Is Private Education Worth it? Evidence from the Free Primary Education Reform in Kenya

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Abstract

In 2003, Kenya introduced a nationwide Free Primary Education (FPE) reform, abolishing school fees in all public schools. As a result, enrolment rates in public primary schools rose by 15 percent, putting significant pressure on the educational system. Overcrowding and lack of school material caused many parents to turn to private school alternatives. Using a nationally representative cross-sectional household survey, I exploit intra-household variation in terms of school enrolment to measure private versus public school effectiveness in terms of math, English and Swahili test scores. My findings suggest that, on average, private school students score 18, 23 and 21 percentage points of a standard deviation higher than public school students, respectively. As my results are likely to be exposed to a selection bias stemming from high-achieving students being sorted into fee-charging private schools, I include household fixed effects and an extensive set of household-related controls. Moreover, I prove that when attempting to control for such sorting effects, half of the effect disappears. I thus argue that the remaining effect can be interpreted as evidence of private schools being more effective than public schools.

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1 Introduction

Education is widely recognized as a key contributor to economic growth (Hanushek and Woessmann, 2012). Equally important, it can be an efficient pathway for underprivileged families to escape poverty. A recently published evaluation of the Millenium Development Goal of universal primary education for all children by 2015 concludes that substantial progress has been made in terms of reducing the number of out-of-school primary children. In sub-Saharan Africa, this share dropped by 25 percent, from 43.7 million down to 32.7 million children between 2000 and 2012 (UNICEF, 2015). These encouraging advances in enrolment rates have been sparked by large-scale programs such as the School Fee Abolition Initiative (SFAI), launched by UNICEF and the World Bank in 2005, which has assisted a range of developing countries in designing school fee abolition policies targeted at public schools (UNICEF, 2009).

With such a dramatic increase in the number of primary students going to school however, concerns in terms of productivity have arisen. Whether or not public schools are able to maintain quality as pupil-teacher ratios rise and school material such as textbooks become increasingly scarce have become compelling arguments for parents to transfer their children to private schools. As evident by the fact that private schools are becoming more and more popular in many developing countries, there seems to be a widely held belief that public schools are less effective than private schools (Hsieh and Urquiola, 2006). Many studies show that students attending private schools achieve better learning outcomes; however, whether this is due to private schools' greater effectiveness or due to selection of higher-achieving students into private schools remains an open question.

In this paper, I study how attending private versus public school affects student achievement in the context of Kenya, where private school enrolment rose dramatically after the abolition of school fees in 2003. This reform, which is commonly referred to as the Free Primary Education (FPE) reform, increased school enrolment in public schools by 15 percent. In turn, this prompted many parents to send their children to private schools amid concerns about deteriorating quality of education in public schools due to crowding.

To assess the effectiveness of private versus public schools, I use three different grade outcomes to measure learner outcomes: math, English and Swahili test scores. My data comes from *Uwezo* which is a nationally representative cross-sectional survey containing comprehensive information about households and their childrens' schooling. All five waves available are used in my analysis, covering the years 2009/10 to 2014. As I do not have access

to a randomized sample, I need to address some methodological challenges. In particular, I investigate if there is a selection bias affecting my results. As mentioned above, it is difficult to separate the 'true' effectiveness of private schools from an unobserved pre-selection of primary students into private schools by their parents. The latter is also called a sorting effect and needs to be dealt with in my analysis. I attempt to control for this by exploiting the fact that the household-level nature of my data allows me to hold both observed and unobserved household factors constant by including household fixed effects in my regression.[1]

My findings show that the average private school learner scores 18, 23 and 21 percent of a standard deviation higher in terms of math, English and Swahili test scores respectively compared to public school learners. These estimates are robust to the inclusion of household fixed effects and do not show any signs of discrimination in terms of parents investing disproportionally depending on the sex of their child[2]. More importantly, I find that approximately half of the effect dissapears when I control for sorting effects. My analysis contributes to the existing literature by presenting suggestive and unbiased evidence of costly private schools being more effective in terms of learner outcomes than free public schools, proving that there is a payoff associated with investing in private education.

The rest of the paper is structured as follows. First, I summarize the previous research regarding schooling choice and student performance in Section 2. Then, I explain the decision-making process parents face when wanting to enrol their child in school, as well as primary education in Kenya in Section 3. Sections 4 and 5 deal with the data used in my analysis and the identification strategy. In Section 6, I present and interpret my results, and Section 7 consists of a concluding discussion.

2 Empirical Literature

There is a widespread beflief that private schools are more effective than public schools in terms of quality, with characteristics such as class size and the supply of school material. Voucher programs, where families are provided the opportunity to select into schools, have been thoroughly investigated in a range of countries (see, among others, Angrist et al., 2002; Ladd, 2002; Hsieh and Urquiola, 2006; McEwan et al., 2008) and offer some insight into the decision making process of families when selecting their children into schools. It should be

[1] The terms 'sorting' and 'selection bias' are used interchangeably throughout this paper.

