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THE IMPACT OF FINANCIAL AID ON SCHOOL ACHIEVEMENT IN SUB-SAHARAN COUNTRIES

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ABSTRACT

This study evaluates the impact of financial aid on pupils' academic achievement in French-speaking sub-Saharan African countries, with a focus on mathematics and reading outcomes. Persistent disparities in educational performance, particularly among disadvantaged students and schools, underscore the need to understand how financial support can influence learning. The analysis applies propensity score matching to compare pupils in schools receiving local community support with those in schools without such support. This method ensures that observed differences in outcomes are attributable to financial aid rather than pre-existing differences between students or schools. The findings indicate that financial aid significantly enhances learning outcomes. Beneficiaries of such support achieve higher scores in both mathematics and reading. The effects vary by gender and type of school: girls tend to benefit more in mathematics, while boys show greater gains in reading; private and community schools experience larger improvements compared with public schools. These results suggest that targeted financial support can meaningfully improve educational achievement, particularly when adapted to the specific needs of schools and students. The study provides evidence for policymakers on effective resource allocation to reduce achievement gaps and promote equitable access to quality education. By highlighting the differential effects of financial aid, the research contributes to strategies aimed at improving learning outcomes and addressing educational inequalities across sub-Saharan Africa.

Keywords: *Financial aid, PASEC, education, propensity score, Academic performance, Sub-Saharan Africa*

1. INTRODUCTION

As a fundamental lever for social and economic transformation, education plays a key role in improving skills, reducing inequalities and accelerating growth (Duflo, 2001). Education is not only a fundamental right, but also a strategic tool for strengthening human capital, which has become a central pillar in modern theories of economic growth (Krueger & Lindahl, 2001). It is in this context that endogenous growth theory has emerged, placing education at the heart of the mechanisms that promote sustainable, inclusive growth (Angrist & Krueger, 1991).

The accumulation of human capital, particularly through education, is a key factor in long-

term economic growth (Mankiw et al., 1992). The quality of education, measured by the skills acquired, also plays a determinant role in the productivity of workers and the competitiveness of economies (Hanushek and Kimko, 2000). The economic returns to education, particularly in primary and secondary education, generate significant benefits in terms of growth and reduced inequality (Psacharopoulos and Patrinos, 2004). Investing in education is therefore an essential strategy for building economic resilience and promoting development (Diagne, 2008).

As technological progress accelerates, the occupational landscape is undergoing significant transformations, placing increasing importance on educational qualifications (Bartel & Lichtenberg, 1987). The ongoing interaction between education and economic growth remains a central concern for researchers, particularly in low- and middle-income nations (Schultz, 1961). This relationship is sparking a series of studies aimed at unveiling the deep links underlying it, as exemplified by the work of Barro (2013) and other leading economists. Machin & Vignoles (2004) have also highlighted the importance of education in reducing socio-economic inequality, emphasizing its central role in improving opportunities for vulnerable populations.

Despite significant advances in understanding this relationship, grey areas remain. Current surveys generally acknowledge the significant impact of education quality on educational attainment, underlining its crucial role in reducing early school leaving (Hanushek et al., 2008). However, even with this consensus, estimates of the effect of education quality on income in developing countries remain somewhat ambiguous (Hanushek & Woessmann, 2008).

Meanwhile, the persistent inequality of educational opportunity remains of major concern. Although slightly reduced over the decades, this inequality remains at worrying levels, as evidenced by the work of Breen et al. (2009) and Ballarino & Schadee (2008). inequality has a differential impact on children from different social classes, impacting their ability to overcome the direct and indirect costs of education (Breen & Goldthorpe, 1997). Furthermore, Chari (2024) points out that educational disparities, particularly between urban and rural areas, continue to exacerbate socio-economic inequalities, limiting opportunities for the most vulnerable groups.

In the context of education policy, one of the main objectives of school funding is to improve students' academic performance, whether by encouraging competition between schools or by granting additional resources to underperforming schools (McGuinn, 2012). These initiatives are designed to mitigate growing economic inequalities, which appear to exacerbate disparities in academic achievement between students from different socio-economic backgrounds, highlighting the critical importance of school funding in supporting struggling schools and students (Jackson et al. 2015).

Nevertheless, despite these efforts, the achievement gap between students remains a serious problem worldwide (Chmielewski, 2019). Children from vulnerable backgrounds often face economic and social barriers that compromise their ability to fully engage in their educational journey (Glewwe & Muralidharan, 2016). These disparities are even more pronounced in sub-Saharan countries, where many households face difficult choices between education and economic survival, limiting regular school attendance (Bashir et al., 2018).

To mitigate these challenges, many countries in the sub-Saharan region have established financial assistance programs that aim to support children from disadvantaged backgrounds in particular (Beegle et al., 2018). In addition to promoting access to education, these initiatives also aim to reduce hunger and malnutrition, thus contributing to better overall health of students (Bundy et al., 2018). In this context, understanding the impact of financial aid on the educational achievement of primary school pupils in sub-Saharan countries becomes essential.

This study is motivated by the need to assess the impact of financial aid on academic performance, given the observed disparities across gender and school types. Its objectives are to evaluate the effect of financial aid on mathematics and reading scores, identify variations in

outcomes between boys and girls, and examine how school context influences these results. The research questions guiding this study are: How does financial aid affect pupils' achievement in mathematics and reading? Are there differences in the impact of financial aid according to gender? How does school type influence the effectiveness of financial aid? By addressing these questions, the study provides evidence-based insights that can guide more targeted allocation of resources to maximize educational achievements.

