Mathematics Gender Gaps in Kenya: Are Resource Differentials Between Boys and Girls to Blame?

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Abstract

The Blinder-Oaxaca approach has been used to decompose the gender gap in mathematics test scores in both private and public primary schools in Kenya. The results show that boys outperform girls in mathematics in both school types. In both private and public primary schools, boys take advantage of the resources more than the girls hence the girls' score can be improved by better utilization of the resources. In addition, the boys' scores in public primary schools can be improved by increasing the educational resources for boys. This indicates that resource based policies aimed at increasing the girls' mathematics scores may not necessarily close the gender gap. Further, such policies may reverse the gender gap and disadvantage the boys.

INTRODUCTION

Many developing economies have made notable strides towards the achievement of universal basic education. However, gender gaps in academic achievement still exist. These gaps adversely affect economic growth by lowering the level of human capital (Klasen, 2002). Durrant, Forsythe and Korzeniewicz (2000) posit that, gender gaps in employment, wages and vulnerability to poverty arise from differentials in human capital. The differentials in skills and education sometimes arise from discrimination and structures that discriminate against one gender. In some societies, parents give differential treatment to boys and girls since it is more economically beneficial to educate boys than girls (Kingdon, 2002). Further, gender gaps at the lower levels of education account for a high proportion of the gender gaps that occur later in age (Klasen, 2002; Freeman, 2004).

Enrolment and completion gender parity has been achieved in most developing countries including Kenya (Grant and Behrman, 2010). In Kenya, programs targeted at enrolment such as Free Primary Education (FPE) in Kenya have been working but grades have been ignored (Grant and Behrman, 2010; Lucas and Mbiti, 2012). The enrolment ratio of boys to girls in primary schools has been 0.51: 0.49 since 2012-2016; the proportions have remained the same for pupils who sat for KCPE in the same period (Republic of Kenya, 2017).

The girls' grade attainment is however, still lower than that of boys (Lucas and Mbiti, 2012; Republic of Kenya, 2012). This academic achievement gap is particularly higher in Science, Technology, Engineering and Mathematics (STEM) disciplines (Republic of Kenya, 2012). Although the gender achievement gap in english has declined (Wasanga, Ogle and Wambua, 2011), gender gaps still persist in mathematics at the primary school level with boys outperforming girls (KNEC, 2018; Wasanga, Ogle and Wambua, 2011).

In order to address macroeconomics and social challenges and allow the growth of a knowledge based economy, the promotion of education and training in the STEM disciplines is paramount. This is due to the importance of these subjects in the promotion of innovation and economic growth (Republic of Kenya, 2012).

The steps suggested to promote STEM include setting affirmative gender actions that are specific to STEM programs. Due to the recognition of the importance of the STEM subjects in the economy and the existing gender gaps in the academic achievement in these disciplines, the current curriculum whose implementation started in 2018, is aimed at encouraging girls to perform well in STEM subjects from early stages of education. This will encourage them to enroll in STEM disciplines at the tertiary levels. Currently, the enrolment and performance by girls in these disciplines has been low (Republic of Kenya, 2016).

There is evidence that learning ability in mathematics, one of the STEM subjects, is the same for both men and women (Hyde, 2005; Smetackova, 2015). There are typically no gender differences in boys and girls abilities in mathematics. The differences within both male and female gender increases with age and this variability is partly due to girls' attitude towards mathematics and boys' identification with mathematics that makes the boys to perform better than the girls (Smetackova, 2015).

However, the government of Kenya (GOK) has continued to implement policies in favor of both genders. The GOK aimed at eliminating gender and regional disparities in basic education by 2017 (Republic of Kenya, 2012). For example, Kenya is a signatory to International Conventions such as the Sustainable Development Goals, provision of FPE, provisions for school re- entry for girls who drop out due to pregnancy, affirmative action bursary allocation, all aimed at achieving gender equality (Republic of Kenya, 2015). According to UNESCO (2003), gender equality in education means that neither boys nor girls are advantaged or disadvantaged in terms of opportunities available to them.

