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The Benefits of a Better Education System: What Cross-Country Data Can Tell Us

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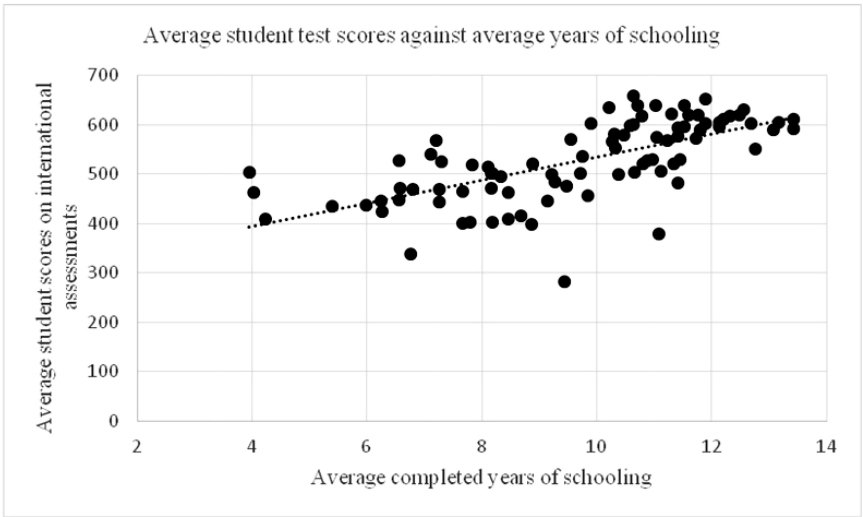
Abstract

Previous cross-country analyses of the factors that affect education outcomes have focused on measures of school inputs such as average pupil-teacher ratios, teacher characteristics, and availability of learning materials. The capacity of the education system to translate these inputs into education outcomes has not been researched in the same way because internationally comparable measures of the quality of the system have not been available. Assessing the quality of an education system is an immense task, but efforts have been made to construct a unique database with information on the quality of the education system in a large number of countries. This paper uses that database to examine how indicators of system quality are associated with measures of learning that are approximately comparable across countries, as well as with average years of schooling and people's view of their education system. The paper estimates these relationship controlling for the level of educaton expenditure and per-capita GDP across countries. Although measures of the quality of the education system can be improved significantly, the findings indicate that better education systems do yield better education outcomes. (181)

Introduction: Why a Systems Approach to Education Reform

In the last several years, there has been increased interest in exploring not only how educational inputs but also how the quality of the education system can improve education outcomes. This interest has grown because of widespread concerns that school systems are falling behind the times and that young job seekers may not be prepared for the labor markets that await them. More cross-country evidence on student learning is now available, revealing that, despite increasing school enrollment and completion rates across the globe, significant numbers of students do not achieve minimum levels of reading comprehension and math skills. Regional and international student assessments show huge differences across countries as well as within countries. And, as Figure 1 shows, the average completed years of schooling across countries, while generally positively associated with average student performance on multinational assessments (correlation coefficient of 0.66),[1] have not ensured correspondingly higher student achievement. For example, while the average completed schooling in South Africa is 9.4 years (that is, at about the 40th percentile), its average student performance is lower than in any other country.[2]

Figure 1. Country-level average student achievement scores and average years of completed schooling



Data sources: Barro-Lee (latest year) data on estimated average years of completed schooling for population ages 25 and over (Barro & Lee, 2013); and harmonized test scores from international assessments (Altinok et al., 2013).

[1] Data are from OECD (2015).
[2] At the same time, it is possible for countries such as Papua New Guinea and Swaziland to do well on international tests because only a small majority of their population enter or stay in school long enough to participate in international tests.

The challenge is how to improve education systems so that they deliver good learning outcomes for all students. This is not an easy challenge. Education systems are complex organizations, consisting of teachers, school leaders and administrators, and students—from pre-schooling to tertiary education. Behind the frontline deliverers of instruction and learning are national and local education agencies that set and implement policies and priorities, allocate budgets, and oversee the schools. The schools (and universities, vocational or technical training programs) include not only state-owned institutions, but also non-state institutions that are owned and operated by the private enterprise sector, faith-based organizations, or private, non-profit organizations and individuals. Further, either as units within the education ministry or as private contractors, there are publishers of textbooks and learning materials, maintenance staff of schools, providers of transport or school meals, and so on.

In addition, an education system consists of the accountability relationships that connect these diverse actors and units; the standards for developing curricula across education levels; employment contracts, compensation packages and career paths of the education workforce; financing and information mechanisms that keep schools operating; and so on. When these standards, rules, accountability relationships and financing levels are aligned towards achieving shared education goals, the system—despite its complexity and size—is able to perform well. The top education systems in the world are not necessarily the best-financed systems, but those systems that manage their financial resources and talent well towards clear objectives. In contrast, weak education systems struggle to achieve that alignment and coherence. Their goals, standards, and rules are not clearly defined; resources are not used efficiently; information about inputs and outcomes are absent or incomplete; and accountability mechanisms are inadequate.

There have been efforts to assess the quality of education systems and what it takes to improve them. A McKinsey study assessed 20 national and city education systems and used their experience to define an improvement path from low performance to better performance (Mourshed et al., 2010). The study listed six elements that are needed to transform an education system: revising curriculum and standards, ensuring an appropriate reward and remunerations structure for teachers and principals, building the technical skills of teachers and principals, assessing students, establishing data systems, and facilitating improvement through the introduction of policy documents and education laws.[3]

[3] The study outlines four stages of improvement (Mourshed et al., 2010): In the *poor to fair* stage, system leaders must choose the set of interventions that support students by providing scaffolding for low-skilled teachers, fulfilling basic student needs, and bringing all the schools up to a minimum quality threshold. In the *fair to good* stage, the interventions must focus on consolidating the system foundations through high quality performance data, ensuring teacher and school accountability, and creating appropriate financing, organization structure, and pedagogy models. In *the good to great* stage, the interventions must focus on professionalizing the teaching force and school leadership, putting in place clearly defined career paths. Finally, in the *great to excellent* stage, the interventions must move the locus of improvement from the center to the schools themselves through peer-based learning, system-wide interaction, and support for innovation and experimentation.

