Explaining the Gender Gap in Learning Performance in Sub-Saharan Africa: The Role of Household Tasks

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ABSTRACT

A gender gap in learning performance is often seen in sub-Saharan African countries, with girls underperforming boys. Scholars have explored the sources of this gap, with some proposing household tasks as one such source. They explain that girls' performance is worse because girls engage more in household tasks. Such a claim seems plausible, though it has not been rigorously proven. This study, therefore, examines empirically whether household tasks can explain the gender gap in the learning performance of sub-Saharan African countries through the Oaxaca-Blinder decomposition technique. Our results show little evidence that the difference in household task engagement explains the gender gap in learning performance. Our analytical results suggest that the source of the gender gap exists else where than household tasks, for example, students' age, classroom environment, and maternal support. Our results highlight the need to examine the appropriate sources to resolve the chronic gender gap in sub-Saharan Africa.

Keywords: gender gap, learning performance, household tasks, sub-Saharan Africa, Oaxaca-Blinder decomposition

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Introduction

The gender gap in learning performance is a general concern in many countries, but the gap in sub-Saharan Africa is particularly concerning because, in sub-Saharan Africa, girls underperform boys in all subjects, whereas in most developed countries, girls typically under perform boys in mathematics but outperform them in reading.Data shows that the gender gap, for instance, in Tanzania, is 16points for reading (586 points for boys and 570 points for girls) and 31 points for mathematics (569 points for boys and 538 points for girls); moreover, this gap has widened between 2000 and 2006 (The Southern and Eastern Africa Consortium for Monitoring Educational Quality, 2006). Furthermore, it is assumed that the actual learning gaps are more significant than has been reported, since girls' enrolment rate is often lower than boys' in most sub-Saharan African countries .

Many scholars have explored the source of the gender gap and have identified several possible sources. One of the most plausible sources is differences in behaviour and attitude towards learning. Another source, which has been proven specifically as regards mathematics, is biological differences, where different levels of sex hormones in the brain prompt boys and girls to use different strategies to solve mathematics problems. Teachers can become the source of the gap when they have different expectations of boys and girls or show favouritism towards one gender over the other. School resources such as libraries or halls and classroom environments such as peer interaction can also be a source, as they can exert different influences on learning for boys and girls.

While various sources have been explored to explain the gender gap in learning performance, household tasks have been identified as a unique source in the African context. Interviewed

students and teachers in Kenyan primary schools and reported that household task engagement differed by gender and that teachers perceived the difference in household task engagement as the reason for the learning differences between boys and girls. Surveyed students and found that there is a significant difference in household task engagement between boys and girls and that the extent of the influence of household tasks on academic performance is equal for boys and girls. With these results, they concluded that household tasks are the source of the gender learning gap.

These two important studies have pointed out that engagement difference in household tasks could cause the gender learning gap, although they present limited evidence for such arguments. One used data retrieved from teachers' observations, and the other used two separate estimations that did not involve a direct association between the learning gap and household tasks. Results derived from such indirect data or methodology may produce misleading associations between the gap and the role of household tasks. Moreover, if we attempt to close the gap based on such unconfirmed evidence, these efforts may be ineffective or, in the worst case, even widen the gap.

This study, therefore, empirically examines whether engagement in household tasks is a source of the gender gap in learning performance in sub-Saharan Africa. To do this, we test the association between the gender gap in learning performance and the gender gap in engagement in household tasks by using the Oaxaca-Blinder Decomposition Technique. The next section describes the context of household tasks in sub-Saharan African countries. Then, the methodology section describes the data and the Oaxaca-Blinder decomposition estimation technique. The results section provides a descriptive summary of the variables

included in the estimation and the results of the decomposition analysis. We also run the quantile decomposition to check the robustness of our primary results. Finally, we conclude.

Household tasks in sub-Saharan Africa

Most children engage in some type of tasks at home in sub-Saharan African countries. Generally, girls engage in washing clothes, cooking, cleaning house, fetching water, and babysitting, and boys, specifically in rural areas, engage in farming and herding (Dida, Obae, and Mungai 2014, Chinyoka and Naidu 2014, Guarcello and Rosati 2005). Household tasks are considered a female responsibility in many sub-Saharan African countries; thus, girls are responsible for the vast majority of household tasks (Arora 2015) . Statistics show a sizable gender disparity in engagement in household tasks in the region (31.1 percentage points); moreover, this gap is more significant than in other regions of the world, e.g., Latin America (14.2 percentage points), transitional developed countries (9.8 percentage points), and Asian and Pacific countries (5.5 percentage points) (Blanco 2009) .

Engaging in household tasks can sometimes exert a positive impact on academic performance, such as learning math by counting money when shopping or acquiring language skills when talking with adults. However, it is evident that heavy engagement in household tasks exerts a negative impact on students' academic performance (Jagero 2010, Smith 1990, 1992, Reich et al. 2013, Guarcello and Rosati 2005). Consequently, international law permits children to perform only light work (International Labor Organization 1973) .

Many studies report that girls in sub-Saharan Africa are involved in many household tasks with little time set aside at home for them to

study or do homework. In the case of Kenya that a 10 percent increase in household tasks engagement reduced girls' academic achievement scores by four points on the Kenya Certificate of Secondary Education Examination Juma & Simafwa 2014. According to Juma and Simafwa (2014) girls engagement in household tasks is associated with low attainment.

