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Abstract

This paper uses data from the PASEC2019 survey to examine the relationship between access to energy at home and the learning outcomes of primary school pupils in Cameroon. Unlike most existing studies, which focus on electricity as a single dimension of energy access, this paper considers multiple dimensions of energy access. It uses ordinary least squares (OLS), multivariate, and quantile regressions to analyze both the average and distributional associations. The results reveal a strong and robust association between energy access and reading performance. However, the association with mathematics is weaker and more heterogeneous across specifications and along the performance distribution. Further distributional analysis shows that energy access benefits higher-performing students more, suggesting that it may reinforce existing learning inequalities. To better understand these patterns, the paper examines the moderating role of parental homework assistance. The findings indicate that energy access and parental support act as complementary inputs in the home learning process. In rural areas, maternal support strengthens the association between energy access and numeracy, while paternal support strengthens the association with reading and overall learning. Most importantly, maternal support combined with improved energy access produces better numeracy outcomes among initially low-performing students, contributing to a reduction in performance gaps. In contrast, paternal support combined with improved energy access is accompanied by modest additional gains in reading for supported pupils. These findings emphasize that the educational benefits of energy access depend not only on infrastructure itself, but also on the household environment through which these benefits are realized.

Keywords: Energy access, learning outcomes, parental support, Cameroon, quantile regression

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1 Introduction

The fourth Sustainable Development Goal (SDG4) states: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all[1]." Despite the various policy interventions, Africa still faces poor learning outcomes. Over 55% of African pupils performed below average in reading and at least 60% performed below average in numeracy by the end of primary school in Africa (PASEC, 2019b). Cameroon is not immune to this issue. In 2013, the government introduced a policy to ensure that "no child leaves primary school unable to read or count (MINEPAT, 2013). Various strategies were implemented to achieve this goal, including overhauling teaching programs, making textbooks and teaching materials available and accessible, providing essential textbooks to public primary schools, and developing and implementing a reading instruction plan for primary schools, prioritizing disadvantaged rural areas (MINEDUB, 2021). While, this policy has increased completion rates, which rose from 73% in 2012 to 76.7% in 2016 before declining slightly to 67% in 2018 (MINEPAT, 2020), learning outcomes remain a concern. According to PASEC (2019b), 66% of students scored below the sufficient threshold in numeracy with only 53.7% scoring sufficiently in reading. Additionally, significant disparities exist between rural and urban areas: 31.21% of rural students scored below the threshold in reading, compared to 15.58% of urban students. Similarly, 66.48% of rural students scored below the threshold in numeracy, compared to 19.08% of urban students (PASEC, 2019b).

Overall, few studies around the world have examined the factors related to the child's home environment when analyzing factors linked to learning outcomes. In the context of India, Jain (2016) and Chatterjee et al., (2023) found a positive causal impact of village-level electrification on learning outcomes. However, existing studies consider the various aspects of energy access individually, and do not acknowledge that many households in developing countries have limited access to both electricity and modern cooking fuels. In Africa for example, only 3 percent of the 1.3 billion people have access to electricity (IEA, 2020), while 70 percent of households use biomass for cooking, heating, and lighting (Bakehe, 2024). Access to electricity and cooking fuels in the households may affect children's learning in different ways, so considering only one dimension may underestimate the overall effect of energy constraints. By combining these aspects, this paper provides a more comprehensive measure of household energy conditions, which is particularly relevant in an African context. Additionally, Chatterjee et al., (2023) present divergent findings across different empirical strategies, showing that while some approaches, such as instrumental variables, suggest a positive impact, more robust approaches, such as difference-in-differences fail to detect significant effects on numeracy outcomes. One interpretation of these mixed results may suggest is that access to electricity alone is probably insufficient to improve more cognitively demanding skills, such as mathematics, which may re-

[1] https://sdgs.un.org/goals/goal4.

quire complementary input. Increased study time resulting from improved energy access does not automatically associated with better academic outcomes. Access to energy alone may not be sufficient without additional support. This paper contributes to the literature by examining the conditions under which access to energy is associated with learning outcomes, an aspect that remains under-explored in the energy-education literature. Building on the existing literature on complementarities in educational attainment (Woessmann, 2016; Becker, 1965; Cunha & Heckman, 2007) this study investigates whether parental homework support moderates the association between energy access and student performance. It also by examines differences between urban and rural areas, and between fathers and mothers. Secondly, this paper provides the first evidence of this kind from Francophone sub-Saharan Africa, where access to home energy and learning are significant concerns.

Access to energy at home can impact students' learning outcomes in several ways. Firstly, having electricity at home enables pupils to study for longer during the day and in the evening (Adamba, 2018; Apergis et al., 2022). Even when pupils spend the daylight hours at school, they still need the evenings to revise and complete their homework (Sovacool & Ryan, 2016). Khandker et al., (2014) found that children in rural India learn 2.3 hours more per week in households with electricity than in households without. This extra time allows children to review their lessons consistently and regularly and practice exercises repeatedly, helping them to master reading and numeracy skills. Furthermore, access to electricity at home improves educational quality by enabling the use of ICTs, which are an important source of educational material at home and at school (Falk et al., 2021). These resources, such as television, for example, help children learn independently by simply watching videos, thereby enhancing their academic skills. During the lockdown in Sub-Saharan Africa (SSA) in 2020–21, many students were unable to learn because they could not access online learning platforms due to a lack of access to electricity (Casati et al., 2023). A second way in which energy affects students' performance is through cooking fuels. In Africa, cooking fuels are mainly dominated by wood, waste and dung, etc. One task that children are often responsible for is collecting fuelwood, which is estimated to take around four hours per day (Casati et al., 2023). Providing access to more affordable, modern fuel options, such as liquefied petroleum gas or natural gas, could reduce the time spent on this task, freeing up more time for children's education, particularly for girls (Casati et al., 2023; Acheampong et al., 2024).

The results reveal a strong and consistent association between access to energy and reading performance, as well as a weaker and more varied effect on mathematics. The results also suggest that parental support acts as a complementary factor, with gender-specific patterns emerging in rural areas. Maternal support is more closely associated with numeracy gains, while paternal support reinforces reading outcomes.

The remainder of the paper is structured as follows: Section 2 provides a non-exhaustive contextual review. Section 3 presents a review of the literature. Section 4 describes the data sources and econometric model. Section 5 presents and comments on the empirical results. Section 6 presents the robustness analysis and section 7 discusses the moderation effects.

2 Context of Study

2.1 Situation of Students Learning Outcomes in Cameroon

The Cameroonian education system comprises three levels: basic, secondary, and higher education. The country's colonial history has resulted in a bilingual education system. Consequently, there are English- and French-speaking education systems. State-run institutions are known as public schools, while those in the private sector are known as private schools. These institutions are co-educational and, as such, provide the same quality of education to girls and boys.

Basic education comprises preschool and primary school and is intended for children aged three to thirteen. In both the English-speaking and French-speaking systems, preschool comprises three classes: pre-nursery, nursery 1 and nursery 2. Primary school lasts six (06) years and culminates in the award of a Certificate of Primary and Elementary Education (CEPE), which is equivalent to the Level Certificate (OLC) in the English-speaking system. It also culminates in an entrance exam for the sixth grade of secondary school. Primary schools in Cameroon operate under three schedules: (i) Full-time: All classes operate from 7:30 a.m. to 3:00 p.m., Monday to Friday, except on Wednesday afternoons. (ii) Half-time: All classes are Monday through Friday, either in the morning or afternoon, as well as on Saturday mornings. (iii) Mixed: some classes operate full-time, and others part-time.

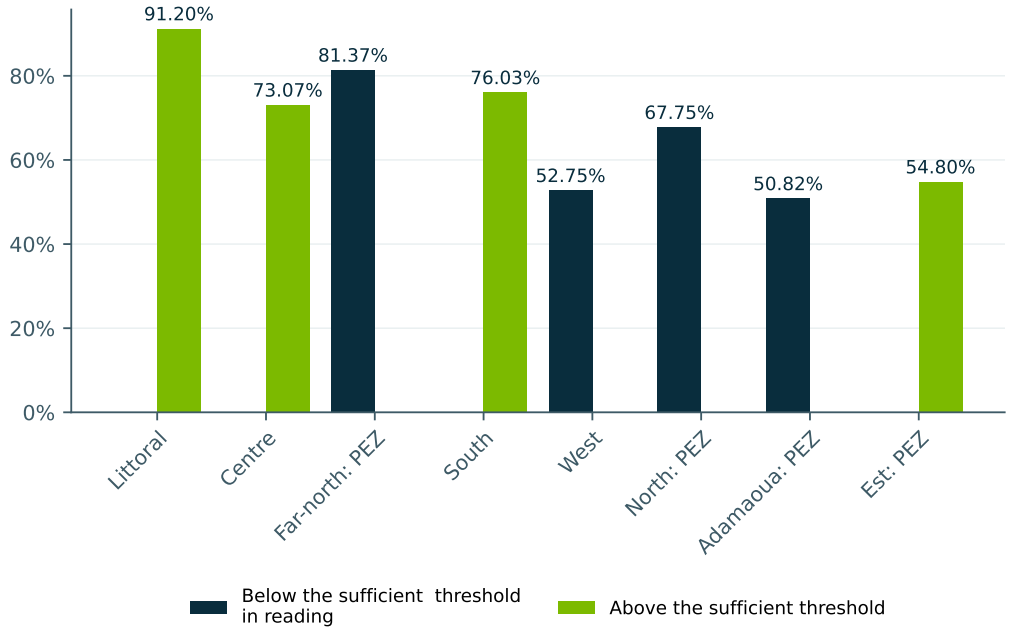
In Cameroon, 46.3% of pupils scored below the 'sufficient' threshold for reading skills. Figure 1 shows the spatial disparity of learning outcomes in Priority Education Zones (PEZs)[2][3], covering four out of the eight total regions surveyed. The Far North has the highest proportion of pupils below the minimum threshold for reading skills. This is followed by the North region, where 67.75% of pupils scored below the threshold, and Adamaoua, where the figure was 50.82%. Surprisingly, one of these regions, Est, has children performing above the proficient level in reading.

In numeracy, 67% of pupils perform below the minimum expected level. This is a worrying trend when we compare priority education zones with other regions (see figure 2).

[2] Adamaoua, Est, Far-Nord and North.

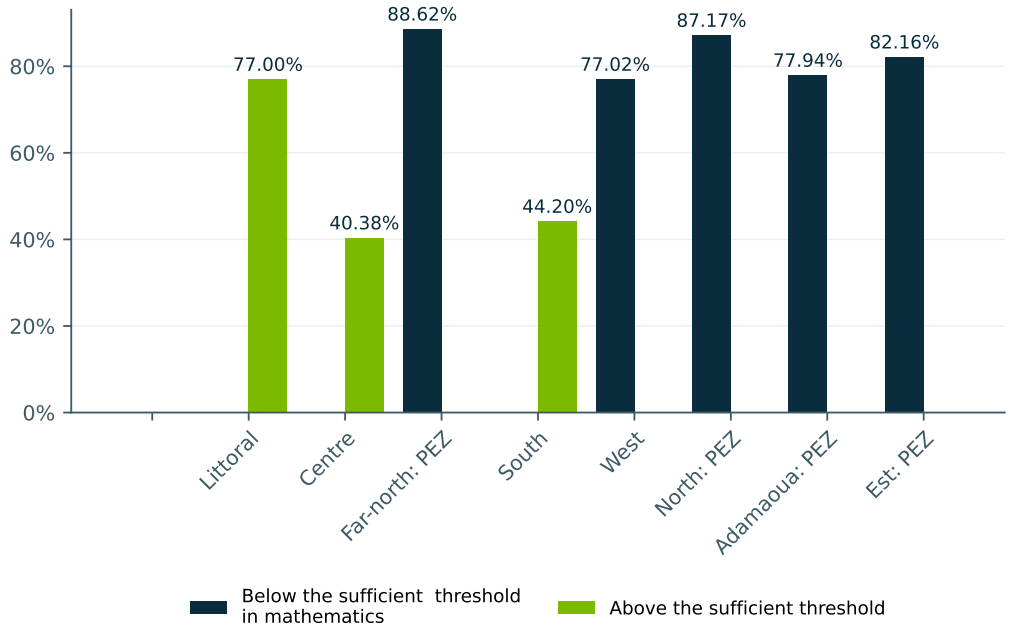
[3] These are the areas characterized by strict cultural norms according to which (1) parents doubt the future benefits of schooling for their children and (2) children's future roles in their households are determined early on, e.g., women are expected to be housewives and men are expected to become economic providers. As a result, many parents do not allow or facilitate their children's access to school.

Figure 1: Spatial Distribution of Students Reading outcomes by Region



Notes: Source: Author using PASEC2019 report

Figure 2: Spatial Disparity in Pupil's Performance in Numeracy



Notes: Source: Author, using PASEC2019 report

As with reading, the Far North remains the region with the highest percentage of pupils performing below the expected standard in mathematics: 88.62%. The North (87.17%), East (82.16%) and Adamawa (77.94%) regions follow closely behind.

Unlike reading, however, the East region has a significant proportion of children with basic numeracy skills. Of the non-PEZ regions, the West has a significant percentage of pupils (77.02%) below the expected minimum competency level. In the FSS of these PEZ regions, 79% of pupils are below the target level in French and 97% are below the target level in mathematics. In the ESS, these percentages are 54% for English and 84% for mathematics.

Secondary education comprises two types: technical and general. Both types are divided into two consecutive cycles: Secondary cycle 1 and Secondary cycle 2, divided into French system, and English-speaking system.

2.2 Brief Description of the Energy Situation in Cameroon

The energy sector comprises several areas: the production of wood energy (charcoal, sawdust, wood chips and wood waste); the production of petroleum products (diesel, gasoline, kerosene and LPG); and the production of electricity.

In terms of petroleum products, Cameroon imports 87% of its crude oil from abroad, with the remainder coming from the national oil company SNH, which has existed since 1980. Cameroon has had a national refinery company, Sonara, since 1976. This company transforms crude oil into petroleum products, making them suitable for use in transport, industry and domestic applications. A large proportion of poor households mainly use kerosene for lighting.

Wood energy comes from the forest regions of southern Cameroon, where logging and wood processing are the main activities. Cameroon produces two million tonnes of wood waste per year. It is one of the countries with the highest average annual fuelwood consumption at 625 kg per capita per year, ahead of Togo (361 kg), Niger (260 kg) and Senegal (165 kg).

Table1 shows the distribution of household cooking fuel use in Cameroon, distinguishing between urban and rural areas. Overall, the Table shows that 55% of households have access to electricity, broken down into 271 households in urban areas and 59 in rural areas.18.31% of households use liquefied petroleum gas as type of cooking fuel, broken into 10347 households in urban areas and 685 in rural areas. 73.60% of households use wood, breakdown as 15386 households in urban areas and 28958 in rural areas.