These fundamentals correspond roughly to Pritchett's (2015) conceptual framework for the Research on Improving Systems of Education (or RISE) program which defines education systems as a set of accountability relationships that must be aligned in order to improve learning outcomes. The relationships include "delegation" which means that the responsible actors are focused on promoting learning; financing the actors and the programs that contribute to learning; using information to measure and monitor learning outcomes; and aligning incentives and rewards to learning objectives. According to this framework, without a coherent education system built to improve learning, even rigorously proven interventions (such as higher teacher pay, greater autonomy for teachers over classroom practices, more textbooks, smaller class sizes) will not necessarily produce better learning. They are likely to work only if they address a weakness in any of the above accountability relationships.[4]

In this paper we examine the relationship between the quality of a country's education system and education outcome measures. We address the following question: *Do countries with a better education system achieve better education outcomes*? In particular, we analyze the relationship between system quality indicators and four measures of education outcomes that are comparable across countries, using regression analyses with controls for countries' level of per-capita GDP, per-student spending level for education, and average education level of the adult population. To our knowledge, this type of quantitative analysis using an aggregate measure of the quality of the education system across countries has not been undertaken for developing countries. The most relevant literature in this respect are those that have quantitative indicators of a broad yet single aspect of the education system such as the overall quality of teachers,[5] school management and governance,[6] corruption within the system,[7] and the existence and supply of private schools.[8]

The next section describes the measures of the quality of the education system that we use. Section III presents descriptive statistics on education outcomes, the quality of the education system, and country characteristics. Section IV discusses the results from regression analyses of the relationships among these variables using different specifications. Finally, Section V summarizes our conclusions.

[4] A description of the 6-year RISE program is in its website: http://www.opml.co.uk/projects/rise-improving-education-systems-low-income-countries-0.
[5] The OECD Teaching and Learning International Study (TALIS) provides comparable data on teacher quality across countries; this database has been used mostly for analyses on more advanced countries (Ben et al., 2012).
[6] See Bruns, Filmer, & Patrinos (2011) for a review of this literature.
[7] See Ferraz, Finan, & Moreira (2012) on Brazil, for example. The study uses measures of corruption involving educational block grants transferred from the central government to municipalities.
[8] See Ashley et al. (2014) and James (1993).

Data Sources

For our analysis, we use data from the World Bank's *Systems Approach to Better Education Results* (SABER) initiative (World Bank, 2016b). This program has been collecting data on the policies and institutions of education systems around the world, and benchmarks them against practices associated with effective learning.[9] The metrics are designed principally to identify policy areas which are weak and in need of improvement in a particular country, using a structured questionnaire to underpin that analysis. This ongoing effort has generated a database that captures different aspects of the education systems in about 100 countries, based on measures that can be easily compared across education systems.

The SABER program collects comparable, well-defined, quantitative and qualitative data on policies and institutions across countries. For each policy domain, the program defines the critical elements that countries have to get right in order to achieve the best outcomes; these are based on extensive reviews of research, global evidence and expert opinion. The reviews are summarized in a suite of framework papers on several policy domains, such as "What Matters for Teacher Policy" (Vegas & Ganimian, 2013) and "What Matters for Student Assessment" (Clarke, 2012). These framework papers are the bases for the design of the questionnaire for each policy domain, and for the development of specific rubrics that are designed to ensure cross-country comparability and replicability.[10] While the focus of the SABER program has been to document countries' education policies (*de jure*), some of the questionnaires also contain elements about policy implementation (*de facto*).[11]

There are other quantitative databases that have globally comparable metrics of certain characteristics of the education system. For example, the OECD's Teaching and Learning International Survey (TALIS) program collects data about teachers and school leaders (OECD, 2018) ; however, in 2013 the survey covered just 34, mostly high-income,

[9] The SABER program aims to give all parties with a stake in educational results?from students and teachers and parents to policymakers, business people, and political leaders?an accessible, detailed, objective, and up-to-date snapshot of how well their country's education system is oriented toward delivering learning. The program is described in http://saber.worldbank.org/index.cfm?indx=5.

[10] The SABER team developed a data-collection instrument appropriate for collecting data for the policy and institutional indicators for each policy domain. This instrument relies on an experienced principal investigator in each country who collects information from key informants, documents, and other data sources. Data collection can usually be completed within a few weeks. An alternative approach used in some policy domains has been to convene a workshop of experts, including government officials, and use that group process to collect the evidence and code data. In either case, data sources are clearly identified and available to the public as the data are posted online (World Bank, 2013). For more information, http://saber.worldbank.org/index.cfm.

[11] One might expect the quality of implementation to change more frequently, not necessarily in the forward direction in each political administration, while policies tend to be more "sticky" and, in theory at least, to serve as guiding norms for managing and operating the education system. A hard challenge for many countries is to reduce the discrepancy between good policies and actual

countries.[12] UNESCO's International Bureau of Education (IBE) collects a trove of country reports on the education system, but the contents of these reports are difficult to use in a quantitative analysis without applying a set of rubrics to transform the generally qualitative information into comparable cross-country data.[13]

SABER aggregates policy and institutional indicators to assess a policy domain. The ratings are on a 4-point scale for each aspect of a domain: "Latent" (with an index value of 1); "Emerging" (2); "Established" (3); and "Advanced" (4). A SABER rating indicates whether or not the policies in a domain are as high in quality or maturity as what is regarded by global research and policy experts to be best practice. The overall rating for a policy domain is a composite of the ratings on all aspects of that policy domain (unweighted average). Each country gets a rating for each policy domain that has been covered by SABER in that country. Table 1 illustrates what the four-scale rating means for two policy domains, teachers and student assessments.

Table 1. What education systems need to get right about teacher policy and student assessment

Policy domain	Latent (Poor=1)	Emerging (Fair=2)	Established (Good=3)	Advanced (Great=4)
Teachers	Low selection criteria for workforce; no induction training for beginning teachers and no structured in-service support; no performance evaluation of teachers; pay based only on years of service, no performance.	Clear professional standards, but weak enforcement; in-service program but no induction program; no structured performance evaluation of teachers; and pay based only on years of service.	Clear professional standards, and generally good enforcement of selection criteria; required induction and in-service program; irregular performance evaluation of teachers; selective performance-based pay.	High professional standards and good enforcement of selection criteria; strong induction program and continuous professional development; competitive pay and benefits to attract best into workforce; performance-based pay.
Student assessment	No large-scale national student assessment.	Nascent large-scale student assessment but of weak quality.	Stable large-scale student assessment of moderate quality, results disseminated but not used for decision-making.	Stable and high quality, large-scale student assessment; evidence published and used for decision-making.

Source of data: World Bank. (2016b). *Systems Approach for Better Education Results* (SABER) data. http://saber.worldbank.org/index.cfm

[12] It would be possible to link country-level data on teacher quality from OECD's Teaching and Learning International survey (TALIS) data to the average student assessment from PISA, but even 2018 TALIS covers only about a dozen less advanced countries (OECD, 2013, 2018). TALIS collects data regarding six thematic areas, including teaching practices, the classroom environment, and school leadership.

[13] The UNESCO country reports follow a guideline about what information should be included, but the reports tend to vary greatly in terms of the breadth and depth of the available detail. For more information, see http://www.ibe.unesco.org/en/document/world-data-education-seventh-edition-2010-11.