In order to address these research questions, this study is structured into three main sections to provide a comprehensive and methodical analysis. The first section presents a review of the theoretical and empirical literature. The second section describes the data used and the empirical methodology, including the presentation of the data, the method specification, and the description of variables and the model. The third section presents and interprets the results, highlighting their implications for educational policy and practice. This structure ensures a clear and complete analysis of the research question.

2. LITERATURE REVIEW

In the economic literature, Schultz et al. (1987) have established that the acquisition of quality education, as manifested by positive progress in literacy, numeracy and life skills, leads to significant benefits such as increased productivity at work, higher individual incomes, economic and social growth, improved health and the stimulation of innovation. Berne & Stiefel (1984) emphasize the need to allocate adequate resources to ensure that all pupils have equitable access to quality primary education.

To address these inequities, a holistic approach is recommended that includes effective organization of educational resources and shared leadership among stakeholders such as schools, students, families, and community organizations (Johnston et al., 2020). Students from disadvantaged backgrounds face many obstacles that exacerbate socioeconomic inequalities (Berliner, 2006). Consequently, attention is focused on funding low-performing schools and disadvantaged students (Jackson et al., 2015), as insufficient funding limits the social mobility of inner-city students (Marks et al., 2006).

The achievement gap between primary and secondary school students has widened over the decades (Byun & Kim, 2010), revealing an intensification of academic inequalities (Lee & Namwook, 2019). Therefore, two approaches are proposed to optimize students' academic performance through school funding policies. The first recommends allocating additional resources to struggling schools or schools serving economically disadvantaged students, while the second advocates promoting competition between schools or districts for funding (McGuinn, 2012).

It is important to emphasize that education has significant effects at both the individual and societal levels, influencing aspects such as income inequality. Current concerns about growing inequality attributable to educational attainment make access to education a central issue (McCall, 2000). Downey (1995) extends this reflection by exploring the influence of family income on student achievement. However, evaluating the impact of need-based financial aid faces the challenge of accounting for the correlation between such aid and other factors that directly influence student outcomes (Buchmann & DiPrete, 2006).

Financial aid to education can be divided into two distinct categories. On the one hand, there is aid provided directly to schools, often aimed at improving infrastructure, teaching resources, or supporting specific initiatives at the institutional level (Alexander, 2002). On the other hand, financial aid is also provided to students in the form of scholarships and other forms of financial support (Saba & Veliappan, 2019). These individual aids aim to ease the financial burden on students, thus promoting access to education by reducing economic barriers (Dynarski & Scott-Clay-

ton, 2013). By implementing both types of aid, education systems aim to create an environment that is conducive to learning, while facilitating equal opportunities and social inclusion.

To better understand how these different forms of financial aid translate into measurable educational outcomes, we now turn to empirical research examining the effects of funding on schools and students.

Empirical research on the effects of financial aid for schools presents both encouraging and mixed results. In South Korea, Sohn et al. (2023) show that a 20% increase in per-pupil funding in underperforming schools significantly reduced the proportion of low-achieving students across several subjects. Similar findings emerge in the United States, where Papke (2005) reports that reforms in Michigan led to improved fourth grade mathematics pass rates, particularly in initially low-performing schools, and Guryan (2001) demonstrates that increased spending in Massachusetts positively influenced test scores, especially in lower grades. Evidence from Europe and Africa reinforces these conclusions: Ooghe (2011) identifies modest but significant improvements in spelling in Flanders, with stronger effects for disadvantaged pupils, while Carneiro et al. (2020) reveal that school grants in Senegal improved test scores in lower grades, especially when resources were invested in teachers and school leadership.

Other studies, however, show more limited effects. Van der Klaauw (2008) finds that Title I funding, a federal program created in 1965 to provide additional educational support for disadvantaged students, failed to raise achievement levels in New York City's high-poverty schools and even had negative effects in some cases. Similarly, Dragoset et al. (2019) report that the large-scale School Improvement Grants program in the United States produced no significant impact on student outcomes, including test scores, graduation, or college enrollment. A comparable result is observed in Mexico, where Romero et al. (2021), using data from the national standardized test PLANEA, which measures student learning in mathematics and language at the end of grades 6, 9, and 12, demonstrate that additional cash subsidies to schools, despite raising per-pupil spending, did not improve student performance, reduce grade repetition, or increase enrollment. These findings highlight the importance of targeting and implementation in ensuring the effectiveness of financial interventions.

Financial aid directed at students produces equally diverse results. In Mexico, De Hoyos (2019) finds that the PROBEMS program, a scholarship initiative aimed at improving graduation rates and test performance among disadvantaged upper secondary students, did not achieve its goals due to poor targeting and insufficient academic preparation of participants. In contrast, Liu (2020) shows that Pell Grants, a federal scholarship program expanded in the 2009–2010 and 2010–2011 academic years to offer an additional grant for students taking more than twenty-four credits before their third semester and at least six credits during the summer term, increased enrollment, degree completion, and subsequent earnings in U.S. community colleges. Positive effects are also evident in Mexico, where Saint Martin and Pardo (2020) report that the BBVA scholarship and mentoring program, an initiative sponsored by Banco Bilbao Vizcaya Argentaria, improved upper-secondary completion, particularly among disadvantaged students from migrant families. Findings from Morocco are more nuanced, Ikira and Ezzrari (2021) observe that the Tayssir program, a Moroccan conditional cash transfer initiative that provides financial assistance to disadvantaged families and links payments to children's school attendance, increased school participation and reduced child labor under some specifications, though instrumental variable estimates suggest more modest impacts. Finally, Vargas et al. (2020) demonstrate that scholarships in Mexico improved parental perceptions of their children's academic performance, suggesting that financial aid can shape not only outcomes but also expectations.

