Average and Quantile Decomposition:

the Gender Gap in Student Performance and the Household Tasks in

Mozambique

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Abstract: Gender gap of student performance is one of the remaining challenge in Mozambique. This study shed light on the role of household tasks in gender gap of student performance and examine whether the gender gap comes as a result of difference in engaging household tasks. We employ the decomposition techniques with the SACMEQ III data for 3360 pupils in Mozambique. Our result by mean and quantile decomposition analysis shows that there is little evidence that the difference of household tasks engagement is the source of gender gap in performance. Though in certain condition, we find that tasks of gardening, taking care of livestock and fetching water may be a factor which causes the gender gap. We also find that the gender gap of student performance varies across the distribution.

Keywords: Gender Gap, Mozambique, Household Tasks

1. Introduction

The gender gap in student performance with girls' disadvantage is a remaining challenge in Mozambique after access disparity has made great improvement since the Education for All (EFA).[1] The net enrollment gap between boys and girls has narrowed from 12% to 5% between 2000 and 2012.[2] However, the test scores shows that the difference in reading scores between boys and girls had widen from 4 points to 5 points between 2000 and 2007, keeping girls' score behind (SACMEQ, 2007).[3] In the math test, the gap was narrowed from 18 points in 2000 to 10 points in 2007, however girls' score remains much lower than boys. The score gap is particularly large in the Northern rural area, such Cabo Delgado, Niassa, Sofala, and Tete, which is the farthest from the capital of Maputo (Passos, Nahara, & Magaia, 2012).

While several factors are examined as a cause of gender gap, involvement in household tasks is one of them. Indeed, in developing countries, it is generally reported that girls are tend to engage more in unpaid work within household than boys. Particularly in the less developed regions, young girls, aged 5-14, tend to engage heavy amount of household tasks, such as cooking, cleaning and care-giving (UN, 2010).

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[1] The goal 5 in the Education for All (EFA) aims to eliminate gender disparities in primary and secondary education by 2015.

[2] The net enrollment in 2000 was 49% for boys and 61% for girls, and they improved to 88% and 83% in 2007 respectively

[3] The reading scores in 2000 were 518 for boys and 514 for girls, and in 2007 fell to 478 and 473 points respectively. Math scores in 2000 were 537 for boys and 519 for girls, while in 2007 it became 488 and 478 points respectively.

In this study, we focus on the role of household tasks on gender gap of student performance in Mozambique. Drawing on the data of SACMEQ III for 3360 pupils in three proficiency tests of reading, math and HIV/AIDS knowledge, we use mean and quantile decomposition techniques to see whether the gap comes as a result of difference in household tasks to greater or lesser extent. We find that there is little evidence that the difference of household tasks is a source of gender gap in Mozambique. Though in certain condition, we find that tasks of gardening, taking care of livestock and fetching water may be a factor which causes the gender gap. We also find that the gender gap of student performance varies across the distribution.

This study is laid out as follows: Chapter 2 provides background information about government's effort for gender gap in Mozambique and reviews past studies. Chapter 3 describes the data and methodology. Chapter 4 presents the summary statistics, the result of mean and qunatile decomposition, while Chapter 5 concludes.

2. Background and Literature Review

Mozambican government has identified the issue of gender gap in student performance and addressed systematical efforts for the gender parity. In 2006, the Cabinet approved the Gender Policy, and established gender units along with appointed gender focal points in all sectors at central, provincial and district levels. Within the context of education sector, the National Education Policy contains specific guidelines for gender issues, such as school environment, social awareness, alternative system for girls' education, and increasing female teachers. More specifically, in the Basic Education General Regulation (REGEB) sets the guidelines for positive discrimination for girls in order to achieve parity in enrolment and retention.

Nevertheless of these efforts by the government, the gender gap still remains in student performance, and it also appears in different forms after schooling age. The literacy rate for youth is 79% for boys and 56 % for girls (UNESCO Institute for Statistics, 2009). The unemployment rate for young labor force is 13.9% for boys and 14.6% for girls (ILO, 2013). One of the important health indicators, prevalence rate of the HIV/AIDS, shows that there is a serious gap of 4 percent between boys and girls, facing girls to be more vulnerable to health issues (UNAIDS, 2013).

While the background of gender gap is not unanimously described by countries, particularly in developed countries and developing countries, the reason for that are also explored in different areas of study. In developed countries, it is generally said that in math boy scores higher than girls, and in reading girl scores higher than boys (Hedges & Nowell, 1995; Goldin, Katz, Kuziemko and Perspect, 2000, etc.). In developing countries, however, this is not the case and often found the girl's overall inferior like Mozambique. To find the reason of gender gap on student performance in Mozambique, it is necessary to investigate a

perspective peculiar to developing countries.

The studies which examined samples in developed country have found the reasons in biological factors and physiological factors. The scholars in biology study, such as Geary, Saults, Liu and Hoard (2000), Hedges & Nowell (1995), Baron-Cohen (2003), and Kimura (1992, 1999), have found that biological difference between male and female in brain structure or sex hormones relates to student performance. Among psychologists, on the other hand, Carr and Jessup (1997) and Gurian and Ballew (2003) have concluded that there is a difference in learning strategy between boys and girls, and the difference approach would affect performance gap between them.

On the other hand, the studies which examined developing country typically identify the reasons of social and cultural factors on performance difference. The popular theory in social science is the Bourdieu's capital theory, which explain the source of the gap in the level of children's capital inherited from family or society. However, instead of using capital perspective the studies which examined the girl's education in developing countries look for the source in negative capital, or debt capital, which children own from family or society, such as gender-unequal culture (Guiso, Monte, Sapienza, & Zingales, 2008), gender-bias environment (Miglani, 1990; Spelke, 2005) and home environment factors (Fullarton, 2004; Howie, 2005; Weiss & Krappmann, 1993).