In the following analyses, we take the average SABER rating across policy domains to arrive at a single value for the quality index of the education system in each country. The SABER program is ongoing and its data are not yet available across all policy domains for every country, so we are not able to examine the relationship between specific policy areas and education outcomes. Instead, our analysis is based on a country's average rating across the domains for which data are available. For some countries, this overall index is computed on the basis of ratings for seven domains, while in others, the index is based on only two or even just one domain, depending on how many SABER assessments have been undertaken for a country at the time of our analysis. In all, we estimate index values for almost 100 countries, but the intersection of countries with SABER data and those with student learning data yields a smaller sample size of 70.[14] We interpret the country average index as reflecting the overall quality of the country's education system.

As a robustness check to the SABER data, we also analyze the ratings from the education component of the World Bank's Country Policy and Institutional Assessment (CPIA) index (World Bank, 2016a).[15] In contrast to the SABER data which are based on the responses of experts and country respondents to questionnaires about specific aspects of policies and on policy documents, CPIA education ratings are assessments made by World Bank staff on six main dimensions of the quality of the primary and secondary education in each country. The six dimensions are sector strategy, education management and information system, student assessments, teachers, education finance, and school-based management.[16]

To measure the outcomes of education systems, we use the Barro-Lee estimates of the average completed years of schooling in each country (Barro & Lee, 2013), academic proficiency levels from several student assessments (Altinok, Diebolt, & De Meulemeester, 2013), and self-reported satisfaction rates with the education system from the Gallup Poll of 2015.[17] Because the current regional and international student assessments are not strictly comparable in terms of age, grade or being curriculum-based, instead of student test scores, we use the percentage shares of students who perform at

[14] The SABER program is ongoing, so it should be possible to update this analysis with a larger number of countries and use more domains to estimate the quality index for each country. In addition, as more developing countries participate in cross-national student assessments, global or regional, it will be possible to expand the sample size of this study.

[15] This program provides ratings on all sectors of the economy, such as agriculture, health, and energy. Our analysis uses the ratings only for the education sector.

[16] See World Bank (2016a) for a description of the criteria used to rate each dimension in the CPIA database.

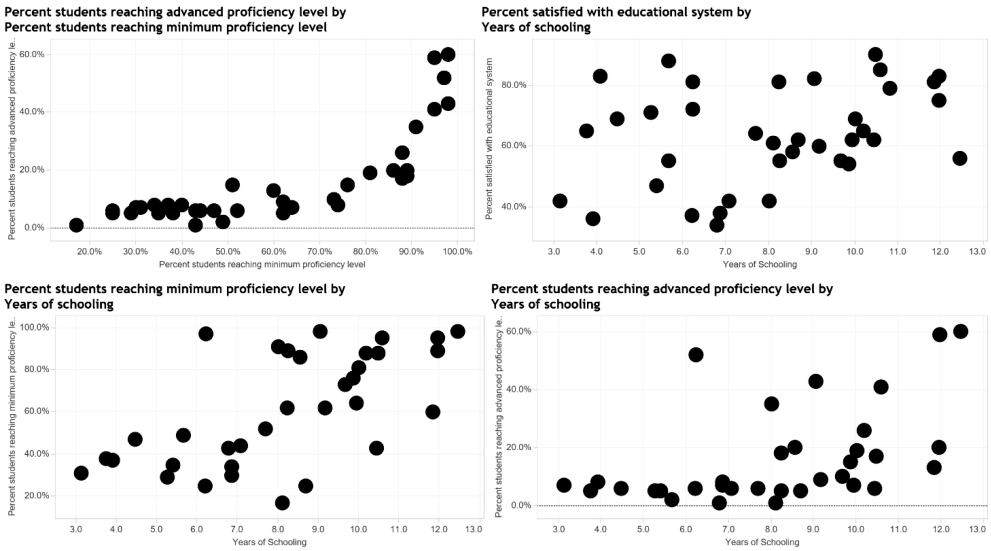
[17] The Gallup World Poll contains information on satisfaction with the educational system for 166 countries over multiple years, based on surveys that average 1,115 respondents per country and per time period. For most of the countries, data are available every year between 2006 and 2015. The specific Gallup poll question that we used is: "In the city or area where you live, are you satisfied or dissatisfied with the educational system or the schools?" For a description of what the Gallup World Poll is, see https://www.gallup.com/analytics/232838/world-poll.aspx. We purchased Gallup's education data in connection with our background paper for the Education Commission report (2016).

the minimum profciency level (defined as one standard deviation below a score of 400) and those who score at the advanced proficiency level (defined as one standard deviation above a score of 400) (Altinok et al., 2013).

Descriptive Analyses

Figure 2 presents the distribution of countries with respect to four education outcomes. Pairing outcomes suggests that education systems that succeed in one outcome tend to do well also in the other outcomes. For example, countries with a larger percentage of students with at least a minimum proficiency level in learning assessments are also more likely to have a larger percentage of students meeting the advanced proficiency level (upper left panel), although this positive relationship is more marked in countries where the percentage of students reaching the minimum proficiency level exceeds 80 percent. In the countries where the share of students reaching minimum proficiency is below 80 percent, the share of students who achieve advanced competency hovers at 10 percent or lower.

Figure 2. Four education outcomes: years of schooling, shares with minimum and advanced proficiency levels, and percent satisfied with education system



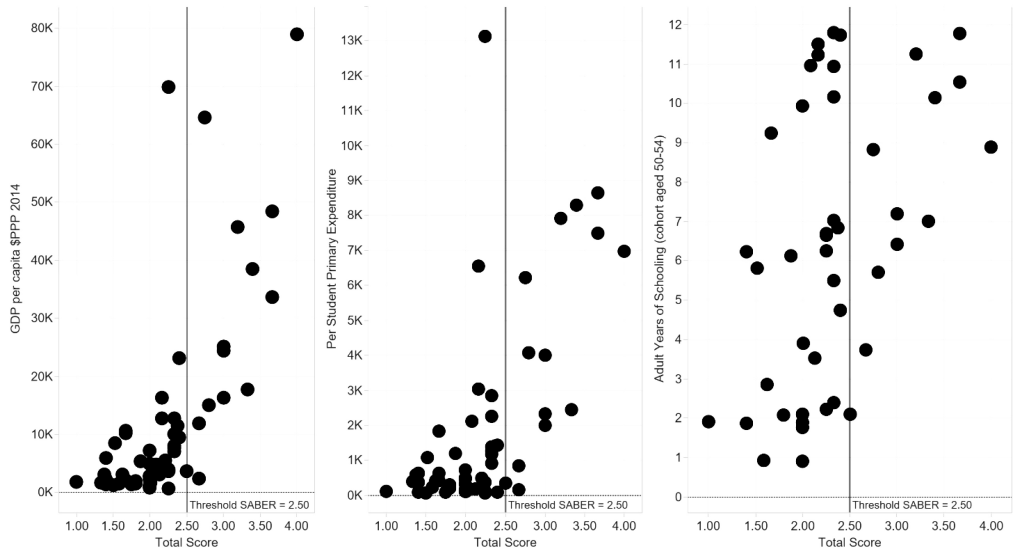
Data sources: Altinok et al. (2013) for harmonized test scores; Gallup World Poll (2015) education data for percent of people satisfied with their education system; and Barro & Lee (2013) for estimated completed years of schooling.