Innovation and economic growth is heavily reliant on promotion of STEM subjects Republic of Kenya (2012) and reduction of gender academic achievement gaps in the subjects (Republic of Kenya, 2016). We hypothesis that even as the government and the private sector continues to adopt resource based policies to improve academic achievement, not all gender gap in mathematics may be explained by the differences in resources between boys and girls. Hence we seek to answer the question: What is the nature of the mathematics score gender gap in public and private primary schools in Kenya? This is by decomposing the mathematics score gender gap in public and private primary schools in Kenya. The results here show that the differentials in resources between boys and girls do not necessarily explain why boys perform better than girls in mathematics. The differences in efficiency in resource utilization explain most of the gap. In fact, concentration on addition of resources for girls to boost their performance may reverse the gender gap.

The rest of the paper is organized as follows: Section 2 discusses the literature, section 3 discusses the methods and section 4 discusses the results while section 5 concludes.

LITERATURE

There are different possible explanations why gender gaps exist at different levels such as in education and in the labor market. According to Marianne (2011), there is a possibility of differences in social norms between men and women. Since men are prone to taking more risks than women, then they (men) are likely to be more aggressive than women in the market. This behavior may translate to less aggression by women in schools. Women also tend to avoid more difficult tasks. As a result, teachers may have greater expectations of boys than girls thus demand higher academic achievement from boys than from girls implying differences in the socialization process.

Gender gaps in education outcomes may also be as a result of parents' preferences to educate boys more than girls (Lucas and Mbiti, 2012; Kingdon, 2002). Where there is a cost to investing in children's education, then parents will invest more where the returns are higher. Other than the unobservable factors such as preferences and socialization, observable and quantifiable factors may be responsible for the gender gaps in education. According to Machin and McNally (2005), school and non-school factors such as parents' education and household income levels account for the differences in the performance gaps between boys and girls in schools.

Recent studies on gender gaps in different school types and using the education production function with quantifiable school and non-school characteristics hence attest to the theory that supply-side effects may contribute to the academic achievement gender gaps. This paper has analyzed the gender gaps based on the premise that the differences in quantifiable education production resources may explain gender gaps in academic achievement.

In the estimation of gender gaps in student achievement, different studies have used different approaches. Studies that have used Oaxaca (1973) to decompose gender gaps in test scores include (Aslam, 2009; Golsteyn and Schils, 2014); OLS (Asadullah and Chaudhury, 2009; Rodríguez-Planasa and Nollenbergerb, 2018; Bedard and Cho, 2010); difference in difference approach (Falch and Naper, 2013; Lucas and Mbiti, 2012; Machin and McNally, 2005).

Asadullah and Chaudhury (2009), Aslam (2009) and Golsteyn and Schils (2014) showed that discrimination in the allocation of more or better resources may lead to increased gender gap in academic achievement in favor of the group with more/ better resources. Golsteyn and Schils (2014) also showed that using Oaxaca (1973) decomposition approach, it is possible to discern whether there are differences in the way that pupils of different sex are able to utilize educational resources by decomposing the difference in scores into parameter and endowment effects.

Different authors have suggested different measures for closing the academic achievement gender gap. These include extra teaching hours (Machin and McNally, 2005). Dee (2007) and Muralidharan and Sheth, (2016) suggested that the gender of the teacher had an effect on the achievement gender gap. However, de Zeeuw et al., (2014) concluded that there was no difference in performance in mathematics resulting from a pupil being taught same-sex teacher while Spilt, Koomen and Jak (2012) concluded that there was no positive match between male teachers and boys.

Studies using data from Kenya include (Lucas and Mbiti, 2012; Dickerson, McIntosh and Valente, 2015). Lucas and Mbiti (2012) concluded that FPE in Kenya did not help to close the gender gaps in achievement. Dickerson, McIntosh and Valente (2015) showed that societal environmental factors explain gender gaps but concluded that further research is important to establish specific interventions to tackle gender gaps in academic achievement.

This paper uses the Oaxaca (1973) approach in order to decompose the gender test score gaps in mathematics in Kenya at the primary school level, hence contributing to the existing literature which currently does not show whether the gap is as a result of differences in resource endowments between boys and girls or whether it results from utilization of the resources (coefficient effect).

METHODOLOGY

Data

This study uses the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ III) data from Kenya National Examination Council. This is a cross-sectional data-set collected in 2007 and is the most recent available data from SACMEQ. The sample was taken from a population of grade 6 pupils in public and private schools in Kenya. 193 schools were selected in the country from which 4,436 pupils were sampled.