In the 1980s, electricity in Cameroon was first produced by national company, then, with the support of the World Bank and the IMF, the electricity sector was liberalized in 1998. Currently, In Cameroon, access to electricity involves a sequential process of generation, transmission, distribution, and connection to households. The Ministry of Energy and Water (MINEE) is the ministry responsible for defining the country's national energy policy. The Electricity Sector Regulatory Agency (ARSEL) is responsible for production. The production of electricity

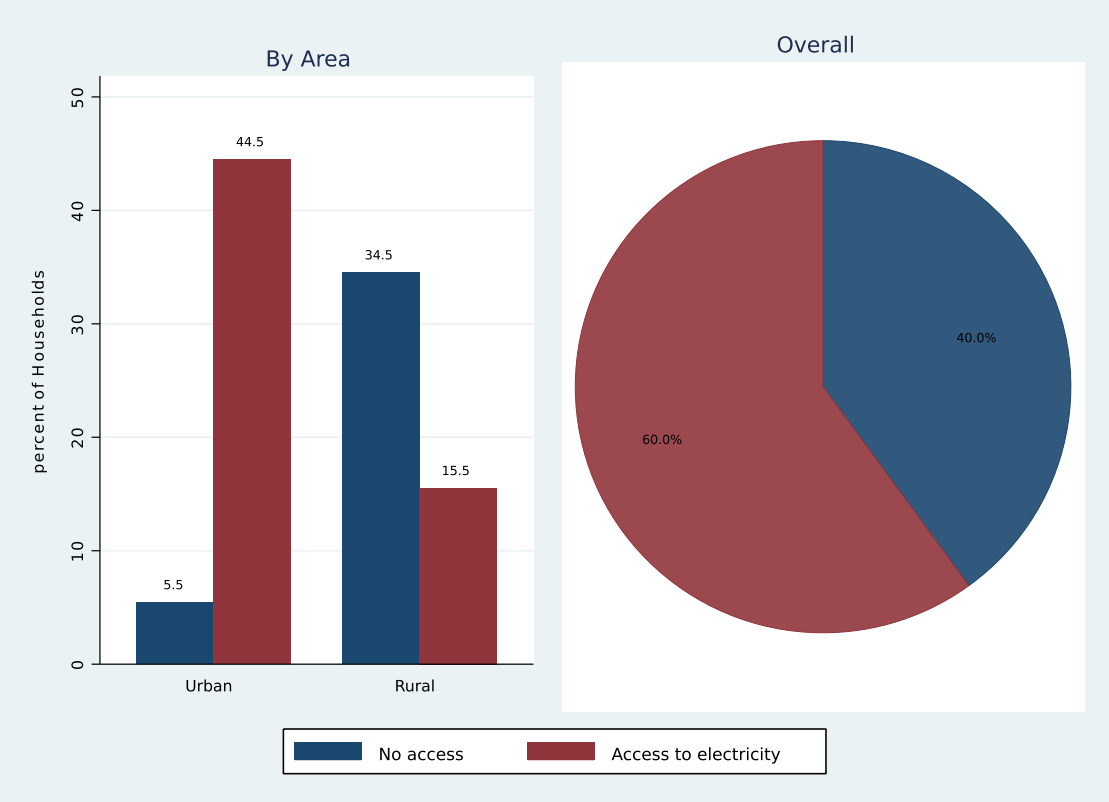
Table 1: Situation of Household cooking Fuel use in Cameroun

	All Households		Type of place of residence		
Type of cooking fuel	Freq.	Percent	Urban	Rural	Total
Electricity	330	0.55	271	59	330
Liquefield Petroleum Gas	11032	18.31	10347	685	11032
natural gas	237	0.39	233	4	237
biogas	53	0.09	40	13	53
kerosene	1085	1.80	985	100	1085
coal, lignite	152	0.25	146	6	152
charcoal	2090	3.47	1861	229	2090
wood	44344	73.60	15386	28958	44344
straw/shrubs/grass	72	0.12	22	50	72
agricultural crop	30	0.05	9	21	30
animal dung	10	0.02	10	0	10
sawdust/wood chips	811	1.35	782	29	811
Total	60246	100.00	30092	30154	60246

Notes: Source: Author, using Demographic and Health Surveys data (2018)

is generated by three hydroelectric power stations and 39 thermal power stations and strongly dominated by hydroelectric plants (76%), whose production represents only 72.2% of the total installed capacity. Finally, Eneo is responsible for distribution. Figure 4 shows that around 60% of households in Cameroon have access to electricity, while approximately 40% do not. However, significant disparities emerge across areas of residence. Access to electricity is considerably higher in urban areas, where around 44.5% of households are connected, compared to much lower levels in rural areas. In rural areas, 34.5% of households lack access to electricity, while only 15.5% have it. For most quarters in economic and political regions, access to electricity is through subcontracting (one meter for several households), and in this case the cost of low-quality electricity (very low intensity and voltage) is very affordable.

Figure 4: Situation of Household's Access to Electricity in Cameroon



Notes: Source: Author, using Demographic and Health Surveys data (2018)

3 Literature Review

The empirical relationship between access to energy and educational outcomes has been widely documented in various contexts. However, the existing literature provides mixed evidence to extent to which access to energy affects education and the ways in which this occurs.

One strand of literature focuses on how access to electricity can increase study time and improve educational participation. For instance, Gustavsson (2007) shows that giving rural Zambian children with access to solar home systems allows them to study at night and spend more time on their homework. Similarly, the UNDESA (2014) found that children living in electrified households in India performed better in exams and had higher enrolment and literacy rates. These studies suggest that electricity improves educational outcomes by extending the time available for study.

A second strand emphasizes the role of energy in shaping educational attainment and decisions about schooling. Using data from Lao PDR, Oum (2019) found that a lack of access to electricity was associated with fewer years of schooling and that this had a stronger negative effect on girls. Similarly, Oktaviani and Hartono (2022) demonstrate that low levels of electricity consumption reduce years of schooling, using Indonesian data. These studies highlight the fact

that access to energy influences long-term educational outcomes, particularly about schooling decisions and the accumulation of human capital.

Beyond electricity, an increasing amount of research is examining the important role of cooking fuels in household energy. For example, Karimu et al., (2018) found that reliance on traditional cooking fuels increases school absenteeism, particularly among boys, as evidenced by data from Ghana. Similarly, Kaddu et al., (2025) demonstrate that time spent collecting fuelwood significantly reduces school attendance in rural Uganda, with a more pronounced impact on girls. These findings suggest that traditional energy use places time constraints on children, thereby limiting their engagement with education.

More recent studies have begun to examine the impact of access to energy on learning outcomes rather than on indicators of schooling. For instance, Jain (2016) and Chatterjee et al., (2023) investigated the cognitive abilities of children in India, concluding that access to electricity improves reading and numeracy outcomes, albeit with a greater effect on reading. These studies represent a significant change in approach, shifting the focus from measuring education in terms of enrolment or years of schooling to the quality of learning.

However, despite these contributions, important limitations remain in existing literature. Firstly, most studies focus on a single dimension of energy, usually electricity, thereby overlooking the multidimensional nature of household energy use. Secondly, only a limited number of studies explicitly capture learning outcomes, and those that do tend to be conducted in contexts with relatively high electrification rates. This may limit the external validity of their findings in low-income settings. Furthermore, while the literature provides evidence that increased access to energy leads to more study time, it pays limited attention to how this additional time is utilized effectively. In particular, the complementary roles of parental support and the home learning environment remain largely unexplored. This is an important gap because increased study time does not automatically lead to better learning outcomes without adequate guidance.

4 Data and Descriptive Statistics

4.1 Sample Size and Data Tools

This paper uses the PASEC2019 survey data from Cameroon. PASEC surveys are standardized assessments of education systems in candidate countries. These assessments are based on detailed information collected about pupils, their households, teachers, principals, classrooms, and the school environment. The nationally representative sample is based on a stratified three-stage design. In the initial stage, schools are selected based on the most recent sampling frame. Within each selected school, one classroom is chosen at the end of primary education (grade 5 or 6), and an additional classroom is chosen at the beginning (grade 2 or 3), if available, using a simple

random procedure during data collection. From the selected primary classrooms, 16 students are randomly chosen from the starting grade classrooms and 25 from the ending grade classrooms, subject to class size constraints. The PASEC2019 survey took place between April and May of 2019. It included an assessment of all teachers in the selected schools regarding their knowledge and skills. The assessment consisted of paper-and-pencil, multiple-choice tests covering subject knowledge and teaching skills in reading comprehension and math. Early primary tests were administered to second grade students, and late primary tests mainly assessed the reading and math knowledge and skills needed by sixth grade students to pursue quality secondary or vocational education.

This study is based on information collected from late primary pupils and their households, as well as teachers' levels, in addition to general information on schools and school principals. While data are also available for second-grade students, more than two-thirds of the second-grade sample have missing information on at least one of the variables required for our analysis.

For this study, I used the grade 6 database. A standard sample of 272 grade 6 schools was selected for 2019, and 4,723 pupils were surveyed.

4.1.1 Dependents and Contextual Variables

Dependent Variable: In this study, educational quality is represented by pupils' cognitive skills in reading and numeracy. According to Michaelowa (2001), standardized assessments of cognitive skills, such as math and reading proficiency are generally considered reliable indicators of the performance of educational systems. PASEC provides five plausible values for each learning outcome. In line with the recommendations of CONFEMEN (2021) and the OECD (2009), aggregated measures are used rather than a single plausible value to avoid biased point estimates and underestimated standard errors.

According to the literature, several methodological approaches can be used to construct an index. The first is the simple average approach (OECD, 2009), for which Cronbach's alpha must exceed 0.74 (Tavakol et Dennick, 2011). The second follows a generalized least squared procedure as described in Anderson (2008). The third approach is PCA introduce by Pearson (1901) and used by Jolliffe (2002), Vyas et Kumaranake (2006) in the fields of development economics and health. This is based on a robust statistical dimension reduction method that maximizes explained variance. Several studies on school performance have used these approaches (Carneiro et al., 2020; Koussihouede, 2020; Koussihouede et al., 2026; Armand et al., 2024).

In this paper, I constructed these three indicators and compared them using Pearson and Spearman correlations. The internal consistency tests reported in Table 2 of the appendix show that the plausible values capture a single underlying latent skill, as indicated by the very high Cronbach's alpha values for both reading and numeracy (0.97–0.98). Furthermore, Tables 2 to 4 show very high Pearson and Spearman correlations across the three alternative indices,

suggesting that they are linear transformations of the same underlying construct. In conclusion, the three approaches are consistent with each other, indicating that the choice of index does not affect the results and that the scores are robust to the method of construction. Based on these consistency checks, I use the indexes derived from the approach of Anderson (2008) as the preferred measure of reading and numeracy outcomes in the baseline estimations, due to their transparency and ease of interpretation. For robustness, I use the indexes derived from the PCA approach. All outcome variables are standardized with a mean of zero and a standard deviation of one, enabling coefficients to be interpreted in standard deviation units.

Focal independent Variable: The independent variable is access to energy, measured by (1) access to electricity and (2) access to modern cooking fuels. This leads us to use an aggregate variable resulting from the principal component analysis (PCA) approach.

Control variables: Following the pioneering studies on education (Diambomba, 1997; Steinbruckner, 2009) and the recent ones (Koussihouede et al., 2026; Kadio, 2025; Armand et al., 2024), we use gender, age, preschool attendance, grade repetition, and socioeconomic status as determinants of students learning outcomes, etc.

4.1.2 Descriptive Statistics in Cameroon Context

Table 5 shows the weighted descriptive statistics for the entire sample, as well as for pupils enrolled in state schools. The analysis is based on data from 4,687 pupils in total, 3,063 of whom were enrolled in public schools and participated in the PASEC 2019 survey in Cameroon. Due to missing values, the number of observations varies across variables. Firstly, the distribution of learning outcomes shows that pupils in public schools perform lower than to the full sample, highlighting the disparities in learning outcomes between private and public schools. In public schools, the average reading score is −0.297, with a standard deviation of 0.937, indicating that pupils generally perform below the standardized mean. A similar pattern emerges in mathematics, where the average score is −0.343 and the standard deviation is 0.825. This pattern is also reflected in the global learning index, which has an average of −0.334, suggesting an overall deficit in learning achievement. In terms of energy access, significant differences emerge when comparing the households of students in the full sample with those of pupils attending public schools. In the full sample, 74.5% of pupils have access to electricity at home, compared to 65% of those attending public schools. Similarly, these pupils are less likely to live in households that use modern cooking fuels (38.7%), compared to 49.9% in the overall sample. The composite energy index further reflects this disparity further: while it is centred around zero in the full sample, it is negative (−0.331) among pupils attending public schools, indicating that they are more likely to come from energy-deprived households. The relatively large standard deviation (1.195) suggests substantial inequality in energy access across households.

Pupils attending public schools also appear to come from more disadvantaged socio-economic backgrounds. The average socio-economic status is lower among households with children enrolled in public schools (51.86) than in the overall sample (54.26). Access to pre-school education is also less common (48% versus 59.3%), while grade repetition is more frequent (57.3% versus 49.1%), which may reflect potential inefficiencies within the education system. The data also shows the high prevalence of child labour and domestic responsibilities. Among public school pupils, 89.8% engage in household work, 70.7% in agricultural activities, 57.4% in petty trading and 46.1% in odd jobs. These figures are generally higher than those for the full sample, suggesting that pupils in public schools have less time for study due to greater time constraints.

Table 5: Descriptive Statistics

	Overall Pupils					Pupils in Public Schools				
Variable	Obs.	Mean	Std. Dev.	Min	Max	Obs.	Mean	Std. Dev.	Min	Max
Reading performance	4687	-.005	1	-3.869	2.866	3063	-.297	.937	-3.869	2.651
Math performance	4687	-.004	1	-3.533	3.405	3063	-.343	.825	-3.533	3.187
Global Learning Index	4687	-.005	1	-3.475	3.077	3063	-.334	.867	-3.462	2.985
Cooking Type	4185	.499	.5	0	1	2640	.387	.487	0	1
Electricity	4272	.745	.436	0	1	2726	.65	.477	0	1
Access to Energy	4065	-.008	1.173	-1.93	1.114	2552	-.331	1.195	-1.93	1.114
Economic Status of family	4437	54.206	9.004	27.445	79.594	2851	51.866	8.965	27.445	79.594
Student access to Preschool	4316	.593	.491	0	1	2759	.48	.5	0	1
Student repeat grade	4273	.491	.5	0	1	2711	.573	.495	0	1
Speak French at Home	4290	.91	.287	0	1	2726	.884	.32	0	1
Mother read	4088	.751	.432	0	1	2567	.69	.462	0	1
Pupils age	4654	11.863	1.574	8	17	3031	12.19	1.641	8	17
Gender	4682	.513	.5	0	1	3058	.518	.5	0	1
Students read at home	4062	.925	.263	0	1	2559	.905	.294	0	1
Students do household work	4254	.897	.304	0	1	2704	.898	.303	0	1
Students do agricultural work	4298	.638	.481	0	1	2734	.707	.455	0	1
Students do small commerce	4299	.499	.5	0	1	2729	.574	.495	0	1
Students do small job	4295	.417	.493	0	1	2729	.461	.499	0	1
Student area of residence	4539	.536	.499	0	1	2998	.385	.487	0	1
Have library at school	4554	.118	.323	0	1	3027	.051	.22	0	1
Director gender	4460	.712	.453	0	1	2951	.789	.408	0	1
Director Degree	4391	.843	.364	0	1	2996	.987	.112	0	1
Teacher gender	3816	.646	.478	0	1	2535	.647	.478	0	1
Teacher Degree	3876	.874	.332	0	1	2655	.963	.19	0	1
School homework	4311	.926	.261	0	1	2755	.93	.256	0	1
Have television at home	4336	.7	.458	0	1	2761	.601	.49	0	1
Have computer at home	4201	.375	.484	0	1	2655	.272	.445	0	1
School Infrastructures	4622	49.354	12.529	30.926	80.805	3063	43.429	8.921	30.926	68.77
Classroom Equipment index	4026	48.369	8.153	24.867	82.653	2700	46.011	6.722	24.867	70.328
School type	4622	.663	.473	0	1					

Notes: Source: Author
Notes: School type is a binary variable equal to 1 for public schools and 0 for private schools.

4.1.3 Correlation between Students Learning Outcomes and Access to Energy at Home

Figure 5 shows the correlation between access to electricity at home and student score in learning outcomes in Cameroon. The first part of Figure 5 shows the correlation between access to electricity at home and reading scores among students. Overall, 65% of children in households with access to electricity have a reading score above the reference (or average), so have good performance in reading, while 35% of students have a score below the average. In households without access to electricity, 75.3% of students have a reading score below the average, while 24.7% have the reading score above average. Overall, students in households with electricity perform better in reading than their counterparts in households without access to electricity. The second part of Figure 5 shows the correlation between access to electricity and numeracy score among students. We observe that, in households with access to electricity, 57.1% of students have score in numeracy above the reference level, and 42.9% of students have score below the average. In households without access to electricity, 85.3% of pupils perform poorly in numeracy, while 14.7% perform well. Overall, students perform better in numeracy in households with electricity than in those without.

Figure 5: Percentage of pupils above and below average scores by Access to Electricity

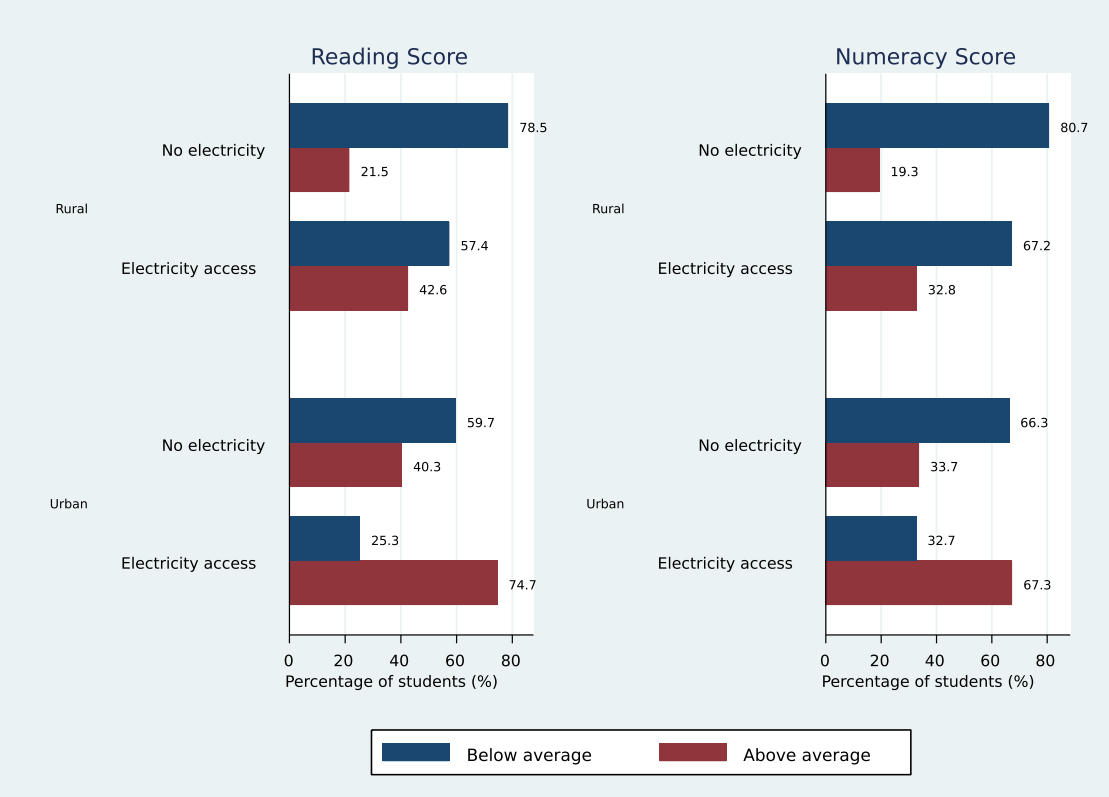


Notes: Source: Author, using PASEC2019 data

Figure 6 shows the spatial disparity in student performance scores. Overall, there is a significant disparity between students for learning outcomes in Cameroon, with those in rural areas

performing considerably worse than their urban counterparts. In the presence of access to electricity, 74.7% of students in urban areas have a reading score above the reference level, compared to 42.6% of students in rural areas. Regarding numeracy, 67.3% of students in urban areas perform above the average compared to 32.8% of students in rural areas.