Among the social and cultural perspective, the engagement in household tasks is one of the specific issues particular to developing country. Many studies found evidence that engagement in household tasks have a negative impact on student's academic performance (Bezerra, Kassouf, & Arends-kuenning, 2009; Jagero, Agak, & Ayodo, 2010; Smith, 1990, 1992). However, despite of the fact that girls involve more tasks than boys (UN, 2010), these findings are not necessary to explain that the household tasks is the source of gender gap. While girls involve in household tasks, boys may have different kinds of burden such as working outside of house or engagement of community service.

Other studies investigated the influence of household tasks on girls' academic performance. They have overall concluded that there is a negative impact of household tasks on girls' academic performance (Achoka, Nafula, & Oyoo, 2013; Chinyoka & Naidu, 2014; Juma & Simatwa, 2014). However, these studies take samples of only girls pupils, it is not taken account for the level of boys' engagement.

The studies by Omenge and Nasongo (2010) compare the effect of household tasks, using data of mixed-day secondary school in Kenya with 119 boys and 100 girls. They found overall negative linkage between students' engagement in household tasks and low academic performance, but direction and degree of the relationship were almost the same for both gender. In the case of primary school in Kenya with samples of 217 students, Dida, Obae and Mungai (2014) concluded that girls are more involved in household tasks than boys, and therefore gender role have an impact on the pupil's academic performance. These two studies

examines both boys and girls samples. However, they merely compare the relationship between engagement of household tasks and academic performance by gender, and not discussed whether it is the source of the gender gap. To assess the role of household tasks on gender gap in performance, it is necessary to hypothesize a counterfactual scenario where girls are involved in the same level as boys.

3. Method

3-1 Data

This study employs data from the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) III conducted in 2007 in Mozambique.[4] It is a large-scale regional assessment of academic performance in Southern and Eastern Africa. In 2007, the SACMEQ assessed students' cognitive domain of reading, mathematics and HIV/AIDS knowledge for grade 6 pupils. The test scores are standardized across countries to have a mean of 500 and a standard deviation of 100, and normal distribution is confirmed in each competency. The student questionnaire also allows us to construct student background such as socio-economic and cultural background, school life, and classrooms condition. Questionnaire to school heads provides information about school level such as school facilities, school management and school types, and questionnaire to teachers give us information about teacher and class level. Samples are selected by a stratified two-stage sampling design. In the first stage, schools are selected based on a probability-proportional-to-size (PPS) basis which was defined by the SACMEQ Coordinating Centre. The PPS technique allows large schools to have higher probability to be selected than smaller schools. In the second stage, twenty five learners are selected from all grade 6 classes in selected schools by using computer-generated random numbers. Through this process, total sample size become 3360 pupils from 183 schools, consisted of 1780 boys and 1580 girls.

Our interest variables of household tasks as an independent variable are consisted of 14 types of household tasks collected in the student questionnaire. Information is asked by means of questions: "How often do you do the following household tasks in the place (home) where you stay during the school week?" Students are given three choices for each question; Never, Some days and Most days. In present study, engagement in household tasks is measured as dichotomous variable with students who "Never" do are coded as 0, while students who engage in "Some days" and "Most days" are coded as 1. To control other possible effect, the variables of student, school, and teacher characteristics as well as province dummy are also included. The description of included variables are presented in the appendix Table A1.

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[4] In SACMEQ III survey, 15 schooling systems from 14 countries in the Southern and Eastern Africa participated in the test.

3-2 Decomposition Estimation

To assess the role of household tasks on student performance, we adopt the Oaxaca-Blinder decomposition method (Blinder, 1973; Oaxaca, 1973). This method allows us to explain the extent to which gender gap may be explained by difference in engagement in household tasks, with remaining gap due to different some other characteristic. Equation is as following;

$$\bar{Y}_m - \bar{Y}_f = \alpha_m \underbrace{(\bar{X}_m - \bar{X}_f)}_{(\text{i})} + \underbrace{\bar{X}_f(\alpha_m - \alpha_f)}_{(\text{ii})} \quad (1)$$

where $\bar{Y}_m$ and $\bar{Y}_f$ represents average test scores for boys and girls respectively, $\bar{X}_m$ and $\bar{X}_f$ is a vector of average values of observed characteristics about student, school, and teacher which are obtained from the questionnaire. α_m and α_f are rectors of parameters, which can be estimated by the standard OLS regression. Term (i) is referred to as explained term, which is contribution of difference of characteristics between boys and girls. Term (ii) is referred to as unexplained term, which is the contribution of differences in return to other characteristics and constant terms.

In this study, we are also interested in decomposing the gender gap at various points of score distribution, and employ one of the quantile decomposition techniques developed by the Firpo, Fortin, & Lemieux (2009). In this method, overall difference of θth quantile of test scores is estimated as following equation (2).

$$Q_\theta(Y_m) - Q_\theta(Y_f) = \underbrace{\beta_{\theta m}(\bar{X}_m - \bar{X}_f)}_{(\text{i})} + \underbrace{\bar{X}_f(\alpha_m - \alpha_{fj})}_{(\text{ii})} \quad (2)$$

where $Q_\theta(Y_m)$ and $Q_\theta(Y_f)$ represents θth quantile values of test scores for boys and girls respectively, $\beta_{\theta m}$ and $\beta_{\theta f}$ are parameters, which can be estimated by the re-centered influence function regression.

4. Results and Discussion

4-1 Descriptive Summary

Table 1 shows the summary statistics by gender as well as the statistical test result of difference. In all subjects, boys have significantly higher mean score than girls. The largest gap is found in the score of HIV/AIDS knowledge by 16 points, following in math by 10 points and reading by 6 points. It also shows that there is a clear difference in composition of household tasks between boys and girls with statistically significant difference of engagement level. Girls are significantly more likely to engage in cooking, fetching water, shopping, house cleaning and washing/ironing clothes, while boys are more likely to involve in taking

care of livestock, helping family business, looking after elderly relatives, taking care of sick family, and gardening. The difference are also found with no statistical significant that girls are involved in collecting fire wood and looking after younger relatives involve more girls, and boys are involved in chopping fire wood,.