Table 1: Definition and measurement of variables

Variables	Measurement
Dependent variable	
Reading/ mathematics score	The pupil's percentage score in the subject
Control variables	
School characteristics	
School type	=1 if private, 0 if public
Condition of school infrastructure	=1 if good , 0 if poor
Head-teacher's sex	Head-teacher's sex =1 if female, 0 if male
Parents homework signing	=1 if parent is required to sign the pupil's homework, 0 if not
School Location	School location; =1 if urban and 0 if rural
Classroom characteristics	
Class size	Number of pupils in the particular class that the pupil attends
Pupil absenteeism	Number of days absent from class during the month
Book-pupil ratio	The ratio of textbooks to the number of pupils in class
Pupil and home characteristics	
Pupil age	Pupil's age in months
Social economic status (SES)	Pupil SES, low, medium and high. Low is used as base category
Mother/ father education	Secondary education and below. Base= Below secondary education.
Number of tuition hours per week	Total number of tuition hours that the pupil attends per week
Teacher characteristics	
Teachers test score	The percentage score of the teacher in the subject evaluation
In-service teacher's training	Number of days of in-service training attended by the subject teacher in the previous three years
Teacher years of professional	Number of years of teacher professional training
Teacher experience	Number of years of teacher experience
Teacher contract	Nature of teacher contract; 1 if permanent, 0 if temporary
Teacher's living condition	=1 if good, 0 if poor
Teacher's sex	=1 if female and 0 if male

Estimation model

Following (Blinder, 1973; Jann, 2008; Oaxaca, 1973), two separate equations for boys and girls are estimated in each school type, the mean difference in the test scores is then decomposed into the difference resulting from differences in resource endowments between boys and girls, that resulting from differences in returns of resources on mathematics test scores (coefficients effect) and the unexplained gap.

$$A_i^b = \beta_o^b + \beta_1^b X^b + U^b \quad (1)$$

$$A_i^g = \beta_o^g + \beta_1^g X^g + U^g \quad (2)$$

A_i is the mathematics test score of pupil i, X is a vector of pupil characteristics, school characteristics and family background characteristics, the b superscript indicates the boys and the g superscript indicates the girls and U is the error term

$\bar{A}^b - \bar{A}^g$ is the overall difference in the average boys test score and average girls test score. This difference is decomposed into two parts. 1) $E = \beta_1^b(\bar{X}^b - \bar{X}^g)$, the explained difference; explained by the differences in resource endowments between boys and girls and 2) unexplained part $X_g'\left(\beta_1^b - \beta_1^g\right)$ hence:

$$\bar{A}^b - \bar{A}^g = \beta_1^b(\bar{X}^b - \bar{X}^g) + X_g'(\beta_1^b - \beta_1^g) \quad (3)$$

The unexplained part is divided into two parts: 1) The difference due to differing returns to the educational resources, $(\beta_1^b - \beta_1^g)\bar{X}^g$. This is the parameter effect. 2) The unexplained difference due to the unobservable, $\beta_o^b - \beta_o^g$.

Descriptive statistics

Tables 2 and 3 compare characteristics between male and female pupils in private and public primary schools respectively; with a simple t-test for the significance of the difference between boys and girls characteristics. In both school types, male pupils' mathematics average score is significantly higher than that of female pupils. In private schools, the average mathematics score for boys is 59.26 while the average for girls is lower at 56.27 hence a difference of 2.99 percentage points. In public schools, the average mathematics score is 52.02 for boys and 49.74 for girls hence a difference of 2.78 percentage points.

Girls come from homes with higher social economic status (SES) as compared to boys. In private schools, 9% more girls than boys come from middle SES; 9.5% more boys than girls come from low SES homes. In public primary schools, 2.2% more girls than girls come from high SES homes. According to Dickerson, McIntosh and Valente (2015), a possible explanation to the age difference is the fact that girls are likely to come from homes with a higher social economic status hence are less likely to suffer late enrolment in school. In public primary schools, the boys are on average 8 months older than the girls. The age difference between boys and girls is however, insignificant in private primary schools.

In private primary schools, a higher proportion of the girls' parents have secondary education compared to the boys' parents. 54% of girls' mothers as compared to 43% of the boys' mothers have secondary education. This difference is insignificant in public primary schools. However, in the public schools, 3.3% more girls than boys get their homework checked by their parents.

While there are no significant differences in most of the teachers' characteristics between boys and girls, the girls in private primary schools are taught by teachers with 1.7 more years of experience than boys. Further, more girls (8.3%) are taught by female teachers are taught be female mathematics teachers.