The impact of financial aid on educational outcomes remains a contested issue in the economics of education. While studies such as those by Sohn et al. (2023) and Papke (2005) demonstrate

positive effects on student achievement, others like Van der Klaauw (2008) and Dragoset et al. (2019) report minimal or context-dependent impacts, suggesting that the effectiveness of funding depends critically on implementation mechanisms and local conditions. This ambiguity is particularly relevant in sub-Saharan African contexts, where resource constraints and systemic challenges may alter how financial inputs translate into learning outcomes.

3. METHOD AND DATA

3.1. DATA

In the context of our evaluation, the data used comes from the Program for the Analysis of Education Systems of the CONFEMEN (PASEC) for 2019. CONFEMEN, the Conference of Ministers of Education of the States and Governments of the Francophonie, conducted this survey at the end of the 2018–2019 school year using a representative sample of pupils both at the beginning and at the end of their primary education. This survey included a substantial sample of 62,934 individuals from at least 180 schools across 14 countries in sub-Saharan Africa.

The countries included in this assessment are Benin, Burkina Faso, Burundi, Cameroon, Chad, Congo, Côte d'Ivoire, Democratic Republic of Congo, Gabon, Guinea, Madagascar, Niger, Senegal and Togo. This geographical diversity provides a significant representation of educational realities in French-speaking Sub-Saharan African countries, allowing for in-depth comparative analyses.

The database used for our study is divided into two grades: PASEC grade 2 and PASEC grade 6. PASEC grade 2 is essential for assessing pupils' early primary school skills in mathematics and reading. This focus on fundamental skills from grade 2 establishes a solid foundation for their educational journey, fostering continuous progression and a thorough understanding of essential concepts.

The grade 6 assessment is critical because pupils have progressed further in their primary education and are faced with more complex content. Evaluation at the 6th grade provides a global view of the effectiveness of the education system in preparing students for higher academic challenges. It also measures the retention and application of acquired skills and provides an indication of the quality of the education provided in previous years.

Our study will focus exclusively on grade 6, as it gives particular attention to this critical stage of the educational journey. The rigorous selection of this particular grade is part of an approach that aims to examine in detail the mathematical and reading skills acquired by pupils at the end of the primary cycle. By focusing our analysis on Grade 6, we aim to achieve an in-depth understanding of the skills acquired by pupils at this stage, in order to identify strengths and gaps that may influence their preparation for future academic challenges.

3. 2. METHOD SPECIFICATION

In our study of the impact of financial aid on student achievement, we employed propensity score matching (PSM). This statistical method, developed by Rosenbaum & Rubin (1983) allows us to estimate the impact of financial aid when random assignment is not feasible.Its main advantage is that it eliminates bias by forming treated and untreated groups with similar characteristics (Austin, 2011).

The PSM method compares individuals who receive an intervention with those who do not, while ensuring that these two groups have similar observed characteristics, which allows us to estimate the causal impact of the intervention on the measured outcomes (Imai et al., 2023). In our work, this method was used to estimate the causal impact of financial aid on pupil achieve-

ment in mathematics and reading. This impact is measured by the effect of the treatment for an individual i at time t noted Δ_{it} which is defined as the difference between the potential outcome under treatment (Y_{it}^{T}) and without treatment (Y_{it}^{C}):

$$\Delta_{it} = Y_{it}^{T} - Y_{it}^{C} \quad (1)$$

To evaluate this impact on a population scale, we calculate the Average Treatment Effect (ATE), as defined by:

$$ATE = E(Y_i^T|T_i = 1) - E(Y_i^C|T_i = 0) \quad (2)$$

However, since the same individual cannot be observed simultaneously in both conditions (treated and untreated), we use the average treatment effect on treated individuals (ATT) as a substitute, defined by:

$$ATT = E(Y_i^T|T_i = 1) - E(Y_i^C|T_i = 1) + E(Y_i^C|T_i = 1) - E(Y_i^C|T_i = 0) \quad (3)$$

To solve the problem of unobservability, we use the conditional mean equivalence assumption. This hypothesis assumes that the mean of Y_i is identical for the treated and untreated groups, provided they have the same distribution of observable characteristics:

$$E(Y_i^C|T_i = 1) - E(Y_i^C|T_i = 0) = 0 \quad (4)$$

Under this assumption, the ATT simplifies to:

$$ATT = E(Y_i^T|T_i = 1) - E(Y_i^C|T_i = 0) = E(Y_i^T - Y_i^C|T_i = 1) \quad (5)$$

The propensity score, noted as P(X), is used to construct a statistical counterfactual group (Austin, 2011). This score represents the probability of receiving the treatment conditionally on the observed characteristics X:

$$P(X) = Pr(T = 1 \mid X) \quad (6)$$

Using propensity scores helps us compare similar schools by balancing their observed characteristics, thus reducing selection bias and ensuring that differences in outcomes between the treated and untreated groups can be attributed to the intervention itself and not to pre-existing differences (Bai, 2011).

3.3. DESCRIPTION OF VARIABLES AND MODEL

In order to evaluate the impact of financial aid, we analyzed pupils' average scores in mathematics and reading, which allows us to examine its effect on academic achievement in these two subjects. The treatment variable chosen is a binary variable that takes the value 1 if the school receives support from the local community, whether from a village, an association, a patron, or the school management committee, and the value 0 otherwise. This approach provides a clear and concise method for measuring the impact of financial aid on student achievement.