There is also a positive relationship between average completed years of schooling, as provided by the Barro-Lee database, and student proficiency levels. Some countries have high average years of schooling without the majority of students reaching the minimum proficiency level (lower left panel), suggesting that success in raising enrollment or years of schooling does not necessarily mean success in raising learning outcomes. However, countries that have lower average completed schooling are the countries that have a lower percentage of students who achieve advanced proficiency (lower right panel).

Figure 2 suggests only a weak relationship between average completed years of schooling and the share of the population who say they are satisfied with their education system, according to the Gallup poll (upper right panel). Interestingly, in some countries that have attained very high average years of schooling (e.g., Korea with 12.5 years), a lower share of the population is satisfied with their education system than in countries that have attained much lower completed years of schooling (e.g., Cambodia with just 5.7 years).

Figure 3 plots the variables that are likely to be associated with education outcomes, besides system quality—a country's GDP per capita, average schooling of the adult population (aged 50-54), and education expenditures as measured by the per-student spending at the primary level—against the SABER system quality index. Previous

Figure 3. Education system quality, GDP per capita, education expenditures and adult years of schooling



Data sources: World Bank SABER data (2016b); World Bank Development Indicators (2016c); Barro & Lee (2013)

research has shown the first two control variables to be related to education outcomes, both possibly capturing the demand for education in the economy and the value that parents place on education. Student-level studies have consistently found that parents' education (either of one or both parents) has a positive effect on their children's school participation and completed years of schooling (for example, Orazem & King, 2007). There are fewer studies on the effect of parents' education on learning outcomes, but they tend to find also a positive relationship (Hanushek & Woessmann, 2015).

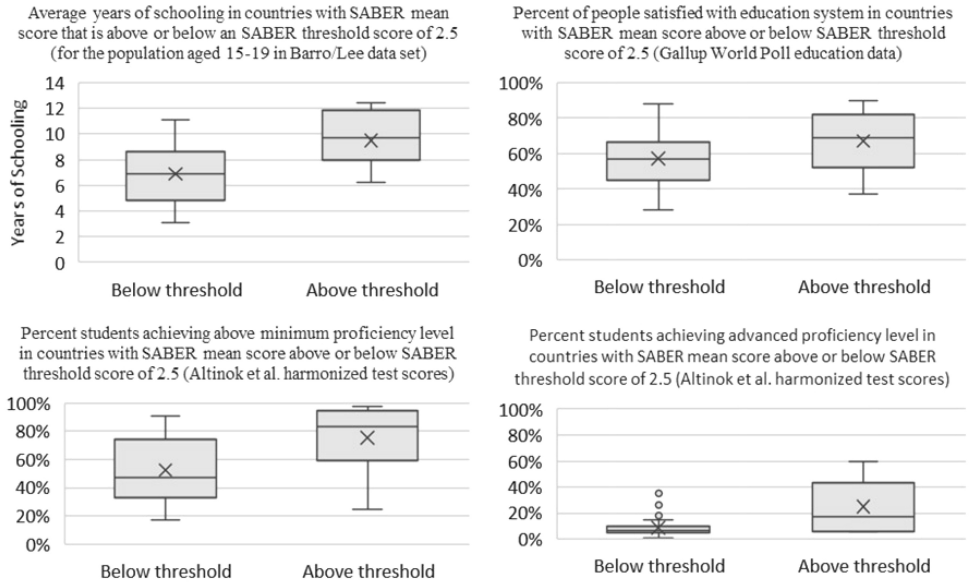
Controlling for the country's income level, education spending per student indicates not only the aggregate level of school inputs, but also the country's willingness to allocate sufficient resources for education. In developing countries, the share of salary costs in education expenditures varies widely, reaching 94% in the case of Togo in 2014, for example. Previous research on the impact of increased public funding for education portray a mixed picture of that impact. If that spending goes to building and staffing schools in areas where no school previously existed, however, then spending increases enrollment (Hanushek, 2003; Glewwe, Hanushek, Humpage, & Ravina, 2011). Fewer studies have estimated this relationship with respect to student learning, but experimental and quasi-experimental evidence show that increases in some school inputs, especially for teachers, do raise student learning.[18] Those expenditures must be able to affect not only the quality of teachers employed in schools or the share who are trained, but also their teaching practices and their interaction with students in the classroom.[19]

Figure 3 also shows that both per-capita GDP (in constant PPP $) and current per-student expenditures in primary education are positively associated with the system quality index, but there is no clear association with the average schooling of the adult population aged 50-54 (or parental generation). Countries with a good education system (defined as those with a SABER index value greater than 2.5) tend to be wealthier and tend to spend more public resources per primary student. Many countries spend less than $1,000 per primary-school student while other countries spend at least five times more. Education spending and system quality are positively associated but this association is evident only for countries that spend more than $1000 per student, implying that a minimum level of education spending may be necessary to ensure a good education system.

In the four panels of Figure 4, we show the distribution of the four education outcomes against a system quality measure based on whether the SABER index value is greater or less than 2.5. The graphs show the mean values of the education outcomes, as well as the values corresponding to the 25th and 75th percentiles and also to the 5th and 95th percentiles. In this descriptive analysis (that is, without controls for other variables), the countries that meet the SABER threshold value have far better education outcomes. The differences between the countries above and those below the threshold value of 2.5

[18] See, for example, Duflo, Hanna, & Ryan (2012) and Muralidharan & Sundararaman (2011).
[19] See Bruns et al. (forthcoming) for an illustration of classroom observation methods for measuring teaching quality in Brazil. Another important measure of the quality of teaching is whether teachers come to class (Bold et al., 2016).

Figure 4. Distribution of four education outcomes, by quality of the education system, without control variables (Source: Authors' calculations)



for the SABER score are notable—over two more years in terms of the average years of schooling, over 30 percentage points in the share of students reaching the minimum proficiency level, over 10 percentage points in the share of students reaching the advanced proficiency level, and 10 percentage points in the satisfaction rate with the national education system.

Regression Results

We now turn to our principal findings about the relationship between the quality of education systems and education outcomes. Our regression results support the expectation that better education systems achieve better education outcomes.