[2] Examined by controlling for birth order within the household and interacting this variable with gender.

noted, however, that the results are mixed and often suffer from difficulties with identifying a causal effect of any such program.

Most notably, Angrist et al. (2002) investigate the case of Colombia, where lotteries were used to distribute vouchers to families. The policy allowed the authors to rely on a quasi-experimental design to find that lottery winners were 15 percentage points more likely to attend private schools and have completed 0.1 additional years of schooling. Moreover, the comparison revealed differences in test results between lottery participants. Lottery winners scored around 0.2 standard deviations higher than those who lost, although not highly significant. This effect was proven both stronger and more significant for girls than for boys. Given these results, the authors discuss sorting and the difficulty of isolating the effects of competitiveness on school quality. They argue that whether an increase in private schools affects the public school system is ultimately going to be determined by the attraction of higher-performing students to private alternatives, posing a methodological challenge in terms of causality.

In addition to the qualitative differences above, on average, students in private schools seem to outperform those in public schools (e.g., Hanushek and Taylor, 1990; Jimenez and Lockheed, 1995; Hsieh and Urquiola, 2006).

In Chile, Hsieh and Urquiola (2006) provide evidence that a nationwide voucher program resulted in more than 1000 private school entering the market and increased enrolment rates in private schools by more than 20 percent, particularly in richer neighbourhoods. The authors investigate the effect of free schooling choice on sorting and measure the relative differences in average academic achievement between private and public schools over time. Built upon strong assumptions, they find that a sorting effect is present as the relative performance of private schools increased post the voucher program, leading to a decrease by almost 40 percent of a standard deviation as a result of a one standard deviation increase in the private enrolment rates. In addition, they find that the students who relocated away from public to private schools tend to come from families with high levels of income and well-educated parents. Again however, the authors were faced with the issue of a selection bias.

Using a similar strategy, Bold et al. (2010) examine the case of Kenyas Free Primary Education (FPE) policy on potential selection of low-achieving students into no-fee public primary schools. The authors use administrative household data to find a larger share of high-performing students in fee-charging private schools relative to public schools post the reform, argued mainly to be the result of the interaction between class size and peer effects.

More specifically, they identify two important mechanisms at play. One being lowered

test score results on average due to an expansion in the overall number of test-takers in both types of schools. This effect is then counteracted by an observed transfer of high-performing students from public to private schools. Their test score data is drawn from the Kenyan Certificate of Primary Education (KCPE), an exam administered to all students finishing primary education across both public and private schools, using standardized test results as a measure of academic performance. Similar to Hsieh and Urquiola (2006) and Angrist et al. (2002), no causal effect can be identified in terms of learner outcomes due to omitted variable bias.

A more recent study by Lucas and Mbiti (2012) uses the same test score database in a difference-in-differences framework to examine the impact of the FPE policy on student achievement for pupils in the eight and final grade of primary school. The authors exploit differences between districts in terms of the intensity of dropout rates to find that the program both increased student access and had some sorting effects in terms of completed primary education, measured as the number of test takers in public and private schools. They manage to find a decreased share of test takers in the lower-ranked private schools, indicating a transfer either towards free public schools or higher-ranked private alternatives. Moreover, their findings show that the new policy led to minor decreases in the range of between 0 and 5 percent of a standard devation in average KCPE exam scores in *both* public and private schools, significant at the 10 percent level. Lucas and Mbiti (2012) conclude that despite the presence of sorting and the lack of investments to compensate the large inflow of new public schools students, the program was welfare enhancing.

Overall, there seems to be an absence of literature sufficiently proving that private schools seem to be more beneficial in terms of academic performance for students compared to public schools. Although some papers have examined such disparities, no study that I have found has managed to effectively control for the presence of sorting effects. More specifically, papers such as Lucas and Mbiti (2012) and Hsieh and Urquiola (2006) measure changes in outcomes at the aggregate (district) level and are unable to control for unobservable household characteristics such as academic ability or genes which are correlated with school choice and likely to bias the results.

Lastly, whereas the FPE reform in Kenya has been analysed in terms of enrolment and completion rates in public schools, little attention has been devoted to evaluating the adverse qualitative effects in ther interaction between public and private schools. This paper contributes to the existing literature by providing robust and unbiased evidence of the consequences of such public school programs on the effectiveness of the educational system

in the private sector.

3 School Choice and Primary Education in Kenya

3.1 School Choice

What determines a households decision to enrol their child in either a private or a public school? Historically, public provision of elementary schooling has been considered a fundamental function and responsibility of the government. Although there have always been private institutions apparent, more focus has been directed to the benefits of a diversified educational system. Moreover, since education plays a central role in childrearing and economic development, constructing school policies which are cost-effective in generating basic cognitive skills has long been a key objective for most developing countries (Levin, 2002).