The variables used to measure the impact of financial aid on the academic performance of pupils in 6th grade in the 14 sub-Saharan countries are presented in the following table:

Table 1. Model Variables

Variables	Description
Treatment variable	
Financial aid	1: If the school has received financial support from the local community, whether from the village, an association, a corporate sponsor, or the school management committee, 0: If not.
Control variables	
Age	The age of each child.
Gender	1: Boy, 0: Girl.
Repetition	1: If the student has already repeated a year, 0 if not.
Electricity	1: If there is electricity in the student's home, 0 if not
Laptop/ Tablet	1: If the student has a laptop or tablet at home, 0: If not.
Comprehension	1: If the student understands and learns well at school this year, 0 if not.
School status	1: Public, 2: Private, 3: Community or local initiative.
School cycle	1: If the school has a complete cycle 0 if not.
Strikes	1: If there were strikes during the school year, 0: If not.
School location	1: A city, 2: A suburb of a large city, 3: A large village, 4: A small village.
School accessibility	1: If the school is accessible all year round, 0: If not.
Support for students in difficulty	1: If the school provides support for students in difficulty (tutoring, extra lessons), 0 if not.
Automatic passage	1: If the school practices automatic transfer of pupils within the various sub-cycles (e.g.: between CP1 and CP2, or between CM1 and CM2), 0: If not.
Output variables	
Average reading score	The average score for each student.
Average mathematics score	The average score for each student.

Source: Authors' own elaboration

To apply the PSM method, we first estimate the probit model. This model is used to calculate the probability of each individual being part of the group receiving the benefits of financial aid, based on their observable characteristics. The model equation is:

$$\begin{aligned} P(Aid) = {} & \beta_0 + \beta_1 age_i + \beta_2 gender_i + \beta_3 repetition_i + \beta_4 electricity_i + \\ & + \beta_5 laptop_{tablet_i} + \beta_6 Comprehension_i + \beta_7 statut_i + \beta_8 cycle_i + \\ & + \beta_9 strikes_i + \beta_{10} location_i + \beta_{11} accessibility_i + \\ & + \beta_{12} support\_for\_students_i + \beta_{13} automatic\_passage_i + \varepsilon_i \end{aligned} \quad (7)$$

In this equation, the variables are used to evaluate the probability that an individual will benefit from financial aid. The first step in the matching method is to model this probability. The marginal effects obtained after estimating the probit model are presented in Table 2. These results allow us to determine the propensity scores, which means the probabilities of participation, for each individual in the sample according to the characteristics defined in our model.

Table 2. Estimation du score de propension

Variables	dy/dx	Delta-method std. err.	Z	P>|z|	[95% conf. interval]	
Age	-.0005643	.0003641	-1.55	0.121	-.001278	.0001494
Gender	-.004319	.003295	-1.31	0.190	-.0107771	.0021391
Repetition	-.002067	.0011338	-1.82	0.068*	-.0042892	.0001551
Electricity	.0035728	.0013488	2.65	0.008***	.0009292	.0062163
Laptop/ Tablet	.000422	.0011215	0.38	0.707	-.001776	.00262
Comprehension	-.0043473	-.001364	-3.19	0.001***	-.0070207	-.0016739
School status	-.0586821	.0022541	-26.03	0.000***	-.0631001	-.0542641
School cycle	.0035006	.002977	1.18	0.240	-.0023342	.0093354
Strikes	-.0432067	.0031328	-13.79	0.000***	-.0493469	-.0370665
School location	.0227613	.0012466	18.26	0.000***	.0203181	.0252046
School accessibility	-.0145138	.0027396	-5.30	0.000***	-.0198834	-.0091442
Support for students in difficulty	-.0080772	.0004578	-17.64	0.000***	-.0089745	-.0071799
Automatic passage	-.0141967	.0014186	-10.01	0.000***	-.0169771	-.0114164

Note :* : p<0,1 ; ** : p<0,05 ; *** : p<0,01

Source: Compiled by authors

The results of the analysis reveal that student age and gender have no significant effect on the probability of receiving financial aid from the local community. The coefficient for age is negative, indicating a modest decrease in the probability of receiving financial aid with student age, but this relationship is not statistically significant. Similarly, the fact that the student is a boy rather than a girl appears to slightly reduce the probability of the school receiving financial aid, although this effect is not significant.

On the other hand, some variables show a more pronounced influence. Schools attended by students who have repeated a year appear to have a slightly lower probability of receiving financial aid, with a marginally significant relationship. In addition, students with access to electricity at home are associated with a higher probability of receiving financial aid for their school. This statistically significant result suggests that students' living conditions play an important role in the allocation of financial aid to schools.

Possession of a computer or tablet by students has no significant effect on the probability of a school receiving financial aid. However, there is an interesting relationship with the "understanding" variable. Students who understand and learn well in school are associated with a significantly lower probability of their school receiving financial aid. This could indicate that financial aid is more targeted to schools where students have difficulties learning.

School status is one of the most influential variables. Community or locally initiated schools and private schools have a significantly lower probability of receiving financial aid from the local community, suggesting that such aid is more directed to public schools. On the other hand, the presence of strikes during the school year is negatively associated with the probability of receiving financial aid. Strikes appear to significantly reduce the probability of a school receiving support from the local community.