Figure 6: Geographical Correlation between Access to electricity at Home and Students' Performance

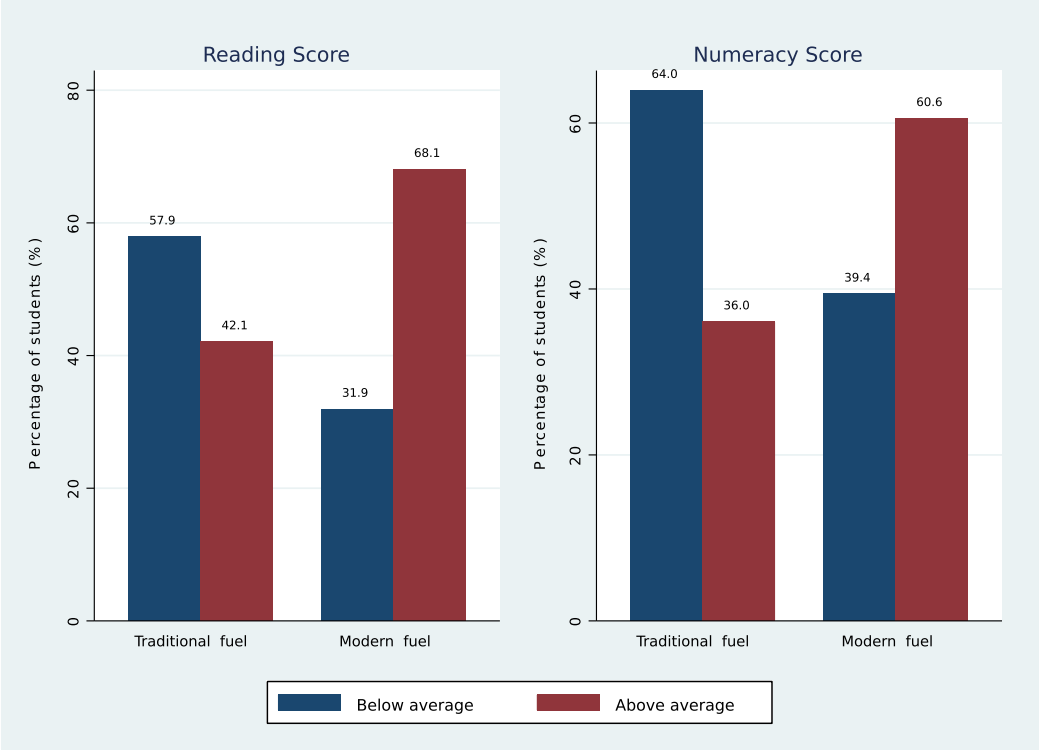


Notes: Source: Author, using PASEC2019 data

Figure7 shows the correlation between type of cooking fuel usage in the households and student performance in Cameroon. The first part of Figure 7 shows the correlation between the type of cooking and reading score performance among students, while the second part shows the correlation between type of cooking fuel and numeracy score performance. Regarding the first part, 68% of students have scored above the reference level in reading in households with modern cooking fuels (liquefied petroleum gas, natural gas, etc.), compared to 42.1% of students in households with traditional cooking fuels. Regarding the second part of picture, 60.5% of children in households with modern cooking have a numeracy score above the average, compared to 36.1% of students in households with traditional cooking. Overall, students perform better in households with modern cooking fuel.

Figure 8 shows the correlation between cooking fuel type and student performance, accounting for geographical location. Overall, students perform better in urban areas than in rural areas.

Figure 7: Proportion of pupils above and below average scores by cooking fuel type



Notes: Source: Author, using PASEC2019 data

The first part of the figure shows that 77.5% of students in urban areas in households using modern cooking fuels have a reading score above the reference level compared to 39.4% of students in areas in same type of households. The second part of the figure shows that 70.5% of students in urban areas in households use modern cooking fuels have a numeracy score above the average level, compared to 30.7% of students in rural areas.

4.2 Methodology

The empirical strategy of this paper is based on the educational production function framework formalized by Hanushek (1979). Educational achievement is modelled as the outcome of a structural relationship linking observed learning outcomes—typically, standardized test scores—to a vector of inputs that includes individual and household characteristics (e.g. family background), school-level resources, teacher attributes, and other contextual factors. This framework allows me to estimate the marginal contribution of different inputs to educational outcomes, while accounting for observed heterogeneity across students and schools.

Building on this framework, the paper also draws on the work of Glewwe and Kremer (2006), who emphasize that learning is produced by multiple complementary inputs. From this perspective, the effectiveness of one input may depend on the presence of others. In our context, this

Figure 8: Share of students above and below average scores by cooking fuel type, by area.



Notes: Source: Author, using PASEC2019 data

suggests that the association between household energy access and learning outcomes may be influenced by other household factors, such as parental involvement.

For all specifications, standard errors are clustered at the school level to account for the sampling design. This adjustment ensures that inference is robust to intra-school correlation and potential heteroskedasticity in the residuals.

4.2.1 Baseline Regressions

The paper begins with baseline specifications, modelling reading and numeracy outcomes separately. This first step serves two purposes. First, it provides a transparent benchmark for evaluating the association between access to energy and each learning outcome considered independently. Secondly, it enables us to determine whether access to energy is systematically associated with both learning domains.

Each outcome is specified as a function of access to energy and a common set of pupil-, household-, and school-level characteristics.

Equation (1): Reading performance achievement

$$ReadingScore_i = \alpha + \beta_0 EnergyAccess_i + \beta_1 X_i + \beta_2 Z_i + \beta_3 W_i + \varepsilon_i$$

Equation (2): Numeracy performance achievement

$$NumeracyScore_i = \alpha_1 + \gamma_0 EnergyAccess_i + \gamma_1 X_i + \gamma_2 Z_i + \gamma_3 W_i + {}_i$$

In these equations, i indexes pupils. $EnergyAccess_i$ captures access to energy at home. X_i denotes a vector of pupil characteristics, Z_i a vector of household characteristics, and W_i a vector of school characteristics. The error terms ε_i and ${}_i$ capture unobserved determinants of reading and numeracy outcomes, respectively.

The main challenge in our empirical analysis is to establish a clear identification strategy, given that our main variable of interest, access to energy is likely to be endogenous. This endogeneity could be due to omitted variable bias, whereby households with and without access to energy differ from characteristics that are not observed but which affect learning outcomes. Alternatively, it could be due to reverse causality, whereby improved economic conditions that facilitate energy access are associated with better educational outcomes. Regarding access to electricity specifically, Jain (2016) uses the proportion of households with electricity in each region or district; Chatterjee et al., (2023) use the village electrification rate, excluding the household to which the individual being surveyed belongs. However, these instruments raise concerns regarding the validity of the exclusion restriction, as access to electricity is likely to be correlated with broader socio-economic conditions that also affect learning outcomes. In practice, it is very challenging to find a suitable instrument due to the associated constraints. Other literature suggests alternative instruments, such as night-time lighting (Banerjee et al., 2021) or electricity prices. However, none of our microeconomic databases contain this information; the only available relates to access to electricity, and databases containing this information are very limited in terms of the variables relating to learning outcomes. We have the same issue regarding cooking fuels. One possible instrument is the time spent collecting fuel, which could help us understand the quality of cooking in households. The less time spent collecting fuel, the more likely it is that households use modern cooking fuels. Given these constraints, it is not feasible to identify a credible instrument. In line with standard econometric practice, we clearly distinguish between causal effects and associations. This study aims to document robust conditional associations, examine heterogeneity across the performance distribution and explore moderating mechanisms linking energy access to learning outcomes.

4.2.2 Joint Estimation of Reading and Numeracy Outcomes

This paper also adopts a joint estimation framework in which reading and numeracy are treated as distinct yet related outcomes. The key assumption underlying this approach is that the unobserved determinants of reading and numeracy may be correlated, even after conditioning on observed covariates. Specifically, we estimate the following system of equations.

Equation (3a): Reading performance equation

$$ReadingScore_i = \alpha + \beta_0 EnergyAccess_i + \beta_1 X_i + \beta_2 Z_i + \beta_3 W_i + \varepsilon_i$$

Equation (3b): Numeracy performance equation

$$NumeracyScore_i = \alpha_1 + \gamma_0 EnergyAccess_i + \gamma_1 X_i + \gamma_2 Z_i + \gamma_3 W_i + {}_i$$

with $\mathrm{Cov}(\varepsilon_i , {}_i) \neq 0$.

This system is estimated using a seemingly unrelated regression (SUR) framework (Zellner, 1962). The SUR approach does not impose a causal ordering between reading and numeracy and does not rely on exclusion restrictions or instrumental variables. Instead, it exploits the correlation between the error terms across equations to improve the efficiency of the parameter estimates relative to separate OLS regressions. From a theoretical standpoint, this approach differs from simultaneous equations models. While simultaneous equations aim to address endogeneity through structural identification, the SUR framework remains reduced form in nature. Its value-added lies in providing efficiency gains and allowing for a more realistic modeling of learning outcomes that are jointly produced but not explicitly causally linked within the model.

4.2.3 Beyond the mean: Analyzing the distributional effects of Access to Energy

Standard ordinary least squares (OLS) estimate the average effect of access to energy on children's school performance. While informative, this average may obscure important heterogeneity: students at different points of the performance distribution may respond differently to the same intervention. For instance, students with initially low skills may benefit more or less than those with average or high skills, depending on how energy access interacts with their learning environment or capacity to study.

To capture these differences, this paper employ quantile regression (Koenker & Bassett, 1978), a technique that estimates the association of explanatory variables at specific points (quantiles) of the conditional outcome distribution. Unlike OLS, which only identifies the mean effect $E[Y \mid X]$, quantile regression identifies $\mathrm{Q}_\theta(Y \mid X)$, the θ-th conditional quantile of the outcome Ygiven covariates X. This allows us to answer questions such as: *Is the association between access to energy and outcomes stronger for students at the lower end of the distribution than for high-performing students?*

Formally, the θ-th quantile regression coefficient vector $\widehat{\beta}(\theta)$is obtained by solving:

$$\widehat{\beta}(\theta) = \arg\min_{\beta} \sum_{i=1}^{n} \rho_\theta(y_i - x_i'\beta)$$

where the check function $\rho_\theta(u)$is defined as:

$\rho_\theta(u) = u \cdot (\theta - 1\{u < 0\})$Here:

- $y_i$is the student's outcome (reading or numeracy score),
- $x_i$includes access to energy and control variables (pupil, household, and school characteristics),
- $\theta \in (0, 1)$is the quantile of interest (e.g., 0.25, 0.50, 0.75), and
- $1\{\cdot\}$is the indicator function.

This method does not require distributional assumptions about the residuals (e.g., normality) and is robust in the presence of heteroskedasticity. It explicitly allows for variation in the association between energy access and the outcome, providing a richer and more nuanced view than average association alone. By estimating the model for several quantiles, it is possible to identify whether access to energy is more beneficial for students with low, median, or high achievement levels. For instance, a stronger association at the lower quantiles would suggest that energy access helps to reduce educational inequalities, whereas a stronger association concentrated at higher quantiles might indicate the reinforcement of existing advantages.

This approach is particularly suitable for use in educational research, where there is substantial heterogeneity in learning capacity and resource utilization is substantial, and where interventions are unlikely to have uniform effects across all on students.

5 Results

5.1 Baseline Results

Table 6 shows the results of the OLS regression analysis investigating the link between access to energy at home and students' learning outcomes.

Column (1) shows that access to energy at home is positively associated with reading performance. The estimated coefficient suggests that pupils living in households with access to energy achieve approximately 0.10 standard deviations higher in reading than those without access. This association is statistically significant at 1%.

Column (2) shows a positive association between access to energy at home and numeracy performance, although the coefficient is not statistically significant.

Column (3) indicates a positive association between the global learning index outcomes and energy at home. The association is statistically significant, indicating a modest improvement in overall academic performance.

Overall, these findings suggest that access to energy is more strongly associated with reading performance than with mathematics. This may be because household energy primarily facilitates

activities such as studying at home, lighting and reading practice, which are more directly related to literacy development than numeracy skills. These results are consistent with those of previous empirical studies on access to electricity (Jain, 2016; Chatterjee et al., 2023). Using robust causal identification strategies Jain (2016) and Chatterjee et al., (2023), in the context of rural India, find a positive effect of access to electricity on reading scores.

Turning to the control variables, several important patterns emerge. Access to preschool education is positively associated with learning outcomes and the relation is statistically significant across all models, which highlights the importance of early childhood development in shaping later academic achievement. In contrast, grade repetition has a negative and significant correlation on performance, suggesting inefficiencies within the education system.

Speaking French at home has a strong, positive, statistically significant association on all learning outcomes, indicating that the language environment plays a crucial role in academic success. Similarly, reading at home is positively associated with performance, reflecting the importance of home learning practices in reinforcing school-based skills.

There is a negative association between age and learning outcomes, which is consistent with the fact that older pupils in a given year group are more likely to have repeated a year. Gender differences are also evident, with boys performing better in mathematics and achieving higher scores in the global index.

Pupils engaged in small jobs perform significantly worse in terms of extracurricular activities, suggesting that time allocated to income-generating activities may crowd out study time.

At school level, better infrastructure is positively and significantly associated with learning outcomes, indicating the importance of adequate learning environments. Classroom equipment also has a positive, albeit less consistent, effect.

Overall, the results emphasize the significance of household and school environments in shaping educational outcomes, with access to energy playing a notable role, particularly in relation to literacy development.

5.2 Multivariate Regression

Table 7 presents the results of a multivariate regression model used to estimate the association between access to energy at home and students' learning outcomes. This approach accounts for potential correlations between the error terms across the different educational outcomes, thereby improving the efficiency of the estimates. Bootstrap standard errors are used to ensure robustness in the face of heteroskedasticity and intra-school correlation.

The first column reports the results for reading performance. Having access to energy at home has a positive and statistically significant association. Since the dependent variable is standardized, this indicates that pupils living in households with access to energy achieve ap-

Table 6: OLS Regression of Energy Access and Learning Outcomes

	(1)	(2)	(3)
Dependent Variables:	Reading	Mathematics	Global Learning Index
Access to Energy at Home	0.098***	0.028	0.062*
	(0.033)	(0.033)	(0.032)
Constant	-0.379	-1.902***	-1.261*
	(0.749)	(0.689)	(0.714)
Observations	1338	1338	1338
Adjusted R-squared	0.438	0.366	0.422

Notes: Source: Author's calculations based on PASEC2019 data. Sample: Grade 6 students in public schools, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

proximately 0.108 standard deviations higher in reading than those without access, when other factors are held constant.

The second column shows the results for mathematics performance. The coefficient associated with access to energy is positive and statistically significant at the 10% level. This indicates that access to energy is associated with higher of approximately 0.048 standard deviations in mathematics performance. However, the relationship is weaker than observed for reading outcomes.

The third column reports the results for the global learning index. Access to energy has a positive and statistically significant association at the 1% level, suggesting that, pupils achieve approximately in overall academic performance of around 0.08 standard deviations.

Overall, the multivariate regression results broadly align with the baseline findings. Having access to energy at home remains to be positively associated with reading performance and the global learning index. While the relationship with mathematics outcomes is not statistically significant in the baseline specification, it becomes positive and statistically significant in the multivariate framework. This indicates that the insignificant association previously observed may have been due to limited estimation efficiency rather than an absence of relationship.

5.3 Quantile Regression

Table 8 shows the results of the conditional quantile regression analysis. This approach allows us to examine how the effect of having access to energy at home varies at different points in the distribution of learning outcomes. The coefficients are reported at the 25th, 50th and 75th percentiles.