The composition of other characteristics show less difference between boys and girls. The composition of student characteristics shows that girls are significantly more likely to be overage and come from household with higher SES. Regarding the number of siblings, it indicates that students are more likely to have more than 3 siblings with the same sex. The parent's education does not show statistically difference by gender. At the school level, girls tend to attend school with a higher ratio of girls. And, boys are more likely to attend schools in rural area. For the teacher characteristics, it reports that girls are more likely to have female reading teacher and older math teacher.

Table1: Descriptive Statistics by Gender

	Boys		Girls		Difference
	mean	sd	mean	sd	
Test Scores:					
Reading	478.4476	73.56117	473.1831	76.44232	6.300*
Math	488.1805	69.25599	478.6082	72.76461	10.38***
HIV/AIDS knowledge	514.4465	111.2971	498.1395	116.0039	16.04***
Household Tasks					
Task 1: Look after younger relatives	0.7600331	0.427183	0.7719255	0.4197237	-0.0148
Task 2: Looking after elderly relatives	0.5318797	0.4991229	0.4539319	0.4980308	0.0676***
Task 3: Taking care of sick family members and relatives	0.6177234	0.4860802	0.5516233	0.4974854	0.0574***
Task 4: Cooking	0.7141573	0.4519418	0.9001947	0.2998351	-0.192***
Task 5: House cleaning	0.8951129	0.306494	0.9222244	0.267903	-0.0371***
Task 6: Sweeping outside the house	0.888584	0.314735	0.9131479	0.2817074	-0.0335**
Task 7: Washing and ironing clothes	0.8010887	0.3992934	0.828522	0.3770455	-0.0306*
Task 8: Fetching water	0.7227438	0.4477699	0.798961	0.400904	-0.0862***
Task 9: Chopping fire wood	0.5911679	0.4917563	0.5319265	0.4991376	0.0262
Task10: Collecting fire wood	0.581043	0.493527	0.5815905	0.4934543	-0.0211
Task11: Shopping	0.7736227	0.4186037	0.7975988	0.4019169	-0.0384**
Task12: Gardening/working in vegetable garden	0.5922431	0.4915556	0.5330517	0.4990643	0.0499**
Task13 :Take care of livestock	0.3211978	0.4670678	0.2125372	0.4092324	0.103***
Task14: Helping in a family business	0.5928382	0.4914435	0.5296379	0.4992788	0.0597***
Student Characteristics					
Age	0.5264596	0.4994397	0.4344512	0.4958417	0.0899***
Mother Education	0.2302241	0.4210945	0.2460086	0.43082	-0.00617
Father Education	0.3665313	0.4819924	0.396959	0.4894223	-0.0223
Student SES	-0.1185631	0.9822995	0.0283486	0.9811019	-0.106**
Brother	0.4415622	0.4967128	0.3702104	0.4830138	0.0733***
Sister	0.3590928	0.4798693	0.4284537	0.4950113	-0.0696***
Repeat	0.5917483	0.4916483	0.6010214	0.4898434	0.00128
Language	0.9125678	0.2825468	0.9337057	0.2488747	-0.00861
Book	0.1606556	0.3673162	0.1469959	0.3542139	0.0145
Homework	0.5910324	0.4917814	0.5819161	0.4934003	0.0107
School Characteristics					
School Head Female	0.2188968	0.4136177	0.2292777	0.4205029	-0.0068
School type	0.0287852	0.1672493	0.0285524	0.1665974	0.00228
Ratio of girls	0.299666	0.4582404	0.3911021	0.4881517	-0.0687***
Rural area	0.3629766	0.4809933	0.3137696	0.4641709	0.0352*
Small town	0.2693829	0.4437639	0.259795	0.4386609	0.00386
Teacher Characteristics					
Reaching Teacher – Female	0.3594688	0.4799796	0.4155547	0.4929734	-0.0547**
Reading Teacher – Age	0.3705107	0.4830773	0.3851097	0.4867753	-0.0219
Reading Teacher – Experienced	0.3184693	0.4660135	0.345309	0.4756195	-0.0213

Math Teacher – Female	0.2718667	0.4450466	0.3054494	0.4607433	-0.0248
Math Teacher – Age	0.3789449	0.4852607	0.4092735	0.4918555	-0.0337*
Math Teacher – Experienced	0.386744	0.4871411	0.3849187	0.4867301	0.0138
Health Teacher – Female	0.2896765	0.4537403	0.3270937	0.469301	-0.0285
Health Teacher – Age	0.3666501	0.4820252	0.3750003	0.4842763	-0.00515
Health Teacher – Experienced	0.347092	0.4761791	0.3467388	0.4760824	0.00127
Province					
Cabo Delgado	0.0696197	0.2545766	0.0624736	0.2420903	0.0091
Ciudade de Maputo	0.0804092	0.272002	0.1130515	0.316756	-0.0304**
Gaza	0.076125	0.2652725	0.0950335	0.293354	-0.0172
Inhambane	0.0845632	0.2783088	0.104719	0.306288	-0.0114
Manica	0.0775586	0.2675509	0.0708766	0.2566999	0.00972
Maputo	0.0902533	0.2866249	0.1148419	0.318932	-0.0215*
Nampula	0.1441969	0.351388	0.1075546	0.3099151	0.0292**
Niassa	0.0408447	0.1979859	0.0470466	0.2118056	-0.0105
Sofala	0.0998979	0.2999481	0.0859693	0.2804075	0.0227*
Tete	0.0731674	0.2604843	0.0745574	0.2627591	-0.00361

Note: The results are based on weighted. *** p<0.01, ** p<0.05, * p<0.1

The difference of test score are also confirmed by analyzing in the Kernel density estimation as in the Figure A1 of appendix. The test score spread is not so much different between boys and girls, but slightly higher mean is depicted in boys in all subjects. It also shows that the difference is not constant over distribution.