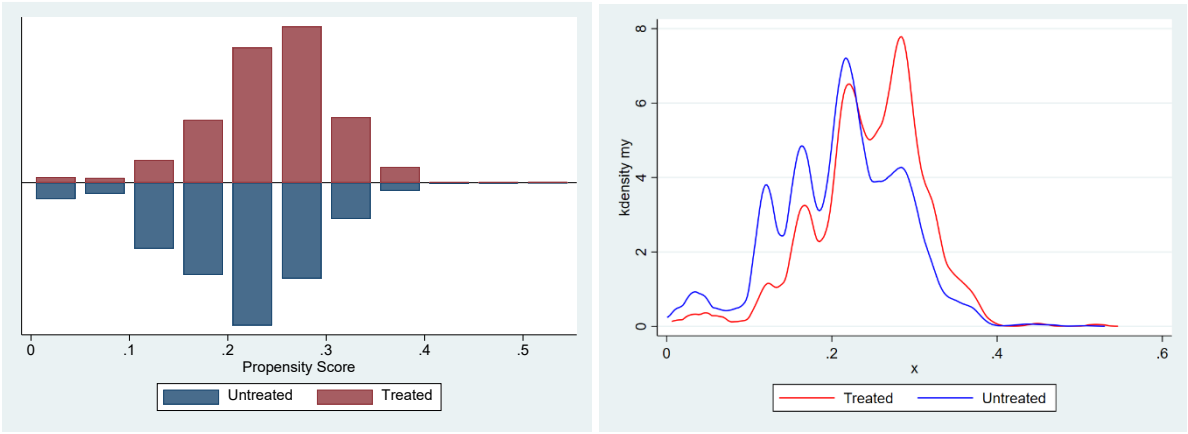
The location of the school also plays an important role. Schools located in urban areas or on the outskirts of large cities have a higher probability of receiving financial support than those located in rural areas or small villages. Interestingly, schools that are accessible throughout the year are associated with a lower probability of receiving financial aid. This suggests that finan-

cial aid may target schools in less accessible areas, probably to compensate for the challenges associated with their location.

Schools that provide support to students in difficulty also have a lower probability of receiving financial aid. This may indicate that financial aid from the local community goes to schools that have fewer resources to support students in difficulty. Finally, schools that practice automatic progression of students between sub-cycles are also less likely to receive financial aid, which may reflect differences in school management practices and resource allocation.

The use of the matching method to evaluate the impact of financial aid is based on the verification of the common support condition, which was satisfactorily confirmed in our study. This condition is crucial to ensure the validity of this method, as it makes it possible to compare individuals who are the beneficiaries with those who are not, while having similar propensity scores (Zwane et al.,2025).

Figure 1. Distribution of propensity score and common support region



Source: Compiled by authors

By confirming this condition, we reinforce the credibility of the comparison between groups. As illustrated in Figure 1, this gives additional robustness to our evaluation. The range of common support identified is between 0.00618058 and 0.54656946.

4. RESULTS AND DISCUSSION

By ensuring the distribution of the propensity score and the common support region, our matching method enables a balanced comparison between groups with and without financial aid, thus reducing potential bias (Rosenbaum & Rubin, 1983). To further enhance the robustness of our estimates, we employed three matching techniques: nearest neighbor, radius, and kernel matching, to estimate the Average Treatment Effect on the Treated (ATT) of access to financial aid on students' academic performance. The use of multiple matching approaches strengthens the reliability and validity of the findings by allowing cross-validation across estimators with distinct weighting mechanisms and sensitivities to the distribution of propensity scores (Caliendo & Kopeinig, 2008).

The nearest neighbor method matches each treated individual with the most similar untreated counterpart, ensuring close comparability between matched pairs. The radius matching method identifies all untreated individuals within a defined neighborhood around each treated unit, thereby increasing the number of suitable matches and reducing estimation variance. The kernel matching method, in contrast, assigns weights to all untreated observations based on the inverse distance of their propensity scores, minimizing information loss and improving the efficiency of the ATT estimates (Khandker et al., 2009).

By combining these three techniques, the analysis mitigates the weaknesses of any single matching procedure and yields robust and consistent causal estimates of the impact of financial aid. This methodological triangulation enhances the internal validity of the study by minimizing confounding effects and provides a clearer understanding of how access to financial aid influences students' achievement in reading and mathematics (Stuart, 2010). The results offer valuable evidence for educational policymakers, particularly in sub-Saharan contexts, by demonstrating the potential of financial support mechanisms to improve academic outcomes.

Table 3. Average effect of treatment on outcome variables

Matching method	Nearest neighbor			Radius			Kernel		
	ATT	Std. Err.	t	ATT	Std. Err.	t	ATT	Std. Err.	t
Mathematics score	14.03	1.224	11.462***	11.878	0.901	13.186***	11.763	0.765	15.386***
Reading score	9.07	1.391	6.517***	5.778	1.019	5.670***	5.211	0.928	5.613***

Source: Compiled by authors

The results of our evaluation, as presented in Table 3, reveal a strong and statistically significant impact of financial aid on the academic achievement of pupils across all three matching methods.

For mathematics, students in schools receiving financial aid score on average 14.03, 11.878, and 11.763 points higher under the nearest neighbor, radius, and kernel matching methods, respectively. These consistent and substantial differences confirm that financial aid positively influences students' mathematics achievement, regardless of the estimation technique used.

For reading, the corresponding effects are 9.07, 5.778, and 5.211 points, respectively, across the three matching methods. Although the magnitudes are smaller than those observed for mathematics, the results remain statistically significant, indicating that financial aid also contributes to improving students' reading proficiency.