Nonetheless, a long-standing debate has been going on dealing with the issue of whether private schools are more efficient than public schools. On one hand, public provision of schools allows for a more standardized national curriculum to be promoted to all students in terms of behaviour, knowledge and values fundamental to a democratic society. On the other hand, democracy also entails freedom of choice as to which school parents would like to enrol their child (Glewwe, 2002). In a similar vein, Friedman (1962) argued that a dynamic market with more competition will provide additional variety and even higher quality of education as the growing extension of governmental responsibility grows unreasonably large. Thus, insititutions administered and financed by private actors may be act as good counterweight in order to maintain the social and economic gain from education. Either way, holding constant educational quality, the effect of fee abolition will ultimately land on the family of the affected child and in turn be determined by their preferences.

From a household perspective, parents are assumed to derive utility from both their own consumption of goods and any human capital gains accuring their children. Focusing on the latter, we expect it to depend the attributes of the school. Whether the school is private or public and fee-charging or free will determine how parents decide to invest in their childrens future. In practice, parents will be required to give up some of their own consumption in order to invest in potential school fees and material. The invested amount can thus be seen as a direct reflection of the household's beliefs of how large the future earnings of their children will be (Alderman et al., 2001).

Not surprisingly, the above is directly related to the cost of sending a child to school.

Assuming that the described utility model holds, fee-abolition may have different impacts depending on the level of wealth in a household. For example, a low-income household is probably more likely to respond positively to the FPE policy if the saved income is enough to raise the incentive for parents to choose to invest in school supplies and other expenses related to enrolment, although they might consider it to be a risky investment. In contrary, wealthier households may be more likely to choose a school offering the best attributes in terms of educational quality for their children, regardless of school type and cost.

Against this background, it should be noted that primary education still might not be entirely free. Indirect costs such as expenses for school material may still be a limitation for the family to invest in their childs schooling. In Malawi for example, where the newly-elected government implemented a nationwide fee-abolition reform in all public schools in 1994, the policy initiative gave rise to a dramatic increase in access to basic education. Despite the increased enrolment rates however, the no-fee policy was highly criticized as considerable indirect schooling costs remained a barrier to households who had to invest in clothes, books and other material necessary for enrolment (Kadzamira and Rose, 2001).

Equally important to the choice of schooling are household factors which can be expected to influence a parents willingness to pay for their childs education. Such factors may include parental education, wealth, household size and the gender of the child. For example, a highly educated mother is more likely to have a higher earnings potential and thus may want to enrol her child in a 'better' school, perhaps with smaller classes and proper school material, compared to a non-educated mother. Moreover, tuition fees are commonly perceived as being a good indicator of school quality as a whole (Lockheed et al., 1991). This type of sorting could potentially lead to differences in grades between fee-charging private and no-fee public schools and needs to be controlled for in my analysis as it is not directly related to the schools effectiveness.

Schooling opportunities might also look different for boys and girls. Gender disparities are widely believed to be apparent in developing countries, often in favour of boys. More specifically, time spent in school is expected to have an opportunity cost in the form of foregone household or market work. This cost may skew slightly higher for girls as they are often considered more likely to help their mothers with domestic work such as child care. In addition, studies have revealed that male-biased differential treatment in terms of childhood investments is apparent in some developing countries (see, for example, Sen, 1990; Behrman, 1992; Rose, 2000). In order to investigate if this is the case in my sample, I attempt to control for differential treatment and conduct a heterogeneity analysis in Section 6.

3.2 Primary Education in Kenya

The Kenyan government has long been committed to improving the social status of the large share of marginalized and underprivileged children. Every Kenyan child should have the right of access to free and compulsory basic education, as stated in the Kenyan Constitution (UNESCO, 2010). Poor enrolment trends have not been uncommon throughout Kenyan history, however. These effects have been most notable in rural areas characterized by low economic development and poor living standards. Such areas often suffer from both low enrolment and completion rates, leading to large within-country disparities between urban and rural districts. Consequently, the Kenyan government has put emphasis on expanding access to the public education system, especially for disadvantaged families (UNESCO, 2015).

Kenya also has an interesting history of fee abolition. The abolishment of public primary school fees was first implemented as an instrument to encourage enrolment and empower vulnerable children in Kenya towards the end of the 1970s. At the time, the Free Primary Education (FPE) reform was targeted only at certain primary schools, but was later expanded in 1978. The goal was to reduce the financial burden of education in order to mitigate the direct opportunity costs of schooling for poor families. The reform did have a substantial effect after its conclusion in 1978 as enrolment rates in primary school went from 86 percent in 1977 to 115 percent in 1980 (Republic of Kenya, 1988).

This came at a large cost, however. In 1988, the Kenyan government had to cut down on primary school funding due to the limited education budget. As part of the Structural Adjustment Programs (SAPs), a new program was launched which instead directed some of the expenses at the parents of the enroled children. Schools started charging fees again and the new policy left parents responsible for acquiring schooling material and even the funding of new school buildings. Consequently, dropout rates rose and the previous high enrolment rates decreased by 20 percent in only 3 years (Republic of Kenya, 1988, 1991 and 2003).