Methodology

Data

We used at a from the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) III survey, which was conducted for fifteen school systems from fourteen sub-Saharan African countries between 2006 and 2011.In this study, we take six countries that show chronic under performance by girls: Kenya, Malawi, Mozambique, Uganda, Tanzania, and Zambia.

In each country, the survey was conducted with students, teachers, and heads of school. The student survey targets grade six students and measures three cognitive domains: reading, mathematics, and HIV/AIDS knowledge, as well as students' background information. The teacher survey contains teachers' background information, and the school head survey includes head teachers' information as well as school information. The samples were selected using a stratified two-stage design. First, schools were selected based on probability-proportional-to-size (PPS), defined by the SACMEQ Coordinating Centre. The PPS gives large schools a higher probability of selection than smaller schools. Then, twenty-five students from all grade six classes are selected

by computer-generated random numbers in the selected schools. The total student sample size for this study was 22,973, including 11,670 boys and 11,303 girls.

The dependent variables in our study are the mean scores on the cognitive domain tests. To observe repetitive factor influences on student's learning, we examine all three subjects: reading, mathematics and HIV/AIDS knowledge. The scores were standardised across countries to have a mean of 500 and a standard deviation of 100, where we confirmed normal distribution for each test.

Our explanatory variables of interest are household task variables, and we examine fourteen types of household task: looking after younger relatives, looking after elderly relatives, taking care of sick relatives, cooking, house cleaning, sweeping outside the house, washing and ironing clothes, fetching water, chopping firewood, collecting firewood, shopping, gardening/working in the vegetable garden, taking care of livestock, helping in the family business. We use a dichotomous variable for these variables, coding 1 for students who engage in tasks most days and 0 for students who do not engage at all or engage only sometimes.

To account for other possible effects on students' learning, we include control variables which represent student, school and teacher characteristics. For student characteristics, we include six variables: over-age, socioeconomic status, mother's education level, father's education level, the existence of a mother, and the existence of a father. The socioeconomic status variable is an aggregate of thirteen variables regarding household items such as clocks, radios, and TVs. The values are rescaled to have a mean of 0 and a standard deviation of 1. The other variables are included as dichotomous variables. For the parents' education level, we coded 1 for a parent who completed primary school and 0 for a parent who did not complete primary school.

For the school characteristics, we include four variables: school location, school type, school head's education level, and school resources. For the school location variable, we coded1 if the school is located in a large city or a small town and 0 if the school is located in a rural or isolated area. For the school type variable, we coded0for public school and 1 for private school. For the school head's education, we coded1 if he/she completed senior secondary education. The school resources variable is an aggregate of 22 facilities and utility variables such as libraries, halls, staff rooms, and the total value is standardised to have a mean of 0 and a standard deviation of 1.

Last, we include four teacher characteristics variables: teacher's age, education level, teaching experience and classroom resources. For the teacher's age variable, we coded 1 if the teacher is younger than 30 years old. For the teacher's education level, we coded 1 if the teacher completed senior secondary education. For the teaching experience variable, we coded 1 if the teacher has more than ten years of teaching experience. The classroom resource variable includes eight classroom items such as white board, chalk, and bookshelf, and the total value was standardised to have a mean of 0 and a standard deviation of 1.In most countries under study, different teachers teach reading, math and HIV/AIDS; thus, in our estimations, we use the variables for the appropriate teacher of each subject and match to the subject of the dependent variable. A description of the included variables is presented in Table 1.

Oaxaca-Blinder Decomposition

To examine the association between the gender gap in learning performance and the gender gap in characteristics, we use the Oaxaca-Blinder decomposition technique (Blinder 1973, Oaxaca 1973). This technique helps to explain why the distribution of