Table 7: Multivariate regression: Association Between Access to Energy with Student Performance

	(1)	(2)	(3)
	Reading	Maths	Global Learning Index
Access	0.1079***	0.0477*	0.0770***
	(0.0272)	(0.0251)	(0.0245)
Constant	-0.5281	-1.4418**	-1.0739*
	(0.6705)	(0.5793)	(0.5817)
Observations	1,338	1,338	1,338
Adjusted R-squared	0.4017	0.3337	0.3870

Notes: Source: Author's calculations based on PASEC2019 data. Notes: Grade 6 students in public schools, Cameroon (PASEC 2019) Bootstrap standard errors based on 100 replications. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Access to energy is positively associated with reading performance across all the quantiles, and associated coefficients are statistically significant. The estimated coefficients suggesting that association becomes stronger at higher levels of the performance distribution. This pattern corroborates the OLS results, which revealed an average positive association on reading performance of around 0.10 standard deviations. Instead, energy access disproportionately benefits pupils at the top of the performance distribution.

Table 8: Quantile Regression

	Reading			Numeracy			Global Learning Index		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	Q25	Q50	Q75	Q25	Q50	Q75	Q25	Q50	Q75
Access	0.087***	0.108***	0.141***	0.040	0.028	0.069*	0.071**	0.080***	0.068**
	(0.034)	(0.033)	(0.034)	(0.031)	(0.033)	(0.036)	(0.034)	(0.029)	(0.034)
Constant	-1.620***	-0.487	0.118	-1.488***	-1.751***	-0.525	-1.612***	-1.452***	-0.898
	(0.556)	(0.543)	(0.561)	(0.522)	(0.547)	(0.595)	(0.565)	(0.482)	(0.564)
Observations	1338	1338	1338	1338	1338	1338	1338	1338	1338

Notes: Source: Author's calculations based on PASEC2019 data.
Notes: Sample: Grade 6 students in public schools, PASEC Cameroon 2019.
Quantiles at 25th, 50th, and 75th percentiles.
Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Access to energy at home is positively associated with numeracy performance, but the estimates are not statistically significant at the 25th and the 50th percentile. However, at the 75th percentile, the coefficient becomes positive and statistically significant. This suggests that ac-

cess to energy primarily benefits higher-performing mathematics students. Compared to the OLS results, where the effect on mathematics was not statistically significant, quantile regression reveals important heterogeneity across distribution.

The last part of table shows a positive and statistically significant association between access to energy at home and overall learning outcomes across quantiles. However, this effect does not increase monotonically in magnitude. These results are consistent with those of both the ordinary least squares (OLS) and multivariate regressions, which also found an average positive and significant average effect of energy access on overall learning outcomes.

Overall, high-achieving students tend to benefit more from having access to energy at home than lower-achieving students, and this pattern is particularly pronounced in numeracy. These patterns of distribution suggest that, in the absence of other contributing factors, access to energy may associate with, rather than reduce existing disparities in learning performance between lower- and higher-achieving pupils. This raises the question of whether access to energy alone is sufficient to generate learning gains or whether lower-performing pupils require additional support to improve their academic performance. Section 7 explores the conditions under which this regressive pattern can be mitigated.

6 Robustness

6.1 Estimating the Global Learning Index with principal component analysis

As discussed in Section 4.1.1, the initial analysis was conducted using learning outcomes derived from the approach of Anderson (2008). To strengthen the credibility of the results, this paper performed a robustness check by reconstructing the outcome variables using principal component analysis (PCA) and re-estimating the baseline models. This approach enables us to ascertain whether the association between access to energy and learning outcomes is sensitive to the measurements of our dependents variables. The results are presented in Tables 9 and 10.

Table 9 presents the OLS estimations based on learning outcomes derived from PCA. Overall, the results suggest that the association between access to energy and learning outcomes remains qualitatively unchanged.

Firstly, regarding reading performance, the coefficient associated with access to energy remains positive and statistically significant at the 1% level in both specifications. Although the magnitude is larger in the PCA-based estimation, this difference is due to scaling and does not affect the economic interpretation. In both cases, access to energy is strongly associated with reading outcomes. Secondly, for mathematics performance, the coefficient remains positive but statistically not significant in tables 6 and 9. This confirms that the association between energy

and numeracy skills is relatively weak and not robust to statistical inference, regardless of how the outcome variable is constructed.

Table 9: Robustness learning outcomes - OLS Estimation

	(1)	(2)	(3)
	Reading	Mathematics	Global Learning Index
Access	0.213***	0.061	0.194**
	(0.073)	(0.071)	(0.095)
Constant	-0.826	-4.072***	-3.446
	(1.628)	(1.480)	(2.110)
Observations	1338	1338	1338
Adjusted R-squared	0.438	0.366	0.427

Notes: Grade 6 students, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on PASEC2019 data.

For the global performance index, the association of access to energy remains positive and statistically significant in both specifications. As with reading, differences in magnitude reflect differences in scaling rather than substantive changes in the results. Transitioning from Anderson (2008) approach to PCA-based outcomes does not affect the sign, statistical significance or interpretation of the coefficients. The OLS results are therefore robust to the method used to construct the dependent variables.

Table 10 shows the quantile regression analysis using PCA-based outcomes, enabling direct comparison with Table 8.

Access to energy is positively and statistically associated with reading performance outcomes across all quantiles (25th, 50th and 75th percentiles). The magnitude of the coefficients increases across the distribution, indicating that the association between access to energy and academic achievements is stronger among higher-achieving students. Although the coefficients are larger in the PCA specification, this reflects differences in scaling rather than a change in the underlying relationship. This confirms that the positive and increasing association between access to energy and reading performance remains consistent across measurement methods.

In mathematics, both tables reveal a weak and heterogeneous pattern. In Table 8, the association with energy is not statistically significant at the 25th and 50th percentiles and is only marginally significant at the 75th percentile. Table 10 (PCA) shows the same pattern, while there is no significant association at the lower and median quantiles and a significant positive association only at the upper tail of the distribution. This confirms that the association between energy

and mathematics is limited and concentrated among higher-performing students, regardless of how the outcome variable is constructed.

For the global index, Tables 8 and 10 both show that access to energy has a positive and statistically significant association across all quantiles. Additionally, the magnitude of the effect remains relatively stable across the distribution, indicating consistent association of energy on overall performance. These results therefore provide strong evidence that the main findings are robust to alternative constructions of the dependent variables, thereby reinforcing the credibility of the empirical analysis.

Table 10: Quantile Regression

	Reading			Numeracy			Global Learning Index		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
	Q25	Q50	Q75	Q25	Q50	Q75	Q25	Q50	Q75
Access	0.185**	0.226***	0.306***	0.087	0.061	0.148**	0.234**	0.242***	0.249**
	(0.073)	(0.071)	(0.074)	(0.068)	(0.071)	(0.075)	(0.098)	(0.084)	(0.097)
Constant	-3.562***	-1.027	0.150	-3.113***	-3.734***	-1.117	-4.027**	-4.249***	-2.052
	-1.208	-1.173	-1.223	-1.131	-1.172	-1.247	-1.630	-1.398	-1.616
Observations	1338	1338	1338	1338	1338	1338	1338	1338	1338

Source: Author's calculations based on PASEC2019 data.
Notes: Sample: Grade 6 students in public schools, PASEC Cameroon 2019.
Quantiles at 25th, 50th, and 75th percentiles.

Notes: Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

6.2 Missing Data Analysis

Table 5 presents the descriptive statistics for the full and restricted samples of pupils attending public schools, highlighting the differences between the two groups. Tables 6–11 report the main estimation results based on a reduced sample of 1,333 observations. Reducing the sample size from 3,063 to 1,333 observations suggests substantial missing data, which may raise concerns about potential selection bias.

To investigate this issue, we first examine the extent and sources of missing data. Table 11 reports the distribution of missing values across variables. The results indicate that it's primarily driven by subset of control variables, particularly those relating to household and school characteristics. Notably, the main outcome variables (reading, mathematics, and global performance) are not affected by missing values, while the key explanatory variable (energy access) exhibits a moderate level of missingness.

Table 11: Missing Values in Covariates

	Missing	Total	Percent
Reading performance	0	4,723	0.000
Math performance	0	4,723	0.000
Global performance	0	4,723	0.000
Cooking Type	502	4,723	10.630
Electricity	415	4,723	8.790
Access to Energy at Home	622	4,723	13.170
Economic Status of family	250	4,723	5.290
Student access to Preschool	371	4,723	7.860
Student repeat grade	414	4,723	8.770
Speak French at Home	397	4,723	8.410
Mother read	600	4,723	12.700
Pupils age	33	4,723	0.700
Gender	5	4,723	0.110
Students read at home	625	4,723	13.230
Students do household work	433	4,723	9.170
Students do agricultural work	389	4,723	8.240
Students do small commerce	388	4,723	8.220
Students do small job	392	4,723	8.300
Student area of residence	184	4,723	3.900
Have library at school	133	4,723	2.820
Director gender	227	4,723	4.810
Director Degree	296	4,723	6.270
Teacher gender	871	4,723	18.440
Teacher Degree	811	4,723	17.170
Student School homework	376	4,723	7.960
Have television at home	351	4,723	7.430
Have computer at home	486	4,723	10.290
School Infrastructure Index	65	4,723	1.380
Classroom Equipment index	661	4,723	14.000
School type	65	4,723	1.380

Notes: Source: Author's calculations based on PASEC2019 data.

To address concerns relating to the reduction in sample size due to missing values, we implemented a simple imputation strategy and re-estimated the baseline models. The results are presented in Table 12 for OLS estimation and table13 for quantile regression.

Table 12: OLS Estimation with missing variables

	(1)	(2)	(3)
	Reading	Mathematics	Global Learning Index
Access	0.102***	0.037	0.069***
	(0.027)	(0.026)	(0.026)
Constant	-0.567	-1.668**	-1.212*
	(0.697)	(0.661)	(0.669)
Observations	2102.000	2102.000	2102.000
Adjusted R-squared	0.413	0.324	0.389

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The results confirm that missing values were primarily driven by missing data in some control variables, showing that the number of observations increased from 1333 to 1882. The estimated coefficients remain remarkably stable in terms of sign, magnitude and statistical significance. Notably, the positive and significant association of access to energy on reading performance and the global learning index is maintained, whereas the effect on mathematics remains weak and less robust, in line with the baseline findings.

Table 13: Quantile Regression with missing variables

	(1)			(2)			(3)		
	Q25	Q50	Q75	Q25	Q50	Q75	Q25	Q50	Q75
	Reading			Mathematics			Global Learning Index		
Access	0.0886***	0.0949***	0.1360***	0.0306	0.0550**	0.0719**	0.0658**	0.0941***	0.0951***
	(0.0263)	(0.0290)	(0.0348)	(0.0243)	(0.0233)	(0.0290)	(0.0273)	(0.0252)	(0.0300)
Constant	-1.1625***	-0.7041*	0.0641	-1.7058***	-1.3200***	-0.6958	-1.5594***	-1.1698***	-0.7737*
	(0.4282)	(0.3961)	(0.4841)	(0.3749)	(0.3593)	(0.4276)	(0.3514)	(0.3686)	(0.4661)
Observations	1882	1882	1882	1882	1882	1882	1882	1882	1882

Source: Author's calculations based on PASEC2019 data.
Notes: Sample: Grade 6 students in public schools, PASEC Cameroon 2019.
Quantiles at 25th, 50th, and 75th percentiles.

Notes: Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

These findings suggest that the reduction in sample size does not introduce substantial bias into the estimation results. The consistency between the baseline and imputed specifications provides strong evidence that the study's main conclusions are not driven by sample selection, thereby reinforcing the robustness and reliability of the empirical findings.

7 Energy, Parental Support, and Learning Outcomes: A Moderation Analysis

7.1 Moderation Role of Parental Support

Overall, the results suggest that access to energy is only weakly associated with learning outcomes in numeracy. There are several possible explanations for this finding. While access to energy increases the time available for study, this additional time does not necessarily lead to improved learning if it is not used effectively. In other words, without proper guidance, the benefits of increased study time may be limited, particularly for cognitively demanding subjects such as mathematics.

This study builds on the broader literature emphasizing the role of complementarities in producing educational outcomes. For example, Woessmann (2016) highlights that student achievement depends not only on individual factors, but also on how these factors interact within the education system, especially with regard to institutional quality and school-level factors. While this literature has primarily focused on complementarities within schools, little attention has been given to how such interactions operate within households. This paper broadens this perspective by examining how parental involvement interacts with energy access in the home learning environment.

The importance of parental contributions has long been recognized within the household production framework developed by Becker (1965). This framework emphasizes that children's outcomes are the result of a combination of time investments and material resources. However, this framework does not explicitly consider for how certain household constraints may affect the productivity of these inputs. Additionally, the literature on skill formation, following Cunha & Heckman (2007), emphasizes that cognitive and non-cognitive skills are formed during childhood through the interaction of various inputs, including parental investments and early-life circumstances. A key insight from this framework is that these inputs may be complementary, meaning the effectiveness of one input depends on the presence of the others.

Building on these insights, this paper argues that access to energy is associated with learning outcomes by increasing the amount of time available for home study, while parental involvement influences how this time is utilized. In this sense, parental support acts as a complementary input that amplifies the benefits of energy access within the household. However, existing literature

on parental involvement, such as that by Grolnick and Slowiaczek (1994) and Hoover-Dempsey et al., (2001), provides conflicting evidence as to its associate on academic performance. This suggests that its effectiveness depends on the way support is provided. Subjects such as mathematics require more structured guidance, as students need assistance to understand concepts and solve exercises effectively.

Hoover-Dempsey and Sandler (1995, 1997) emphasize that parental assistance with homework may affect student performance through several channels, such as providing instructional support, reinforcement, and modelling. In terms of instructional support, the idea is that parents assist children in completing assignments by explaining concepts, correcting mistakes during homework, and helping them understand problem-solving steps. Reinforcement operates through encouragement, praise, and feedback, which can strengthen children's motivation, confidence, and persistence in learning tasks. Finally, modelling involves parents influencing their children's attitudes and behaviors towards learning by demonstrating effort, discipline and engagement with schoolwork.

These mechanisms may be more effective in subjects such as mathematics when energy is present. For example, having energy enables parents to read and work through problems with their children, provide clearer explanations for basic exercises, and repeatedly revise schoolwork, thereby helping children to become more familiar with key numeracy concepts. Together, these mechanisms suggest that parental involvement can influence how effectively improved study conditions translate into learning outcomes.

Therefore, this paper follows the literature of Baron and Kenny (1986) and hypothesize that parental homework assistance can moderate the relationship between access to energy and learning outcomes. To be more specific, I estimate the following equations:

Equation (4a): Reading performance equation

$$ReadingScore_i = \alpha + \beta_0 EnergyAccess_i + \beta_1 ParentalSupport_i + \beta_2 ParentalSupport * EnergyAccess_i + \beta_3 W_i + \varepsilon_i$$

Equation (4b): Numeracy performance equation

$$NumeracyScore_i = \alpha_1 + \gamma_0 EnergyAccess_i + \gamma_1 ParentalSupport_i + \gamma_2 ParentalSupport * EnergyAccess_i + \gamma_3 W_i + {}_i$$

Parental support means parents helping their children with their homework. We then have 'Do homework with father' and 'Do homework with mother'.

However, as discussed in Section 4.2.1, access to energy itself may be endogenous. Additionally, parental homework assistance may be subject to endogeneity, meaning that both the main explanatory variable and the moderating variables could be affected by bias. In particular, parental support may suffer from omitted variable bias, as households may differ in unobserved characteristics such as motivation, educational preferences, or the time available to supervise children's studies. Some parents may prioritize education for their children's future prosperity and invest more in homework support, while others may have constraints that limit their involvement. Since these unobserved factors may also influence children's learning outcomes, the moderating relationships identified in this paper should not be interpreted as causal effects. Due to these limitations, the results should be understood as conditional associations estimated using ordinary least squares, particularly when regard interpretation of the interaction term.

The empirical results are presented in Tables 14 and 15. Table 14 reports the overall relationship, while Table 15 examines geographic heterogeneity by distinguishing between urban and rural areas.

However, according to Brambor et al., (2006), interpreting interaction effects requires an examination of conditional relationships using predicted values/marginal effect, as well as an analysis of the interaction term's coefficient. This approach enables us to evaluate how the association between energy access and learning outcomes changes with parental homework assistance. The results are present in section 7.2.

Table 14 examines whether parental assistance with homework moderates the relationship between access to energy and pupils' learning outcomes. The results are presented separately for support from mothers and fathers. Overall, these findings emphasize that the role of parental support is not uniform.

In the models that include maternal support (columns 1–3), access to energy is positively and statistically significantly associated with reading performance and the global learning index. However, the coefficient for mathematics remains positive, yet is not statistically significant. Similar patterns are observed in the models that include paternal support (columns 4–6), where the association between access to energy and reading performance and overall performance remains strong and significant.

Turning to parental homework assistance, the coefficient for ' Mother Support ' is negative and statistically significant for all outcomes. This is likely due to a selection bias: pupils who are struggling academically are more likely to receive help from their mothers.

The interaction term between maternal support and access to energy (Mother Support x Energy) is positive, but not statistically significant in any of the models. This suggests that maternal support does not significantly alter the association between energy access and learning outcomes. In other words, while both energy access and maternal support are both relevant fac-

tors, there is no evidence that their combined association differs from the sum of their individual contributions.