The next large initiative came in January in 2003 when Kenyan policymakers took an important step towards reversing the negative trends and reintroduced the Free Primary Education (FPE) program as part of a large political campaign. The program meant a nationwide elimination of fees in all public primary schools through each school receiving an earmarked central government grant two times each year in order to cover school-related expenses. In the year of the introduction, total primary school enrolment rose by approximately 18 percent, from 6.1 million to 7.2 million, while the number of teachers in

primary schools merely increased from 178,037 to 178,622 (Republic of Kenya, 2004).

The sudden increase in enroled students came with a number of challenges. As the dramatic rise in students was not accompanied by a similar increase in the number of primary school teachers, overcrowding in schools became an issue. Pupil-teacher ratios rose from 34:1 in 2002 to 40:1 in 2003, sometimes forcing students to study outside of the classroom and putting more stress on teachers (Muyanga et al., 2010).

One example comes from Sanders (2007) who describes the case of Olympic, one of Kenyas highest-performing primary schools, in which the FPE led to an increase in average class size to almost 84 students, double the previous size. Additional impacts were observed in terms of lowered academic performance and a school budget stretched to its limits. School material became increasingly scarce resulting in students lacking textbooks, desks and other supplies which can be considered necessary for proper learning. There is even evidence proving that more qualified teachers transferred away from public primary schools to private and secondary alternatives (Lucas and Mbiti, 2012). Consequently, the FPE program gave rise to serious concerns in terms of the quality of public schooling.

In response to the more prominent role of the government in Kenyan public education, the market for non-free private alternatives grew rapidly. As parents became aware of the worsening schooling conditions of their children in public schools, those who could afford it sought other alternatives (Bold et al., 2013). Between 1999 and 2006, the number of private schools increased from 569 to 1,839, while the number of public schools only increased from 17,054 to 17,946 (Muyanga et al., 2010).

In short, despite Kenyas ambitious efforts to improve the access and quality of public education, government officials have not managed to back their policy with enough resources. The country has failed to adapt to the dramatic increase in the demand for public schools, lacking investments in teacher salaries, material and classrooms. In the sections below, we will see how this has affected the learners who responded to the deteriorating quality by enroling in private schools.

4 Data

The dataset used in my analysis comes from Twaweza's dataset on learning, *Uwezo,* which is a nationally representative, repeated cross-section survey conducted in a large number of Kenyan households[3]. The questionnaires contain detailed and comprehensive information on household, village and school level. The survey incorporates a large sub-set of Kenyan children, including those who are not attending school, and allows a link to be made between learners and schools. I include all five waves available of the survey, covering the years 2009/10 to 2014. After extracting the observations central to my analysis, namely children aged between 6 to 15 who report to be enroled in a primary school (grades 1 to 8), the final sample consists of 492,901 observations across 158 districts[4].

I use three outcome variables to measure any changes in educational achievement: math, English and Swahili test scores. These outcomes were measured through tests administered by the *Uwezo* survey asking school-aged children (both enroled and not enroled) a series of basic literacy and numeracy questions[5]. The tests are designed to assess the basic competence after having completed two years of schooling, which, according to the national curriculum in Kenya, is thought to be enough time to have acquired a solid foundation for future learning (Jones et al., 2014).

Cognitive achievement in terms of math is assessed by having students answer six different questions covering basic number skills such as counting, addition and division. Math scores range from 1 to 8, where 1 is the lowest achievable score and 8 the highest. Language skills are evaluated on the basis of the students ability to read a short sentence, recognize letters and words as well as comprehension as a whole. *Uwezo* tests incorporate both English and Swahili as these are the two main languages taught in Kenyan primary schools. Language scores range from 1 to 5 in a similar manner to the numeracy test.

The independent variable of interest in my analysis consists of a dummy indicating school type which takes on value 1 if it is private and 0 if it is a public school. The total number of schools amount to 54,259 private (11 percent) and 428,071 public schools in my extracted sample.

I include a set of household-specific control variables in order to account for a range of preconditions which may affect the decision to enrol a child in public vs. private school. Such

[3] For more details and documentation, see "www.uwezo.net".

[4] In the final sample, only households containing two or more siblings where one goes to private and one to public school will be used as variation. This is explained in more detail in Section 5.

[5] Tests were conducted at the time of the survey.

factors include the mother's level education, household size, number of other children in the household, the material used to build the houses' outer walls (used as a proxy to indicate the wealth level of the household) and two dummy variables indicating whether or not the household has access to electricity and water. Table 1 below presents an overview of the final sample and all of the variables.