4-2 Regression Results

Regression result of the final model specification for boys and girls are presented in the Table A2 of the appendix. The model fits better girls than boys in all three subjects. Overall the association between household tasks engagement and performance varies by gender. Only the same negative association is found in the task 13 of taking care of livestock both in reading score and in boys of HIV/AID knowledge. The task 2 of looking after elderly relatives and the task 9 of chopping fire wood shows statistically negative relation in boys' score. The task 8 of fetching water is negatively related to girls' reading score, while in HIV/AIDS knowledge positively related. There are also positive relation in some of the scores, such as the tasks of cooking, the task 5 of house cleaning for girls' score and the task 1 of looking after younger relatives, the task 11 of shopping, the tasks 12 of gardening/working in vegetable garden for boys' score. This may be assumed reverse causality that good students engage in household tasks.

Among the student characteristics, the associations are similar between boys and girls. The student's overage, repeat experience are negatively associated with performance. The positive relationships are found in student SES, frequency of homework given and instruction language spoken at home in both gender. Different relationship are found in number of siblings. Learners who have the same sex siblings perform better; girls with higher number of sisters perform better, and boys with higher number of brothers perform better. On contrary, boys who have more sisters perform poorer. Father education is only positively related to

performance in boys.

On the school level, school location is significantly related to both gender. Learners who lives in small city and rural area perform poorer for both gender, while the degree of relation is larger in girls. School type also matters for girls performance, and girl who attend private school have lower score of HIV/AIDS knowledge test.

Among the teacher characteristics, girls taught by female teacher performance significantly better in math. For boys, learners taught by female have lower score in HIV/AIDS knowledge and learners taught by experienced teachers perform poorer than those learners taught by newer teachers. Regarding the province dummy, learners who live in capital province, Ciudade de Maputo and Maputo province, have higher score in both gender, while the learners who lives in the Northern province such as Niassa, Safala and Tete, perform poorer. The degree of the association is larger in girls.

4-3 Decomposition Result

Table 2 shows the result of decomposition of the mean gender gap into explained and unexplained components. First part illustrates the mean result of test score of boys and girls and difference as well as decomposed value of explained and unexplained components. The second part shows the breakdown of explained component. The third part presents the detail of characteristics of household tasks. As in line with the descriptive summary presented in the previous section, all test scores are poorer in girls than it is for boys with statistically significance. The result also indicates that all of these differences are attributed to the unexplained component, which have exceeded value of actual gap. The negative value of explained component implies that the explained component contributes to explain not in a direction for creating the gap but in a direction for cancelling the gap. For instance, the result in reading suggests that the gap of 5.327 points is attributed by the difference of unexplained components by 13.21 points after the explained components cancel the gap by 5.327 points. In other words, if the observed characteristics of girls are all the same as boys, the test score of girls would be higher, and after all the gap is reduced the gap by 5.327 point.

The breakdown of explained components shows that among four characteristics, the teacher characteristics shows that its difference explains to contribute the gender gap, but it does not have statistical significance. In the detail of our interest characteristics of household tasks, it shows that the task 12 of gardening/working in vegetable garden contributes to explaining the gap in math test with statistical significant. Since for the task 13, boys involve more than girls, it implies that if girls increase the tasks as much as boys, the girls score will increase and the gap will be reduced by 0.59 points.

Table 2: Oaxaca-Blinder decomposition, boys returns as counterfactual

	Total

	Reading	Math	HIV
Boys (B)	479.3	488.4	513.6
Girls (G)	474.0	479.2	498.8
Difference (G-B)	5.327*	9.179***	14.87***
"Explained" part (Q)	-7.883***	-4.619***	-7.312***
"Unexplained" part (U)	13.21***	13.80***	22.18***
Breakdown of "Explained" part (Q)			
Household Task (QH)	-2.605**	-1.577	-4.956***
Pupil (QP)	-2.295**	-0.537	0.263
School (QS)	-1.028*	-0.78	-0.911
Teacher (QT)	0.0502	0.0987	0.553
Province (QI)	-2.005***	-1.823***	-2.260**
Detail of Household Task Characteristics (QH)			
Task 1: Look after younger relatives	-0.0216	-0.176	-0.0876
Task 2: Looking after elderly relatives	-0.499	-0.558*	-0.724
Task 3: Taking care of sick family members and relatives	0.312	0.347	0.342
Task 4: Cooking	-0.0463	-1.028	-1.212
Task 5: House cleaning	-0.197	-0.0675	-0.254
Task 6: Sweeping outside the house	0.0594	-0.146	0.0489
Task 7: Washing and ironing clothes	-0.113	-0.0364	0.0205
Task 8: Fetching water	0.0964	0.289	-0.313
Task 9: Chopping fire wood	-0.428	-0.221	-0.736
Task10: Collecting fire wood	-0.0196	0.013	-0.0146
Task11: Shopping	-0.147	-0.115	-0.21
Task12: Gardening/working in vegetable garden	0.213	0.590*	0.0796
Task13 :Take care of livestock	-1.334***	-0.342	-1.557**
Task14: Helping in a family business	-0.480*	-0.127	-0.339