In contrast, the results for paternal support reveal a different pattern. While 'Do homework with father' is negatively associated with performance, likely reflecting selection, the interaction term between paternal support and energy access (Father Support x Energy) is positive and statistically significant for reading performance and the global learning index. However, this is not the case for mathematics.

Table 14: Energy Access and Learning Outcomes: Interaction with parental support

	(1)	(2)	(3)	(4)	(5)	(6)
	Reading	Mathematics	Global Learning Index	Reading	Mathematics	Global Learning Index
Access	0.122***	0.041	0.080**	0.113***	0.050	0.081**
	(0.035)	(0.033)	(0.032)	(0.038)	(0.035)	(0.035)
Mother Support	-0.158***	-0.096**	-0.129***			
	(0.048)	(0.044)	(0.044)			
Mother Support x Energy	0.011	0.063	0.041			
	(0.046)	(0.043)	(0.042)			
Father Support				-0.160***	-0.057	-0.108**
				(0.044)	(0.048)	(0.045)
Father Support x Energy				0.071**	0.060	0.067*
				(0.036)	(0.037)	(0.034)
Constant	-0.310	-1.635**	-1.076	-0.012	-1.315*	-0.753
	(0.668)	(0.675)	(0.672)	(0.673)	(0.673)	(0.672)
Observations	855	855	855	834	834	834
Adjusted R-squared	0.411	0.358	0.404	0.416	0.359	0.407

Notes: Source: Author's calculations based on PASEC2019 data. Mother support = doing homework with mother

Mother Support x Energy = doing homework with mother in the presence of electricity.

Father support = doing homework with father.

Father Support x Energy = doing homework with father in the presence of electricity.

Sample: Grade 6 students, PASEC Cameroon 2019.

Outcomes standardized (mean=0, SD=1).

Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Tables 15a and 5b examine whether the conditional association of parental homework assistance on the relationship between access to energy and learning outcomes differs depending on people's location. The results are presented separately for urban and rural subsamples.

In urban areas (Table 15a), access to energy is positively associated with learning outcomes. However, the association are generally weaker and less consistently significant than in the baseline results. The coefficient is marginally significant for reading performance, becoming slightly

stronger in the specification that includes paternal support. Nevertheless, the association with mathematics and the global index remains statistically insignificant or only weakly significant.

Regarding the maternal role, the coefficient for 'Mother Support' is negative and significant for reading performance, reflecting a likely selection association whereby lower-performing pupils receive more assistance. However, the interaction between maternal support and energy access is not statistically significant for all outcomes. This suggests that maternal involvement does not significantly alter the association between energy access and learning outcomes in urban areas. Similarly, paternal support does not exhibit significant moderating association in urban settings. The interaction term between paternal support and energy access is small and statistically insignificant across all specifications, indicating that parental involvement does not substantially modify the association between energy access and learning outcomes in urban environments.

By contrast, the results for rural areas (Table 15b) reveal a markedly different pattern. Although access to energy continues to be positively associated with reading performance, its association with mathematics and the overall index is weaker and less consistently significant.

As in previous results, parental support alone has a negative association on learning outcomes, particularly maternal support for reading and paternal support for reading, as well as learning the global index. This again suggests a compensatory mechanism.

Importantly, the interaction association are more pronounced in rural areas. The interaction between maternal support and energy access is positive and marginally significant for mathematics performance, suggesting that maternal involvement strengthens the effectiveness of energy access in improving numeracy skills. Furthermore, paternal support exhibits a consistent moderating association in rural areas.

Mother Support x Energy = doing homework with mother in the presence of electricity.

Father Support = doing homework with father.

Father Support x Energy = doing homework with father in the presence of electricity.

Sample: Grade 6 students, PASEC Cameroon 2019.

Outcomes standardized (mean=0, SD=1).

Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Mother Support x Energy = doing homework with mother in the presence of electricity.

Father Support = doing homework with father.

Father Support x Energy = doing homework with father in the presence of electricity.

Sample: Grade 6 students, PASEC Cameroon 2019.

Outcomes standardized (mean=0, SD=1).

Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The interaction between father support and energy access is positive and statistically significant for reading performance and the global learning index. This suggests that the benefits

Table 15a: Urban Heterogeneity in the Role of Parental Support

	(1)	(2)	(3)	(4)	(5)	(6)
	Reading	Mathematics	Global Learning Index	Reading	Mathematics	Global Learning Index
Access	0.095*	0.072	0.084	0.114**	0.063	0.088*
	(0.053)	(0.059)	(0.056)	(0.051)	(0.051)	(0.050)
Mother Support	-0.182**	-0.075	-0.131			
	(0.087)	(0.076)	(0.079)			
Mother Support x Energy	0.099	0.052	0.076			
	(0.087)	(0.088)	(0.087)			
Father Support				-0.095	-0.004	-0.049
				(0.082)	(0.080)	(0.080)
Father Support x Energy				0.037	0.004	0.020
				(0.079)	(0.064)	(0.070)
Constant	-1.013	-1.041	-1.064	-0.740	-0.557	-0.660
	(1.032)	(1.056)	(1.059)	(0.999)	(0.990)	(1.004)
Observations	390	390	390	383	383	383
Adjusted R-squared	0.403	0.375	0.403	0.398	0.373	0.401

Notes: Source: Author's calculations based on PASEC2019 data. Mother Support = doing homework with mother.

Table 15b: Rural Heterogeneity in the Role of Parental Support

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables:	Reading	Mathematics	Global Learning Index	Reading	Mathematics	Global Learning Index
Access	0.121**	0.009	0.061	0.111**	0.037	0.072
	(0.050)	(0.045)	(0.045)	(0.051)	(0.051)	(0.050)
Mother Support	-0.164**	-0.104	-0.136*			
	(0.077)	(0.072)	(0.073)			
Mother Support x Energy	-0.006	0.102*	0.055			
	(0.061)	(0.059)	(0.058)			
Father Support				-0.190***	-0.079	-0.133**
				(0.055)	(0.064)	(0.056)
Father Support x Energy				0.080*	0.086	0.087*
				(0.041)	(0.052)	(0.045)
Constant	-0.749	-2.383***	-1.698**	-0.559	-2.238***	-1.529**
	(0.718)	(0.636)	(0.656)	(0.713)	(0.668)	(0.671)
Observations	465	465	465	451	451	451
Adjusted R-squared	0.291	0.197	0.256	0.309	0.207	0.272

Notes: Source: Author's calculations based on PASEC2019 data. Mother Support = doing homework with mother.

of energy access are significantly amplified in rural contexts when fathers are involved in their children's homework.

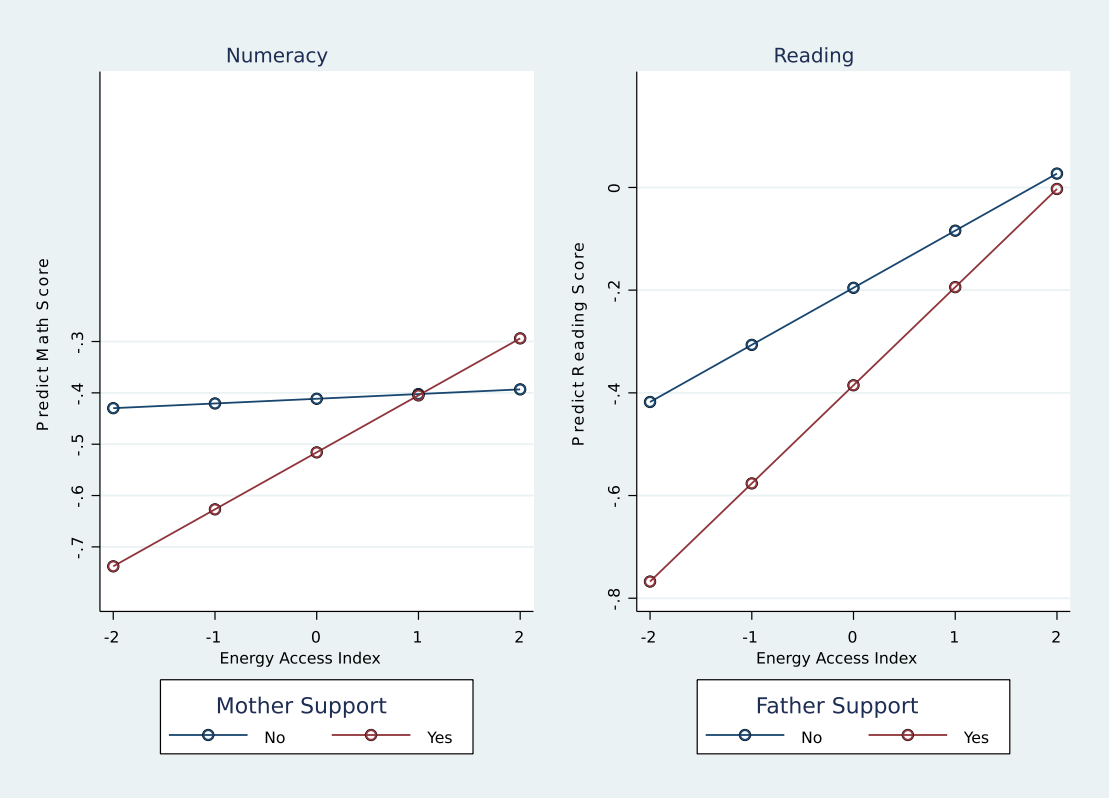
Overall, these findings emphasize the significant geographic variations in the role of parental support. While access to energy has a direct positive association with learning outcomes in both urban and rural areas, the interaction between access to energy and parental involvement is only associated in rural settings.

Furthermore, the results reveal that the moderating role of parental support varies by learning outcome and parents involved. Maternal involvement appears to be more relevant to mathematics performance, whereas paternal support plays a stronger role in enhancing reading performance and overall learning outcomes. These results imply that the effectiveness of energy access hinges not only on the presence of parental support, but also on the type of support provided and the learning outcome in question.

7.2 Predicted Learning Gains from Energy Access under Parental Support

Figure 9 shows how the relationship of association between energy access at home and learning outcomes change depending on the assistance provided by parents regarding homework.

Figure 9: Predicted Learning Gains from Energy Access under Parental Support



Notes: Source: Author

The left-side graph shows that, at very low levels of energy access (around -2 on the index), the group receiving maternal homework support starts from lower predicted numeracy scores (approximately -0.74) than the group without such support (around -0.43).

However, the predicted scores of supported pupils rise markedly from around -0.74 to -0.30, whereas the scores of unsupported pupils only improve modestly, from approximately -0.43 to -0.39. Consequently, the substantial initial disparity diminishes, vanishes at moderate-to-high energy levels, and reverses slightly at the top of the energy distribution.

This pattern indicates a strong association between maternal support and energy access: improvements in household energy conditions lead to disproportionately larger numeracy gains among pupils who receive support.

The second part of Figure shows a similar pattern for paternal support and reading outcomes. At very low levels of energy access (around -2), pupils receiving paternal support have lower predicted reading scores (around -0.78) than those without support (around -0.43). However, the predicted reading scores of pupils receiving paternal support rise sharply with improvements in energy access, increasing to around 0.00 at the highest level of the energy index. In contrast, the scores of pupils without support rise more moderately, reaching approximately 0.03. Consequently, the substantial initial gap narrows considerably and almost disappears at higher levels of energy access. This pattern suggests that paternal support strengthens the learning gains associated with improved energy access, particularly with regard to reading performance.

8 Conclusion

This paper examined the relationship between access to energy at home and the learning outcomes of primary school students in Cameroon, paying particular attention to the moderating role of parental support. Using a multidimensional measure of energy access that combines electricity and modern cooking fuels, the findings show a consistent and robust positive association between energy access and reading performance, as well as overall learning outcomes. By contrast, the association with mathematics is weaker and more inconsistent across specifications and performance distributions, suggesting that the educational benefits of energy access are not uniform across cognitive domains. Beyond these average associations, the analysis suggests that access to energy alone is insufficient to significantly affect learning outcomes. Rather, the relationship between access to energy and learning outcomes appears to depend on how the additional study time is utilized within the household. In this respect, the moderation analysis shows different parental roles in rural areas. Specifically, in rural areas, maternal homework support strengthens the association between energy access and mathematics performance, while paternal homework support strengthens the association between energy access and reading and broader learning outcomes. The predicted-value analysis shows that, when combined with improvements

in energy access, maternal support is associated with the largest learning gains among children with very low initial mathematics scores, while paternal support is associated with modestly higher reading scores among supported pupils.

These findings carry two policy implications for Cameroon, particularly in rural areas where access to energy and learning gaps are still a major issue. First, improving household energy conditions could help to create a more supportive home learning environment for children. In this regard, policies that expand access to reliable and affordable energy sources in rural communities such as high-intensity solar lighting systems that provide stable lighting for several days as well as access to modern cooking technologies could improve study conditions at home. Second, as energy alone is insufficient, policies that promote parental education and awareness of home learning support could help to strengthen parents' engagement in their children's homework and study activities, particularly programs that engage rural mothers in numeracy support and rural fathers in reading support. Program combining energy access with parental engagement initiatives are therefore likely to yield the greatest equity gains.

While this study provides consistent evidence of the association between access to energy and learning outcomes, there are some limitations. Firstly, the nature of the available dataset does not allow the implementation of more advanced methodologies, such as experimental or quasi-experimental approaches, which could strengthen identification. Future research could build on this work by using richer datasets that allow for more robust designs. A second limitation relates to the measurement of energy access itself. Although the multidimensional indicator employed in this study captures significant aspects of household energy conditions, it does not accurately reflect variations in the intensity and quality of energy usage among households. Future studies could address this by incorporating more direct measures, such as electricity consumption, household energy expenditure, and time spent collecting fuel per day or per week, and the frequency of the types of cooking technology used. Such extensions would provide a more precise understanding of how household energy conditions translate into educational outcomes.

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Appendix A: Additional tables and figures

Table A1: OLS Regression of Energy Access and Learning Outcomes

	(1)	(2)	(3)
	Reading	Mathematics	Global Learning Index
Access to energy at home	0.098***	0.028	0.062*
	(0.033)	(0.033)	(0.032)
Socio-economic Status of family	-0.006	0.006	0.001
	(0.005)	(0.005)	(0.005)
Student access to Preschool	0.125**	0.111*	0.121**
	(0.054)	(0.062)	(0.058)
Student repeat grade	-0.136**	-0.161***	-0.154***
	(0.066)	(0.051)	(0.056)
Speak French at Home	0.368***	0.246***	0.312***
	(0.092)	(0.088)	(0.088)
Mother Read	-0.075	-0.059	-0.067
	(0.082)	(0.069)	(0.075)
Pupils age	-0.062***	-0.048***	-0.056***
	(0.022)	(0.016)	(0.018)
Gender	0.047	0.169***	0.117**
	(0.053)	(0.047)	(0.049)
Students read at home	0.371***	0.290***	0.340***
	(0.100)	(0.093)	(0.098)
Students do household work	0.100	-0.061	0.011
	(0.071)	(0.064)	(0.066)
Students do agricultural work	-0.029	-0.001	-0.015
	(0.075)	(0.069)	(0.071)
Students do small commerce	-0.129*	-0.064	-0.096
	(0.068)	(0.068)	(0.067)
Students do small job	-0.326***	-0.195***	-0.262***
	(0.066)	(0.060)	(0.060)
Student area of residence	-0.033	-0.098	-0.070
	(0.124)	(0.115)	(0.117)
Have library at school	0.446***	0.283	0.369
	(0.170)	(0.288)	(0.224)
Director Gender	-0.106	-0.131	-0.124
	(0.099)	(0.116)	(0.106)
Director Degree	-0.537***	0.026	-0.230***
	(0.102)	(0.089)	(0.076)
Teacher Gender	-0.377***	-0.175*	-0.276***
	(0.098)	(0.102)	(0.098)
Teacher Degree	0.078	-0.279	-0.122
	(0.160)	(0.356)	(0.271)
Student School homework	0.395***	0.382***	0.401***
	(0.106)	(0.104)	(0.101)
Have television at home	0.109	0.008	0.054
	(0.107)	(0.085)	(0.096)
Have computer at home	0.055	0.037	0.046
	(0.083)	(0.077)	(0.078)
School Infrastructure Index	0.019***	0.022***	0.021***
	(0.006)	(0.006)	(0.005)
Classroom Equipment Index	0.007	0.016*	0.012
	(0.011)	(0.009)	(0.010)
Constant	-0.379	-1.902***	-1.261*
	(0.749)	(0.689)	(0.714)
Observations	1338	1338	1338
Adjusted R-squared	0.438	0.366	0.422

Notes: Source: Author's calculations based on PASEC2019 data. Sample: Grade 6 students in public schools, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A2: Multivariate regression: Effect of Access to Energy on Student Performance