Table 1. *Descriptive statistics*

Variable	*Mean*	*Std. Dev*	*Min*	*Max*	*N*
Demographic variables					
Age	10.46	2.718	6	15	492901
Male	.5078	.4999	0	1	492901
Female	.4922	.4999	0	1	492901
Mothers edu = Primary	.7438	.4366	0	1	334736
Mothers edu = Secondary	.2424	.4285	0	1	334736
Mothers edu = Post secondary	.0138	.1168	0	1	334736
Household size	6.484	2.348	1	16	492901
No. children in household	3.443	1.589	1	15	492901
House wall = Polythene	.5995	.4899	0	1	492901
House wall = Iron sheet	.0066	.0813	0	1	492901
House wall = Timber	.0691	.2536	0	1	492901
House wall = Stone/Bricks	.2223	.4157	0	1	492901
Household has electricity	.1755	.3801	0	1	492901
Household has water supply	.3552	.4785	0	1	483951
Treatment variable					
Private school	.1125	.3159	0	1	482330
Outcome variables					
English score	3.905	1.281	1	5	492901
Math score	6.128	2.167	1	8	492901
Swahili score	3.954	1.313	1	5	492901

Note: 'Type of house wall' refers to the material used to build the walls in the house.
Test score outcomes are measured using an ordinal scale.

Although the descriptive statistics provide some insight into the distribution and characteristics of my sample, it may prove even more valuable to look closer at the demographics of those who attend private schools. Table 2 below shows the results from a regression using the private school dummy as the outcome and the variables age, gender, type of wall on the house (as a wealth proxy), the number of children and size of the household and the mother's level of education as independent variables.

Table 2. *Demographics of private school students*

VARIABLES	Private school
Age = 7	-0.0276***
	(0.00553)
Age = 8	-0.0615***
	(0.00553)
Age = 9	-0.0827***
	(0.0106)
Age = 10	-0.114***
	(0.0123)
Age = 11	-0.123***
	(0.0147)
Age = 12	-0.141***
	(0.0144)
Age = 13	-0.160***
	(0.0160)
Age = 14	-0.181***
	(0.0179)
Age = 15	-0.189***
	(0.0179)
Female	0.000632
	(0.00194)
Wall = Polythene	-0.0313***
	(0.0115)
Wall = Iron sheet	0.124***
	(0.0291)
Wall = Timber	0.051***
	(0.00893)
Wall = Stone/Bricks	0.180***
	(0.0271)
Mothers edu = Primary	0.027***
	(0.0066)
Mothers edu = Secondary	0.139***
	(0.0105)
Mothers edu = Post secondary	0.333***
	(0.2101)
Household size	-0.00242**
	(0.00112)
No. children in household	-0.0210***
	(0.00278)
Observations	482,330

Standard errors in parentheses clustered by district

*** p<0.01, ** p<0.05, * p<0.1

The findings suggest a few important things. First of all, by looking at the age variable, there seems to be a growing trend towards enrolling children in private schools. This can be observed in the table by looking at the decreasing coefficient as age increases and means that young children in families are more likely to be enroled in private schools compared to their older siblings.

Secondly, households who enrol their children in private schools seem to live in houses with walls built with better material, indicating a higher level of wealth. As discussed in Section 3, this is a probable reflection of the relative costs of enrolling a child in either a private or a public school, suggesting that private schools attract higher-income families. Although it would have been more optimal to use a crude measure of income level, the dataset did not include any such variable. Related to this, private school students are more likely to come from families where the mother is highly educated. These findings are similar to those in Hsieh and Urquiola (2006) and indicate that highly educated parents are more likely to invest more resources into their childrens schooling.

Lastly, Table 2 suggests that households who choose private schooling have fewer family members and children on average than those in the public educational system. Although this coefficient is very small, it is highly significant. A simple explanation to this could be that the surrounding costs associated with having a large family do not leave enough resources to afford private school fees for the children.

5 Methodology

I seek to examine if investing in private schooling is worth it in terms of childrens' educational outcomes. In other words, I evaluate the effectiveness of private vs. public schools in the context of Kenya.

Ideally, I would have had access to a sample where children were randomly allocated into different schools. Randomization would have allowed me to compare the academic achievements of children without having to worry about potential selection biases being present in the composition of private and public school children. However, as such data is not available to me, I am forced to deal with some challenges regarding my empirical results associated with the observational data used in my analysis.

My identification strategy lies within a standard Ordinary Least Squares (OLS) framework and consists of exploiting differences in average scholastic achievement between

students in privately and publicly owned schools in Kenyas 158 districts, measured as three different grade outcomes between the years 2009/10 and 2014, six years after the FPE policy was introduced. The grade outcomes take the form of math, English and Swahili test scores.

As mentioned above, there are important methodological issues which need to be addressed when performing this kind of analysis. First, the backgrounds of public and private school students are likely to differ from one another. Again related to the discussion in Section 3, family characteristics may be the determinant of the success of their children in school rather than simply the type of institution that he or she attends. For example, children whose mothers are highly educated are more likely to send their children to a private school. This effect can be observed in Table 2 and could constitute a potential source of selection bias in a simple OLS regression of achievement on private schools as it would not reflect a causal effect.

Similarly, a bias could be present in my results if there was a systematic pre-selection of students into schools. For example, as more and more private schools enter the market, families might not transfer a child who is already enroled in a public school mid-term, but rather send a younger sibling to private school. Such behaviour could potentially understate the true effect of the FPE program. However, it could also be the case that parents invest more in their first-born child and thus choose to pay the fee associated with a private school for the first-born but not for younger siblings. The presence of such bias would lead to an overestimation of the effect of the FPE policy. To examine this, as selection bias is non-observable and difficult to control for without a randomized sample, I implicitly rely on my household fixed effects and control for birth order throughout all regressions[6].