Results using SABER data

We use alternative specifications of the quality of the education system variable. The estimated relationship between system quality and education outcomes is positive whether the quality variable is measured by the SABER aggregate index or by a dummy variable which equals one if the average SABER value is above a threshold of 2.5 (Table 2). [20,21] This positive association holds even as controls are added, as shown by the full estimates in Appendix Table A1. When controlling for a country's GDP per capita and the average education level of adults aged 50-54, the results suggest that, of countries with

similar levels of GDP per capita or adult education levels, those with a better education system are likely to have more years of schooling for its youth, a higher proportion of students meeting the minimum and advanced proficiency levels in multi-country learning assessments, and more of the general population being satisfied with their education system. With controls, the size of the education system coefficients is smaller, but in general, not dramatically so. Even with controls, in education systems that pass the threshold (SABER score>2.5), the share of students who reach the minimum proficiency level is 25 percent higher, the share who reach the advanced proficiency level is 14 percent higher, the average schooling is 2.6 years higher, and the satisfaction rate with the education system is greater by 15 percentage points.

In contrast, the average expenditure level for basic education, even when included by itself and without the system quality variable, is not significantly associated with any of the education outcomes (Appendix Table A1), and its inclusion does not significantly change the coefficient of system quality. In fact, for average years of schooling, the per-student expenditure level has a significantly negative coefficient. Spending more for education per student, by itself, does not appear to benefit education outcomes, and whatever effect it has seems to be dominated by the quality of the education system. We explore this observation further by adding also an interaction term between system quality and expenditures. Results change only in the proficiency-related outcomes:

Table 2. Regression results for education outcomes, with education system quality and expenditures

Variables	Percent reaching minimum proficiency		Percent reaching advanced proficiency		Years of schooling		Percent satisfied with education system	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
System quality:								
Average SABER	0.162**		0.118***		1.935***		0.104*	
	(0.0603)		(0.0382)		(0.530)		(0.0543)	
SABER dummy (=1, if average score>2.5)		0.253***		0.145***		2.623***		0.148**
		(0.0655)		(0.0446)		(0.663)		(0.0658)
Education expenditures	0.00546	0.00532	0.000876	0.000854	-0.327**	-0.336**	-0.00763	-0.00762
	(0.0163)	(0.015)	(0.0103)	(0.0102)	(0.145)	(0.142)	(0.0152)	(0.0150)

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Notes: Appendix Table A1 contains the full regression results. The control variables included in the regressions are GDP per capita, average years of schooling of the adult cohort, aged 50-54, and a constant term.
Source: Authors' calculations

[20] We explored alternative threshold values for SABER, including 2 and 2.25. We find that there is a higher positive association with education outcomes with the more stringent rating of 2.5.
[21] As mentioned earlier, SABER ratings categorize the level of the quality of education policies in a domain as latent, emerging, established and advanced. To generate the four categories, a total score is calculated based on the rating of individual policies that make up each domain. In our aggregation, the same cut-off points are applied to the total score as are used in aggregating up the individual scores within a policy domain.

a loss in statistical significance for system quality with no change in the magnitude of its coefficient, and no positive change in the statistical significance of per-student expenditure.

The above regression results support some optimism about the ability of low- and middle-income countries to overtake richer countries in terms of the quality of education systems, which is aligned with the relationships implied by Figure 3 which do not control systematically for other country characteristics. Optimistically, these countries can have as good education outcomes as higher-income countries if they have a good education system, although few low-income countries in the current SABER database score above 2. In the same vein, higher-income countries may do no better than middle-income countries if they do not have a better education system. Per-capita GDP does not figure significantly in any of the regressions, with the exception of one specification for the proportion of students reaching the advanced proficiency level. Table 3 is a simple illustration of these findings.

Consistent with the existing literature (and contrary to the descriptive analyses without controls), the regression results show the expected intergenerational effect of education (Appendix Table A1). In all the regressions, the average years of schooling of adults aged 50-54 have a significant positive association with current education outcomes. In countries where the parent generation completed an average of one more year of schooling, the share of students reaching the minimum proficiency is higher by 2.8-5 percent and students reaching advanced competency by 1.2-3.4 percent, depending on the specification of the system quality variable. The average completed years of schooling is up by almost half a year across the specifications, while the share of the population who are satisfied with their education system is higher only by 0.4-1.5 percent.

Table 3. Education outcomes by level of GDP and quality of the education system

	Lower income, weaker education system	Lower income, stronger education system	Middle income, weaker education system	Middle income, stronger education system	Higher income, weaker education system	Higher income, stronger education system
Percent of students achieving advanced proficiency level	6.9	6.9	8.7	11.5	17.0	30.8
Percent of students achieving at least minimum proficiency level	36.0	46.6	59.6	73.5	74.8	83.5
Percent of people satisfied with their education system	53.6	56.0	61.0	69.0	58.5	71.8
Average completed years of schooling	5.7	6.4	8.3	9.1	8.0	10.2

Source: Authors' calculations using their regression results, with controls for education spending and average level of education of adults aged 50-54.

A robustness check

In this section, we use an alternative measure of the quality of the education system, the CPIA index produced by World Bank staff. Using this index has the advantage that the data related to each dimension of an education system are available for a much larger number of countries. The CPIA index on the education sector has six core components that are graded on a six-point scale, although hardly any country has been given the lowest rating and only a few countries have been assigned the top rating. Based on this compressed distribution, we rescale the CPIA score to a four-point scale (Table 4). As a check on the comparability of the SABER and CPIA ratings, we undertake regression analyses on the full CPIA sample as well as on a sample consisting of only those countries with also a SABER score.

Table 5 shows the results when the same control variables are included as in the prior regression analysis. Similar to the findings from the regressions using the SABER data presented in Table 2, the quality of the education system is significantly associated with learning outcomes, as measured by the percent shares of students reaching the minimum proficiency level and those reaching the advanced proficiency. However, while the coefficients across the two CPIA samples (full and subsample of SABER countries only) are qualitatively similar, they are not statistically significant in the smaller sample of SABER countries. In contrast to the results using the SABER score, the coefficient of the CPIA score is not statistically significant for either the years of average schooling or the percent of the population satisfied with the education system. Part of the reason for the generally weaker associations of the policy variables with the educational outcomes