Overall, the consistency of the results across the three matching approaches demonstrates the robustness and reliability of the estimated effects. These findings are in line with previous research showing that financial resources, when effectively allocated, can enhance student achievement. Sohn et al. (2023) found that a 20% increase in per-pupil funding in South Korea reduced the number of low-achieving students across subjects, including mathematics. Papke (2005) observed that increased education spending in Michigan had significant effects on mathematics achievement, particularly in schools that initially performed poorly. In contrast, Van der Klaauw (2008), studying the Title I program in New York, and Dragoset et al. (2019), examining the School Improvement Grants program, report less convincing effects, highlighting that the impact of funding depends on how the resources are allocated and used. Overall, these findings reinforce that financial aid, when properly targeted and utilized, can meaningfully improve academic outcomes.

These findings provide robust evidence that financial aid, when appropriately targeted and utilized, can significantly enhance academic achievement. The table below presents the average treatment effect by gender for mathematics and reading.

Table 4. Average treatment effect by gender

Variables	Coefficient	AI robust std. err.	z	P>|z|	[95% conf. interval]	
Mathematics scores						
Boys	15.77	1.615581	9.76	0.000***	12.60523	18.93819
Girls	19.10	1.693405	11.28	0.000***	15.7828	22.42082
Reading Scores						
Boys	13.22	1.716465	7.70	0.000***	9.854567	16.58299
Girls	11.86	1.818255	6.53	0.000***	8.30109	15.42852

Note :* : p<0,1 ; ** : p<0,05 ; *** : p<0,01

Source: Compiled by authors

The results in Table 4 show significant gender differences in the impact of financial aid. In mathematics, girls benefit more, with an increase of 19.10 points compared to 15.77 points for boys, while in reading, boys benefit more, with an increase of 13.22 points compared to 11.86 points for girls. All effects are statistically significant, highlighting the importance of considering gender when evaluating the impact of financial aid. These findings suggest that the effect of financial aid varies according to gender-specific needs, requiring targeted approaches. This contrasts with Ooghe (2011), who found positive effects of financial aid on various skills.

Evaluation of financial aid by school type reveals significant differences in the impact on academic achievement. By analyzing the results by school type (public, private, community, or local initiative), we can better understand how this funding affects mathematics and reading scores. Table 5 shows the ATE by these categories, providing a detailed view of the distribution of achievement gains.

Table 5. The average treatment effects by school type.

Variables	Coefficient	AI robust std. err.	Z	P>|z|	[95% conf. interval]	
Mathematics scores						
Public	17.85	1.246923	14.32	0.000***	15.40869	20.29654
Private	25.89	4.231357	6.12	0.000***	17.59566	34.18228
Community or local initiative	19.99	6.256899	3.19	0.001***	7.723009	32.2496
Reading Scores						
Public	12.43	1.324494	9.38	0.000***	9.834157	15.02608
Private	17.13	4.924014	3.48	0.001***	7.478483	26.78026
Community or local initiative	21.73	7.866492	2.76	0.006***	6.312642	37.14872

Note :* : p<0,1 ; ** : p<0,05 ; *** : p<0,01

Source: Compiled by authors

The results show that the impact of financial aid varies by school type. In mathematics, students in private schools show the largest increase of 25.89 points, followed by community or local initiative schools with an increase of 19.99 points, and public schools with a more modest increase of 17.85 points. These differences suggest that private and community schools are better able to use additional resources to improve mathematics results.

For reading, the largest impact is observed in community or local initiative schools, with an increase of 21.73 points, followed by private schools with 17.13 points and public schools with 12.43 points. These results indicate that community schools benefit most from financial aid in reading, while public schools show a smaller impact in comparison.

5. CONCLUSION

This study has evaluated the impact of financial aid on the academic performance of primary school pupils in sub-Saharan Africa, with a particular focus on mathematics and reading scores. The results demonstrate that financial aid significantly improves student achievement, with notable variations according to gender and school type. Girls benefited more than boys in mathematics, while boys showed higher gains in reading. In terms of school type, private and community schools exhibited the largest improvements in mathematics, whereas community or local initiative schools benefited most in reading. These findings confirm that well-targeted financial support can effectively enhance learning outcomes and reduce educational disparities.

The original contribution of this study lies in providing evidence-based insights on the differentiated effects of financial aid according to gender and school type within a sub-Saharan African context. By combining robust empirical methodology and a large, representative dataset, this research offers practical guidance for policymakers and educational planners in allocating resources more efficiently to maximize learning outcomes.

Future research could expand on these findings by examining the long-term effects of financial aid on educational attainment, exploring the role of complementary interventions such as teacher training or school infrastructure improvements, and assessing the impact of different forms of financial aid across other regions in Africa.

REFERENCES

Alexander, F. K. (2002). The federal government, direct financial aid, and community college students. *Community College Journal of Research &Practice,* 26(7-8), 659-679. https://doi.org/10.1080/10668920290102680

Angrist, J. D., & Krueger, A. B. (1991). Does compulsory school attendance affect schooling and earnings?. *The quarterly journal of economics*, *106*(4), 979-1014. https://doi.org/10.2307/2937954

Austin, P. C. (2011). Optimal caliper widths for propensity-score matching when estimating differences in means and differences in proportions in observational studies. *Pharmaceutical statistics*, 10(2), 150-161. https://doi.org/10.1002/pst.433

Bai, H. (2011). A comparison of propensity score matching methods for reducing selection bias. *International Journal of Research & Method in Education, 34*, 107 - 81. https://doi.org/10.1080/1743727X.2011.552338

Ballarino, G., & Schadee, H. (2008). La disuguaglianza delle opportunità educative in Italia, 1930-1980: tendenze e cause. Polis, 22(3), 373-402. https://doi.org/10.1424/28282

Barro, R. J. (2013). Education and economic growth. *Annals of economics and finance,* 14(2), 301-328. https://ftp.aefweb.net/WorkingPapers/w571.pdf