I construct four different specifications, all of which regress the test scores on the private school indicator. The first only controls for the child's age, the second also incorporates district fixed effects, the third socio-demographic controls and the fourth is a full specification in which the district fixed effects are replaced by household fixed effects. I then repeat the four specifications using English and Swahili test scores as the dependent variable.

As a first step to mitigate potential bias due to non-random selection into schools, I estimate specifications which control for socio-demographic factors related to childrens' backgrounds and household characteristics. In addition, district fixed effects are included in order to control for unobserved differences across districts in terms of public and private school achievement. These specifications can be summarized with Equation (1) below:

[6] Specifically, birth order is included as an interaction with gender in order to account for the possibility that parents invest disproportionally in their children's education based on the sex of the child.

$$S_{ihdt} = \alpha + \beta PRIV_{ihdt} + \gamma H_{ihdt} + \delta_d + \lambda_t + \varepsilon_{idht} \quad (1)$$

where $PRIV_{ihdt}$ indicated whether it is a private (=1) or a public (=0) school in which student i in household h in district d and year t is enroled; S_{ihdt} the dependent variable consisting of either math, English or Swahili test scores for the same child; H_{ihdt} is a vector of observable socio-demographic characteristics for household h in district d and year t; δ_d corresponds to district fixed effects; λ_t year fixed effects and ε_{idht} is the error term. β is the coefficient of interest in this analysis. Throughout all regressions, standard errors are clustered on the district level and observations are weighed according to their occurrence in the random sample.

Even with extensive controls however, the coefficient related to the school indicator may still be biased due to unobserved factors such as academic ability and genes which are correlated with school choice and hence cannot be controlled for. In order to deal with this concern, I estimate a model with household fixed effects.

Accordingly, Equation (1) is modified slightly, resulting in the final specification below:

$$S_{ihdt} = \alpha + \beta PRIV_{ihdt} + \gamma H_{ihdt} + \omega_h + \lambda_t + \varepsilon_{idht} \quad (2)$$

where the district fixed effects, δ_d, have been replaced by ω_h, referring to household fixed effects.

A key interpretational strength with Equation (2) is that it relies on within-household variation between siblings, taking into account endogenous factors such as family background and household environment which are highly likely to influence the choice of schooling. Thus, the measured effect of the FPE program on test scores should not be distorted by relative differences in preconditions between households. An example of such a concern could be that public school students may have enjoyed less of a background advantage compared to private school students. Moreover, variables which may be systematically correlated on the district level with both grades and the type of school over time are controlled for with the inclusion of both household and year fixed effects. In the next section, I present the regression outcomes from these two equations and discuss the results based on the methodological approach above.

6 Results

I perform a series of regressions using three different educational outcomes as the dependent variable: math, English and Swahili test scores. All specifications control for age and year fixed effects and are presented in Tables 3, 4 and 5.

Column 1 shows the very basic OLS regression where test score outcomes are regressed on the private school dummy. We can see that being enroled in a private school is associated with a 0.70 unit higher math score test result, 0.54 unit higher English result and a 0.50 unit higher Swahili result on average. As the math variable takes the form of test results in the range of 1 to 8 and the language variables from 1 to 5, the results may at first be hard to interpret. Thus, in order to make it easier to compare the three outcomes, I divide the resulting coefficients with their respective standard deviations. The resulting effects from these basic specification are large, yielding a 32 percent of a standard deviation increase in math scores, 42 percent for English scores and 38 percent for Swahili test scores.

In the simple setup above however, we do not expect the link between the choice of private education and academic achievement to be causal due to potentially omitted variables related to households and selection bias. In addition, differential trends across districts are not accounted for, which could further reduce the precision of my estimates.

Instead, Column 2 in Tables 3 to 5 incorporates district fixed effects to control for such trends. The results show that all three coefficients are slightly lowered, indicating that some of the variation captured in my model could have been due to differences across districts have now been removed. Nonetheless, there may still be a range of household factors which influence parents decisions to enrol their children in private schools. I explain how I deal with this below.

In Column 3, a set of socio-demographic controls are included in the specification in order to mitigate the potential bias due to non-random selection into schools. These factors are likely to be different between households and could, for example, take the form of wealth, mother's education, birth order and gender. Similar to the transition from Column 1 to 2, moving to the coefficients in Column 3 presents evidence consistent with the view that socio-demographic household characteristics are likely to determine much of the variation found in my sample. Nonetheless, even if these control variables account for much of the unwanted variation in my model, it could still suffer from non-observable selection bias.

In order to address the above concern of endogenous household factors influencing academic achievement, district fixed effects are replaced by household fixed effects. As stated

earlier, the inclusion of household fixed effects is key advantage with the use of my dataset and allows for variation to take place within families, disregarding dissimilarities between households. Column 4 shows the coefficients associated with Equation (2) which is designed to only exploit intra-household variation over time. The results from these regressions show an 18, 23 and 21 percentage point of a standard deviation increase in math, English and Swahili respectively. In comparison to the findings in Column 1, we can see that almost half of the effect has been absorbed by the inclusion of the extensive set of control variables and the household fixed effects. This leads us back to the discussion about omitted variable bias how my results should be interpreted.