Table 4. Comparing the distributions of the SABER and CPIA scores

	Percent reaching minimum proficiency	Percent reaching advanced proficiency	Average years of schooling	Percent satisfied with education system
A. SABER score				
Minimum value	1.4	1.4	1.4	1.4
25th percentile	2.08	2.08	2.0	2.0
50th percentile	2.33	2.33	2.33	2.33
75th percentile	2.80	2.80	2.75	2.75
Maximum value	4	4	4	4
Mean	2.46	2.46	2.40	2.43
Standard deviation	.65	.65	.63	.62
N	34	34	39	37
B. Rescaled CPIA score, full sample (for SABER subsample only, in parentheses)				
Minimum value	2 (2)	2 (2)	2 (2)	2 (2)
25th percentile	2.44 (2.44)	2.44 (2.44)	2.44 (2.44)	2.44 (2.44)
50th percentile	2.67 (2.72)	2.67 (2.72)	2.67 (2.78)	2.67 (2.78)
75th percentile	3 (3)	3 (3)	3 (3)	3 (3.11)
Maximum value	3.78 (3.78)	3.78 (3.78)	3.78 (3.78)	3.78 (3.78)
Mean	2.76 (2.77)	2.76 (2.76)	2.75 (2.78)	2.76 (2.81)
Standard deviation	.40 (.44)	.40 (.44)	.39 (.43)	.39 (.42)
N	53 (28)	53 (28)	65 (33)	65 (31)

Source: Authors' calculations.

with the CPIA measure as opposed to the SABER measure may be due to the compressed distribution of the CPIA score, shown in Table 4. As with the SABER specifications, we undertake robustness analyses using the CPIA data by using alternative threshold values of system quality; the results vary when alternative threshold values of 2.5 and 3 are set.[22]

The regression analysis here and in the previous section use average SABER and CPIA scores to measure the quality of the whole education system. As mentioned above, the SABER program has scored individual policy domains of the system, but as of this writing, SABER data on all domains are not complete, and we are not able to identify the domains of the education system that may be more or less critical to education outcomes. Because such an analysis could be useful, we re-estimated our model using the individual CPIA scores for dimensions of the education system. The results do not point strongly to any one dimension being dominant, except perhaps having a serious sector strategy (SST) which does appear to be associated with a higher proportion of students reaching the minimum proficiency level (Appendix Table A5). The coefficients for teacher policies and school management are significant only for a subset of our estimates.

Table 5. Regression analyses using the CPIA score to measure system quality

Variables	Percent reaching minimum competency	Percent reaching advanced competency	Average years of schooling completed	Percent satisfied with education system
A. Rescaled CPIA, full CPIA sample				
Per-student expenditure in primary/1000	0.0142	0.0175**	-0.167	-0.0151
	(0.0179)	(0.00821)	(0.174)	(0.0178)
Rescaled CPIA average score	0.144***	0.0898***	-0.156	-0.0248
	(0.0535)	(0.0245)	(0.463)	(0.0488)
B. CPIA dummy variable, full CPIA sample				
Per-student expenditure in primary/1000	0.0165	0.0197**	-0.168	-0.0152
	(0.0179)	(0.00863)	(0.173)	(0.0178)
Dummy=1 if Average CPIA score > 2.75	0.0944**	0.0447**	-0.133	-0.0225
	(0.0376)	(0.0181)	(0.335)	(0.0350)
C. Rescaled CPIA, SABER countries only				
Per-student expenditure in primary/1000	0.0286	0.0146	-0.185	-0.00942
	(0.0215)	(0.00956)	(0.216)	(0.0232)
Rescaled CPIA average score	0.110	0.0898**	-0.181	-0.0539
	(0.0738)	(0.0328)	(0.673)	(0.0738)
D. CPIA dummy variable, SABER countries only				
Per-student expenditure in primary/1000	0.0288	0.0161	-0.187	-0.00953
	(0.0216)	(0.0106)	(0.217)	(0.0233)
Dummy=1 if Average CPIA score > 2.75	0.0777	0.0310	-0.0176	-0.0194
	(0.0555)	(0.0272)	(0.507)	(0.0564)

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations; full results corresponding to Table 4 are in Appendix Table A3.

[22] See Appendix Table A4 for the full results using alternative threshold values for estimating the CPIA dummy variables.

Conclusions

The magnitude of the current call for more education and learning is unprecedented, as exemplified by the UN Sustainable Development Goals for 2030, the report *The Learning Generation* (Education Commission, 2017), and the World Development Report *Learning to Realize Education's Promise* (World Bank, 2018). Most striking about this global call is the clear shift in focus to quality education and improvements in learning. In response to the Education for All movement in the 1990s, governments dramatically increased the capacity of their school systems to enroll students, mostly by building many more classrooms and recruiting many more teachers than ever before. Learning outcomes, as measured by even basic student assessments, however, have not kept up with this progress.

Research about how to improve learning point to a large number of factors besides investments in more classrooms, more textbooks, and even more teachers; these include the quality of teaching, time spent on actual learning, appropriate curriculum, and language of instruction (Bruns et al., 2011). Top school systems in the world pay a great deal of attention to how they select their staff; they work hard to improve the performance of schools, provide an environment in which teachers work together to frame good practice, and establish smart pathways for teachers to grow in their careers. They are able to achieve these improvements because their education systems are organized, adequately resourced, and led by managers who are accountable for their performance. Strong education systems have standards, academic curricula, financing, information and other structured processes that are coherent and aligned towards achieving education goals. In contrast, weak education systems struggle to achieve that alignment and coherence: their standards, goals and rules are not clearly defined; the inputs are inappropriate or inadequate; resources are used inefficiently and accountability mechanisms are weak. Moreover, these systems are not sufficiently dynamic to adjust to shifts in the socioeconomic and political contexts, as well as to changes in the financial and management capacities of the country.

Our analyses of the relationship between measures of the quality of an education system and education outcomes suggest that system quality matters for student performance, completed years of schooling, and people's regard for their education system. This positive association holds, controlling for country-level factors that may affect these education outcomes, suggesting that education outcomes are not likely to improve if the education system is weak. Previous cross-country analyses have included system-level variables such as average pupil-teacher ratio, percentage of teachers trained, or public spending for education, but those measures pertain to input levels rather than the overall quality of the system.

There is no internationally comparable, rigorous quantitative measure of education system quality on less advanced countries, although elements of such a measure exist through (uncoordinated) efforts by OECD, UNESCO, the World Bank, and the McKinsey

consulting company. The SABER data we use come from a promising initiative by the World Bank, but this database is far from complete, with data on many developing countries and on several policy domains still missing. Our results provide initial support for investing in such a database.