Table 1: Variables List

	Type	Description	Obs	Mean	S.D.	Min	Max
Dependent Variables							
Reading	Continuous (mean =500, SD=100)	Reading test score	22973	497.77	95.69	63.04	965.69
Math		Math test score	22932	499.53	89.23	11.45	1090.39
HIV/AIDS		HIV/AIDS knowledge test score	22913	514.11	107.08	0.86	1070.05
Explaining Variables							
Household Tasks							
Task1	Dummy (0, 1)	= 1 if student looks after younger relatives	22973	0.187	0.390	0	1
Task2	Dummy (0, 1)	= 1 if student looksafter elderly relatives	22973	0.121	0.326	0	1
Task3	Dummy (0, 1)	= 1 if student takes care of sick relatives	22973	0.144	0.351	0	1
Task4	Dummy (0, 1)	= 1 if student does the cooking	22973	0.305	0.460	0	1
Task5	Dummy (0, 1)	= 1 if student cleans house	22973	0.459	0.498	0	1
Task6	Dummy (0, 1)	= 1 if student sweeps outside the house	22973	0.469	0.499	0	1
Task7	Dummy (0, 1)	= 1 if student washes and irons clothes	22973	0.375	0.484	0	1
Task8	Dummy (0, 1)	= 1 if student fetches water	22973	0.473	0.499	0	1
Task9	Dummy (0, 1)	= 1 if student chops firewood	22973	0.201	0.401	0	1
Task10	Dummy (0, 1)	= 1 if student collects firewood	22973	0.223	0.41	0	1
Task11	Dummy (0, 1)	= 1 if student does the shopping	22973	0.241	0.428	0	1
Task12	Dummy (0, 1)	= 1 if student does gardening/works in the vegetable garden	22973	0.206	0.404	0	1
Task13	Dummy (0, 1)	= 1 if student takes care of livestock	22973	0.162	0.369	0	1
Task14	Dummy (0, 1)	= 1 if student helps in the family business	22973	0.149	0.356	0	1
Student							
Age	Dummy (0, 1)	= 1 if student is over-age for grade 6	22973	0.893	0.308	0	1
SES	Continuous (mean = 0, SD = 1)	Index of student socioeconomic status (aggregation of 13 items of family possession)	22973	-0.013	0.981	-1.649	3.254
Mother's education	Dummy (0, 1)	= 1 if mother has at least a primary education	22973	0.526	0.499	0	1
Father's education	Dummy (0, 1)	= 1 if father has at least a primary education	22823	0.612	0.487	0	1
Mother alive	Dummy (0, 1)	= 1 if mother is alive	22973	0.884	0.319	0	1
Father alive	Dummy (0, 1)	= 1 if father is alive	22973	0.797	0.401	0	1
School							
Location	Dummy (0, 1)	= 1 if school is located in urban area =0 if school is in rural area	22973	0.354	0.478	0	1
Type	Dummy (0, 1)	= 1 if school is private = 0 if school is public	22973	0.086	0.281	0	1
Resources	Continuous (mean = 0, SD = 1)	Index of school resources (aggregated from 22 school facility items)	22598	-0.004	0.965	-1.927	4.907
School head education	Dummy (0, 1)	= 1 if school head has at least a senior secondary education	22598	0.293	0.455	0	1
Teacher							
Reading teacher – Age	Dummy (0, 1)	= 1 if reading teacher is younger than 30 years	22944	0.317	0.465	0	1
Reading teacher – Education	Dummy (0, 1)	= 1 if reading teacher has at least a seniors econdary education	22944	0.223	0.416	0	1
Reading teacher – Experience	Dummy (0, 1)	= 1 if reading teacher has more than 10 years of teaching experience	22973	0.452	0.497	0	1
Reading classroom resources	Continuous (mean = 0, SD = 1)	Index of reading classroom resources (aggregated from 8classroom facility items)	22944	-0.018	0.993	-2.120	1.850
Math teacher – Age	Dummy (0, 1)	= 1 if math teacher is younger than 30 years	22880	0.318	0.465	0	1
Math teacher – Education	Dummy (0, 1)	= 1 if math teacher has at least a senior secondary education	22880	0.220	0.414	0	1
Math teacher – Experience	Dummy (0, 1)	= 1 if math teacher has more than 10 years of teaching experience	22973	0.431	0.495	0	1
Math classroom resources	Continuous (mean = 0, SD = 1)	Index of math classroom resources (aggregated from 8classroom facility items)	22880	-0.015	0.998	-2.135	1.857
Health teacher – Age	Dummy (0, 1)	= 1 if health teacher is younger than 30 years	22838	0.317	0.465	0	1
Health teacher – Education	Dummy (0, 1)	= 1 if health teacher has at least a senior secondary education	22838	0.209	0.407	0	1
Health teacher – Experience	Dummy (0, 1)	= 1 if health teacher has more than 10 years of teaching experience	22973	0.445	0.497	0	1
Health classroom resources	Continuous (mean = 0, SD = 1)	Index of health classroom resources (aggregated from 8classroom facility items)	22838	-0.032	1.010	-2.169	1.839

outcomes between the two groups differs by identifying the attribution of differences in observed characteristics and differences in unobserved characteristics. It also explains the extent to which differences in observed or unobserved characteristics can be attributed to outcome differences.

The decomposition model is based on a model that is linear and where the regression coefficient is different between the two groups.

$$Y_{ig} = X'_i\beta_g + \varepsilon_{ig} \quad \text{where } E\left[\varepsilon_{ig}|X_i, g_i\right] = 0 \quad \text{for } g \in \{0,1\} \quad (1)$$

where Y_{ig} is the student test score outcome indexed by 1, …., N, divided into two exclusive groups denoted by the binary variables g_i, where $g_i = 1$ represents membership in the boys group, and $g_i = 0$ represents membership in the girls group. β_g are the coefficient vectors; X_i is the vector of a set of observed characteristics that are the household tasks and student, school and teacher characteristics; and ε_{ig} is a random error term.

From this function, we know the values of β_0 and β_1 and can thus compute a counterfactual of the following case, "what would the girls' test scores be if girls were in the boys' group." This potential outcome would be different if some were in another group. With the knowledge of counterfactual distribution, we can write the equation for the difference between boys and girls as (2) and rewrite as (3).

$$E[Y_i|g_i = 1] - E[Y_i|g_i = 0] = E[X_i|g_i = 1]\beta_1 - E[X_i|g_i = 0]\beta_0 \quad (2)$$

$$= E[X_i|g_i = 1]\beta_1 - E[X_i|g_i = 0]\beta_1 + E[X_i|g_i = 0]\beta_1 - E[X_i|g_i = 0]\beta_0$$

$$= (E[X_i|g_i = 1]\beta_1 - E[X_i|g_i = 0])\beta_1 + E[X_i|g_i = 0](\beta_1 - \beta_0) \quad (3)$$

The first term in the function (3) represents a component that is attributed to differences in the observed characteristics that is called the explained component. In the current study, this component is the portion of the gender gap in learning that can be explained by the differences in household tasks and student, school, and teacher characteristics. The second term represents a component that is attributed to differences in the return structure of the observed characteristics or other characteristics, which is called the unexplained component. In this study, this component is the portion of the gender gap in learning that is explained by differences in unobserved characteristics and constant terms.