	(1)	(2)	(3)
	Reading	Maths	Global Learning Index
Access	0.1079***	0.0477*	0.0770***
	(0.0272)	(0.0251)	(0.0245)
Socio-economic Status of family	-0.0029	0.0065	0.0023
	(0.0057)	(0.0057)	(0.0056)
Student access to Preschool	0.1050**	0.0911*	0.1008**
	(0.0495)	(0.0537)	(0.0510)
Student repeat grade	-0.1118**	-0.1275***	-0.1237***
	(0.0553)	(0.0446)	(0.0469)
Speak French at Home	0.3007***	0.1167	0.2072**
	(0.0942)	(0.0882)	(0.0913)
Mother Read	-0.0965	-0.0799	-0.0898
	(0.0630)	(0.0549)	(0.0569)
Pupils age	-0.0569***	-0.0486***	-0.0540***
	(0.0160)	(0.0131)	(0.0140)
Gender	-0.0086	0.1206***	0.0637
	(0.0421)	(0.0427)	(0.0418)
Students read at home	0.3339***	0.2753***	0.3123***
	(0.0772)	(0.0812)	(0.0801)
Students do household work	0.1503**	0.0136	0.0774
	(0.0679)	(0.0618)	(0.0630)
Students do agricultural work	-0.0577	-0.0032	-0.0294
	(0.0684)	(0.0613)	(0.0633)
Students do small commerce	-0.1819***	-0.1189**	-0.1528***
	(0.0513)	(0.0553)	(0.0524)
Students do small job	-0.2950***	-0.1983***	-0.2494***
	(0.0577)	(0.0505)	(0.0512)
Student area of residence	0.0822	0.0262	0.0538
	(0.1250)	(0.1269)	(0.1258)
Have library at school	0.4584**	0.2667	0.3649
	(0.1985)	(0.3038)	(0.2378)
Director Gender	-0.0517	-0.0358	-0.0444
	(0.1149)	(0.1300)	(0.1222)
Director Degree	-0.4216*	-0.0073	-0.1952
	(0.2507)	(0.3196)	(0.2319)
Teacher Gender	-0.2716***	-0.1219	-0.1962**
	(0.0970)	(0.1031)	(0.0990)
Teacher Degree	-0.0332	-0.4172	-0.2517
	(0.2047)	(0.3387)	(0.2668)
Student School homework	0.4691***	0.3810***	0.4358***
	(0.0812)	(0.0731)	(0.0723)
Have television at home	0.0518	-0.0369	0.0025
	(0.0743)	(0.0645)	(0.0688)
Have computer at home	-0.0084	-0.0196	-0.0153
	(0.0718)	(0.0668)	(0.0668)
School Infrastructure Index	0.0143**	0.0185***	0.0173**
	(0.0072)	(0.0070)	(0.0069)
Classroom Equipment Index	0.0086	0.0129	0.0113
	(0.0080)	(0.0081)	(0.0078)
Constant	-0.5281	-1.4418**	-1.0739*
	(0.6705)	(0.5793)	(0.5817)
Observations	1,338	1,338	1,338
Adjusted R-squared	0.4017	0.3337	0.3870

Notes: Source: Author's calculations based on PASEC2019 data. Notes: Grade 6 students in public schools, Cameroon (PASEC 2019) Bootstrap standard errors based on 100 replications. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A3a: Quantile Regression – Reading

	(1) Q25	(2) Q50	(3) Q75
Access to energy at home	0.087***	0.108***	0.141***
	(0.034)	(0.033)	(0.034)
Socio-economic Status of family	-0.004	-0.002	-0.007
	(0.006)	(0.006)	(0.006)
Student access to Preschool	0.138**	0.116**	0.090
	(0.058)	(0.057)	(0.059)
Student repeat grade	-0.094*	-0.123**	-0.151***
	(0.056)	(0.055)	(0.057)
Speak French at Home	0.319***	0.252***	0.332***
	(0.089)	(0.087)	(0.090)
Mother Read	-0.111*	-0.126**	-0.083
	(0.062)	(0.061)	(0.063)
Pupils age	-0.042**	-0.046***	-0.070***
	(0.018)	(0.017)	(0.018)
Gender	0.026	-0.042	-0.007
	(0.053)	(0.052)	(0.054)
Students read at home	0.334***	0.373***	0.327***
	(0.091)	(0.089)	(0.092)
Students do household work	0.129	0.102	0.244***
	(0.089)	(0.087)	(0.090)
Students do agricultural work	-0.112*	-0.042	-0.016
	(0.065)	(0.063)	(0.066)
Students do small commerce	-0.185***	-0.187***	-0.174***
	(0.055)	(0.054)	(0.056)
Students do small job	-0.335***	-0.276***	-0.282***
	(0.055)	(0.053)	(0.055)
Student area of residence	0.129*	0.109	0.017
	(0.072)	(0.070)	(0.073)
Have library at school	0.409***	0.537***	0.517***
	(0.136)	(0.133)	(0.137)
Director Gender	-0.022	-0.018	0.028
	(0.074)	(0.072)	(0.075)
Director Degree	-0.378	-0.695**	-0.475
	(0.307)	(0.299)	(0.309)
Teacher Gender	-0.312***	-0.307***	-0.367***
	(0.062)	(0.061)	(0.063)
Teacher Degree	-0.011	-0.082	-0.004
	(0.127)	(0.124)	(0.128)
Student School homework	0.371***	0.536***	0.672***
	(0.126)	(0.123)	(0.127)
Have television at home	0.081	0.034	0.026
	(0.076)	(0.075)	(0.077)
Have computer at home	-0.003	-0.038	0.004
	(0.071)	(0.070)	(0.072)
School Infrastructure Index	0.014***	0.014***	0.016***
	(0.004)	(0.004)	(0.004)
Classroom Equipment Index	0.020***	0.011**	0.006
	(0.005)	(0.005)	(0.005)
Constant	-1.620***	-0.487	0.118
	(0.556)	(0.543)	(0.561)
Observations	1338	1338	1338

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students in public schools, Cameroon (PASEC2019). Standard errors are robust. Quantiles at 25th, 50th, and 75th percentiles. *** p<0.01, ** p<0.05, * p<0.1.

Table A3b: Quantile Regression – Mathematics

	(1) Q25	(2) Q50	(3) Q75
Access to energy at home	0.040	0.028	0.069*
	(0.031)	(0.033)	(0.036)
Socio-economic Status of family	0.009*	0.013**	0.004
	(0.005)	(0.006)	(0.006)
Student access to Preschool	0.058	0.089	0.102
	(0.054)	(0.057)	(0.062)
Student repeat grade	-0.137***	-0.078	-0.149**
	(0.053)	(0.055)	(0.060)
Speak French at Home	0.128	0.095	0.007
	(0.084)	(0.087)	(0.095)
Mother Read	-0.081	-0.115*	-0.044
	(0.058)	(0.061)	(0.067)
Pupils age	-0.049***	-0.054***	-0.054***
	(0.017)	(0.017)	(0.019)
Gender	0.137***	0.109**	0.120**
	(0.050)	(0.053)	(0.057)
Students read at home	0.258***	0.250***	0.238**
	(0.086)	(0.090)	(0.098)
Students do household work	-0.035	-0.033	0.003
	(0.084)	(0.087)	(0.095)
Students do agricultural work	0.081	-0.008	0.049
	(0.061)	(0.064)	(0.069)
Students do small commerce	-0.029	-0.104*	-0.241***
	(0.052)	(0.054)	(0.059)
Students do small job	-0.245***	-0.190***	-0.175***
	(0.051)	(0.054)	(0.059)
Student area of residence	0.060	0.077	0.038
	(0.068)	(0.071)	(0.077)
Have library at school	0.073	0.345**	0.357**
	(0.128)	(0.134)	(0.145)
Director Gender	-0.009	-0.052	-0.038
	(0.070)	(0.073)	(0.079)
Director Degree	-0.338	-0.051	-0.012
	(0.288)	(0.302)	(0.328)
Teacher Gender	-0.161***	-0.118*	-0.119*
	(0.058)	(0.061)	(0.066)
Teacher Degree	-0.422***	-0.363***	-0.615***
	(0.119)	(0.125)	(0.136)
Student School homework	0.317***	0.310**	0.460***
	(0.118)	(0.124)	(0.134)
Have television at home	-0.058	-0.031	-0.078
	(0.072)	(0.075)	(0.082)
Have computer at home	-0.005	-0.047	-0.128*
	(0.067)	(0.070)	(0.076)
School Infrastructure Index	0.017***	0.015***	0.025***
	(0.004)	(0.004)	(0.005)
Classroom Equipment Index	0.011**	0.019***	0.007
	(0.005)	(0.005)	(0.005)
Constant	-1.488***	-1.751***	-0.525
	(0.522)	(0.547)	(0.595)
Observations	1338	1338	1338

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students in public schools, Cameroon (PASEC2019). Standard errors are robust. Quantiles at 25th, 50th, and 75th percentiles. *** p<0.01, ** p<0.05, * p<0.1.

Table A3c: Quantile Regression – Global Learning Index

	(1) Q25	(2) Q50	(3) Q75
Access to energy at home	0.071**	0.080***	0.068**
	(0.034)	(0.029)	(0.034)
Socio-economic Status of family	0.002	0.009*	0.003
	(0.006)	(0.005)	(0.006)
Student access to Preschool	0.114*	0.097*	0.115*
	(0.059)	(0.050)	(0.059)
Student repeat grade	-0.114**	-0.126***	-0.148***
	(0.057)	(0.049)	(0.057)
Speak French at Home	0.216**	0.192**	0.200**
	(0.090)	(0.077)	(0.090)
Mother Read	-0.107*	-0.138**	-0.057
	(0.063)	(0.054)	(0.063)
Pupils age	-0.041**	-0.051***	-0.067***
	(0.018)	(0.015)	(0.018)
Gender	0.090*	0.081*	0.064
	(0.054)	(0.046)	(0.054)
Students read at home	0.298***	0.293***	0.344***
	(0.093)	(0.079)	(0.093)
Students do household work	0.052	0.013	0.152*
	(0.090)	(0.077)	(0.090)
Students do agricultural work	-0.004	-0.002	-0.039
	(0.066)	(0.056)	(0.066)
Students do small commerce	-0.107*	-0.145***	-0.204***
	(0.056)	(0.048)	(0.056)
Students do small job	-0.326***	-0.241***	-0.236***
	(0.056)	(0.047)	(0.056)
Student area of residence	0.140*	0.038	0.052
	(0.073)	(0.063)	(0.073)
Have library at school	0.368***	0.268**	0.355**
	(0.138)	(0.118)	(0.138)
Director Gender	-0.019	0.004	-0.037
	(0.075)	(0.064)	(0.075)
Director Degree	-0.339	-0.397	-0.132
	(0.311)	(0.266)	(0.311)
Teacher Gender	-0.169***	-0.232***	-0.192***
	(0.063)	(0.054)	(0.063)
Teacher Degree	-0.239*	-0.224**	-0.239*
	(0.129)	(0.110)	(0.129)
Student School homework	0.350***	0.508***	0.603***
	(0.128)	(0.109)	(0.127)
Have television at home	0.007	-0.007	-0.021
	(0.078)	(0.066)	(0.078)
Have computer at home	-0.019	-0.084	-0.046
	(0.072)	(0.062)	(0.072)
School Infrastructure Index	0.015***	0.018***	0.024***
	(0.004)	(0.004)	(0.004)
Classroom Equipment Index	0.016***	0.016***	0.007
	(0.005)	(0.004)	(0.005)
Constant	-1.612***	-1.452***	-0.898
	(0.565)	(0.482)	(0.564)
Observations	1338	1338	1338

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students in public schools, Cameroon (PASEC2019). Standard errors are robust. Quantiles at 25th, 50th, and 75th percentiles. *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Robustness learning outcomes (using PCA) OLS Estimation

	(1)	(2)	(3)
	Reading	Mathematics	Global Learning Index
Access to Energy at home	0.213***	0.061	0.194**
	(0.073)	(0.071)	(0.095)
Socio-economic Status of family	-0.012	0.014	0.001
	(0.011)	(0.012)	(0.015)
Student access to Preschool	0.273**	0.239*	0.362**
	(0.118)	(0.133)	(0.169)
Student repeat grade	-0.296**	-0.344***	-0.453***
	(0.144)	(0.109)	(0.166)
Speak French at Home	0.799***	0.530***	0.941***
	(0.199)	(0.188)	(0.260)
Mother Read	-0.163	-0.126	-0.205
	(0.179)	(0.148)	(0.223)
Pupils age	-0.136***	-0.103***	-0.169***
	(0.047)	(0.034)	(0.053)
Gender	0.102	0.363***	0.327**
	(0.115)	(0.101)	(0.145)
Students read at home	0.807***	0.623***	1.012***
	(0.218)	(0.199)	(0.290)
Students do household work	0.218	-0.130	0.065
	(0.155)	(0.138)	(0.197)
Students do agricultural work	-0.063	-0.002	-0.046
	(0.164)	(0.148)	(0.210)
Students do small commerce	-0.280*	-0.136	-0.295
	(0.148)	(0.146)	(0.198)
Students do small job	-0.709***	-0.420***	-0.800***
	(0.143)	(0.129)	(0.179)
Student area of residence	-0.072	-0.211	-0.199
	(0.269)	(0.248)	(0.347)
Have library at school	0.970***	0.609	1.119*
	(0.369)	(0.619)	(0.639)
Director Gender	-0.231	-0.281	-0.362
	(0.216)	(0.250)	(0.311)
Director Degree	-1.166***	0.051	-0.795***
	(0.222)	(0.191)	(0.225)
Teacher Gender	-0.820***	-0.376*	-0.848***
	(0.214)	(0.220)	(0.287)
Teacher Degree	0.168	-0.596	-0.299
	(0.348)	(0.765)	(0.767)
Student School homework	0.860***	0.817***	1.186***
	(0.230)	(0.224)	(0.298)
Have television at home	0.236	0.018	0.181
	(0.233)	(0.182)	(0.286)
Have computer at home	0.120	0.078	0.141
	(0.181)	(0.165)	(0.231)
School Infrastructure Index	0.041***	0.047***	0.062***
	(0.012)	(0.012)	(0.016)
Classroom Equipment Index	0.015	0.033*	0.034
	(0.024)	(0.019)	(0.029)
Constant	-0.826	-4.072***	-3.446
	(1.628)	(1.480)	(2.110)
Observations	1338	1338	1338
Adjusted R-squared	0.438	0.366	0.427

Notes: Source: Author's calculations based on PASEC2019 data Grade 6 students, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A5a: Quantile Regression - Reading estimated with PCA

	(1) Q25	(2) Q50	(3) Q75
Access to Energy at home	0.185**	0.226***	0.306***
	(0.073)	(0.071)	(0.074)
Socio-economic Status of family	-0.009	-0.005	-0.016
	(0.013)	(0.012)	(0.013)
Student access to Preschool	0.294**	0.251**	0.186
	(0.126)	(0.122)	(0.128)
Student repeat grade	-0.215*	-0.275**	-0.332***
	(0.122)	(0.119)	(0.124)
Speak French at Home	0.680***	0.553***	0.710***
	(0.193)	(0.188)	(0.196)
Mother Read	-0.237*	-0.279**	-0.191
	(0.135)	(0.131)	(0.137)
Pupils age	-0.093**	-0.104***	-0.151***
	(0.039)	(0.038)	(0.039)
Gender	0.063	-0.087	-0.026
	(0.116)	(0.113)	(0.118)
Students read at home	0.726***	0.814***	0.724***
	(0.198)	(0.192)	(0.201)
Students do household work	0.267	0.226	0.517***
	(0.193)	(0.188)	(0.196)
Students do agricultural work	-0.258*	-0.089	-0.026
	(0.141)	(0.137)	(0.143)
Students do small commerce	-0.384***	-0.404***	-0.376***
	(0.120)	(0.117)	(0.122)
Students do small job	-0.745***	-0.599***	-0.606***
	(0.119)	(0.115)	(0.120)
Student area of residence	0.272*	0.240	0.036
	(0.157)	(0.152)	(0.159)
Have library at school	0.917***	1.146***	1.118***
	(0.295)	(0.287)	(0.299)
Director Gender	-0.058	-0.034	0.060
	(0.161)	(0.156)	(0.163)
Director Degree	-0.786	-1.533**	-1.046
	(0.666)	(0.647)	(0.674)
Teacher Gender	-0.675***	-0.682***	-0.812***
	(0.135)	(0.131)	(0.137)
Teacher Degree	-0.000	-0.182	0.028
	(0.276)	(0.268)	(0.279)
Student School homework	0.835***	1.191***	1.452***
	(0.273)	(0.265)	(0.276)
Have television at home	0.164	0.081	0.055
	(0.166)	(0.161)	(0.168)
Have computer at home	0.008	-0.079	0.010
	(0.155)	(0.151)	(0.157)
School Infrastructure Index	0.030***	0.031***	0.035***
	(0.009)	(0.009)	(0.009)
Classroom Equipment Index	0.043***	0.025**	0.014
	(0.010)	(0.010)	(0.011)
Constant	-3.562***	-1.027	0.150
	(1.208)	(1.173)	(1.223)
Observations	1338	1338	1338

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students in public schools, Cameroon (PASEC2019). Standard errors are robust. Quantiles at 25th, 50th, and 75th percentiles. *** p<0.01, ** p<0.05, * p<0.1.