As presented throughout Columns 1 to 4 in all three output tables, the estimated coefficients decrease in a stepwise manner when first extending Equation (1) through the inclusion of socio-demographic controls and district fixed effects and then replacing it with Equation (2) in order to circumvent household omitted variable bias. This development is likely to indicate an effective exclusion of endogenous factors which may influence schooling decisions not directly related to the FPE policy, and thus provide a more isolated and precise estimate of the effect. Specifically, we see that most of the reduction in the coefficients happens when moving from Column 1 to 3, i.e from the very basic setup to Equation (1). This indicates that much of the unwanted variation stemming from other sources than the direct link between school choice and achievement is captured in Equation (1) already. Finally, only a minor change takes place between Column 3 and 4 when household fixed effects are included in the model, indicating that no significant selection bias should be influencing my results.

To sum up, there seems to be a strong positive effect on student achievement from investing in fee-charging private schools compared to free public alternatives. In the final specifications based on Equation (2), children in private schools score 18, 23 and 21 percentage points of a standard deviation higher on average in terms of math, English and Swahili test scores than those in public schools. This is a rather substantial difference and, supported by Table 2, reflects a larger share of high-performing students being enroled in private schools after the FPE reform. In addition, my estimations are robust to both the inclusion of household fixed effects and the birth order variable. Judging by the decreasing behaviour of the coefficients, my results do not seem to suffer from any selection bias. Hence, I argue that the remaining impact of the FPE reform, after the removal of sorting effects, can be robustly interpreted as evidence of private education being superior to free public schooling in terms of student learning outcomes.

Table 3. *Regression results using Math scores as outcome*

VARIABLES	(1) Math	(2) Math	(3) Math	(4) Math
Private school	0.705***	0.563***	0.398***	0.391***
	(0.0349)	(0.0358)	(0.0274)	(0.0213)
Age control	YES	YES	YES	YES
Socio-demographic controls	NO	NO	YES	YES
District FE	NO	YES	YES	NO
Household FE	NO	NO	NO	YES
Observations	482,330	482,330	426,230	426,230

Standard errors in parentheses are clustered by district. All regressions include year fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 4. *Regression results using English scores as outcome*

VARIABLES	(1) English	(2) English	(3) English	(4) English
Private school	0.543***	0.423***	0.298***	0.298***
	(0.0219)	(0.0297)	(0.0216)	(0.0144)
Age control	YES	YES	YES	YES
Socio-demographic controls	NO	NO	YES	YES
District FE	NO	YES	YES	NO
Household FE	NO	NO	NO	YES
Observations	482,330	482,330	426,230	426,230

Standard errors in parentheses are clustered by district. All regressions include year fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 5. *Regression results using Swahili scores as outcome*

VARIABLES	(1) Swahili	(2) Swahili	(3) Swahili	(4) Swahili
Private school	0.503***	0.397***	0.274***	0.278***
	(0.0227)	(0.0309)	(0.0231)	(0.0158)
Age control	YES	YES	YES	YES
Socio-demographic controls	NO	NO	YES	YES
District FE	NO	YES	YES	NO
Household FE	NO	NO	NO	YES
Observations	482,330	482,330	426,230	426,230

Standard errors in parentheses are clustered by district. All regressions include year fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

6.1 Heterogeneity Analysis

In addition to the analysis above, I conduct a heterogeneity analysis based on the three outcome variables in order to investigate whether the effectiveness of private vs. public schools seem to differ between gender. Against the background of Table 2 and the inclusion of a birth order variable interacted with gender, I have already showed that there does not seem to be a unequal selection of boys or girls into private schools. However, it could still be the case that private school attendance benefits boys and girls differently, which is the purpose of this analysis.

Table 6 below shows the regression outcome when interacting the private school indicator with the gender variable. The two variables are interacted in order to avoid limiting my sample only to households with girls. Columns 1 to 3 indicate that there is a slightly more advantageous effect on math scores for girls who enrol in private schools, however not strongly significant. On the other hand, this effect is cut in half and loses its significance in Column 4, suggesting that the previous specifications are likely to suffer from omitted variable bias. The same analysis is conducted using English and Swahili test scores as the outcome variable, yielding even less significant results.[7]

Based on these findings, I can safely say that I find no robust evidence of any disproportionate effects of the effectiveness of private versus public schools for boys and girls. Although the first three columns in Table 6 suggests that there is a weak beneficial effect present for girls, it should not be interpreted as evidence of heterogeneous impacts stemming from private school enrolment as it is both reduced and made insignificant with the inclusion of household fixed effects.

[7] Output tables for these regressions can be found in the Appendix.