In private primary schools, 9.8% more boys than girls attend school in urban areas. In public primary school, 4% more boys than girls attend schools whose infrastructure is in good condition.

Generally, boys and girls in the same school type face the same conditions. However, there are differences in mathematics scores. The difference in performance may therefore not necessarily be explained by the difference in the resource endowment between boys and girls.

Table 2: Comparison of characteristics between male and female pupils in private primary schools: t-test, mean (standard deviation)

	Boys	Girls	Difference (boy-girl)	t-stat
Mean mathematics score	59.264 (10.947)	56.274 (9.609)	2.990*** (0.989)	3.024
Pupils age	167.866 (31.255)	156.612 (20.462)	11.253 (2.577)	4.367
Low SES	0.340 (0.475)	0.245 (0.4310	0.095** (0.043)	2.189
Middle SES	0.292 (0.456)	0.383 (0.487)	-0.090** (0.045)	-2.0169
High SES	0.368 (0.483)	0.372 (0.485)	-0.005 (0.046)	-0.1056
Proportion of pupils with mothers with secondary education	0.427 (0.496)	0.541 (0.500)	-0.114** (0.047)	-2.4075
Proportion of pupils with fathers with secondary education	0.530 (0.500)	0.607 (0.490)	-0.077 (0.047)	-1.643
Proportion of pupils whose parents sign their homework	0.458 (0.499)	0.449 (0.499)	0.010 (0.047)	0.201
Pupil absenteeism	1.043 (2.000)	1.316 (2.606)	-0.273 (0.217)	-1.255

Class size	36.119 (14.123)	35.949 (14.391)	0.170 (1.355)	0.1252
Book-pupil ratio	0.996 (2.508)	1.189 (2.698)	-0.194 (0.247)	-0.786
Number of tuition hours per week	6.075 (6.713)	6.367 (6.349)	-0.292 (0.624)	-0.468
Mathematics teacher's test score	75.720 (7.589)	75.308 (7.880)	0.413 (0.851)	0.485
In-service mathematics teacher's training	3.478 (7.303)	3.383 (5.615)	0.096 (0.630)	0.152
Mathematics teacher's years of professional training	1.346 (0.881)	1.352 (0.864)	-0.006 (0.083)	-0.075
Mathematics teacher experience	9.071 (8.184)	10.765 (7.921)	-1.694** (0.768)	-2.206
Proportion of mathematics teachers with a permanent contract	0.368 (0.483)	0.378 (0.486)	-0.010 (0.046)	-0.2161
Mathematics teacher's sex, =1 if female, 0 if male	0.162 (0.369)	0.245 (0.431)	-0.083** (0.038)	-2.191
Proportion of pupil's with a female headteacher	0.265 (0.442)	0.316 (0.466)	-0.052 (0.043)	-1.195
Proportion of pupils whose school infrastructure is in good condition	0.577 (0.495)	0.556 (0.498)	0.021 (0.047)	0.444

Proportion of pupils whose mathematics teacher live in good condition compared to poor condition	0.621 (0.486)	0.628 (0.485)	0.007 (0.046)	-0.152
Proportion of pupils going to school in urban centers	0.680 (0.467)	0.582 (0.495)	0.098** (0.046)	2.153

Source: Author's computation from the SACMEQ, 2007 data. .***, ** , *: significant at 1%, 5% and 10% respectively

Table 3: Comparison of characteristics between male and female pupils in public primary schools: t-test, mean (standard deviation).

	Boys	**Girls**	**Difference (girl–boy)**	**t-stat**
Mean mathematics score	52.020 (8.450)	49.741 (7.247)	2.279*** (0.250)	9.118
Pupils age	169.557 (21.229)	161.482 (18.060)	8.076*** (0.626)	12.906
Low SES	0.452 (0.498)	0.429 (0.495)	0.022 (0.016)	1.423
Middle SES	0.466 (0.499)	0.466 (0.500)	-0.000 (0.016)	-0.031
High SES	0.082 (0.275)	0.105 (0.306)	-0.022** (0.009)	-2.377
Proportion of pupils with mothers with secondary education	0.260 (0.439)	0.287 (0.452)	-0.027 (0.014)	-1.9248

Proportion of pupils with fathers with secondary education	0.363 (0.481)	0.384 (0.487)	-0.021 (0.015)	-1.358
Proportion of pupils whose parents sign their homework	0.362 (0.011)	0.395 (0.011)	-0.033** (0.015)	-2.123
Pupil absenteeism	1.329 (2.744)	1.109 (2.213)	0.220*** (0.079)	2.784
Class size	44.893 (15.888)	44.508 (16.220)	0.386 (0.509)	0.758
Book-pupil ratio	0.693 (2.176)	0.761 (2.229)	-0.068 (0.070)	-0.972
Number of tuition hours per week	6.332 (6.489)	6.556 (6.617)	-0.224 (0.208)	-1.077
Mathematics teacher’s test score	74.450 (7.838)	74.554 (7.617)	-0.104 (0.253)	-0.411
In-service mathematics teacher’s training	30.664 (68.873)	28.790 (66.599)	1.874 (2.147)	0.873
Mathematics teacher’s years of professional training	2.126 (0.807)	2.090 (0.836)	2.108 (0.013)	1.376
Mathematics teacher experience	14.006 (8.790)	14.077 (8.889)	-0.070 (0.280)	-0.251
Proportion of mathematics teachers with a permanent contract	0.895 (0.307)	0.880 (0.326)	0.015 (0.010)	1.534

Mathematics teacher's sex, =1 if female, 0 if male	0.269 (0.444)	0.295 (0.456)	-0.026 (0.014)	-1.797
Proportion of pupil's with a female head-teacher	0.145 (0.352)	0.152 (0.360)	-0.008 (0.011)	-0.681
Proportion of pupils whose school infrastructure is in good condition	0.158 (0.365)	0.133 (0.340)	0.026** (0.011)	2.288
Proportion of pupils whose mathematics teacher live in good condition compared to poor condition	0.568 (0.495)	0.608 (0.488)	-0.040** (0.016)	-2.561
Proportion of pupils going to school in urban centers	0.356 (0.479)	0.343 (0.475)	0.012 (0.015)	0.797

Source: Author's computation from the SACMEQ, 2007 data. .***, ** , *: significant at 1%, 5% and 10% respectively

RESULTS AND DISCUSSIONS

This section presents the results on mathematics scores function for boys and girls starting with private then followed with public schools (table 4). It also presents the results on the decomposition of the scores by gender (table 5).

Determinants of mathematics score for boys and girls in primary schools in Kenya.

In private primary schools, on average, a male pupil from a high SES home background scores six percentage points higher than a boy from a low SES background. There is however, no difference in performance between girls who come from low SES and high SES backgrounds.

The return to education as a result of the parents' involvement in checking their children's homework is higher for boys by about 3% compared to that of girls. Similarly, the return to education as a result of a higher text-book ratio is also positive and significant for boys but the effect is insignificant for girls. Absenteeism negatively affects the boys' score where one day absent reduces the average score of a male pupil by about 1%. There is no effect on the girls' math score.

The teacher's test score has a positive and significant effect on the girls score. A girl taught by a teacher who scores 1% higher in the teacher's English test scores 0.4 percentage points higher than other pupils. The teacher's cognitive skills have no significant effect on the boys' score.

In public primary schools, the return to education due to high SES background is almost equal for both boys and girls; scoring an average 3.7% and 3.5% higher for boys and girls respectively compared to pupils from a low SES background. There is a positive and significant return to education for girls whose mothers have a secondary education. There is a surprising negative effect on the scores for the boys whose mothers have a secondary education.

The return to education as a result of a higher book ratio is also higher for girls than for boys. An increase in the books –pupil ration increases a girl's average score by 0.05 percentage points. There is however, no effect on the boys' score. The results are similar to the effect of the teachers score on the pupil's score.

On the other hand, a teacher with a permanent contract, a teacher who reports to be living in a good condition house improves a boy's average test score by 1.8 percentage points. There is no significant effect on the girls' score. On the other hand, a girl taught be a female teacher scores 1.3 percentage points higher than a girl taught by a male teacher. There is a positive effect on scores attributable to female head teachers with the effect being higher for boys than girls.

The positive return due to good condition school infrastructure accrue to boys but not girls. The return due to urban location of the school is similar for both boys and girls.

Decomposition of the mathematics score gender gap in public and private primary schools in Kenya.

The predicted mathematics score is higher for boys than for girls in both private and public primary schools. The predicted average scores in private primary schools are 60.7% and 56.9% for boys and girls respectively while the scores in public schools are 52% and 49.7% for boys and girls respectively. The difference in score between boys and girls for private school pupils is 3.8% while the same difference is lower at 2.3% for public primary school pupils. For explanation purposes, the girls score is the reference point.

In private primary schools, the difference in average mathematics score between boys and girls resulting from a difference in resource endowment is insignificant. This means that there is no difference in resource endowment between boys and girls does in private primary schools hence the girls would not perform any better or worse if they had the resources that are available to the boys. The difference due to the parameter effect is 3.44 percentage points. This implies that the girls would score 3.34 percentage points higher if the relationship between the resources and the test scores would be similar to that of boys. It therefore, means that while boys and girls in private schools have an equal amount of educational resources, boys are able to take advantage of the resources better than the girls.

In public primary schools, the difference in average mathematics score between boys and girls resulting from a difference in resource endowment is small but significant. On average, girls would score 0.74 percentage points lower if they had the same resources as boys. This means that girls have more/ better resources than the boys. The boys score can therefore, increase if they get more resources to match the resources available to girls. The difference due to the parameter effect is 2.81 percentage points. This implies that the girls would score 2.81 percentage points higher if the relationship between the resources and the test scores would be similar to that of boys. It therefore, means that 1) girls have more access to educational resources than boys and 2) boys are able to take advantage of the resources better than the girls.

The results in both private and public primary schools contradict Golsteyn and Schils (2014) who found that boys perform better since they are exposed to more educational resources and revealed that girls took advantage of their IQ more than the boys. Further, the results here corroborate the evidence by Asadullah and Chaudhury (2009) who concluded that concentration on resource based policies geared towards addition of resources to the disadvantaged group in order to reduce the gender gap may cause a reversal of the gap. In this case, if girls continue receiving more resources in a case where the educational resources to boys and girls are in fact equal or the girls have more resources, the result may be a reversal of the gender gap.

While the analysis can involve the decomposition of the specific resources that explain the gap in test scores between boys and girls, the results from this study provide evidence that such an analysis may not add much value since the resources do not explain the gap. Further the t-test results in tables 2 and 3 show that there are a few significant differences in resources endowment between boys and girls in both private and public primary schools, with girls being more advantaged compared to the boys.

For both public and private primary schools, the unexplained difference between boys and girls mathematics average test score is insignificant. This is the gap due to un-observables.

Table 4: Mathematics test scores in primary schools by gender

	Private primary schools		Public primary schools	
	Boys	**Girls**	**Boys**	**Girls**
Pupils age	-0.0712* (0.0365)	-0.1010* (0.0539)	-0.0608*** (0.0093)	-0.0626*** (0.0093)
Pupil SES (base- low SES)				
Middle SES	5.1414** (2.3990)	2.7706 (2.3188)	0.6360 (0.4934)	0.0977 (0.4161)
High SES	6.0406* (3.2089)	1.7541 (2.9089)	3.7997*** (0.9517)	3.5069*** (0.7526)
Parent's education (base-below secondary education)				
Mothers education	-0.9119 (1.7637)	0.6153 (1.8104)	-1.0020* (0.5393)	1.0451** (0.4463)
Fathers education	-2.3427 (1.8929)	-2.2052 (1.9772)	0.3970 (0.5016)	0.5432 (0.4178)

Parents homework signing: =1 if yes, 0 if no	11.4372*** (2.6301)	8.8175*** (2.7445)	-0.9886** (0.4082)	-0.2319 (0.3381)
Pupil absenteeism	-0.8424*** (0.3071)	-0.1824 (0.2265)	-0.1861*** (0.0675)	-0.2019*** (0.0701)
Class size	0.1317 (0.1174)	-0.1189 (0.1387)	-0.0245* (0.0131)	-0.0419*** (0.0108)
Book-pupil ratio	0.8093** (0.3945)	0.2166 (0.4027)	0.1397 (0.0905)	0.1683** (0.0749)
Number of tuition hours per week	-0.1445 (0.1344)	-0.2035 (0.1303)	0.0195 (0.0298)	0.0531** (0.0241)
Teacher's test score	0.1372 (0.1845)	0.4215** (0.1768)	0.01718 (0.02488)	0.0530** (0.0216)
In-service teacher's training	-1.1096** (0.4537)	-0.4022 (0.5111)	-0.0017 (0.0027)	-0.0052** (0.0024)
Teacher years of professional training	-0.7318 (2.8397)	-10.2796** (5.3335)	-0.3481 (0.2655)	0.4481** (0.2132)

Teacher experience	-0.1997 (0.1366)	0.0223 (0.1518)	-0.0787*** (0.0252)	-0.0228 (0.0211)
Teacher contract; 1 if permanent, 0 if temporary.	2.5826 (2.9307)	-3.2177 (3.2134)	1.7594** (0.7437)	-0.3450 (0.6160)
Living conditions, =1 if good, =0 if poor	1.3931 (4.4899)	23.0822** (9.3536)	0.9081** (0.3931)	0.5498 (0.3341)
Teacher's sex =1 if female, 0 if male	0.2486 (1.9680)	2.0255 (1.7645)	0.6057 (0.4412)	1.3479*** (0.3604)
Head-teacher's sex =1 if female, 0 if male	2.2232 (3.6781)	4.5278 (3.6410)	2.3865*** (0.5682)	1.0440** (0.4607)
School infrastructure condition=1 if good,= 0 if poor	-4.0493 (2.9533)	-9.1765*** (2.9380)	1.9625*** (0.5288)	0.0194 (0.4632)
School location; =1 if urban and 0 if rural	1.4120 (2.5713)	1.8130 (2.3725)	1.8083*** (0.4421)	1.9387*** (0.3814)
Constant	51.7583*** (13.9170)	41.4936*** (14.5400)	60.3755*** (2.6424)	54.9465*** (2.3713)

n	179	152	1,931	1,806
R^2	0.5182	0.4060	0.1045	0.1700

Standard errors in brackets.***, ** , *: significant at 1%, 5% and 10% respectively

Table 5: Decomposed mathematics test scores gender gap

	Boys Predicted score	Girls Predicted score	Total Difference	Endowments	Coefficients	Unexplained Difference
Private school pupils	60.6775*** (0.8398)	56.8976*** (0.7401)	3.7798*** (1.1195)	-0.2426 (0.8710)	3.3441*** (0.9757)	0.6784 (0.8123)
Public school pupils	51.9791*** (0.1951)	49.7190*** (0.1703)	2.2601*** (0.2590)	-0.7361*** (0.1253)	2.8091*** (0.2562)	0.1871 (0.1217)

Standard errors in brackets.***, ** , *: significant at 1%, 5% and 10% respectively

SUMMARY, CONCLUSION AND POLICY IMPLICATION

Empirical evidence show gender disparities in academic achievement in both developed and developing economies. In Kenya, gender gaps are observed in various academic achievement measures including enrolment, test scores and transition to higher levels of education. There have been attempts to close this gap including the introduction of FPE to ensure that primary education is accessible to all. Lucas and Mbithi (2012) concluded that FPE did not close the academic achievement gender gap. The gender gap in mathematics still persists (KNEC, 2018; Wasanga, Ogle and Wambua, 2011).

Since primary education is provided by both the government and the private sector, it is important to estimate academic achievement gender gap in both private and public primary schools and investigate whether the gap is explained by the difference in resource endowment or by the way the resources are utilized. This paper hence uses the Blinder-Oaxaca decomposition to decompose the gender gap in mathematics scores using scores of standard six pupils in Kenya.

The results show that the mathematics score gender gap exists in both public and private schools. Differences in resource endowment in favor of girls explain the gap in public but not in private primary schools. There is an indication of equality in resource allocation between boys and girls in private primary schools. In both school types, boys take better advantage of the resources than the girls. The girls score can thus be improved by better utilization of the resources.

This study shows evidence of gender gaps in both public and private primary schools. Policy makers that include the government and school owners should derive measures of reducing the academic achievement gender gap. While the introduction of FPE by the government in 2003 was a good step towards reducing the academic gender gap by making primary school education accessible to everyone, the finding in this study is that a gender gap still exists and specifically in mathematics where the boys outperform the girls.

The debate around reduction of gender gap is usually around the provision of resources equally to both boys and girls. However, the results in this study show that the gender gaps in academic achievement may not be necessarily explained by resource gaps between boys and girls. The utilization of the resources explain most of the gap. Boys are seen to take more advantage of the available resources as compared to the girls. The girls’ score would therefore, improve by improving utilization of the available educational resources. Addition of school resources without considering how they are utilized may therefore, aggravate the gender gap in academic achievement. It is thus important for the school managers to consider evaluating how girls learn to ensure that they benefit from available resources. The findings also suggest that the government should increase funding in public schools with a focus of improving the boys' scores to deter a reversal of the gender gap in the future.

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