Bartel, Ann P & Lichtenberg, Frank R, 1987.," The Review of Economics and Statistics, *MIT Press*, 69(1), 1-11, February. https://doi.org/10.2307/1937894

Bashir, S., Lockheed, M., Ninan, E., & Tan, J. P. (2018). Facing forward: Schooling for learning in Africa. World Bank Publications. http://dx.doi.org/10.1596/978-1-4648-1260-6

Beegle, K., Coudouel, A., & Monsalve, E. (Eds.). (2018). *Realizing the full potential of social safety nets in Africa*. World Bank Publications. http://doi.org/10.1596/978-1-4648-1164-7

Berliner, D. C. (2006). Our impoverished view of educational research. *Teachers college record*, *108*(6), 949-995. https://doi.org/10.1111/j.1467-9620.2006.00682.x

Berne, R., & Stiefel, L. (1984). The measurement of equity in school finance: Conceptual, methodological, and empirical dimensions. Johns Hopkins University Press. https://doi.org/10.3102/01623737016004405

Breen, R., & Goldthorpe, J. H. (1997). Explaining educational differentials: Towards a formal rational action theory. *Rationality and society,* 9(3), 275-305. https://doi.org/10.1177/104346397009003002

Breen, R., Luijkx, R., Müller, W., & Pollak, R. (2009). Nonpersistent inequality in educational attainment: Evidence from eight European countries. *American journal of sociology,* 114(5), 1475-1521. https://doi.org/10.1086/595951

Buchmann, C., & DiPrete, T. A. (2006). The growing female advantage in college completion: The role of family background and academic achievement. *American sociological review,* 71(4), 515-541. https://doi.org/10.1177/000312240607100401

Bundy, D. A., de Silva, N., Horton, S., Patton, G. C., Schultz, L., Jamison, D. T., ... & Sawyer, S. M. (2018). Investment in child and adolescent health and development: key messages from Disease Control Priorities. *The Lancet*, *391*(10121), 687-699. https://doi.org/10.1016/s0140-6736(17)32417-0

Byun, Soo-yong, and Kyung-keun Kim. (2010). Educational inequality in South Korea: The widening socioeconomic gap in student achievement. https://doi.org/10.1108/S1479-3539(2010)0000017008

Caliendo, M., & Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of economic surveys,* 22(1), 31-72. https://doi.org/10.1111/j.1467-6419.2007.00527.x

Carneiro, P., Koussihouedé, O., Lahire, N., Meghir, C., & Mommaerts, C. (2020). School grants and education quality: Experimental evidence from Senegal. *Economica,* 87(345), 28-51. https://doi.org/10.1111/ecca.12302

Chari, S. G. (2024). Bridging gaps, building futures: Tackling socio-economic disparities through education and technology. *London Journal of Research In Humanities and Social Sciences*, 24(16), 1-12. https://journalspress.uk/index.php/LJRHSS/article/view/1122

Chmielewski, A. K. (2019). The global increase in the socioeconomic achievement gap, 1964 to 2015. *American sociological review,* 84(3), 517-544. https://doi.org/10.1177/0003122419847165

De Hoyos, R., Attanasio, O., & Meghir, C. (2019). Can scholarships increase high school graduation rates? Evidence from a randomized control trial in Mexico. http://dx.doi.org/10.1596/1813-9450-8826

Diagne, A. (2008). Investir sur le capital humain: éducation et santé. *African development review*, 19(1), 163-199. https://doi.org/10.1111/j.1467-8268.2007.00159.x

Downey, D. B. (1995). When bigger is not better: Family size, parental resources, and children's educational performance. *American sociological review,* 746-761. https://doi.org/10.2307/2096320

Dragoset, L., Thomas, J., Herrmann, M., Deke, J., James-Burdumy, S., & Lee Luca, D. (2019). The impact of school improvement grants on student outcomes: Findings from a national evaluation using a regression discontinuity design. *Journal of Research on Educational Effectiveness,* 12(2), 215-250. https://doi.org/10.1080/19345747.2019.1571654

Dynarski, S., & Scott-Clayton, J. (2013). Financial aid policy: Lessons from research. https://doi.org/10.3386/w18710

Esther Duflo, 2001. "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment," American Economic Review, *American Economic Association,* 91(4), 795-813, September. https://doi.org/10.1257/aer.91.4.795

Glewwe, P., & Muralidharan, K. (2016). Improving education outcomes in developing countries: Evidence, knowledge gaps, and policy implications. In *Handbook of the Economics of Education*, 5, 653-743. Elsevier. https://doi.org/10.1016/B978-0-444-63459-7.00010-5

Guryan, J. (2001). Does money matter? Regression-discontinuity estimates from education finance reform in Massachusetts. https://doi.org/10.3386/w8269

Hanushek, E. A., & Kimko, D. D. (2000). Schooling, labor-force quality, and the growth of nations. *American economic review*, 90(5), 1184-1208. https://doi.org/10.1257/aer.90.5.1184

Hanushek, E. A., & Woessmann, L. (2008). The role of cognitive skills in economic development. *Journal of economic literature*, 46(3), 607-668. https://doi.org/10.1257/jel.46.3.607

Hanushek, E. A., Jamison, D. T., Jamison, E. A., & Woessmann, L. (2008). Education and economic growth: It's not just going to school, but learning something while there that matters. *Education next,* 8(2), 62-71. https://link.gale.com/apps/doc/A177556508/AONE?u=anon~e8cf2e89&sid=-googleScholar&xid=e4370f3d

Ikira, M., & Ezzrari, A. (2021). Evaluating the impact of conditional cash transfer programs: Evidence from Morocco. *American Journal of Educational Research,* 9(5), 320-329. https://doi.org/10.12691/education-9-5-10

Imai, K., Kim, I. S., & Wang, E. H. (2023). Matching methods for causal inference with time-series cross-sectional data. *American Journal of Political Science*, 67(3), 587-605. https://doi.org/10.1111/ajps.12685

Jackson, C. K., Johnson, R. C., & Persico, C. (2015). The effects of school spending on educational and economic outcomes: Evidence from school finance reforms (No. w20847). National Bureau of Economic Research. https://doi.org/10.3386/w20847

Johnston, W., Engberg, J., Opper, I., Sontag-Padilla, L., & Xenakis, L. (2020). Illustrating the promise of community schools. Rand Corporation. http://dx.doi.org/10.7249/RR3245

Khandker, S. R., Koolwal, G. B., & Samad, H. A. (2009). Handbook on impact evaluation: quantitative methods and practices. World Bank Publications. http://documents.worldbank.org/curated/en/650951468335456749

Krueger, A. B. et Lindahl, M. (2001). "Éducation for Growth: Why and For Whom" Journal of Economic Literature, 29:1101–1136. https://doi.org/10.1257/jel.39.4.1101

Lee, Inwha, and Namwook Ku. (2019). Analysis of PISA 2015 reading achievement characteristics of Korean students and influence of educational context variables. http://doi.org/10.17095/JRR.2019.50.4

Liu, V. Y. T. (2020). Is school out for the summer? The impact of year-round pell grants on academic and employment outcomes of community college students. *Education Finance and Policy,* 15(2), 241-269. https://doi.org/10.1162/edfp_a_00277

Machin, S., & Vignoles, A. (2004). Educational inequality: the widening socio-economic gap. *Fiscal Studies*, 25(2), 107-128. https://doi.org/10.1111/j.1475-5890.2004.tb00099.x

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, *107*(2), 407-437. https://doi.org/10.2307/2118477

Marks, Gary N., John Cresswell, and John Ainley. (2006). Explaining socioeconomic inequalities in student achievement: The role of home and school factors. *Educational Research and Evaluation* 12(2): 105–128. https://doi.org/10.1080/13803610600587040

McCall, L. (2000). Gender and the new inequality: Explaining the college/non-college wage gap. *American Sociological Review*, 234-255. https://doi.org/10.1177/000312240006500205

McGuinn, Patrick. 2012. Stimulating reform: Race to the Top, competitive grants and the Obama education agenda. *Educational Policy* 26(1): 136–159. https://doi.org/10.1177/0895904811425911

Ooghe, E. (2011). The impact of'equal educational opportunity'funds: a regression discontinuity design. Available at SSRN 1833251. https://dx.doi.org/10.2139/ssrn.1833251

Papke, L. E. (2005). The effects of spending on test pass rates: evidence from Michigan. *Journal of Public Economics,* 89(5-6), 821-839. https://doi.org/10.1016/j.jpubeco.2004.05.008

Psacharopoulos, G., & Patrinos , H. A. (2004). Returns to investment in education: a further update. *Education economics*, *12*(2), 111-134. https://doi.org/10.1080/0964529042000239140

Romero, M., Bedoya, J., Yanez-Pagans, M., Silveyra, M., & de Hoyos, R. (2024). The effect of school grants on test scores: experimental evidence from Mexico. *Economica*, 91(363), 980-995. http://dx.doi.org/10.1111/ecca.12523

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika,* 70(1), 41-55. https://doi.org/10.1093/biomet/70.1.41

Saba, A., & Veliappan, A. (2019). Government Scholarships – A Panacea for education among under privileged students. *International Journal of Research*, 6(2), 873-879. https://journals.pen2print.org/index.php/ijr/article/view/17147

Saint Martin, M., & Pardo, M. S. (2020). Estimating the Medium-Term Impact of a Scholarship Program Using Standardized Test Data. *Journal of Education and Learning*, 9(1), 172-195. https://doi.org/10.5539/jel.v9n1p172

Sánchez Vargas, A., Villarespe Reyes, V., & Naranjo Carbajal, A. (2020). Scholarships and their impact on the perception of grade averages: Evidence from Mexico City. *Problemas del desarrollo*, 51(201), 111-132. https://doi.org/10.22201/iiec.20078951e.2020.201.69536

Schultz, E. W., Glass, R. M., & Kamholtz, J. D. (1987). School climate: Psychological health and well-being in school. *Journal of school health,* 57(10), 432-436. https://doi.org/10.1111/j.1746-1561.1987.tb03189.x

Schultz, T. W. (1961). Education and economic growth. *Teachers College Record*, 62(10), 46-88. https://doi.org/10.1177/016146816106201003

Sohn, H., Park, H., & Jung, H. (2023). The Effect of Extra School Funding on Students' Academic Achievements under a Centralized School Financing System. *Education Finance and Policy*, *18*(1), 1-24. https://doi.org/10.1162/edfp_a_00375

Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. Statistical science: a review journal of the Institute of Mathematical Statistics, 25(1), 1. https://doi.org/10.1214/09-STS313

Van der Klaauw, W. (2008). Breaking the link between poverty and low student achievement: An evaluation of Title I. *Journal of Econometrics,* 142(2), 731-756. https://doi.org/10.1016/j.jeconom.2007.05.007

Zwane, T., Biyase, M., & Rooderick, S. (2025). Assessing the impact of social grants on household welfare using propensity score matching approach. *International journal of development issues*, 24(1), 1-15. https://doi.org/10.1108/IJDI-01-2022-0024