Note: The results are based on weighted. *** p<0.01, ** p<0.05, * p<0.1

4-4 Quintile Decomposition Result

Table 3 shows the result of decomposition of gender gap at 5th, 25th, 50th, 75th and 95th quantile by using the estimated counterfactual distribution. It is clear that the level of gender gap is not consistent over score distribution in each subject. In reading test, the largest gap is found at the lowest quantile, while in the math score the gap is large at the 25th and 50th quantiles. In the HIV/AIDS knowledge test, the largest gap is found at 25th quantile following by 5th and 75th quantile. As reported in the result by mean decomposition above, almost all the gap are explained by unexplained component. Only at the 95th quantile in math test, observed characteristics explain the gender gap by 6.716 out of 8.357 points. The breakdown of this explained component shows that the difference of household tasks is attributed to the gap by 4.744 point. Furthermore, among the household tasks, the task 13 of taking care of livestock is significantly associated to the gap. Since the task 13 is the task that boys engage more than girls, it is assumed that boys benefit mathematical knowledge by doing livestock caring. Another positive relation is found at the 5th quantile in reading, where the difference of task 8 of fetching water explained the gender gap. The task 8 of fetching water is involved more in girls than boys, therefore it can be interpreted that this task burdens girls' academic excellence and become a source of the gender gap. There are other positive associations found at the 95th quantile in reading and also in HIV/AID knowledge and at 5th qunatile in math, though since the gender difference is not statistically significant, they do not have much of meaning.

Table 3: Quantile Decomposition of gender gap

	Reading					Math					HIV/AIDS Knowledge				
	Q5	Q25	Q50	Q75	Q95	Q5	Q25	Q50	Q75	Q95	Q5	Q25	Q50	Q75	Q95
Difference	24.047***	5.195	7.287**	2.608	2.436	5.479	26.031***	10.722***	5.959*	8.357*	13.497**	34.249***	8.729**	14.174**	12.412
Explained	-4.423	-5.505**	-9.719***	-11.471***	5.997	8.516	-5.833***	-4.184**	-2.301	6.716*	-0.587	-8.169**	-6.02**	-7.586**	25.644*
Unexplained	28.470***	10.701***	17.007***	14.079***	-3.561	-3.036	31.865***	14.906***	8.260**	1.64	14.085**	42.418***	14.75***	21.761**	-13.232
Breakdown of "Explained" part															
Household Task	-1.723	-1.286	-4.642***	-4.635***	-0.84	1.287	-1.106	-1.520	-1.229	4.774*	0.429	-5.1**	-5.04**	-6.373***	3.963
Pupil	-1.288	-2.07*	-2.705**	-2.614**	4.603***	3.386**	-2.006*	-0.630	0.816	0.297	0.300	-0.337	0.156	-0.170	14.702**
School	0.2	-0.335	-1.176	-1.367	2.263	1.983	-0.816	-0.165	-0.673	-0.435	-0.317	-1.93*	-1.372	-0.273	-5.948
Teacher	-0.37	0.101	0.289	-0.023	-1.908**	0.001	-0.267	0.061	0.317	0.076	0.349	-0.046	0.470	0.314	-0.613
Province	-1.24	-1.914*	-1.484	-2.829	1.88	1.859	-1.638**	-1.93***	-1.532*	2.004	-1.348	-0.754	-0.234	-1.085	13.540**
Detail of Characteristics															
Task 1: Look after younger relatives	-0.007	-0.114	-0.134	0.032	-0.256	-0.090	-0.171	-0.215	-0.119	0.076	-0.162	-0.015	-0.117	0.007	-0.423
Task 2: Looking after elderly relatives	-0.058	-0.285	-0.782*	-0.666	0.324	1.256	-0.595	-0.090	-0.089	-1.532*	-1.094	-1.106	-1.084*	-0.753	4.722**
Task 3: Taking care of sick family and relatives	-0.353	0.626	0.46	0.528	0.076	-0.187	0.170	-0.042	0.255	0.675	0.794	0.633	0.633	0.378	0.763
Task 4: Cooking	-2.603	0.7792146	-1.365	-1.596	-2.275	3.763	-0.607	-1.142	-0.860	2.930	0.544	-1.491	0.146	-1.561	-5.911
Task 5: House cleaning	-0.152	-0.143	-0.055	-0.178	0.385	0.031	-0.543	-0.061	0.075	-0.187	-0.313	-0.485	-0.137	-0.292	3.035*
Task 6: Sweeping outside the house	0.194	0.164	0.046	0.058	0.023	0.372	-0.189	-0.034	-0.052	-0.146	-0.021	0.153	0.132	0.008	1.646
Task 7: Washing and ironing clothes	-0.101	-0.363	-0.316	-0.118	-0.089	-0.195	-0.040	-0.024	0.205	-0.048	0.055	-0.143	-0.157	0.047	-1.848
Task 8: Fetching water	1.158*	0.021	-0.437	0.075	-1.44	-1.077*	0.421	0.199	0.413	-0.007	0.427	-1.282	-0.576	-0.330	4.030
Task 9: Chopping fire wood	-0.507	-0.161	-0.674	-0.565	0.063	0.464	-0.232	-0.089	-0.146	0.419	-0.440	-0.632	-0.706	-0.552	-0.014
Task10: Collecting fire wood	-0.054	-0.015	-0.007	-0.001	-0.034	-0.051	0.010	0.010	0.014	-0.049	-0.085	-0.048	-0.016	0.061	0.224
Task11: Shopping	0.022	-0.221	-0.176	-0.179	0.396	-0.116	-0.254	-0.002	-0.126	-0.012	-0.121	-0.119	-0.255	-0.243	0.050
Task12: Gardening/working in vegetable garden	-0.445	-0.379	0.337	0.515	-0.215	-0.299	0.871*	0.464	0.287	0.203	0.574	-0.233	-0.166	0.249	1.408
Task13 :Take care of livestock	0.772	-0.796	-0.942	-1.706**	1.517*	-0.975	0.380	-0.250	-1.066*	2.131**	0.235	-0.440	-2.267**	-2.677***	-2.758
Task14: Helping in a family business	0.414	-0.397	-0.593	-0.831*	0.683	-1.606**	-0.326	-0.243	-0.020	0.320	0.036	0.109	-0.469	-0.715	-0.962