Table A5b: Quantile Regression -Numeracy (estimated via PCA)

	(1) Q25	(2) Q50	(3) Q75
Access to Energy at home	0.087	0.061	0.148**
	(0.068)	(0.071)	(0.075)
Socio-economic Status of family	0.019	0.027**	0.009
	(0.012)	(0.012)	(0.013)
Student access to Preschool	0.136	0.183	0.217*
	(0.118)	(0.122)	(0.130)
Student repeat grade	-0.291**	-0.165	-0.325**
	(0.114)	(0.118)	(0.126)
Speak French at Home	0.291	0.208	0.028
	(0.181)	(0.187)	(0.199)
Mother Read	-0.169	-0.245*	-0.099
	(0.127)	(0.131)	(0.139)
Pupils age	-0.108***	-0.119***	-0.118***
	(0.036)	(0.037)	(0.040)
Gender	0.296***	0.239**	0.251**
	(0.109)	(0.113)	(0.120)
Students read at home	0.570***	0.533***	0.521**
	(0.186)	(0.192)	(0.204)
Students do household work	-0.074	-0.053	-0.000
	(0.181)	(0.187)	(0.199)
Students do agricultural work	0.179	-0.009	0.109
	(0.132)	(0.137)	(0.146)
Students do small commerce	-0.068	-0.217*	-0.511***
	(0.112)	(0.116)	(0.124)
Students do small job	-0.523***	-0.395***	-0.382***
	(0.111)	(0.115)	(0.123)
Student area of residence	0.135	0.167	0.075
	(0.147)	(0.152)	(0.162)
Have library at school	0.164	0.739***	0.733**
	(0.276)	(0.286)	(0.305)
Director Gender	-0.019	-0.095	-0.091
	(0.151)	(0.156)	(0.166)
Director Degree	-0.730	-0.124	-0.025
	(0.624)	(0.646)	(0.687)
Teacher Gender	-0.349***	-0.248*	-0.241*
	(0.126)	(0.131)	(0.139)
Teacher Degree	-0.898***	-0.781***	-1.342***
	(0.258)	(0.267)	(0.285)
Student School homework	0.661***	0.672**	0.988***
	(0.255)	(0.265)	(0.281)
Have television at home	-0.114	-0.061	-0.158
	(0.155)	(0.161)	(0.171)
Have computer at home	-0.016	-0.106	-0.280*
	(0.145)	(0.150)	(0.160)
School Infrastructure Index	0.035***	0.032***	0.054***
	(0.009)	(0.009)	(0.009)
Classroom Equipment Index	0.023**	0.041***	0.016
	(0.010)	(0.010)	(0.011)
Constant	-3.113***	-3.734***	-1.117
	(1.131)	(1.172)	(1.247)
Observations	1338	1338	1338

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students in public schools, Cameroon (PASEC2019). Standard errors are robust. Quantiles at 25th, 50th, and 75th percentiles. *** p<0.01, ** p<0.05, * p<0.1.

Table A5c: Quantile Regression - Global Learning Index (estimated via PCA)

	(1) Q25	(2) Q50	(3) Q75
Access to Energy at home	0.234**	0.242***	0.249**
	(0.098)	(0.084)	(0.097)
Socio-economic Status of family	-0.003	0.021	0.009
	(0.017)	(0.015)	(0.017)
Student access to Preschool	0.396**	0.300**	0.271
	(0.170)	(0.146)	(0.168)
Student repeat grade	-0.333**	-0.406***	-0.451***
	(0.165)	(0.141)	(0.163)
Speak French at Home	0.782***	0.618***	0.604**
	(0.261)	(0.223)	(0.258)
Mother Read	-0.322*	-0.376**	-0.215
	(0.182)	(0.156)	(0.181)
Pupils age	-0.120**	-0.135***	-0.218***
	(0.052)	(0.045)	(0.052)
Gender	0.233	0.219	0.195
	(0.157)	(0.134)	(0.155)
Students read at home	0.981***	0.877***	1.083***
	(0.267)	(0.229)	(0.265)
Students do household work	0.235	0.132	0.406
	(0.261)	(0.223)	(0.258)
Students do agricultural work	-0.138	-0.049	-0.098
	(0.191)	(0.163)	(0.189)
Students do small commerce	-0.340**	-0.479***	-0.636***
	(0.162)	(0.139)	(0.161)
Students do small job	-0.950***	-0.764***	-0.716***
	(0.160)	(0.138)	(0.159)
Student area of residence	0.353*	0.087	0.152
	(0.212)	(0.181)	(0.210)
Have library at school	1.134***	0.931***	1.127***
	(0.398)	(0.341)	(0.395)
Director Gender	-0.123	0.070	-0.161
	(0.217)	(0.186)	(0.215)
Director Degree	-1.321	-1.372*	-0.550
	(0.899)	(0.771)	(0.891)
Teacher Gender	-0.531***	-0.685***	-0.585***
	(0.182)	(0.156)	(0.181)
Teacher Degree	-0.606	-0.521	-0.656*
	(0.372)	(0.319)	(0.369)
Student School homework	1.101***	1.440***	1.706***
	(0.368)	(0.316)	(0.365)
Have television at home	0.108	0.044	-0.166
	(0.224)	(0.192)	(0.222)
Have computer at home	-0.036	-0.218	-0.195
	(0.209)	(0.179)	(0.207)
School Infrastructure Index	0.041***	0.051***	0.069***
	(0.012)	(0.011)	(0.012)
Classroom Equipment Index	0.042***	0.048***	0.023*
	(0.014)	(0.012)	(0.014)
Constant	-4.027**	-4.249***	-2.052
	(1.630)	(1.398)	(1.616)
Observations	1338	1338	1338

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students in public schools, Cameroon (PASEC2019). Standard errors are robust. Quantiles at 25th, 50th, and 75th percentiles. *** p<0.01, ** p<0.05, * p<0.1.

Table A6: OLS Estimation with missing variables

	(1) Reading	(2) Mathematics	(3) Global Learning Index
Access to Energy at home	0.102***	0.037	0.069***
	(0.027)	(0.026)	(0.026)
Missing Indicator for Access	-0.402***	-0.202**	-0.300***
	(0.110)	(0.089)	(0.097)
Economic Statuts of family	-0.006	0.002	-0.002
	(0.004)	(0.005)	(0.005)
Student access to Preschool	0.055	0.052	0.055
	(0.048)	(0.054)	(0.051)
Student repeat grade	-0.139***	-0.156***	-0.153***
	(0.051)	(0.043)	(0.044)
Speak French at Home	0.347***	0.231***	0.293***
	(0.077)	(0.077)	(0.077)
Mother Read	-0.075	-0.073	-0.076
	(0.074)	(0.065)	(0.068)
Missing Indicator for Mother Read	0.043	0.013	0.027
	(0.101)	(0.089)	(0.094)
Pupils age	-0.060***	-0.047***	-0.055***
	(0.019)	(0.016)	(0.017)
Gender	0.046	0.138***	0.099**
	(0.043)	(0.039)	(0.039)
Students read at home	0.337***	0.268***	0.311***
	(0.089)	(0.081)	(0.085)
Missing Indicator for Student read at home	0.267**	0.221**	0.253**
	(0.125)	(0.106)	(0.115)
Students do household work	0.164***	0.005	0.078
	(0.063)	(0.059)	(0.060)
Students do agricultural work	0.008	0.050	0.032
	(0.062)	(0.059)	(0.059)
Students do small commerce	-0.182***	-0.130**	-0.158***
	(0.057)	(0.056)	(0.056)
Students do small job	-0.332***	-0.191***	-0.263***
	(0.060)	(0.057)	(0.057)
Student area of residence	0.053	-0.002	0.024
	(0.104)	(0.101)	(0.100)
Have library at school	0.319*	0.082	0.196
	(0.169)	(0.261)	(0.213)
Director Gender	-0.059	0.005	-0.025
	(0.092)	(0.106)	(0.097)
Director Degree	-0.397***	-0.059	-0.216***
	(0.124)	(0.117)	(0.082)
Teacher Gender	-0.314***	-0.201*	-0.260***
	(0.097)	(0.105)	(0.099)
Missing Indicator for Teacher Gender	0.011	0.064	0.041
	(0.151)	(0.165)	(0.157)
Teacher Degree	0.091	-0.237	-0.091
	(0.182)	(0.395)	(0.305)
Missing Indicator for Teacher Degree	0.054	0.668*	0.401
	(0.250)	(0.385)	(0.307)
Student School_homework	0.284***	0.248***	0.274***
	(0.086)	(0.089)	(0.082)
Have television at home	0.072	-0.013	0.026
	(0.079)	(0.068)	(0.072)
Have computer at home	0.084	0.070	0.079
	(0.073)	(0.063)	(0.066)
School Infrastructure Index	0.020***	0.022***	0.022***
	(0.006)	(0.005)	(0.005)
Classroom Equipment Index	0.007	0.016**	0.013
	(0.010)	(0.008)	(0.009)
Missing Indicator for Classroom Equipment Index	0.272	-0.234	-0.003
	(0.428)	(0.400)	(0.399)
Constant	-0.567	-1.668**	-1.212*
	(0.697)	(0.661)	(0.669)
Observations	2102.000	2102.000	2102.000
Adjusted R-squared	0.413	0.324	0.389

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A7: Quantile Regression with missing problem

	(1)			(2)			(3)		
	q25	q50	q75	q25	q50	q75	q25	q50	q75
	Reading			Mathematics			Global Learning Index		
Access	0.0886***	0.0949***	0.1360***	0.0306	0.0550**	0.0719**	0.0658**	0.0941***	0.0951***
	(0.0263)	(0.0290)	(0.0348)	(0.0243)	(0.0233)	(0.0290)	(0.0273)	(0.0252)	(0.0300)
Missing Indicator for Access	-0.2827***	-0.3807***	-0.2987***	-0.0621	-0.2605***	-0.2516**	-0.2096***	-0.2820***	-0.2683***
	(0.0791)	(0.0979)	(0.0962)	(0.0680)	(0.0640)	(0.1001)	(0.0702)	(0.0705)	(0.0934)
Economic Statuts of family	-0.0070*	-0.0042	-0.0060	0.0032	0.0045	0.0036	-0.0024	-0.0005	0.0019
	(0.0039)	(0.0046)	(0.0053)	(0.0040)	(0.0038)	(0.0052)	(0.0045)	(0.0041)	(0.0051)
Student access to Preschool	0.0890*	0.1383***	0.0770	0.1219**	0.0814**	0.0548	0.1303***	0.0966**	0.0679
	(0.0485)	(0.0485)	(0.0534)	(0.0501)	(0.0413)	(0.0547)	(0.0415)	(0.0441)	(0.0563)
Student repeat grade	-0.1181**	-0.1369***	-0.1069**	-0.1138***	-0.0860*	-0.1218**	-0.1117***	-0.1003**	-0.1451***
	(0.0494)	(0.0430)	(0.0537)	(0.0349)	(0.0448)	(0.0578)	(0.0407)	(0.0426)	(0.0518)
Speak French at Home	0.3293***	0.3779***	0.3553***	0.1754**	0.1363*	0.0495	0.2420***	0.2905***	0.1726**
	(0.0643)	(0.0735)	(0.0887)	(0.0707)	(0.0707)	(0.0718)	(0.0585)	(0.0641)	(0.0757)
Mother read	-0.0509	-0.0953**	-0.0728	-0.0416	-0.0919	-0.0482	-0.0160	-0.0637	-0.0592
	(0.0642)	(0.0483)	(0.0638)	(0.0493)	(0.0571)	(0.0571)	(0.0532)	(0.0546)	(0.0563)
Missing Indicator for Mother Read	0.1488*	-0.0114	0.0164	0.0997	0.0143	-0.1327	0.1736**	0.0216	-0.0167
	(0.0858)	(0.0647)	(0.1047)	(0.0837)	(0.0706)	(0.0902)	(0.0828)	(0.0764)	(0.0787)
Pupils age	-0.0414***	-0.0491***	-0.0742***	-0.0408***	-0.0508***	-0.0605***	-0.0385***	-0.0509***	-0.0722***
	(0.0122)	(0.0136)	(0.0168)	(0.0108)	(0.0119)	(0.0153)	(0.0118)	(0.0137)	(0.0168)
Gender	0.0466	0.0452	0.0496	0.1462***	0.1782***	0.1574***	0.1042**	0.1296***	0.1099**
	(0.0443)	(0.0424)	(0.0457)	(0.0370)	(0.0454)	(0.0478)	(0.0416)	(0.0445)	(0.0485)
Student read at home	0.3772***	0.3652***	0.3525***	0.2571***	0.2200***	0.2553***	0.3079***	0.3076***	0.3593***
	(0.0785)	(0.0846)	(0.0927)	(0.0771)	(0.0838)	(0.0982)	(0.0802)	(0.0843)	(0.1099)
Missing Indicator for Student read at home	0.3214***	0.2798***	0.2142	0.2176*	0.1267	0.2124*	0.2214**	0.1922*	0.2344*
	(0.1165)	(0.1056)	(0.1363)	(0.1149)	(0.0966)	(0.1243)	(0.1121)	(0.1111)	(0.1286)
Student do household work	0.2283***	0.1841***	0.1877*	0.0462	0.0562	-0.0044	0.1071	0.0583	0.0899
	(0.0868)	(0.0625)	(0.1002)	(0.0712)	(0.0790)	(0.0762)	(0.0776)	(0.0682)	(0.0807)
Students do agricultural work	-0.0790	-0.0169	0.0089	0.0579	-0.0066	0.0892*	-0.0253	0.0164	0.0346
	(0.0550)	(0.0501)	(0.0650)	(0.0506)	(0.0478)	(0.0527)	(0.0508)	(0.0500)	(0.0617)
Students do small commerce	-0.2425***	-0.2625***	-0.2458***	-0.0946**	-0.1524***	-0.2382***	-0.1691***	-0.2243***	-0.2345***
	(0.0536)	(0.0475)	(0.0525)	(0.0454)	(0.0458)	(0.0582)	(0.0460)	(0.0410)	(0.0513)
Students do small job	-0.3351***	-0.3322***	-0.3415***	-0.2650***	-0.2168***	-0.2115***	-0.3274***	-0.2705***	-0.2978***
	(0.0441)	(0.0480)	(0.0529)	(0.0410)	(0.0405)	(0.0443)	(0.0404)	(0.0446)	(0.0504)
Student area of residence	0.2519***	0.2438***	0.1520**	0.0915*	0.1135*	0.0833	0.2045***	0.1593***	0.1651***
	(0.0560)	(0.0615)	(0.0738)	(0.0486)	(0.0588)	(0.0635)	(0.0593)	(0.0556)	(0.0596)
Have library at school	0.3862***	0.4607***	0.4657***	0.0250	0.0968	0.3102**	0.1999**	0.1936	0.3856***
	(0.1068)	(0.1404)	(0.1191)	(0.0844)	(0.2026)	(0.1507)	(0.1000)	(0.1383)	(0.1362)
Director Gender	-0.0961*	-0.0190	-0.0094	-0.0333	-0.0008	-0.0345	-0.0217	0.0126	-0.0371
	(0.0582)	(0.0526)	(0.0703)	(0.0600)	(0.0633)	(0.0737)	(0.0547)	(0.0626)	(0.0717)
Director Degree	-0.5609**	-0.5293***	-0.3417**	-0.2788	-0.1915	-0.0741	-0.3060*	-0.3889**	-0.0791
	(0.2559)	(0.1830)	(0.1511)	(0.2053)	(0.1567)	(0.2081)	(0.1769)	(0.1656)	(0.1427)
Teacher gender	-0.1878***	-0.2060***	-0.2641***	-0.0830*	-0.1168**	-0.1272**	-0.1533***	-0.1705***	-0.1523***
	(0.0546)	(0.0564)	(0.0679)	(0.0458)	(0.0527)	(0.0571)	(0.0513)	(0.0524)	(0.0577)
Missing Indicator for Teacher Gender	0.1282	-0.0797	-0.0877	0.0973	-0.0008	0.0251	0.0554	-0.0402	-0.0150
	(0.0926)	(0.0834)	(0.1289)	(0.0703)	(0.0778)	(0.0958)	(0.0815)	(0.0760)	(0.1261)
Teacher Degree	0.0026	-0.0009	-0.0304	-0.2975**	-0.2893***	-0.4638**	-0.2025**	-0.1299	-0.1788
	(0.1313)	(0.0937)	(0.1256)	(0.1275)	(0.1094)	(0.1823)	(0.0986)	(0.1037)	(0.1461)
Missing Indicator for Teacher Degree	0.1348	-0.0772	-0.1296	0.4063**	0.4733***	0.1820	0.4310**	0.2697*	0.1149
	(0.2079)	(0.1843)	(0.2855)	(0.1951)	(0.1741)	(0.2214)	(0.1729)	(0.1474)	(0.2264)
Student School homework	0.2773***	0.3811***	0.5169***	0.2680***	0.2108***	0.4322***	0.2777***	0.3470***	0.4707***
	(0.1052)	(0.0850)	(0.1283)	(0.0846)	(0.0745)	(0.0757)	(0.0837)	(0.0662)	(0.0936)
Have television at home	0.0379	-0.0060	-0.0394	-0.0370	-0.0336	-0.1194*	0.0184	-0.0517	-0.1087
	(0.0566)	(0.0643)	(0.0700)	(0.0517)	(0.0561)	(0.0651)	(0.0636)	(0.0614)	(0.0737)
Have computer at home	0.0878	0.0622	0.0421	0.0353	0.0073	-0.0661	0.0371	0.0139	-0.0448
	(0.0641)	(0.0548)	(0.0627)	(0.0531)	(0.0555)	(0.0691)	(0.0607)	(0.0520)	(0.0633)
School Infrastructure Index	0.0146***	0.0140***	0.0153***	0.0182***	0.0174***	0.0276***	0.0149***	0.0172***	0.0232***
	(0.0034)	(0.0038)	(0.0045)	(0.0033)	(0.0029)	(0.0052)	(0.0039)	(0.0035)	(0.0048)
Classroom Equipment Index	0.0130***	0.0105**	0.0070	0.0113***	0.0165***	0.0084*	0.0150***	0.0154***	0.0092**
	(0.0041)	(0.0041)	(0.0045)	(0.0033)	(0.0040)	(0.0045)	(0.0039)	(0.0038)	(0.0043)
Constant	-1.1625***	-0.7041*	0.0641	-1.7058***	-1.3200***	-0.6958	-1.5594***	-1.1698***	-0.7737*
	(0.4282)	(0.3961)	(0.4841)	(0.3749)	(0.3593)	(0.4276)	(0.3514)	(0.3686)	(0.4661)
Observations	1882	1882	1882	1882	1882	1882	1882	1882	1882

Notes: Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)
Source: Author's calculations based on PASEC2019 data.
Notes: Grade 6 students in public schools, Cameroon (PASEC2019).
Standard errors are robust.
Quantiles at 25th, 50th, and 75th percentiles. *** p<0.01, ** p<0.05, * p<0.1.