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Appendix Table A1. Regression Analyses Using SABER to Measure Education System Quality

	Using average SABER score				Using SABER dummy	
Variables	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**	**[6]**
A. Percent Reaching Minimum Proficiency						
System quality		0.181**	0.162**	0.140	0.264***	0.253***
		(0.069)	(0.0603)	(0.0836)	(0.0746)	(0.0655)
Per-student expenditure	0.00694		0.00546	-0.00946		0.00532
in primary education	(0.00601)		(0.0163)	(0.0419)		(0.0150)
System quality x Expenditure				0.00616		
				(0.0159)		
Adult schooling, aged 50-54	0.0504***	0.0285***	0.0390***	0.0392***	0.0333***	0.0429***
	(0.00577)	(0.00933)	(0.00888)	(0.00901)	(0.0086)	(0.00789)
GDP per capita, 2014 $ PPP	0.000780	0.00158	0.000480	0.000334	0.000699	-0.000473
	(0.000939)	(0.00198)	(0.00267)	(0.00273)	(0.00189)	(0.00247)
Constant	0.243***	-0.0382	-0.0641	-0.0160	0.303***	0.246***
	(0.0397)	(0.146)	(0.127)	(0.179)	(0.0563)	(0.049)
Observations	99	44	40	40	44	40
R-squared	0.649	0.538	0.678	0.679	0.587	0.728
B. Percent Reaching Advanced Proficiency						
System quality		0.119***	0.118***	-0.0390	0.123***	0.145***
		(0.0376)	(0.0382)	(0.0355)	(0.0439)	(0.0446)
Per-student expenditure	0.00676		0.000876	-0.105***		0.000854
in primary education	(0.00429)		(0.0103)	(0.0178)		(0.0102)
System quality x Expenditure				0.0436***		
				(0.00675)		
Adult schooling, aged 50-54	0.0246***	0.0131**	0.0136**	0.0153***	0.0163***	0.0168***
	(0.00412)	(0.00509)	(0.00562)	(0.00383)	(0.00506)	(0.00537)
GDP per capita, 2014 $ PPP	0.00125*	0.00146	0.00164	0.000601	0.00161	0.00147
	(0.000670)	(0.00108)	(0.00169)	(0.00116)	(0.00111)	(0.00168)
Constant	-0.0552*	-0.247***	-0.246***	0.0944	-0.0213	-0.0209
	(0.0283)	(0.0795)	(0.0804)	(0.0759)	(0.0331)	(0.0334)
Observations	99	44	40	40	44	40
R-squared	0.578	0.592	0.638	0.838	0.574	0.646
C. Average years of schooling						
System quality		1.574***	1.935***	2.207***	1.927***	2.623***
		(0.489)	(0.530)	(0.713)	(0.605)	(0.663)
Per-student expenditure	-0.149**		-0.327**	-0.115		-0.336**
in primary education	(0.0579)		(0.145)	(0.394)		(0.142)
System quality x Expenditure				-0.0844		
				(0.146)		
Adult schooling, aged 50-54	0.429***	0.417***	0.448***	0.445***	0.450***	0.500***
	(0.0527)	(0.0715)	(0.0809)	(0.0818)	(0.07)	(0.0773)
GDP per capita, 2014 $ PPP	0.0237***	-0.00871	0.0190	0.0198	-0.00761	0.0164
	(0.00904)	(0.0147)	(0.0209)	(0.0211)	(0.0145)	(0.0206)
Constant	5.083***	1.710*	0.999	0.423	4.610***	4.639***
	(0.341)	(1.004)	(1.104)	(1.494)	(0.445)	(0.468)
Observations	117	59	49	49	59	49
R-squared	0.482	0.584	0.629	0.632	0.583	0.644

D. Percent satisfied with education system

System quality		0.106**	0.104*	0.0742	0.125**	0.148**
		(0.0471)	(0.0543)	(0.0712)	(0.0571)	(0.0658)
Per-student expenditure	-0.000233		-0.00763	-0.0300		-0.00762
in primary education	(0.00576)		(0.0152)	(0.0375)		(0.015)
System quality x Expenditure				0.00924		
				(0.0142)		
Adult schooling, aged 50-54	0.00434	0.0122*	0.00703	0.00754	0.0148**	0.0103
	(0.00460)	(0.00655)	(0.00802)	(0.00811)	(0.00638)	(0.00758)
GDP per capita, 2014 $ PPP	0.00163	0.000191	0.00164	0.00137	0.000264	0.00121
	(0.00107)	(0.00147)	(0.00249)	(0.00255)	(0.00147)	(0.00249)
Constant	0.575***	0.270***	0.313***	0.376**	0.465***	0.508***
	(0.0296)	(0.0953)	(0.111)	(0.148)	(0.0409)	(0.0454)
Observations	109	54	45	45	54	45
R-squared	0.112	0.295	0.253	0.261	0.291	0.276

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations

Appendix Table A2. Regression Analyses using Alternative Thresholds for SABER Index

Variables	[1]	[2]	[3]
A. Using a SABER threshold value of 2.0			
% students reaching minimum proficiency	0.227***	0.122	0.0626
	(0.0764)	(0.0768)	(0.0829)
% students reaching advanced proficiency	0.0734	0.00590	-0.0251
	(0.0467)	(0.0441)	(0.0541)
Average years of schooling completed	1.899***	1.326*	1.067
	(0.672)	(0.710)	(0.692)
% respondents satisfied with their education system	0.0365	-0.0194	0.0198
	(0.0446)	(0.0450)	(0.0645)
B. Using a SABER threshold value of 2.25			
% students reaching minimum proficiency	0.203***	0.120*	0.0600
	(0.0626)	(0.0621)	(0.0673)
% students reaching advanced proficiency	0.0856**	0.0350	0.0182
	(0.0379)	(0.0357)	(0.0441)
Average years of schooling completed	2.693***	2.340***	1.715***
	(0.499)	(0.540)	(0.516)
% respondents satisfied with their education system	0.0511	0.00860	-.0300
	(0.0394)	(0.0406)	(0.0555)

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Specifications: (1) only SABER dummy variable and constant term; (2) SABER dummy variable and control variables; (3) SABER dummy variable, per-student expenditure, and control variables.
Source: Authors' calculations

Appendix Table A3. Regression results using CPIA scores as measure of system quality