Table 6. *Heterogeneity analysis using math scores as outcome*

VARIABLES	(1) Math	(2) Math	(3) Math	(4) Math
Private school	0.687***	0.545***	0.383***	0.383***
	(0.0350)	(0.0366)	(0.0281)	(0.0237)
Private school × Female	0.0342*	0.0367**	0.0323*	0.0166
	(0.0175)	(0.0185)	(0.0176)	(0.0181)
Age control	YES	YES	YES	YES
Socio-demographic controls	NO	NO	YES	YES
District FE	NO	YES	YES	NO
Household FE	NO	NO	NO	YES
Observations	482,330	482,330	426,230	426,230

Standard errors in parentheses are clustered by district. All regressions include year fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

7 Concluding Discussion

In this paper I evaluate the effectiveness of private vs. public schooling in terms of student learning outcomes in the context of Kenya. My identification strategy exploits the introduction of Free Primary Education (FPE) in Kenya in 2003 and relies on variation within households, stretching across all of Kenyas 158 districts between the years 2009/10 and 2014. My variables of interest consists of math, English and Swahili test scores and my independent variable is a dummy indicating whether the school is privately or publicly owned.

A concern was that my results could be driven by factors related to household characteristics, not common between families. For instance, private school students might have more advantageous backgrounds compared to students enroled in public schools, which is likely to overstate the effect of the policy. However, in contrary to other studies which have tried to estimate the impact of schooling choice on sorting limited to district fixed effects (e.g. Hsieh and Urquiola, 2006; Bold et al., 2010; Lucas and Mbiti, 2012), I manage to address this problem by holding constant household information. In addition, despite the methodological challenges found in other studies, the findings of this paper are in line with recent research surrounding school choice and learner outcomes.

I run multiple regressions using different specifications and the outcomes mentioned above. With the final specification, in which I control for sorting effects, I find that on average, math, English and Swahili test scores are 18, 23 and 21 percentage points of a standard deviation higher in private than in public schools. This effect can be considered

large, especially considering the fact that my model is designed to eliminate household-specific bias.

Given the presented identification strategy and resulting coefficients above, this paper contributes to the existing research on academic achievement and school choice in two ways. First, it provides evidence in the context of a developing country that fee-charging private schools are more effective than free public alternatives in terms of students' learning outcomes. Second, my strategy is superior those of other studies which have investigated the impacts of school choice on academic achievement in that it controls for omitted variable bias and sorting effects into different types of schools with the use of household fixed effects.

Despite these strengths, ideally I would have had access to a randomized sample of children in order to establish the real causal relationship between private schools and academic achievement. In addition, I cannot completely rule out the possibility of my findings suffering from selection bias. Nevertheless, I argue that my research design is, to a large extent, successful in dealing with this concern, yielding precise and robust estimates of the effectiveness of private schooling. Hence, I conclude that one can interpret the Kenyan evidence as providing strong support for the fact that costly private schools are more effective than free public schools at providing qualitative education.

As for policy implications, these findings raise some concerns regarding the cost-effectiveness of fee abolition programs. The disproportionate impact on the quality of public schools should be taken into consideration in the planning process of such large-scale reforms. Although free public schooling gives rise to a dramatic boost in participation rates, they risk undermining the amount of knowledge that children actually attain whilst in school. Therefore, decision makers should be careful not to focus solely on enrolment, ignoring the quantitative and qualitative trade-off in public schools. However, whilst there may be losses associated with public schools, learners seem to benefit more from private alternatives. Hence, I argue that further research is needed in order to fully understand the channels through which learner outcomes are to be improved.

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Appendix

Table A. *Heterogeneity analysis using English scores as outcome*

VARIABLES	(1) English	(2) English	(3) English	(4) English
Private school	0.550***	0.432***	0.304***	0.304***
	(0.0231)	(0.0283)	(0.0200)	(0.0155)
Private school × Female	-0.0139	-0.0160	-0.0116	-0.0117
	(0.0157)	(0.0169)	(0.0171)	(0.0147)
Age control	YES	YES	YES	YES
Socio-demographic controls	NO	NO	YES	YES
District FE	NO	YES	YES	NO
Household FE	NO	NO	NO	YES
Observations	482,330	482,330	426,230	426,230

Standard errors in parentheses are clustered by district. All regressions include year fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table B. *Heterogeneity analysis using Swahili scores as outcome*

VARIABLES	(1) Swahili	(2) Swahili	(3) Swahili	(4) Swahili
Private school	0.509***	0.405***	0.280***	0.282***
	(0.0242)	(0.0302)	(0.0220)	(0.0168)
Private school × Female	-0.0137	-0.0146	-0.00869	-0.00715
	(0.0154)	(0.0166)	(0.0172)	(0.0149)
Age control	YES	YES	YES	YES
Socio-demographic controls	NO	NO	YES	YES
District FE	NO	YES	YES	NO
Household FE	NO	NO	NO	YES
Observations	482,330	482,330	426,230	426,230

Standard errors in parentheses are clustered by district. All regressions include year fixed effects.
*** p<0.01, ** p<0.05, * p<0.1