Note: The results are based on weighted. *** p<0.01, ** p<0.05, * p<0.1

5. Conclusion and Recommendation

This study brings to light on the role of household tasks underlying the gender gap in student performance in Mozambique. First, the result shows that there is substantial gender gap of test scores in Mozambique, disadvantaging in girls. The largest performance gap is found in the test of HIV/AIDS knowledge following math test, and the gap is relatively smaller in reading test. The largest knowledge gap in HIV/AIDS may explain the serious prevalence gap of HIV/AIDS in young age, and require a special attention on the HIV/AIDS knowledge on girls. The descriptive summary showed that boys and girls involve in different types of household tasks and almost all the difference were statistically significant. This result may imply that there is a clear gender role at home in Mozambican household. Second, we found that the relationship between household tasks and academic performance varies by gender. Tasks of taking care of elderly relative, chopping fire wood and helping family business is negatively associated to boys' performance. Whilst, the task of fetching water is negatively related to girls' performance. The tasks of taking care of livestock is related both gender and hinder the academic excellence.

From the decomposition analysis, we did not find clear evidence the difference of household tasks is the source of gender gap. Only at the detail observation of household tasks, however, we found that the different engagement level of gardening and working in vegetable garden was associated to the gender gap in math score. It is assumed that children learn science knowledge through gardening and working in vegetable garden and helps to improve the aspiration of the math. We also found that the gender gap is not constant across the score distribution. In the test of reading and math, the largest gap is found at the poorer performance

student, while in test of HIV/AIDS knowledge the gap is more severe at average level. In the decomposition result across the score distribution, we found that fetching water is the source of gender gap in poorest performance. This can be concluded that girls' heavier engagement in fetching water results in the gender gap in reading score.

The data of household tasks obtained by SACMEQ questionnaire may not capture all possible tasks that Mozambican pupils engaged at household. Furthermore, this study employed the variable of household tasks as a dichotomous type, and the results may be changed by taking cognisance of quality of household tasks. Therefore, the large and significant coefficient on household tasks may not necessarily reflect the true relationship with test performance. Other limitation is also identified of this dataset, in which remains possible floor effect that large portion of very low score affect statistics results by not being able to differentiate relatively lower achievement student score level in raw test score.

The major significance of this study lies in contribution to improvement gender gap in Mozambique but also to existing literature of investigation for gender gap factors, taking special focus on pupil's household tasks. This paper hoped to contribute to the policy effort by the Mozambican government, and also to add to the debate of gender gap factors. Future analysis would be strengthen by adding qualitative analysis which allow researchers to understand not only source of the gap but also process of causing the gender gap.

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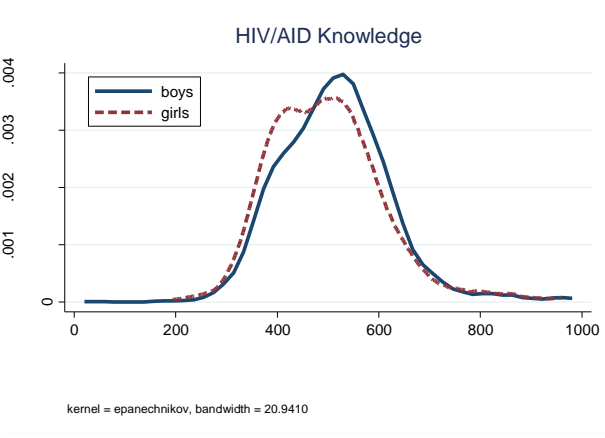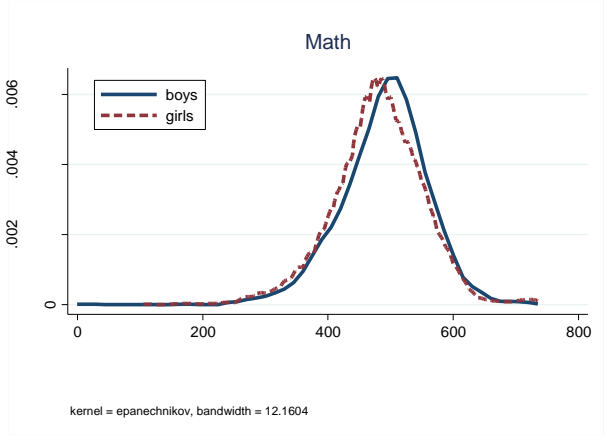
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Appendix