Results

Differences between boys and girls

Table 2 shows values for differences between boys and girls for the included variables, which are calculated by subtracting the mean value for girls from that for boys. The mean values for each gender are omitted due to space constraints. A positive value indicates that

Table 2: Descriptive statistics for differences between boys and girls

	Kenya	Malawi	Mozambique	Tanzania	Uganda	Zambia
Reading	6.012**	10.71***	6.300**	14.47***	4.790**	6.513**
Math	26.99***	10.96***	10.38***	26.49***	9.746***	11.35***
HIV/AIDS Knowledge	14.29***	22.92***	16.04***	8.195**	10.28***	18.37***
Task 1: Looking after younger relatives	-0.0411***	-0.0229	-0.0248	-0.0162*	-0.0264**	-0.0212
Task 2: Looking after elderly relatives	-0.00065	-0.0161	0.0425***	0.0196**	0.00432	-0.00961
Task 3: Taking care of sick relatives	0.0018	-0.0338***	0.0317**	0.0225***	-0.012	-0.0202
Task 4: Cooking	-0.155***	-0.274***	-0.241***	-0.346***	-0.205***	-0.212***
Task 5: House cleaning	-0.206***	-0.191***	-0.0442**	-0.211***	-0.153***	-0.172***
Task 6: Sweeping outside the house	-0.158***	-0.0915***	-0.0394**	-0.0638***	-0.0502***	-0.173***
Task 7: Washing and ironing clothes	-0.0107	0.00226	-0.0434***	0.00637	0.000314	-0.00122
Task 8: Fetching water	-0.0673***	-0.267***	-0.146***	-0.126***	-0.0327**	-0.0373**
Task 9: Chopping firewood	-0.0242**	-0.0665***	-0.0343**	-0.0390***	-0.0289***	0.0995***
Task 10: Collecting firewood	-0.0620***	-0.134***	-0.0336**	-0.0701***	-0.0479***	0.0208
Task 11: Shopping	0.00609	0.00315	-0.0602***	0.0492***	0.0316***	0.0158
Task 12: Gardening/working in vegetable garden	0.0653***	0.0902***	0.0412***	0.0552***	0.0646***	0.0575***
Task 13: Taking care of livestock	0.144***	0.0600***	0.0717***	0.170***	0.0996***	0.0987***
Task14: Helping in family business	0.0148	-0.0344**	0.0375***	0.0285***	0.0287***	0.0304**
Over-age	0.0654***	0.0479***	0.0333***	0.0268***	0.0196**	0.0466***
SES	-0.0427	-0.0245	-0.0478	0.0489*	0.000812	-0.0224
Mother's education	-0.0440***	-0.0156	-0.0293*	-0.0201	-0.0380***	-0.0556***
Father's education	-0.0531***	0.0112	-0.027	0.0198	-0.0227*	-0.0286
Mother alive	-0.00702	-0.00399	-0.0179	0.000852	-0.01	-0.00307
Father alive	-0.0229*	-0.0112	-0.0591***	0.00903	0.0017	0.00769
School location	0.0259*	-0.00908	-0.0339**	-0.00316	-0.0185	-0.0415**
School type	0.0184**	0.0322*	0.00228	0	-0.0118	0.0161*
School resources	0.005	0.00798	-0.0643*	-0.0157	-0.0183	-0.0468
School head education	0.0354**	0.00616*	-0.0101	0.0133	-0.012	0.0104
Reading teacher – Age	0.0347***	0.00845	0.0278*	-0.00094	0.00192	0.027
Reading teacher – Education	0.00586	0.00244	-0.00549	-0.00211	-0.0154	-0.00853
Reading teacher – Experience	-0.0507***	-0.0408**	-0.0175	0.0144	0.00281	-0.00868
Reading classroom resources	-0.014	-0.0163	0.0151	-0.0167	0.00206	-0.0471
Math teacher – Age	0.0162	0.0152	0.0404**	-0.00055	-0.0128	0.0255
Math teacher – Education	-0.0122	0.00754**	0.000405	0.00378	-0.0133	-0.00853
Math teacher – Experience	-0.0127	-0.0332*	-0.0386***	0.0014	-0.00272	-0.00868
Math classroom resources	0.00613	-0.0427	-0.0155	-0.00139	-0.0293	-0.0504
Health teacher – Age	0.0364***	0.00473	0.00413	-0.00588	0.00218	0.0255
Health teacher – Education	0.0158	0	0.0104	0.00324	-0.0142	-0.00853
Health teacher – Experience	-0.0445***	-0.0294*	-0.0135	0.00667	0.00607	-0.00868
Health classroom resources	0.0196	-0.00997	-0.0646*	-0.0282	-0.0411	-0.0571

Note: Results are weighted. *p<.1, **p<.05, ***p<.0

the value for boys is higher than that for girls, and a negative value indicates the opposite.

Table 2 also shows that the boys' scores are generally statistically significantly higher than those of girls in all subjects in all countries. The differences are particularly large in math and HIV/AIDS knowledge, with a maximum gap of 26and 22 points, respectively. Kenya, Malawi, and Tanzania show a large gap, while Mozambique and Uganda show a relatively small one.

Regarding household task variables, the table shows that the differences are not a blein most tasks. In particular, differences for the tasks of cooking (Task 4) and cleaning house (Task 5), sweeping outside the house (Task 6), and fetching water (Task 8) are large, with maximum gaps of 0.3, 0.2, and 0.1, and are statistically significant in all countries. The differences for the tasks of gardening/working in the vegetable garden (Task 12) and taking care of livestock (Task 13) are also clear and statistically significant in all countries. The differences for Tasks 4, 5, 6, and 7 are positive, indicating that girls engage in these tasks more than boys, whereas the differences in Tasks12 and 13 are negative, which indicates that boys engage in these tasks more than girls.

All six countries have a considerable gender gap in many of the 14 household task variables. The differences are particularly notable in Tanzania, where 13 of 14 tasks exhibit statistically significant differences. Uganda and Malawi are significantly differences for 11 tasks, and Zambia, Kenya, and Mozambique for10, 9, and 8 tasks, respectively.

Regarding the student characteristics variables, the table shows that the sample countries have similar student characteristics. All sampled countries exhibit a clear gender difference in student age,

with male students being older than female students on average. Four countries, Kenya, Mozambique, Uganda, and Zambia, show a difference in the mother's and father's education, with girls' parents having higher education levels. Tanzania shows a gender gap in socioeconomic status, with girls originating from wealthier families. The results of these two variables indicate that only girls who have a fortunate family background are likely to attend school. Among the sample countries, Kenya in particular shows a clear gender gap in student characteristics, with four of the six variables demonstrating statistical significance. The table shows that the sample countries have various school characteristics as well. In Mozambique and Zambia, schools that girls attend are more likely to be in urban areas, and in Kenya, Malawi, and Zambia, boys are more likely to attend private schools. Among the sample countries, Kenya again has the most explicit gender gap in school characteristics, with three of four variables showing statistical significance. Not all sampled countries have a critical gender gap for teacher characteristics, however. The only difference is teacher experience: in Kenya, Malawi, and Mozambique, girls' teachers are likely to have more experience than boys' teachers.

Decomposition Results

Tables 3-1, 3-2, and 3-3 show the results of the decomposition estimation for reading, mathematics, and HIV/AIDS knowledge, respectively. The first part of each table shows the mean test score for boys (B), the mean test score for girls (G), the score difference between boys and girls (B-G), the decomposed value of the explained component (Q), and the decomposed value of the unexplained component(U).The second part shows the breakdown of explained and unexplained components, which consist of household task (QH, UH), student (QP, UP), school (QS, US), and teacher (QT, UT) characteristics. The robust standard errors are omitted due to space constraints. For the components and characteristics, a positive value suggests that the difference is

positively related to the learning gap, or in other words, it contributes to explaining the gender gap in learning. This indicates that, if the difference in the components or characteristics narrows, the learning gap also narrows. By contrast, a negative value indicates that the difference is negatively related to the gap, so that reducing the difference in the component widens the learning gap.

Analysing the estimation results of the explained components (Q), they indicate that the differences in the observed characteristics contribute little to explaining the gender learning gaps and the results are quite homogeneous among countries and subjects. For reading, in Kenya, the explained component accounts for 0.2 points out of the 5.8-point learning gap, which is equivalent to 4 percent. Most of the gap (97 percent) is attributed to the unexplained component (U) that is due to the differences in unobserved characteristics. In addition, the explained component is statistically insignificant, and the unexplained portion is significant. In the other five countries, the explained components show negative values and the unexplained components show positive values that exceed the learning gap value. This means that the unexplained portions account for the entire learning gap.

In relation to math, in Kenya, Mozambique and Tanzania, the explained components represent approximately 5 to 7 percent of the learning gap but are statistically insignificant. Most of the gap is attributed to the unexplained portion. In Uganda and Zambia, the explained components show negative values and are statistically insignificant, while the unexplained components show positive and significant values that exceed the learning gap. Malawi is an exception, where the explained component accounts for 30 percent of the gap (3.2 out of 10.9 points). However, the majority of the gap (70 percent)is explained by the unexplained component.

For the HIV/AIDS knowledge test, in Kenya and Malawi, the explained components represent 6 and 15 percent of the learning gap, respectively, but are statistically insignificant. The unexplained components account for most of the learning gap. For the other four countries, the explained components are statistically insignificant and show negative values, whereas the unexplained portion accounts for the entire gap.

The breakdown of the explained component indicates that the household task characteristics (QH) do not have a good explanation power for the learning gap in most countries and subjects. For reading, in Kenya, Mozambique and Uganda, the characteristics of household tasks represent 12, 20 and 13 percent of the respective learning gaps, but the values are statistically insignificant. In relation to math, in Kenya, Mozambique, Tanzania, and Uganda, the household task characteristics represent approximately 2 to 15 percent of the learning gaps, but they are all statistically insignificant. Malawi is the only country where household tasks statistically explain a portion of the learning gap, contributing30 percent of the gap (3.2 out of 10.9 points). For HIV/AIDS knowledge, in Kenya, Malawi and Uganda, the differences in household task characteristics represent small portions of the leaning gap, but they are all statistically insignificant. Regarding the other observed characteristics, student characteristics (QP) and school characteristics (QS) account for a portion of the learning gap. In Kenya, school characteristics account for 27, 6, and 11 percent of the gap in reading, math and HIV/AIDS knowledge, respectively. With regard to Zambia's HIV/AIDS knowledge test, school characteristics explain 12 percent of the learning gap. With regard to Tanzania's math and HIV/AIDS knowledge test, student characteristics account for 3 and 13 percent of the learning gap, respectively.

Table 3-1: Oaxaca-Blinder Decomposition: Reading test

	Kenya	Malawi	Mozambique	Tanzania	Uganda	Zambia
Boy (B)	551.5***	438.3***	481.1***	588.1***	481.1***	435.4***
Girl (G)	545.7***	427.5***	474.7***	573.4***	476.3***	430.4***
Difference (B-G)	5.887*	10.77***	6.398**	14.76***	4.827**	5.067*
Explained Component(Q)	0.271	-1.813	-0.885	-1.841	-1.338	-4.486**
Unexplained Component (U)	5.616*	12.58***	7.283**	16.60***	6.165***	9.553***
Breakdown of Explained Component(Q)						
Household Tasks (QH)	0.812	-1.057	1.280	-2.512	0.613	-3.177**
Student (QP)	-2.659***	-0.797*	-1.252**	0.641	-0.719**	-1.423**
School (QS)	1.637*	0.137	-0.848**	0.206	-1.227	0.287
Teacher (QT)	0.481	-0.0958	-0.0641	-0.176	-0.00550	-0.174
Breakdown of Unexplained Component (U)						
Household Tasks (UH)	-2.409	1.964	3.230	12.77***	0.748	2.770
Student (UP)	-8.289	3.169	4.032	8.958	26.88***	16.39
School (US)	2.888	-1.977	3.271	0.0748	2.387	3.816
Teacher (UT)	0.111	-3.990	-0.430	-0.708	6.814**	-0.911

Note: *p<.1, **p<.05, ***p<.01, Boys' returns as counterfactual

Table3-2: Oaxaca-Blinder Decomposition: Math test

	Kenya	Malawi	Mozambique	Tanzania	Uganda	Zambia
Boy (B)	576.0***	452.7***	489.8***	568.3***	484.8***	439.5***
Girl (G)	549.0***	441.8***	479.6***	542.0***	474.8***	429.1***
Difference (B-G)	27.05***	10.96***	10.16***	26.28***	9.971***	10.44***
Explained Component(Q)	1.461	3.268*	0.718	1.830	-0.776	-1.724
Unexplained Component (U)	25.59***	7.689**	9.447***	24.45***	10.75***	12.16***
Breakdown of Explained Component (Q)						
Household Tasks (QH)	1.654	3.257*	1.561	0.616	0.544	-0.766
Student (QP)	-2.142***	-0.110	-0.548	0.969*	-0.443	-0.683
School (QS)	1.886**	0.230	-0.230	0.214	-0.915	-0.0349
Teacher (QT)	0.0627	-0.109	-0.0653	0.0308	0.0384	-0.241
Breakdown of Unexplained Component (U)						
Household Tasks (UH)	-5.931*	-3.874	11.54***	10.88**	-1.441	-0.525
Student (UP)	-19.54*	4.837	9.754	5.086	14.59	20.67*
School (US)	5.278*	-0.248	7.549*	-1.517	6.928**	5.778**
Teacher (UT)	-8.807	0.928	-2.373	6.445	-8.133**	1.105

Note: *p<.1, **p<.05, ***p<.01, Boys' returns as counterfactual.

Table 3-3: Oaxaca-Blinder Decomposition: HIV/AIDS knowledge test

	Kenya	Malawi	Mozambique	Tanzania	Uganda	Zambia
Boy (B)	522.3***	519.7***	514.5***	581.9***	493.2***	499.3***
Girl (G)	508.1***	496.6***	497.6***	573.4***	482.9***	482.4***
Difference (B-G)	14.18***	23.03***	16.85***	8.472**	10.30***	16.85***
Explained Component (Q)	0.890	3.484	-3.176	-0.424	-0.0194	-2.984
Unexplained Component (U)	13.29***	19.55***	20.03***	8.896**	10.32***	19.83***
Breakdown of Explained Component (Q)						
Household Tasks (QH)	0.700	2.973	-2.040	-1.943	0.783	-4.519**
Student (QP)	-1.464***	-0.169	-0.402	1.120*	-0.131	-0.414
School (QS)	1.634**	0.343	-0.369	0.362	-0.882	2.137**
Teacher (QT)	0.0198	0.336	-0.365	0.0370	0.210	-0.188
Total (Q)	0.890	3.484	-3.176	-0.424	-0.0194	-2.984
Breakdown of Unexplained Component (U)						
Household Tasks (UH)	-0.663	-14.73**	3.047	5.237	4.364	-2.414
Student (UP)	-7.395	10.08	3.971	2.349	16.31	17.97
School (US)	4.474	12.26**	8.048	0.924	3.557	-7.335*
Teacher (UT)	8.853	-8.656	-2.289	-1.633	2.511	-3.001
Total (U)	13.29***	19.55***	20.03***	8.896**	10.32***	19.83***

Note: *p<.1, **p<.05, ***p<.01, Boys' returns as counterfactual.

Robustness Check: Quantile Decomposition

To check the robustness of the previous findings, we run the decomposition by quantiles. There is a possibility that the association with household task characteristics varies based on students' performance levels. For instance, differences in household task engagement are strongly associated with the gender learning gap for poorly performing students but not for high performing students. The analysis using mean scores potentially undermines a critical association for groups at a particular performance level or balances the positive and negative associations among the groups.

To estimate the quantile decomposition, we follow , which enables us to estimate the impact of a change in the distribution of the observed characteristics on quantiles of the unconditional (marginal) distribution of learning performance. In this study, we examine five quantiles at the bottom 5th, 25th, 50th, 75th, and 95th which is the top 5th percentile. Figures 1-1, 1-2 and 1-3show the results for the quantile decomposition. The analysis of the detailed decomposition is available from the authors on request.

The figures show that the gender gap in learning performance is divergent across the quantiles for all countries. For reading, Kenya, Malawi, Mozambique, Tanzania, and Uganda have the largest gap at the 95th quantile at approximately 10 points. In Kenya, Malawi and Mozambique, the gap becomes larger for the groups with better scores. In Zambia, the largest gap is found in the group with the lowest score.

Regarding math, Malawi, Mozambique, Uganda, and Zambia have the largest gap at the 95th quantile at approximately 30 points. Malawi and Mozambique also have a relatively large gap

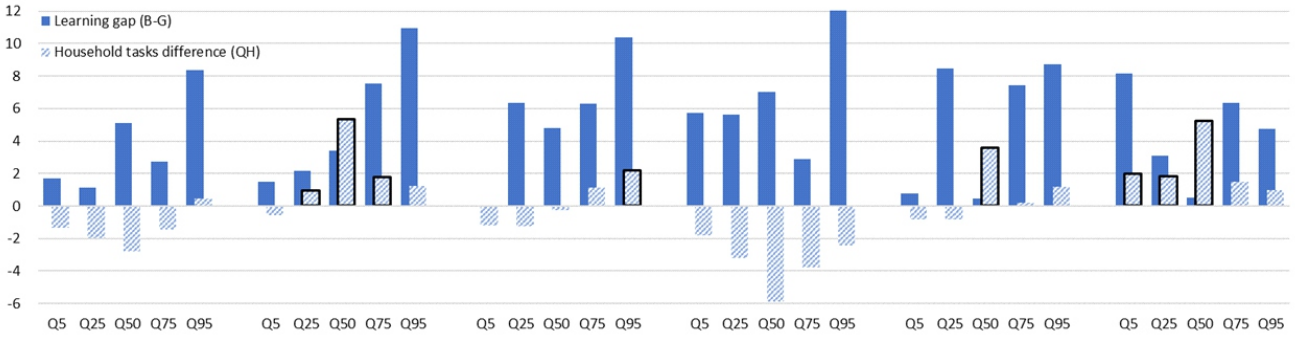
at the 5th quantile with 21 and 15 points, respectively. In Uganda and Zambia, the gap becomes larger for the group with a better score. In Kenya and Tanzania, the gaps are mostly constant across the quantiles with a slightly smaller gap at the 5th quantile.

In relation to HIV/AIDS knowledge, the gaps are more even across the quantiles than those for reading and math. In Kenya, Malawi, and Mozambique, the largest gap is found at the 95th quantile with 13, 15, and 18 points, respectively. In Tanzania, Uganda and Zambia, the largest gap is at the 25th quantile with 16, 13, and 12 points, respectively.

Regarding the contribution of the characteristics of household tasks to the gender learning gap, the results indicate that the contributions are very limited, as the previous findings showed with regard to the mean score. For reading, in Kenya and Tanzania, the household task characteristics do not explain the learning gap at any quantile. In Malawi, the household task characteristics explain the learning gap at three quantiles. At the 50th quantile, they explain the entire learning gap, but at the 25th and 75th quantiles, they explain only part of the learning gap. At the 95th quantile, which has the largest gap, household task characteristics do not statistically explain any portion of the gap. In Zambia, household task characteristics partially explain the learning gap at the 5th, 25th, and 50th quantiles but not at the upper two quantiles. In Mozambique and Uganda, the characteristics of household tasks explain the gender gap only at one quantile, the 95th and 50th, respectively, and not at other quantiles.

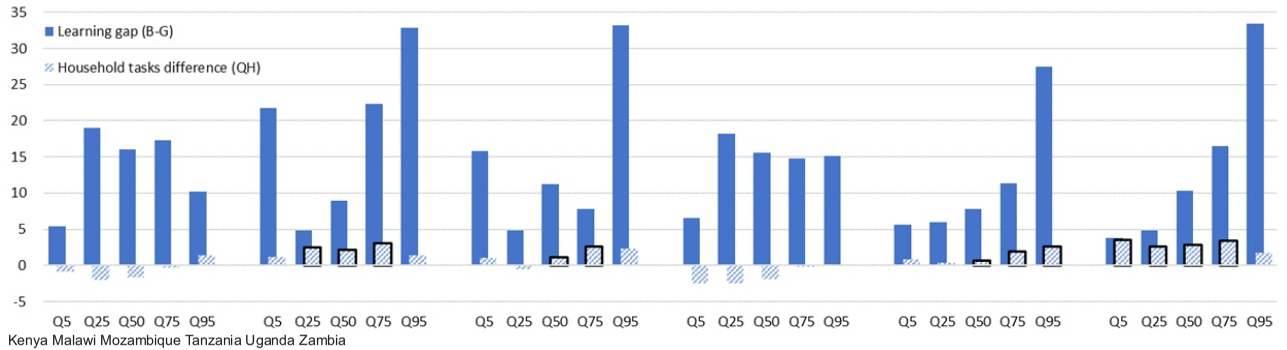
For math, in Kenya and Tanzania, the household task characteristics do not explain the learning gap at any quantiles. In Malawi, Mozambique and Uganda, household tasks explain the