Variables	% reaching minimum competency	% reaching advanced competency	Average years of schooling completed	% satisfied with education system
A. Rescaled CPIA, full CPIA sample				
Per-student expenditure in primary/1000	0.0142	0.0175**	-0.167	-0.0151
	(0.0179)	(0.00821)	(0.174)	(0.0178)
Rescaled CPIA average score	0.144***	0.0898***	-0.156	-0.0248
	(0.0535)	(0.0245)	(0.463)	(0.0488)
Adult schooling (cohort aged 50-54)	0.0332***	0.00845**	0.328***	0.000800
	(0.00795)	(0.00365)	(0.0694)	(0.00775)
GDP per capita (2014 $ PPP/1000)	0.00573	0.00107	0.148***	0.00604
	(0.00406)	(0.00186)	(0.0393)	(0.00408)
Constant	-0.124	-0.236***	5.021***	0.643***
	(0.145)	(0.0667)	(1.230)	(0.130)
Observations	61	61	77	72
R-squared	0.622	0.580	0.602	0.044
B. CPIA dummy variable, full CPIA sample				
Per-student expenditure in primary/1000	0.0165	0.0197**	-0.168	-0.0152
	(0.0179)	(0.00863)	(0.173)	(0.0178)
Dummy=1 if Average CPIA score > 2.75	0.0944**	0.0447**	-0.133	-0.0225
	(0.0376)	(0.0181)	(0.335)	(0.0350)
Adult schooling (cohort aged 50-54)	0.0314***	0.00723*	0.330***	0.00104
	(0.00796)	(0.00383)	(0.0691)	(0.00773)
GDP per capita (2014 $ PPP/1000)	0.00792*	0.00249	0.146***	0.00564
	(0.00398)	(0.00192)	(0.0383)	(0.00398)
Constant	0.211***	-0.0206	4.670***	0.588***
	(0.0442)	(0.0213)	(0.365)	(0.0390)
Observations	61	61	77	72
R-squared	0.616	0.531	0.603	0.047
C. Rescaled CPIA, SABER countries only				
Per-student expenditure in primary/1000	0.0286	0.0146	-0.185	-0.00942
	(0.0215)	(0.00956)	(0.216)	(0.0232)
Rescaled CPIA average score	0.110	0.0898**	-0.181	-0.0539
	(0.0738)	(0.0328)	(0.673)	(0.0738)
Adult schooling (cohort aged 50-54)	0.0303***	0.00853*	0.350***	0.000835
	(0.00992)	(0.00440)	(0.0922)	(0.0103)
GDP per capita (2014 $ PPP/1000)	0.00852	0.00483*	0.202***	0.00793
	(0.00579)	(0.00257)	(0.0587)	(0.00630)
Constant	-0.0643	-0.250**	4.649**	0.688***
	(0.208)	(0.0924)	(1.880)	(0.208)
Observations	31	31	38	35
R-squared	0.729	0.753	0.721	0.093
D. CPIA dummy variable, SABER countries only				
Per-student expenditure in primary/1000	0.0288	0.0161	-0.187	-0.00953
	(0.0216)	(0.0106)	(0.217)	(0.0233)
Dummy=1 if Average CPIA	0.0777	0.0310	-0.0176	-0.0194

score > 2.75	(0.0555)	(0.0272)	(0.507)	(0.0564)
Adult schooling	0.0304***	0.00640	0.357***	0.00186
(cohort aged 50-54)	(0.0101)	(0.00494)	(0.0924)	(0.0104)
GDP per capita	0.0106*	0.00709**	0.196***	0.00655
(2014 $ PPP/1000)	(0.00542)	(0.00265)	(0.0552)	(0.00597)
Constant	0.177**	-0.0287	4.173***	0.555***
	(0.0663)	(0.0325)	(0.577)	(0.0655)
Observations	31	31	38	35
R-squared	0.726	0.697	0.721	0.081

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations

Appendix Table A4. Regression results using alternative CPIA specifications

	[1]	[2]	[3]
A. Full CPIA sample			
% students reaching minimum proficiency	0.108***	0.131***	0.161***
	(0.0383)	(0.0430)	(0.0480)
% students reaching advanced proficiency	0.0158	0.0536**	0.0860***
	(0.0226)	(0.0246)	(0.0265)
Average years of schooling completed	0.529	-0.0875	-0.348
	(0.369)	(0.431)	(0.490)
% respondents satisfied with their education system	0.0353	-0.0428	-0.0519
	(0.0[33)	(0.0484)	(0.0557)
B. SABER sample only			
% students reaching minimum proficiency	0.0926*	0.126**	0.127**
	(0.0536)	(0.0542)	(0.0599)
% students reaching advanced proficiency	-0.00167	0.0302	0.0884**
	(0.0351)	(0.0366)	(0.0358)
Average years of schooling completed	0.586	0.391	-0.349
	(0.570)	(0.589)	(0.655)
% respondents satisfied with their education system	0.0379	-0.000158	-0.0558
	(0.0734)	(0.0113)	(0.0789)

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Specifications: (1) using a CPIA threshold value of 2.5 to define the CPIA dummy variable; (2) using a CPIA threshold of 3.0; (3) using a rescaled CPIA index score. All regressions include the same control variables. The full CPIA sample consists of all countries with CPIA data and education outcomes data; the SABER sample is the set of countries that have both SABER and CPIA data as well as education outcomes data. The rescaled CPIA index is a simple transformation of the 6-point scale to a 4-point scale because of extremely small number of countries at the bottom and top ratings.
Source: Authors' calculations

Appendix Table A5. Regression results using CPIA scores for policy areas of education system

Variables	% reaching minimum competency	% reaching advanced competency	Average years of schooling completed	% satisfied with education system
A. CPIA index for system dimensions				
Education sector strategy (SST)	0.0488**	0.0164	0.0293	-0.00266
	(0.0238)	(0.0113)	(0.226)	(0.0247)
Management & Information system (EMS)	0.0165	0.0178	-0.0727	-0.0214
	(0.0270)	(0.0128)	(0.229)	(0.0251)
Student assessment (ASS)	-0.0195	0.00389	-0.273	0.0210
	(0.0227)	(0.0108)	(0.203)	(0.0208)
Teachers (TCH)	0.0261	-0.00269	0.0746	-0.00651
	(0.0349)	(0.0166)	(0.300)	(0.0317)
Financing (FCN)	-0.0118	0.00454	0.143	-0.0309
	(0.0292)	(0.0139)	(0.246)	(0.0251)
School management (SBM)	0.0365	0.00914	0.0490	0.00899
	(0.0230)	(0.0109)	(0.206)	(0.0218)
B. CPIA dummy variables for system dimensions				
SST >= 4	0.205***	0.0244	0.0326	0.0584
	(0.0631)	(0.0325)	(0.644)	(0.0718)
EMS >=4	-0.0500	0.0316	0.0172	-0.0455
	(0.0503)	(0.0259)	(0.452)	(0.0492)
ASS >=4	-0.0645	-0.0127	-0.0660	0.0678
	(0.0416)	(0.0214)	(0.396)	(0.0416)
TCH >= 4	0.0982**	0.0255	-0.173	-0.0266
	(0.0460)	(0.0237)	(0.438)	(0.0456)
FNC >=4	-0.0241	-0.0269	0.525	-0.0232
	(0.0437)	(0.0225)	(0.422)	(0.0438)
SBM >=5	0.0977**	0.0562**	-0.0352	0.00372
	(0.0442)	(0.0228)	(0.434)	(0.0447)
Observations	60	60	75	70

Note: The variables included in these regressions are per-student education expenditures, GDP per capita, and the average schooling of the adult population aged 50-54; the full CPIA sample is used. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations