public spending on education, Reinikka and Svensson (2006) pointed out that in countries with weak institutions, spending does not reach its destination in its entirety. Some of the money disappears in administrative constraints, or through corruption channels; and this reduces the effectiveness of this public spending. Gallego (2010) focuses on governance and points out that the form of governance (centralized or decentralized power) can have effects on the allocation and distribution of resources. He argues that centralized power tends to devote fewer resources to education. Political instability is also a phenomenon that affects educational spending. When a country experiences political instability, it generally gives priority to security and the restoration of stability. These actions require financing efforts, and can lead to a reduction in spending on social sectors such as education and health.

Following the channel of the quality of teaching, Bourdon and Nkengne (2007) noted that the shortage of trained teachers leads to the recruitment of untrained or

Table 4 Effect of institutional quality on school completion and school failure, OLS estimator

Variables	School completion			School failure		
	(4)	(5)	(6)	(7)	(8)	(9)
Institutional quality	0.0301**	0.0304**	0.1696**	−0.428**	−0.370	−0.357
	(0.0116)	(0.0123)	(0.0753)	(0.174)	(0.244)	(0.238)
Public expenditure	0.0216	0.0136	0.0817**	−0.297***	−0.451***	−0.324***
	(0.0280)	(0.0365)	(0.0336)	(0.0890)	(0.118)	(0.0886)
GDP per capita	0.151**	0.149**	0.144**	−0.310	−0.337	−0.329
	(0.0725)	(0.0738)	(0.0676)	(0.217)	(0.209)	(0.222)
Students-teacher ratio	−0.0887	−0.0865	−0.0748	0.794***	0.702***	0.791***
	(0.113)	(0.115)	(0.114)	(0.207)	(0.198)	(0.208)
Trained teachers	0.0908***	0.0957***	0.0563***	−0.124	−0.0409	−0.160
	(0.0145)	(0.0146)	(0.0106)	(0.249)	(0.241)	(0.227)
iq_pubexp		0.0508**			−0.1128**	
		(0.0206)			(0.0511)	
iq_teachtr			0.375**			−0.705*
			(0.167)			(0.359)
Literacy	0.465***	0.465***	0.449***	−0.571*	−0.523*	−0.533*
	(0.114)	(0.115)	(0.115)	(0.306)	(0.291)	(0.316)
Income inequality	−0.142	−0.162	−0.239	1.916*	2.214**	1.984*
	(0.177)	(0.176)	(0.170)	(1.040)	(1.026)	(1.054)
Urbanization	−0.0853	−0.0829	−0.101	−0.342	−0.305	−0.396
	(0.103)	(0.101)	(0.101)	(0.284)	(0.255)	(0.281)
Constant	1.099***	1.168***	1.618***	−8.077***	−8.804***	−8.609***
	(0.356)	(0.350)	(0.206)	(2.914)	(2.845)	(2.863)
Net effect	-	0.112	0.480	-	−0.552	−0.940
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	62	62	62	65	65	65
R-squared	0.822	0.823	0.832	0.774	0.803	0.778
Fisher	24.17***	25.23***	23.58***	101.9***	83.86***	114.6***

iq_pubexp is the interaction term between institutional quality and public spending on education; *iq_teachtr* is the interaction term between institutional quality and quality of teaching

Standard errors in parentheses ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

less trained people to work as teachers. These people recruited as parent teachers or as temporary teachers or education volunteers generally do not have the skills or qualifications to provide good quality education to students. However, as Raymond (1968) points out, education quality is first and foremost the quality of the education system, and the latter depends primarily on the quality of teachers. It follows that the shortage of trained teachers in developing countries is one of the main causes of poor education quality in this context.

The signs of the coefficients of the other explanatory variables are consistent with the existing literature. The results show that increasing the number of students per teacher tends to reduce education quality. As Angrist and Lavy (1999) and Case and Deaton (1999) indicate, increasing class size limits teacher-student interactions and does not promote individualized monitoring of students. As a result, the teacher does not have the time to follow up with individual students and provide solutions to specific problems of each student. However, authors such as Asadullah (2005) and Hoxby (2000) find that class size does not have a significant effect on students' academic results. Hattie (2005) argues that reducing class size can have major improvements in students' performance if certain conditions are satisfied.

The coefficient of GDP per capita is significant (Table 3). This result reflects UNESCO statistics that indicate that quantitative and qualitative indicators of education are better in high-income countries compared to low-income countries. McMahon (2002) stated that students from developed countries have better education quality. However, a wide disparity in the distribution of national income leads to a decrease in education quality, as the results show a negative sign of the coefficient of income inequality. The results also show that the coefficient of adult literacy is positive. This result indicates the importance of adult education on children's performance at school.

Table 3 also indicates that urbanization negatively affects education quality in developing countries. An increase in urbanization leads to a significant drop in educational achievement in the order of 0.06. This result can be justified by the challenges of employment and access to basic social services in urban areas in several developing countries, particularly those in Sub-Saharan Africa. While urbanization is generally presented as a development factor, the experience of developing countries, particularly those in Sub-Saharan Africa, generates controversies. The urban population is growing rapidly in this context, but socio-economic development remains modest. Several researchers argue that the massive and unplanned installation of people in urban areas in several developing countries is accompanied by increasing difficulties in accessing decent jobs in urban areas, housing, and basic social services (Ravallion, 2002; Ravallion et al., 2007). These difficulties are not conducive to the provision of good education to students.

The net effect of institutional quality on education quality through the channel of public spending on education and through the channel of quality of teaching is calculated using Eq. 3. Taking into account the transmission channels allows not to underestimate (or overestimate) the effect of institutional quality on education quality. The results are shown in Table 3. These results show that the net effect of institutional quality on student achievement is 0.088 through public spending on education and 0.045 through the quality of teaching.

We also analyzed the effect of institutional quality on school failure of students and on the primary school completion rate (Table 4). The results highlight a positive and significant effect of institutional quality on the primary school completion rate (columns 4 to 6). The coefficients of the interaction variables are

positive and significant, reflecting the role of public spending on education and the quality of teaching on the educational performance of students. The coefficient of GDP per capita is positive and significant, reflecting the importance of income in school completion. In fact, many students drop out of school early in developing countries because of the lack of school fees or the inability of parents to support the financial charges related to education (school fees, purchase of school furniture). Other factors that significantly explain school completion are adult literacy and the proportion of trained teachers. The increase in the number of students per teacher has a negative but not significant effect on school completion. With regard to school failure, the results show that institutional quality has a negative effect on primary school failure (columns 7 to 9). The main explanatory factors for school failure of students are the number of students per teacher, adult literacy, and public spending on education.

The results also show that the net effect of institutional quality on primary school completion is 0.112 through public spending on education and 0.48 through the quality of teaching (Table 4). And, the net effect of institutional quality on primary school failure is -0.552 through public spending on education and -0.94 through the quality of teaching (Table 4).

Analysis of the Robustness of the Results

We analyzed the robustness of the results by regressing with the 2SLS estimator on the one hand, and by evaluating the specific effect of indicators of institutional quality on educational outcomes on the other hand.

Regression with 2SLS Estimator

The above results are estimated by the OLS regression method, which assumes that institutional quality is exogenous. However, as several authors have pointed out, it is possible that two of the explanatory variables, institutional quality and GDP per capita, for example, are determined jointly. This may be a source of endogeneity. The 2SLS estimator is used to solve this problem. We use the duration of colonization and the origin of the settler as instruments of institutional quality in the 2SLS regression. Concerning the validity of the instruments, the p value associated to the Hansen's overidentification test is greater than the 10% threshold value, indicating that the instruments are valid (see Tables 5 and 6). This statistical test indicates that the results with the 2SLS estimator are more consistent, compared to those with the OLS estimator.

The results of the Baseline regression using 2SLS estimator are presented in Tables 5 and 6. These results largely confirm those of the OLS regression. However, the magnitudes of the coefficients are mostly higher in the regressions with

Table 5 Effect of institutional quality on international test scores, 2SLS estimator

Variables	International test score		
	(1)	(2)	(3)
Institutional quality	0.0568**	0.0339**	0.0929***
	(0.0256)	(0.0134)	(0.0265)
Public expenditure	0.0148***	0.0112*	0.00693**
	(0.0012)	(0.0059)	(0.0030)
GDP per capita	0.0848*	0.0770*	0.0571*
	(0.0486)	(0.0453)	(0.0301)
Students-teacher ratio	−0.0526*	−0.0532**	−0.0536*
	(0.0285)	(0.0252)	(0.0321)
Trained teachers	0.0881**	0.0863**	0.109*
	(0.0368)	(0.0356)	(0.0649)
iq_pubexp		0.0276*	
		(0.0163)	
iq_teachtr			0.0214*
			(0.0119)
Literacy	0.0837**	0.0875*	0.107**
	(0.0415)	(0.0507)	(0.0528)
Income inequality	−0.0996	−0.0862	−0.0684
	(0.112)	(0.111)	(0.112)
Urbanization	−0.0531*	−0.0532**	−0.0708**
	(0.0292)	(0.0265)	(0.0347)
Constant	5.263***	5.276***	5.255***
	(0.425)	(0.410)	(0.574)
Net effect	-	0.0785	0.1106
Regional dummies	Yes	Yes	Yes
Observations	60	60	60
R-squared	0.805	0.731	0.746
Hansen (*p* value)	0.662	0.544	0.330

iq_pubexp is the interaction term between institutional quality and public spending on education; *iq_teachtr* is the interaction term between institutional quality and quality of teaching

Standard errors in parentheses ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

2SLS estimator. These results show that institutional quality positively affects educational achievement and school completion (Tables 5 and 6) in developing countries. Similarly, public spending on education and the proportion of trained teachers positively affect educational achievement and primary school completion. The opposite results are obtained with school failure (Table 6).

With regard to the net effect, the results show that the net effect of institutional quality on student achievement is 0.078 through public spending on education and

Table 6 Effect of institutional quality on school completion and school failure, 2SLS estimator

Variables	School completion			School failure		
	(4)	(5)	(6)	(7)	(8)	(9)
Institutional quality	0.531***	0.546***	0.821	−1.707***	−1.381***	−0.7959***
	(0.186)	(0.210)	(0.666)	(0.474)	(0.468)	(0.0915)
Public expenditure	0.183*	0.180*	0.350***	−0.896***	−0.908***	−0.904*
	(0.106)	(0.108)	(0.064)	(0.290)	(0.244)	(0.472)
GDP per capita	0.117***	0.124***	0.103**	−0.999***	−0.844***	−0.502**
	(0.0121)	(0.0117)	(0.0486)	(0.370)	(0.325)	(0.248)
Students-teacher ratio	−0.117*	−0.123*	−0.025***	1.278***	1.158***	0.701***
	(0.0614)	(0.0627)	(0.0014)	(0.252)	(0.228)	(0.138)
Trained teachers	0.145***	0.143***	0.0914***	−0.367**	−0.661**	−1.706***
	(0.0145)	(0.0150)	(0.0224)	(0.141)	(0.307)	(0.257)
iq_pubexp		0.0576***			−0.104**	
		(0.018)			(0.0496)	
iq_teachtr			0.1836***			−0.177***
			(0.051)			(0.0278)
Literacy	0.534***	0.538***	0.317**	−1.151***	−1.068***	−0.210
	(0.142)	(0.141)	(0.146)	(0.371)	(0.316)	(0.506)
Income inequality	−0.196	−0.228	−0.312	2.447**	3.072***	5.271**
	(0.301)	(0.299)	(0.276)	(0.983)	(0.901)	(2.555)
Urbanization	−0.148***	−0.155***	−0.190***	−0.551*	−0.429*	−1.156
	(0.012)	(0.012)	(0.0119)	(0.302)	(0.235)	(0.954)
Constant	1.329	1.253	2.935*	−13.58***	−14.94***	−3.005**
	(1.452)	(1.443)	(1.772)	(3.347)	(3.107)	(1.508)
Net effect	-	0.639	0.973	-	−1.502	−0.942
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	58	58	58	60	60	60
R-squared	0.839	0.828	0.799	0.867	0.891	0.726
Hansen (*p* value)	0.458	0.377	6.061	0.113	0.121	0.955

iq_pubexp is the interaction term between institutional quality and public spending on education; *iq_teachtr* is the interaction term between institutional quality and quality of teaching

Standard errors in parentheses ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

0.1106 through the quality of teaching (Table 5). The results also show that the net effect of institutional quality on primary school completion is 0.639 through public spending on education and 0.973 through the quality of teaching (Table 6). Finally, the net effect of institutional quality on primary school failure is −1.502 through public spending on education and −0.942 through the quality of teaching (Table 6).

Specific Effect of Indicators of Institutional Quality

The previous analyses are carried out with a composite indicator of institutional quality. Such an indicator does not make it possible to understand the specific

Table 7 Effect of corruption on educational outcomes [1]

Variables	International test score		School completion		School failure	
	(1)	(2)	(3)	(4)	(5)	(6)
Control corruption	0.729**	0.574**	0.416*	0.724**	−0.279*	−1.802***
	(0.316)	(0.281)	(0.216)	(0.359)	(0.164)	(0.313)
cor_pubexp	0.396**		0.287*		−0.590**	
	(0.185)		(0.158)		(0.275)	
cor_teachtr		0.205*		0.668**		−0.406**
		(0.114)		(0.272)		(0.172)
Constant	5.701***	5.275***	0.437**	3.656	−1.370***	−1.841
	(0.446)	(1.113)	(0.181)	(3.580)	(0.321)	(1.257)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	60	60	58	58	60	60
R-squared	0.757	0.710	0.695	0.753	0.731	0.853
Hansen (p value)	0.301	0.414	0.656	0.115	0.261	0.641
Fisher	5.377***	7.984***	10.85***	13.40***	19.49***	11.58***

cor_pubexp is the interaction term between control of corruption and public spending on education; cor_teachtr is the interaction term between control of corruption and quality of teaching

Standard errors in parentheses ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

[1]All variables are included in the regression, but for simplicity, we have published the results for a small number of variables

effect of each item of institutional quality on educational outcomes. In order to address this concern, this section examines the specific effects of each of the six indicators of institutional quality. Tables 7 and 8 present the sample results in simplified form.

The results show that a decrease in corruption significantly promotes improved educational outcomes in developing countries (Table 7). Improved control of corruption has a positive effect on students' scores on international tests of skills and knowledge, and on school completion. In addition, reduced corruption leads to lower school failure rates. The coefficients of the interaction variables are statistically significant, reflecting the effect of corruption on public spending on education and the quality of teaching. Similar results are obtained with political stability (Table 8). Political instability thus appears to be a barrier to improving education quality. These results are consistent with the existing literature (Gupta et al., 2001; Nir & Kafle, 2013). Government effectiveness significantly influences education quality in developing countries. Improving government effectiveness promotes better education quality (Table 12 in Appendix 3). However, its indirect effect through public spending on education and the quality of teaching is not statistically significant. The results also show that the rule of law has a positive and significant effect on the quality of

Table 8 Effect of political stability on educational outcomes [1]

Variables	International test score		School completion		School failure	
	(1)	(2)	(3)	(4)	(5)	(6)
Political stability	0.0520**	0.1642***	0.0688**	1.898***	−0.898**	−0.3686*
	(0.0245)	(0.0543)	(0.0260)	(0.108)	(0.434)	(0.2141)
stab_pubexp	0.0303*		0.0543**		−0.925*	
	(0.0162)		(0.0213)		(0.493)	
stab_teachtr		0.359**		0.419**		−0.816*
		(0.143)		(0.168)		(0.4745)
Constant	5.634***	5.333***	1.006	0.535***	−1.512***	−5.844**
	(0.335)	(0.559)	(1.049)	(0.058)	(0.3751)	(2.415)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	60	60	58	58	60	60
R-squared	0.689	0.727	0.822	0.845	0.731	0.633
Hansen (p value)	0.240	0.248	0.0872	0.0506	0.783	0.258
Fisher	13.08***	14.38***	21.04***	27.35***	18.48***	11.62***

stab_pubexp is the interaction term between political stability and public spending on education; stab_teachtr is the interaction term between political stability and quality of teaching

Standard errors in parentheses ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

[1]All variables are included in the regression, but for simplicity, we have published the results for a small number of variables

education (Table 13 in Appendix 4). Its indirect effect is significant through the quality of teaching and non-significant through public spending on education. We also found that quality of regulation and voice and accountability positively affect education quality; but their effects are not statistically significant (Tables 14 and 15 in Appendices 5 and 6, respectively).

Sensitivity of Results: the Effect of Institutional Quality on Educational Outcomes in Sub-Saharan Africa

The sensitivity analysis of the results consisted in analyzing the effect of institutional quality on education quality in the sample of Sub-Saharan African countries. This analysis aims to assess the sensitivity of the results across the sample.

The results in Table 9 show that institutional quality negatively affects educational achievement in SSA countries. As in the developing country sample, public spending on education, the proportion of trained teachers, and per capita income positively affect educational achievement in SSA countries. However, the coefficients of the interaction variables are negative and significant. This result shows that in SSA countries, the positive effect of public spending on education and the quality of teaching on education quality is undermined by institutional quality. Thus, institutional quality reduces

Table 9 Effect of institutional quality on international test scores in SSA

Variables	International test score		
	(1)	(2)	(3)
Institutional quality	−0.0203**	−0.0418**	−0.491**
	(0.0097)	(0.0190)	(0.216)
Public expenditure	0.0374**	0.0532**	0.0603**
	(0.0149)	(0.0212)	(0.0286)
GDP per capita	0.110**	0.101**	0.113**
	(0.0470)	(0.0479)	(0.0477)
Students-teacher ratio	−0.5511***	−0.0659*	−0.0518*
	(0.0465)	(0.0375)	(0.0273)
Trained teachers	0.0701**	0.0543**	0.0817**
	(0.0260)	(0.0244)	(0.0369)
iq_pubexp		−0.139*	
		(0.0766)	
iq_teachtr			0.105***
			(0.034)
Literacy	0.0338**	0.0228*	0.0350
	(0.0168)	(0.0126)	(0.0570)
Income inequality	−0.0744	−0.0736	−0.0672
	(0.281)	(0.335)	(0.287)
Urbanization	−0.0912**	−0.0740*	−0.0848*
	(0.0442)	(0.0380)	(0.0435)
Constant	5.149***	4.748***	5.031***
	(0.716)	(0.842)	(0.781)
Net effect	-	−0.266	−0.404
Observations	31	31	31
R-squared	0.690	0.720	0.701
Hansen (*p* value)	0.922	0.847	0.605

iq_pubexp is the interaction term between institutional quality and public spending on education; *iq_teachtr* is the interaction term between institutional quality and quality of teaching

Standard errors in parentheses ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

the effectiveness of public spending on education and the quality of teaching on educational achievement in SSA countries. And as the existing literature points out, poor institutional quality can lead to unethical behavior of teachers, to the misuse of part of the funds allocated to education or the orientation of part of the education budget towards security when the country is facing insecurity crises. All these actions are likely to deteriorate education quality.

The results also show that institutional quality has a positive effect on school completion (Table 10). Public spending on education, pupil-teacher ratios, quality of teaching, adult literacy, and income inequality are the main factors affecting primary school

Table 10 Effect of institutional quality on school completion and school failure in SSA

Variables	School completion			School failure		
	(4)	(5)	(6)	(7)	(8)	(9)
Institutional quality	0.480***	0.468***	1.066***	−1.413***	−1.377***	−0.232**
	(0.157)	(0.159)	(0.142)	(0.447)	(0.434)	(0.093)
Public expenditure	−0.599**	−0.603***	0.924	−1.206**	−1.246**	−2.197
	(0.236)	(0.234)	(0.937)	(0.580)	(0.582)	(4.500)
GDP per capita	0.131	0.123	0.033**	−0.894***	−0.867***	−0.758*
	(0.112)	(0.119)	(0.014)	(0.296)	(0.291)	(0.410)
Students-teacher ratio	−0.406***	−0.402***	−0.225	1.237***	1.216***	1.178*
	(0.131)	(0.130)	(0.147)	(0.221)	(0.215)	(0.715)
Trained teachers	0.236*	0.245**	0.180**	−0.143***	−0.109***	−0.851***
	(0.128)	(0.124)	(0.079)	(0.022)	(0.022)	(0.179)
iq_pubexp		0.0721			−0.320	
		(0.210)			(0.421)	
iq_teachtr			0.241*			4.878
			(0.132)			(12.94)
Literacy	0.464***	0.467***	0.454***	−0.336*	−0.358*	−0.287**
	(0.108)	(0.108)	(0.164)	(0.192)	(0.190)	(0.136)
Income inequality	−1.138**	−1.063**	−0.228	−0.929	−0.587	0.0851
	(0.463)	(0.541)	(0.992)	(1.215)	(1.193)	(2.099)
Urbanization	−0.0332**	−0.0243*	−0.161	0.122**	−0.0726	0.324
	(0.013)	(0.0137)	(0.397)	(0.052)	(0.357)	(0.814)
Constant	−0.376**	−0.200	0.420	−5.579**	−6.487**	−13.45
	(0.159)	(0.173)	(0.727)	(2.793)	(2.533)	(25.24)
Net effect	-	0.458	1.265	-	−1.377	−0.232
Observations	30	30	30	31	31	31
R-squared	0.715	0.720	0.692	0.705	0.723	−0.686
Hansen (*p* value)	0.461	0.462	0.092	0.436	0.366	0.325

iq_pubexp is the interaction term between institutional quality and public spending on education; *iq_teachtr* is the interaction term between institutional quality and quality of teaching

Standard errors in parentheses ***$p<0.01$; **$p<0.05$; *$p<0.1$

completion. The effect of public spending is mixed, while urbanization, pupil-teacher ratios, and income inequality have a negative impact on primary school completion.

Regarding school failure, the results show that a deterioration in institutional quality increases the repetition rate of students in primary schools (Table 10). Increase in public spending on education, per capita income, adult literacy rate, and number of trained teachers contributes significantly to reducing the failure rates of primary school students, while increase in the number of students per teacher and income inequality contributes to increasing the failure rates of students, but with a non-significant effect of income inequality (Table 10).

Conclusion

The issue of education quality is gaining increasing attention in development policies in several countries around the world. The general observation being that the quantity of education characterized by the educational attainment, school completion, or transition from one cycle to another, does not guarantee a good formation of human capital. Many children leave school without having acquired the knowledge and skills corresponding to their level of education or allowing better socio-professional integration. Consequently, providing a good quality of education has become an objective that several governments, mainly those of developing countries, are seeking to achieve. Achieving such an objective requires an in-depth diagnosis of the factors explaining education quality. Several theoretical and empirical studies have emerged in this direction. While institutional quality has been identified as one of the determinants of education quality, the analysis of the mediating factors of its effect has not received the scientific attention it deserves. This study complements the existing literature by examining the direct and indirect effects of institutional quality on education quality. The literature review explored the potential channels through which this effect is possible. The potential indirect channels are mainly public spending on education and quality of teaching.

The empirical analysis covered a sample of 82 developing countries. The main results obtained using the OLS and 2SLS estimators show that institutional quality has a positive effect on student achievement and school completion and a negative effect on school failure. With respect to the role of transmission channels, the results show that a deterioration in institutional quality reduces the efficiency of public spending on education and reduces the quality of teaching.

The analysis of the specific effect of each indicator of institutional quality on educational outcomes demonstrated the importance of improving institutional quality, in particular the control of corruption, the preservation of political stability, and government effectiveness, as tools for promoting education quality. The analysis of the sensitivity of the results consisted in analyzing the effect of institutional quality on educational outcomes in a sample of Sub-Saharan African countries.

On the whole, this study showed that the low values of indicators of the quality and quantity of education in several developing countries are a consequence of poor institutional quality. When the quality of institutions is not good (presence of corruption, political instability, deterioration of government effectiveness, etc.), the effectiveness of public spending is reduced, teachers tend to develop unethical behavior, and there is also an increase in the recruitment of untrained or less trained individuals for teaching activities.

The limitation of this study is that it empirically examined only two mediating factors of the effect of institutional quality on education quality. It is therefore important to extend this study by examining other transmission channels through which institutional quality affects educational outcomes of students.