Table 1-1: Quantile Decomposition: Reading



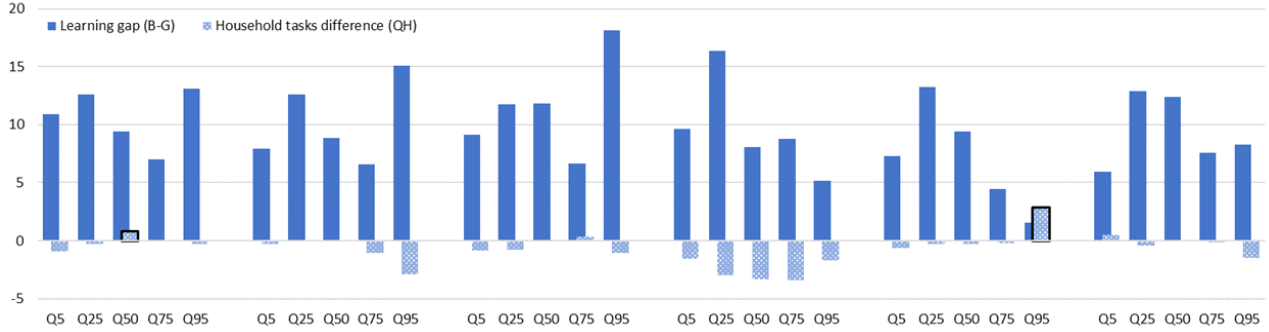
Note: For the household tasks difference (QH), the bars with a frame border have statistical significance.

Table 1-2: Quantile Decomposition: Mathematics



Note: For the household tasks difference (QH), the bars with a frame border have statistical significance.

Table 1-3: Quantile Decomposition: HIV/AIDS Knowledge



Kenya Malawi Mozambique Tanzania Uganda Zambia

Note: For the household tasks difference (QH), the bars with a frame border have statistical significance.

learning gap at a few quantiles, but they are minimal considering the whole gaps. In Zambia,household task characteristics explain a large portion of the learning gap at the lowest and 25th quantiles but only a very partial or small portion of the gap at the upper quantiles. For HIV/AIDS knowledge, in Kenya and Uganda, household tasks explain the gap at one quantile, the 50th and 95th, respectively, but not at other quantiles. In other countries, none of the gaps are explained by the characteristics of household tasks.

Discussion and Conclusions

This study aimed to examine whether the differences in household tasks between boys and girls can be a source of the gender gap in learning performance in sub-Saharan African countries. Based on this aim, we used the Oaxaca-Blinder decomposition technique for six countries in sub-Saharan Africa and three cognitive test scores including reading, math and HIV/AID knowledge. We first decomposed the learning gap into a portion that can be explained by the difference in the observed characteristics and a portion that is due to unobserved characteristics. The observed characteristics included household task characteristics as our variable of interest and student, school and teacher characteristics as control variables.

The decomposition results indicated that the difference in the observed characteristics explained very little of the gender learning gap, most of which is due to the unobserved characteristics. It suggests that the difference in household task engagement is not the primary source of the gender learning gap. The only exception was the math test in Malawi, where the difference in household task engagement explained 30 percent of the learning gap.

To check the robustness of the mean score results, we further estimated the decomposition at five quantiles in the test score

distribution. The quantile decomposition confirmed the main result that the contribution of household task characteristics to the learning gap was very limited and could not be the main source of the gap. The limited contribution was with regard to reading and math in Malawi at the middle quantiles, in Mozambique and Uganda at the middle and upper quantiles, and in Zambia at the lower and middle quantiles. For these quantiles and countries, some portions of the learning gap could be narrowed by equalising the engagement in household tasks between boys and girls, but the majority of the gap remained.

The findings of this study suggest the need to explore the sources of gender learning gaps in areas other than household tasks. The first area that we consider is student age. Our current results showed that male students are, on average, older than female students. In the current study, we used the age variable as a dichotomous variable (whether the student is six years old or not), but the actual age value may explain the gap. The second area is the classroom environment. Previous literature has shown that an atmosphere of male dominance in the classroom can affect girls' learning attainment. In many sub-Saharan African countries, male-dominant culture is present in various aspects of school life, which could be a source for the gender learning gap. The final area is the mother's expectations or support for the student. Our descriptive analysis showed that the mother's education level differs between boys and girls, with girls' mothers having a higher education level. This finding indicates that only girls whose mothers acknowledge the importance of female education are able to attend school, but it also implies that the mother's support for her children at home may differ for boys and girls.

Although our study has determined that the difference in household task engagement is not the primary source of the

learning gap, there are at least two limitations that can be addressed in future research. First, we examined the household tasks that are most commonly performed or generally reported in sub-Saharan Africa but may not have captured all the household tasks in which children engage. Second, we used the quantified measurement for the household task burden by counting the types of tasks but could include qualified measurements such as engagement time or levels of physical tiredness from each task. Despite these limitations, the current findings contribute to the debate about closing the gender gap and achieving equal educational opportunities for boys and girls in sub-Saharan Africa.

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