Table A8: Access to Energy and Learning Outcomes: Moderation Effect of parents support

	(1)	(2)	(3)	(4)	(5)	(6)
	Reading	Mathematics	Global Learning Index	Reading	Mathematics	Global Learning Index
Access to Energy at home	0.122***	0.041	0.080**	0.113***	0.050	0.081**
	(0.035)	(0.033)	(0.032)	(0.038)	(0.035)	(0.035)
Do Homework With Mother	-0.158***	-0.096**	-0.129***			
	(0.048)	(0.044)	(0.044)			
Do Homework With Mother in presence of Energy	0.011	0.063	0.041			
	(0.046)	(0.043)	(0.042)			
Socio-economic Status of family	-0.001	0.010	0.005	-0.001	0.010*	0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Student access to Preschool	0.160***	0.141**	0.156**	0.162***	0.147**	0.160***
	(0.059)	(0.063)	(0.061)	(0.059)	(0.062)	(0.060)
Student repeat grade	-0.111**	-0.081*	-0.097**	-0.113**	-0.099**	-0.108**
	(0.051)	(0.046)	(0.046)	(0.050)	(0.046)	(0.046)
Speak French at Home	0.259***	0.124	0.192**	0.230***	0.117	0.175**
	(0.087)	(0.091)	(0.085)	(0.084)	(0.096)	(0.087)
Mother Read	-0.068	-0.053	-0.061	-0.099*	-0.091	-0.098*
	(0.066)	(0.060)	(0.060)	(0.060)	(0.057)	(0.056)
Pupils age	-0.069***	-0.054***	-0.063***	-0.073***	-0.061***	-0.069***
	(0.016)	(0.017)	(0.016)	(0.016)	(0.017)	(0.016)
Gender	0.009	0.090*	0.054	0.016	0.103**	0.065
	(0.049)	(0.047)	(0.047)	(0.048)	(0.049)	(0.047)
Students read at home	0.248***	0.147	0.199**	0.245***	0.150	0.199**
	(0.092)	(0.093)	(0.093)	(0.091)	(0.091)	(0.091)
Students do household work	0.081	-0.091	-0.015	0.053	-0.087	-0.027
	(0.071)	(0.074)	(0.069)	(0.068)	(0.073)	(0.066)
Students do agricultural work	-0.126*	-0.047	-0.085	-0.115	-0.040	-0.075
	(0.070)	(0.073)	(0.071)	(0.071)	(0.074)	(0.072)
Students do small commerce	-0.130**	-0.070	-0.101*	-0.117**	-0.067	-0.093
	(0.055)	(0.060)	(0.057)	(0.057)	(0.060)	(0.057)
Students do small job	-0.293***	-0.193***	-0.245***	-0.279***	-0.180***	-0.232***
	(0.061)	(0.053)	(0.055)	(0.060)	(0.054)	(0.055)
Student area of residence	0.124	0.045	0.084	0.121	0.039	0.080
	(0.114)	(0.121)	(0.119)	(0.109)	(0.117)	(0.114)
Have library at school	0.483***	0.395	0.451**	0.517***	0.451	0.499**
	(0.167)	(0.270)	(0.202)	(0.167)	(0.275)	(0.207)
Director Gender	-0.019	-0.022	-0.022	-0.029	-0.059	-0.047
	(0.126)	(0.119)	(0.123)	(0.122)	(0.117)	(0.120)
Director Degree	-0.412***	0.255***	-0.044	-0.486***	0.195***	-0.113
	(0.069)	(0.071)	(0.069)	(0.075)	(0.068)	(0.069)
Teacher Gender	-0.302***	-0.118	-0.209**	-0.263***	-0.081	-0.169*
	(0.098)	(0.089)	(0.092)	(0.094)	(0.088)	(0.090)
Teacher Degree	-0.017	-0.425*	-0.248	-0.016	-0.423*	-0.247
	(0.180)	(0.231)	(0.202)	(0.174)	(0.227)	(0.199)
Student School homework	0.385**	0.423***	0.418***	0.416***	0.439***	0.443***
	(0.155)	(0.139)	(0.143)	(0.157)	(0.145)	(0.148)
Have television at home	0.049	-0.044	-0.002	0.030	-0.087	-0.036
	(0.087)	(0.076)	(0.080)	(0.086)	(0.079)	(0.081)
Have computer at home	0.012	0.005	0.008	-0.003	0.013	0.005
	(0.074)	(0.070)	(0.070)	(0.075)	(0.072)	(0.071)
School Infrastructure Index	0.010	0.017***	0.014**	0.010	0.016***	0.014**
	(0.007)	(0.006)	(0.007)	(0.007)	(0.006)	(0.006)
Classroom Equipment Index	0.015**	0.013*	0.014*	0.011	0.010	0.011
	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)
Do Homework With Father				-0.160***	-0.057	-0.108**
				(0.044)	(0.048)	(0.045)
Do Homework With Father in presence of Energy				0.071**	0.060	0.067*
				(0.036)	(0.037)	(0.034)
Constant	-0.310	-1.635**	-1.076	-0.012	-1.315*	-0.753
	(0.668)	(0.675)	(0.672)	(0.673)	(0.673)	(0.672)
Observations	855	855	855	834	834.000	834.000
Adjusted R-squared	0.411	0.358	0.404	0.416	0.359	0.407

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A9a: Access to Energy and Learning outcomes: Moderation Effect of parents support, Urban area

	(1)	(2)	(3)	(4)	(5)	(6)
	Reading	Mathematics	Global Learning Index	Reading	Mathematics	Global Learning Index
Access to Energy at home	0.095*	0.072	0.084	0.114**	0.063	0.088*
	(0.053)	(0.059)	(0.056)	(0.051)	(0.051)	(0.050)
Do Homework With Mother	-0.182**	-0.075	-0.131			
	(0.087)	(0.076)	(0.079)			
Do Homework With Mother in presence of Energy	0.099	0.052	0.076			
	(0.087)	(0.088)	(0.087)			
Socio-economic Status of family	0.002	0.005	0.004	0.001	0.007	0.004
	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)
Student access to Preschool	0.123	0.111	0.123	0.165*	0.157	0.169*
	(0.082)	(0.100)	(0.090)	(0.085)	(0.098)	(0.089)
Student repeat grade	-0.184***	-0.172**	-0.184**	-0.178**	-0.174**	-0.182**
	(0.066)	(0.074)	(0.069)	(0.069)	(0.079)	(0.073)
Speak French at Home	0.407***	0.134	0.266	0.412***	0.136	0.270
	(0.139)	(0.185)	(0.161)	(0.143)	(0.197)	(0.169)
Mother Read	-0.079	-0.161	-0.126	-0.165**	-0.217**	-0.200**
	(0.088)	(0.104)	(0.094)	(0.068)	(0.093)	(0.078)
Pupils age	-0.065***	-0.050	-0.059**	-0.072***	-0.070**	-0.073***
	(0.021)	(0.031)	(0.026)	(0.020)	(0.029)	(0.025)
Gender	-0.017	0.031	0.009	-0.003	0.049	0.026
	(0.074)	(0.073)	(0.074)	(0.072)	(0.073)	(0.073)
Students read at home	0.242	0.183	0.214	0.184	0.156	0.171
	(0.144)	(0.158)	(0.151)	(0.146)	(0.156)	(0.150)
Students do household work	-0.025	-0.108	-0.075	-0.062	-0.106	-0.092
	(0.111)	(0.112)	(0.107)	(0.110)	(0.117)	(0.109)
Students do agricultural work	-0.127	-0.061	-0.093	-0.156	-0.079	-0.118
	(0.101)	(0.104)	(0.103)	(0.099)	(0.107)	(0.103)
Students do small commerce	-0.039	0.041	0.004	-0.015	0.033	0.010
	(0.081)	(0.086)	(0.083)	(0.087)	(0.091)	(0.089)
Students do small job	-0.171*	-0.166*	-0.173*	-0.170*	-0.165*	-0.172*
	(0.088)	(0.088)	(0.088)	(0.088)	(0.088)	(0.088)
Have library at school	0.466*	0.445	0.472	0.540**	0.514	0.547*
	(0.231)	(0.377)	(0.284)	(0.227)	(0.389)	(0.289)
Director Gender	0.075	-0.018	0.026	0.037	-0.076	-0.026
	(0.181)	(0.173)	(0.179)	(0.183)	(0.174)	(0.180)
Director Degree	0.000	0.000	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)	(.)	(.)
Teacher Gender	-0.480***	-0.159	-0.316*	-0.427***	-0.121	-0.268*
	(0.166)	(0.154)	(0.159)	(0.154)	(0.145)	(0.148)
Teacher Degree	-0.042	-0.630**	-0.374	-0.050	-0.639**	-0.384
	(0.255)	(0.270)	(0.254)	(0.248)	(0.263)	(0.246)
Student School homework	0.843***	0.695**	0.791**	0.881***	0.675**	0.798**
	(0.286)	(0.335)	(0.317)	(0.279)	(0.317)	(0.304)
Have television at home	0.171	-0.015	0.071	0.201	-0.015	0.085
	(0.163)	(0.147)	(0.155)	(0.165)	(0.152)	(0.159)
Have computer at home	0.026	0.056	0.045	0.015	0.050	0.036
	(0.090)	(0.091)	(0.087)	(0.096)	(0.098)	(0.094)
School Infrastructure Index	0.011	0.014	0.013	0.010	0.013	0.012
	(0.011)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)
Classroom Equipment Index	0.006	0.013	0.010	0.004	0.009	0.007
	(0.010)	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)
Do Homework With Father				-0.095	-0.004	-0.049
				(0.082)	(0.080)	(0.080)
Do Homework With Father in presence of Energy				0.037	0.004	0.020
				(0.079)	(0.064)	(0.070)
Constant	-1.013	-1.041	-1.064	-0.740	-0.557	-0.660
	(1.032)	(1.056)	(1.059)	(0.999)	(0.990)	(1.004)
Observations	390	390	390	383	383	383
Adjusted R-squared	0.403	0.375	0.403	0.398	0.373	0.401

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A9b: Access to energy and learning outcomes: Moderation Effect of parents support, Rural area

	(1)	(2)	(3)	(4)	(5)	(6)
	Reading	Mathematics	Global Learning Index	Reading	Mathematics	Global Learning Index
Access to Energy at home	0.121**	0.009	0.061	0.111**	0.037	0.072
	(0.050)	(0.045)	(0.045)	(0.051)	(0.051)	(0.050)
Do Homework With Mother	-0.164**	-0.104	-0.136*			
	(0.077)	(0.072)	(0.073)			
Do Homework With Mother in presence of Energy	-0.006	0.102*	0.055			
	(0.061)	(0.059)	(0.058)			
Socio-economic Status of family	-0.002	0.008	0.004	-0.000	0.009	0.005
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Student access to Preschool	0.181**	0.144*	0.166*	0.157*	0.123	0.143*
	(0.088)	(0.081)	(0.085)	(0.085)	(0.081)	(0.083)
Student repeat grade	-0.083	-0.038	-0.058	-0.101	-0.071	-0.086
	(0.072)	(0.065)	(0.066)	(0.071)	(0.065)	(0.066)
Speak French at Home	0.156	0.082	0.121	0.121	0.069	0.097
	(0.104)	(0.099)	(0.096)	(0.100)	(0.107)	(0.099)
Mother Read	-0.028	0.031	0.004	-0.024	0.001	-0.011
	(0.096)	(0.080)	(0.086)	(0.086)	(0.078)	(0.081)
Pupils age	-0.073***	-0.058***	-0.068***	-0.076***	-0.058**	-0.069***
	(0.022)	(0.022)	(0.021)	(0.022)	(0.022)	(0.021)
Gender	0.009	0.137**	0.081	0.009	0.151**	0.088
	(0.066)	(0.059)	(0.060)	(0.064)	(0.065)	(0.062)
Students read at home	0.241**	0.133	0.190*	0.266**	0.154	0.213**
	(0.119)	(0.107)	(0.113)	(0.114)	(0.100)	(0.107)
Students do household work	0.162	-0.056	0.042	0.141	-0.054	0.033
	(0.106)	(0.111)	(0.105)	(0.107)	(0.111)	(0.104)
Students do agricultural work	-0.098	-0.008	-0.048	-0.055	0.030	-0.007
	(0.084)	(0.099)	(0.091)	(0.089)	(0.101)	(0.094)
Students do small commerce	-0.164**	-0.103	-0.135*	-0.150*	-0.087	-0.119
	(0.077)	(0.087)	(0.081)	(0.076)	(0.086)	(0.080)
Students do small job	-0.349***	-0.191***	-0.270***	-0.329***	-0.171**	-0.249***
	(0.075)	(0.066)	(0.069)	(0.074)	(0.070)	(0.069)
Have library at school	0.304	0.192	0.251	0.276	0.210	0.247
	(0.245)	(0.299)	(0.281)	(0.242)	(0.298)	(0.280)
Director Gender	-0.238	-0.105	-0.175	-0.230	-0.133	-0.187
	(0.168)	(0.175)	(0.174)	(0.174)	(0.185)	(0.183)
Director Degree	-0.352***	0.311***	0.014	-0.438***	0.212***	-0.082
	(0.082)	(0.082)	(0.080)	(0.084)	(0.077)	(0.077)
Teacher Gender	-0.164	-0.068	-0.115	-0.111	-0.028	-0.067
	(0.116)	(0.111)	(0.111)	(0.117)	(0.117)	(0.115)
Teacher Degree	0.434***	0.294***	0.367***	0.426***	0.268**	0.349***
	(0.089)	(0.101)	(0.087)	(0.089)	(0.109)	(0.092)
Student School homework	0.223	0.337**	0.292*	0.242	0.362**	0.316**
	(0.176)	(0.148)	(0.156)	(0.163)	(0.151)	(0.151)
Have television at home	0.013	-0.039	-0.016	-0.035	-0.120	-0.085
	(0.102)	(0.083)	(0.088)	(0.101)	(0.088)	(0.089)
Have computer at home	0.008	-0.057	-0.031	-0.027	-0.034	-0.035
	(0.107)	(0.094)	(0.095)	(0.102)	(0.093)	(0.092)
School Infrastructure Index	0.006	0.015**	0.011*	0.008	0.017**	0.013*
	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Classroom Equipment Index	0.025***	0.017*	0.021**	0.019**	0.015	0.018*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Do Homework With Father				-0.190***	-0.079	-0.133**
				(0.055)	(0.064)	(0.056)
Do Homework With Father in presence of Energy				0.080*	0.086	0.087*
				(0.041)	(0.052)	(0.045)
Constant	-0.749	-2.383***	-1.698**	-0.559	-2.238***	-1.529**
	(0.718)	(0.636)	(0.656)	(0.713)	(0.668)	(0.671)
Observations	465	465	465	451	451	451
Adjusted R-squared	0.291	0.197	0.256	0.309	0.207	0.272

Notes: Source: Author's calculations based on PASEC2019 data. Grade 6 students, PASEC Cameroon 2019. Outcomes standardized (mean=0, SD=1). Standard errors clustered at the school level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.