Appendix

Appendix 1. Definition of Variables and Data Sources

Table 11 Definition of variables and data sources

Variable	Definition	Data source
Institutional quality	Mean of the six dimensions of governance (control of corruption, voice and accountability, rule of law, government effectiveness, regulatory quality, and political stability)	Worldwide Governance Indicators (WGI)
Urbanization	People living in urban as a percentage of total population	WDI
Harmonized test scores	Harmonized test scores from major international student achievement testing programs	WDI, Altinok et al. (2014)
Income inequality	Measured by GINI. That is the extent to which the distribution of income (or consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution	World Development Indicators (WDI)
Public spending on education	Government expenditure on education as percentage of GDP	UNESCO
GDP per capita	Gross domestic product divided by midyear population. Data are in constant 2010 U.S. dollars	WDI
literacy rate	Adult literacy rate, population 15 + years	UNESCO
School failure	Proportion of pupils from a cohort enrolled in a given grade at a given school year, who study in the same grade in the following school year	UNESCO
School completion	Completion rate, primary education, both sexes	UNESCO
Student–teacher ratio	Pupil-teacher ratio in primary school	UNESCO
School failure rates	Proportion of pupils from a cohort enrolled in a given grade at a given school year, who study in the same grade in the following school year	UNESCO
Trained teacher	Percentage of trained teachers among primary school teachers	UNESCO
Origin of the settler	Origin of the settler	La Porta et al. (1999)
Duration of colonization	Duration of colonization	Ashraf and Galor (2013)

Appendix 2. List of Countries of the Sample

Sub-Saharan Africa countries—Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Chad, Congo Dem. Rep., Congo Rep., Cote d'Ivoire, Eswatini, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, South Sudan, Tanzania, Togo, Zambia, Zimbabwe

Others developing countries—Algeria, Armenia, Bangladesh, Bhutan, Cambodia, Colombia, Costa Rica, Dominican Rep, Egypt, El Salvador, Georgia, Guyana, Honduras, India, Indonesia, Iran Islamic Rep., Jamaica, Jordan, Kazakhstan, Kuwait, Lao PDR, Malaysia, Maldives, Mexico, Moldova, Mongolia, Morocco, Myanmar, Nepal, Nicaragua, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Serbia, Sri Lanka, Thailand, Tunisia, Ukraine, United Arab Emirates, Uruguay, Venezuela RB, Viet Nam

Appendix 3. Effect of Government Effectiveness on Educational Outcomes

Table 12 Effect of government effectiveness on educational outcomes[1]

Variables	International test score		School completion		School failure	
	(1)	(2)	(1)	(2)	(1)	(2)
Government effectiveness	0.192***	0.224*	1.204*	0.2113**	−2.836**	−0.242**
	(0.021)	(0.124)	(0.648)	(0.106)	(1.330)	(0.119)
gov_pubexp	0.0537***		0.258**		−0.464***	
	(0.014)		(0.092)		(0.152)	
gov_teachtr		0.510**		0.525*		−0.526*
		(0.253)		(0.290)		(0.293)
Constant	5.462***	6.020***	1.678	0.350	−15.27***	−17.55***
	(0.390)	(0.684)	(1.661)	(1.450)	(3.177)	(5.783)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	60	60	58	58	60	60
R-squared	0.844	0.736	0.502	0.772	0.748	0.638
Hansen (*p* value)	0.138	0.158	0.953	0.143	0.660	0.0909
Fisher	6.393***	10.58***	7.549***	17.30***	11.94***	31.18***

gov_pubexp is the interaction term between government effectiveness and public spending on education; *gov_teachtr* is the interaction term between government effectiveness and quality of teaching

Standard errors in parentheses ***$p<0.01$; **$p<0.05$; *$p<0.1$

[1]All variables are included in the regression, but for simplicity, we have published the results for a small number of variables

Appendix 4. Effect of Rule of Law on Educational Outcomes

Table 13 Effect of rule of law on educational outcomes[1]