Table A1: List of Independent Variables

	Type	Values/Definition
Household Tasks		
Task 1	Dummy (0, 1)	Look after younger relatives
Task 2	Dummy (0, 1)	Looking after elderly relatives
Task 3	Dummy (0, 1)	Taking care of sick family members and relatives
Task 4	Dummy (0, 1)	Cooking
Task 5	Dummy (0, 1)	House cleaning
Task 6	Dummy (0, 1)	Sweeping outside the house
Task 7	Dummy (0, 1)	Washing and ironing clothes
Task 8	Dummy (0, 1)	Fetching water
Task 9	Dummy (0, 1)	Chopping fire wood
Task 10	Dummy (0, 1)	Collecting fire wood
Task 11	Dummy (0, 1)	Shopping
Task 12	Dummy (0, 1)	Gardening/working in vegetable garden
Task 13	Dummy (0, 1)	Take care of livestock
Task 14	Dummy (0, 1)	Helping in a family business
Student Characteristics:		
Age	Dummy (0, 1)	Overage for grade 6
Mother Education	Dummy (0, 1)	Mother has at least secondary education
Father Education	Dummy (0, 1)	Father has at least secondary education
Student SES	Continuous (mean=0, s.d.=1)	Student socio-economic status (Derived from the aggregation at the student level of
Brother	Dummy (0, 1)	More than 3 brothers
Sister	Dummy (0, 1)	More than 3 sisters
Repeat	Dummy (0, 1)	Repeated a grade at least once
Language	Dummy (0, 1)	Speaks instructional language at home
Book	Dummy (0, 1)	More than 10 books at home
Homework	Dummy (0, 1)	Homework given
School Characteristics:		
School Head Female	Dummy (0, 1)	1 = female
School type	Dummy (0, 1)	0 = government, 1 = private
Ratio of girls	Dummy (0, 1)	Ratio of girls in grade 6 is below 0.5
Rural area	Dummy (0, 1)	School located in rural area
Small town	Dummy (0, 1)	School located in small town
Teacher Characteristics:		
Reaching Teacher – Female	Dummy (0, 1)	1 = female
Reading Teacher – Age	Dummy (0, 1)	Teacher is older than 30 years old
Reading Teacher – Experienced	Dummy (0, 1)	Teacher has more than 5 years of teaching experience
Math Teacher – Female	Dummy (0, 1)	1 = female
Math Teacher – Age	Dummy (0, 1)	Teacher is older than 30 years old
Math Teacher – Experienced	Dummy (0, 1)	Teacher has more than 5 years of teaching experience
Health Teacher – Female	Dummy (0, 1)	1 = female
Health Teacher – Age	Dummy (0, 1)	Teacher is older than 30 years old
Health Teacher – Experienced	Dummy (0, 1)	Teacher has more than 5 years of teaching experience
Province:		
Cabo Delgado	Dummy (0, 1)	
Ciudade de Maputo	Dummy (0, 1)	
Gaza	Dummy (0, 1)	
Inhambane	Dummy (0, 1)	
Manica	Dummy (0, 1)	
Maputo	Dummy (0, 1)	
Nampula	Dummy (0, 1)	
Niassa	Dummy (0, 1)	
Sofala	Dummy (0, 1)	
Tete	Dummy (0, 1)	

Figure A1: Kernel Density Estimate by Distribution

Reading

kernel = epanechnikov, bandwidth = 13.5876

Math

kernel = epanechnikov, bandwidth = 12.1604

HIV/AID Knowledge

kernel = epanechnikov, bandwidth = 20.9410
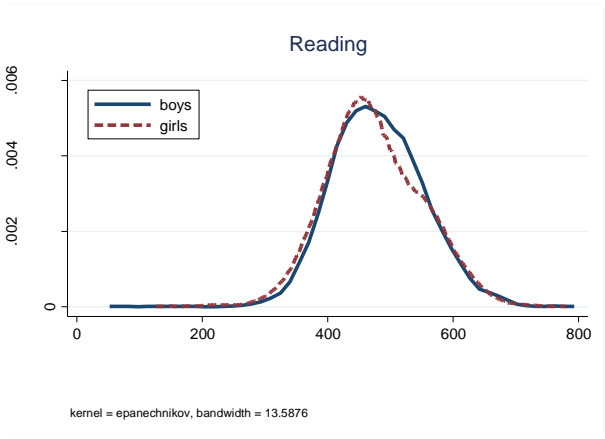
Table A1: OLS Regression by Gender