Variables	International test score		School completion		School failure	
	(1)	(2)	(1)	(2)	(1)	(2)
Rule of law	0.078**	1.969***	0.526**	1.055	−1.095**	−0.814***
	(0.038)	(0.439)	(0.213)	(1.024)	(0.471)	(0.101)
law_pubexp	0.0213		0.215		−0.556	
	(0.0662)		(0.213)		(0.688)	
law_teachtr		0.445		0.2378*		−1.823***
		(0.291)		(0.132)		(0.229)
Constant	5.578***	6.340***	0.740	5.360	−13.27***	−4.344
	(0.342)	(1.603)	(1.516)	(4.134)	(3.136)	(3.248)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	60	60	58	58	60	60
R-squared	0.716	0.845	0.677	0.664	0.724	0.761
Hansen (p value)	0.841	0.125	0.972	0.159	0.0797	0.953
Fisher	7.346***	9.679***	9.949***	8.018***	18.71***	18.75***

law_pubexp is the interaction term between rule of law and public spending on education; *law_teachtr* is the interaction term between rule of law and quality of teaching

Standard errors in parentheses ***$p<0.01$; **$p<0.05$; *$p<0.1$

[1]All variables are included in the regression, but for simplicity, we have published the results for a small number of variables

Appendix 5. Effect of Voice and Accountability on Educational Outcomes

Table 14 Effect of voice and accountability on educational outcomes[1]

Variables	International test score		School completion		School failure	
	(1)	(2)	(1)	(2)	(1)	(2)
Voice and accountability	−0.114	−2.631	0.255*	0.8848	−0.109	0.2872
	(0.0693)	(3.335)	(0.134)	(0.8208)	(0.359)	(0.3378)
voic_pubexp	−0.00951		0.0937		−0.726***	
	(0.0621)		(0.123)		(0.274)	
voic_teachtr		0.587		−1.981		−0.6484
		(0.746)		(1.840)		(0.7538)
Constant	5.697***	6.303***	0.705	−1.611	−13.50***	−1.971*
	(0.348)	(0.987)	(1.172)	(2.581)	(2.934)	(1.168)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	60	60	58	58	60	60
R-squared	0.687	0.548	0.728	0.600	0.738	0.447
Hansen (p value)	0.892	0.380	0.0959	0.298	0.369	0.112
Fisher	7.496***	8.060***	14.23***	13.03***	23.26***	6.239***

voic_pubexp is the interaction term between voice and accountability and public spending on education; *voic_teachtr* is the interaction term between voice and accountability and quality of teaching

Standard errors in parentheses ***$p<0.01$; **$p<0.05$; *$p<0.1$

[1]All variables are included in the regression, but for simplicity, we have published the results for a small number of variables

Appendix 6. Effect of Regulatory Quality on Educational Outcomes

Table 15 Effect of regulatory quality on educational outcomes[1]

Variables	International test score		School completion		School failure	
	(1)	(2)	(1)	(2)	(1)	(2)
Regulatory quality	0.839***	0.306*	0.989**	0.366*	−1.950**	−0.378**
	(0.092)	(0.169)	(0.482)	(0.198)	(0.889)	(0.167)
regu_pubexp	0.0420		1.075*		−2.920**	
	(0.0364)		(0.630)		(1.145)	
regu_teachtr		0.690***		0.0701*		0.841
		(0.203)		(0.037)		(0.596)
Constant	5.465***	6.381***	3.407	0.946	−1.788***	−2.200***
	(0.393)	(0.781)	(2.407)	(1.149)	(0.449)	(0.775)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	60	60	58	58	60	60
R-squared	0.638	0.708	0.694	0.842	0.702	0.665
Hansen (*p* value)	0.829	0.155	0.837	0.0652	0.438	0.0524
Fisher	9.064***	7.272***	7.315***	22.39***	22.54***	12.62***

regu_pubexp is the interaction term between regulatory quality and public spending on education; *regu_teachtr* is the interaction term between regulatory quality and quality of teaching

Standard errors in parentheses ***$p<0.01$; **$p<0.05$; *$p<0.1$

[1]All variables are included in the regression, but for simplicity, we have published the results for a small number of variables

Declarations

Conflict of Interest The authors declare no competing interests.

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