	Reading		Math		HIV/AIDS Knowledge	
	Boy	Girl	Boy	Girl	Boy	Girl
Task 1: Look after younger relatives	1.240	-3.533	9.217**	0.00314	4.901	-5.963
	(4.312)	(4.638)	(4.556)	(4.833)	(6.861)	(7.550)
Task 2: Looking after elderly relatives	-6.936*	4.698	-7.750*	2.409	-9.750	-5.402
	(4.012)	(3.808)	(4.027)	(4.358)	(6.343)	(6.397)
Task 3: Taking care of sick family members and relatives	4.888	0.112	5.364	-0.954	5.217	6.579
	(4.189)	(3.948)	(4.029)	(4.333)	(6.671)	(6.847)
Task 4: Cooking	0.244	15.94**	5.426	4.105	6.383	-4.176
	(4.209)	(6.497)	(4.272)	(7.047)	(6.752)	(11.44)
Task 5: House cleaning	7.891	14.72**	2.601	4.736	10.07	33.89***
	(5.757)	(6.758)	(6.854)	(9.082)	(8.897)	(11.67)
Task 6: Sweeping outside the house	-2.986	2.708	7.032	2.588	-2.568	33.85***
	(5.346)	(6.650)	(6.378)	(7.777)	(8.920)	(10.81)
Task 7: Washing and ironing clothes	4.683	-5.311	1.519	-6.689	-0.779	-5.607
	(5.016)	(4.942)	(5.470)	(5.810)	(7.957)	(9.957)
Task 8: Fetching water	-1.365	-9.057*	-4.039	0.396	4.468	14.76*
	(4.158)	(4.688)	(4.271)	(4.864)	(6.985)	(8.958)
Task 9: Chopping fire woo	-7.653*	-4.131	-3.878	-3.900	-13.34*	-10.97
	(4.347)	(4.637)	(4.287)	(5.145)	(7.345)	(7.878)
Task10: Collecting fire wood	4.991	-0.782	-2.673	-3.671	3.177	1.344
	(4.600)	(4.590)	(4.319)	(5.158)	(7.325)	(7.843)
Task11: Shopping	7.786*	2.897	5.972	2.525	11.21	-2.570
	(4.347)	(4.725)	(4.771)	(5.271)	(6.951)	(7.785)
Task12: Gardening/working in vegetable garden	3.397	-0.596	9.556**	1.896	1.303	-10.46
	(4.212)	(4.072)	(4.210)	(4.567)	(6.389)	(6.898)
Task13 :Take care of livestock	-11.84***	-11.76***	-3.035	-3.461	-13.76**	-3.824
	(4.200)	(4.380)	(3.997)	(4.693)	(6.080)	(7.571)
Task14: Helping in a family business	-7.379*	-3.202	-1.978	3.005	-5.266	7.079
	(3.829)	(3.615)	(3.793)	(4.070)	(5.952)	(6.250)
Age	-9.844**	-11.42***	-4.025	-6.784	18.42***	9.822
	(3.831)	(3.695)	(3.686)	(4.263)	(5.715)	(6.403)
Mother Education	-2.112	0.760	1.989	1.067	-0.361	-5.351
	(4.730)	(4.996)	(4.673)	(5.249)	(7.908)	(8.178)
Father Education	8.318*	2.128	-4.053	-2.205	19.97***	0.106
	(4.323)	(4.325)	(4.106)	(4.640)	(6.937)	(7.211)
Student SES	8.029***	10.77***	4.130*	3.865	7.204*	14.27***
	(2.619)	(2.613)	(2.421)	(2.829)	(3.879)	(4.467)
Brother	-3.155	-10.02***	2.250	-7.121*	3.825	-9.704
	(3.567)	(3.604)	(3.531)	(4.006)	(5.597)	(6.146)
Sister	-9.199**	6.572*	-8.374**	5.682	-3.441	4.994
	(3.722)	(3.537)	(3.675)	(3.911)	(5.784)	(6.183)
Repeat	-13.45***	-6.386*	-12.71***	-3.878	-9.166	-5.224
	(3.901)	(3.614)	(3.646)	(4.000)	(5.803)	(5.959)
Language	33.58***	12.65*	26.84***	-0.352	38.68***	26.76***
	(6.063)	(7.333)	(7.017)	(9.334)	(10.23)	(10.18)
Book	9.022*	7.432	5.106	3.067	14.25*	-2.523
	(4.670)	(4.964)	(4.631)	(5.218)	(7.438)	(8.208)
Homework	21.08***	16.93***	13.75***	13.25***	21.83***	22.47***
	(3.727)	(3.681)	(3.768)	(4.181)	(6.109)	(6.384)
School Head Female	-0.265	1.437	-1.089	-0.392	-7.346	2.539
	(4.665)	(4.835)	(4.226)	(4.683)	(6.972)	(8.147)
School type	1.433	-35.87***	-4.332	-13.45	-6.673	-45.27***
	(8.862)	(8.984)	(9.658)	(10.51)	(14.46)	(16.60)
Ratio of girls	2.912	-0.923	1.153	2.004	2.603	-17.17**
	(4.616)	(4.548)	(4.447)	(4.563)	(7.490)	(7.761)
Rural area	-12.02**	-18.26***	-11.17**	-4.199	-11.88	-13.32
	(5.732)	(5.535)	(5.406)	(6.094)	(8.300)	(8.606)
Small town	-17.90***	-21.69***	-11.92**	-14.58***	-27.56***	-37.55***
	(5.423)	(5.277)	(5.169)	(5.633)	(8.830)	(9.286)
Reaching Teacher – Female	-2.592	-4.013				
	(4.000)	(3.840)				
Reading Teacher – Age	-4.274	-5.958				
	(3.897)	(3.941)				
Reading Teacher – Experienced	6.480	4.618				
	(4.143)	(3.741)				
Math Teacher – Female			-1.982	19.42***		
			(3.949)	(4.193)		
Math Teacher – Age			-2.360	-4.699		
			(3.730)	(3.997)		
Math Teacher – Experienced			-6.819*	6.218		
			(3.884)	(4.095)		
Health Teacher – Female					-16.78***	-3.692
					(6.219)	(6.262)
Health Teacher – Age					-3.286	-8.422
					(6.220)	(6.828)
Health Teacher – Experienced					0.535	-4.778
					(6.184)	(6.419)
Cabo Delgado	-16.46**	-29.43***	-21.67***	-11.33	-50.02***	-49.54***
	(8.084)	(8.394)	(7.658)	(9.625)	(12.25)	(14.18)
Ciudade de Maputo	24.94***	35.33***	3.842	26.45***	37.87**	47.16***
	(8.574)	(8.431)	(7.694)	(9.027)	(16.00)	(15.45)
Gaza	-4.507	-3.457	8.607	18.76**	-17.30	-20.04*

	(1)	(2)	(3)	(4)	(5)	(6)
	(7.671)	(7.347)	(7.829)	(9.463)	(10.53)	(11.86)
Inhambane	4.243	18.31**	18.32**	21.94***	10.05	8.189
	(8.629)	(7.732)	(7.299)	(8.420)	(11.05)	(13.34)
Manica	-18.37**	-11.47	-14.11	12.63	2.732	-26.48*
	(8.740)	(9.545)	(8.791)	(10.73)	(12.09)	(14.59)
Maputo	14.83*	17.98**	14.90*	20.88**	12.28	22.14
	(7.827)	(7.789)	(7.774)	(8.960)	(13.79)	(15.27)
Nampula	-10.47	-15.03*	-16.95**	-1.777	-10.63	7.861
	(8.356)	(8.566)	(7.790)	(10.24)	(13.29)	(16.05)
Niassa	-21.41***	-37.29***	-37.24***	-26.35***	-24.67**	-44.31***
	(7.941)	(8.397)	(8.679)	(9.909)	(11.31)	(14.38)
Sofala	-24.64***	-36.92***	-17.17**	-12.24	-23.00**	-44.21***
	(7.526)	(8.833)	(7.399)	(10.75)	(10.96)	(13.52)
Tete	-34.98***	-45.06***	-17.18*	-19.36**	-45.66***	-57.77***
	(7.944)	(7.452)	(9.447)	(9.595)	(12.98)	(13.84)
Constant	460.2***	465.4***	463.6***	464.0***	466.2***	444.6***
	(11.94)	(14.19)	(12.50)	(16.93)	(19.32)	(22.34)
Observations	1,721	1,554	1,712	1,546	1,708	1,543
R-squared	0.253	0.336	0.149	0.162	0.156	0.191

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1