Is there an early gender gap in Ghanaian children development? Evidence from 3-4 years old boys and girls

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Is there an early gender gap in Ghanaian children development? Evidence from 3-4 years old boys and girls

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Abstract

Using data from the 2011 round of the Ghana Multiple Indicator Cluster Survey (MICS), we investigate the presence of an early gender gap in child development among 3-4-year olds. First, we built two multidimensional indexes of early childhood development that account for children's ability to read, count, recognize numbers, interact with peers and others, follow rules and be independent for their health outcomes and for their physical skills. Second, we estimate the gender gap while controlling for factors affecting early childhood development. We found no evidence of gender difference in children's early development. This result is robust to several specifications and sensitivity tests. In contrast, the results suggest that a mother's education, a father's involvement and the fact of living in an urban area increase early childhood development both for boys and for girls. Based on these findings, we argue that the educational gender gap in Ghana most likely reflects the unequal access to schooling opportunities between boys and girls.

Keywords: gender gap, early childhood development, Ghana

1. Introduction

The presence of a persisting educational gender gap in developing countries continues to raise the question of whether an early gender gap exists between boys and girls in childhood development (Ertem et al., 2018). The literature highlights the importance of early childhood development in late life outcomes including academic achievement, educational attainment, employment and health status (Batty et al., 2007; Koenen et al., 2009; Bornstein et al., 2013; Hofer and Clouston, 2014; Vandivere et al., 2015). Vandivere et al. (2015) find that children who already have a head start in acquiring skills before entering school are more likely to experience later academic success, attain higher levels of education, and secure better employment than their peers. Several driving factors have been explored to explain the educational gender gap, including the economically

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disadvantaged geographic areas (McAvoy and Purdy, 2013), the traditional value patterns (Dagne, 1994; Jensen and Thornton, 2003; Tanye, 2008; Kristof, 2009), poverty (King and Hill, 1993), child labour and domestic work (Bendera and Mboya 1999, Mulama, 2010). In a study in Sub-Saharan Africa, Ombati and Ombati (2012) find that political instability, poverty, negative cultural values, female genital mutilation, early marriage, teenage pregnancy, and sexual harassment are the leading contributors to gender gap in educational attainment in these countries.

In order to explain the educational gender gap, more recent studies begin to focus on gender gap in early childhood development. Surprisingly, a large body of these studies find evidence that girls outperform boys in this early childhood stage (Kent and Pitsia 2018). Using intelligence tests, some studies such as Palejwala and Fine (2015), Doyle and McNamara (2011) and Masnjak (2017) find that girls have scored higher in overall measures of early cognitive abilities and socioemotional development. Isaacs (2012) in the United-States, Von Stumm and Plomin (2015) and Ring et al. (2016) in Ireland also find significant gender gap early childhood developmentin favour of girls. Another study by Toivainen, Papageorgiou, Tosto and Kovas (2017) find that young girls have significantly stronger abilities in verbal and nonverbal abilities than boys at ages 2, 3 and 4. Using micro-level data from Demographic and Health Surveys (DHS) of 38 developing countries, including Ghana, Grant and Behrman (2010) find that girls who have attended school have equal or significantly better schooling progress. Hence, Grant and Behrman (2010) argue that the gender differences in education achievement reflects unequal access to schooling opportunities among male and female children rather than early early childhood development. In contrast, some studies find that boys demonstrate higher development and this, in several domains of early childhood development. For example, Palejwala and Fine (2015) find evidence that boys have stronger visual processing than young girls. Other studies also find that boys display higher spatial ability skills (Merrill et al., 2016) and physical abilities (Masnjak, 2017).

Our paper contributes to this literature by estimating the gender gap early childhood development in Ghana. In this paper, we exploit data from the 2011 round of Ghana Multiple Indicator Cluster Surveys (MICS)[1] to build an index of early childhood development. This index

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[1] MICS is the only nationally representative micro-level dataset, that addresses early childhood development in developing countries including Ghana up-to-now. The 2011 round is the latest available wave of MICS in Ghana.

focuses on children's ability to read, count, recognize numbers, interact with peers and others, their health, their physical skills as well as their ability to follow rules and to be independent. We built two indexes of early childhood development. The first one is built as an unweighted sum of the child score at each item/question. For the second index, we use a principal component analysis approach to extract a weighted index for early childhood development based on all the information available to us.

Our results indicate that, overall, there is no evidence of early gender gap in terms of early childhood development between boys and girls in Ghana. One index even indicates that being female is associate with higher children development. This result is consistent previous studies (Palejwala and Fine, 2015; Doyle and McNamara, 2011; Masnjak, 2017). Grant and Behrman (2010) and Ombati and Ombati (2012) also find that the gender differences in educational achievement in Sub-Saharan Africa is actually a result of unequal access to schooling opportunities and of later factors including social, political and economic factors which affects male and female children differently.

The rest of this paper is structured as follows. Section 2 discussed evidence on gender differences in educational achievement. Section 3 presents our data. The identification strategy is presented in Section 4 while Section 5 reports and discusses the results. Section 6 presents sensitivity analyses and section 7 concludes the paper.

2. Educational gender gap in Ghana

Ghana is one of the most successful Sub-Saharan African country in terms of rate of school enrolment with around 92% of children aged 6–14 years who are enrolled in either kindergarten, primary school or junior high school, far ahead of average Sub-Saharan rates (UNICEF, 2017). For example, in 2018, the net school enrollment rate was 37% in Liberia, 37% in Congo Democratic Republic, 61% in Mali, 64% in Nigeria and 74% in Senegal (UNESCO, 2018).

Early in the year 2000, the revolutionary government of Ghana has indicated that girls' education remained a priority in order to reduce the educational gender gap and to achieve the Millennium Development Goals. In fact, according to the Ministry of Education and the Girls' Education Unit, Ghana (2012) although there is virtual gender parity in enrolment at primary and junior high

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school, girls' educational attainment continues to lag behind boys in Ghana. A study by Nguyen and Wodon, (2014) find that the national gender ratio for completion of senior high school is around two girls for every three boys. The studies find that girls are especially more vulnerable to drop out, especially due to early marriage, and teenage pregnancy and are disadvantaged by being over-aged. In addition, girls who live in rural areas, and girls who live in poor households are less likely to enroll in school compared to boys under the same conditions (Nguyen and Wodon, 2014). Over the years, Ghana has launched several education policies such as the Education Sector Plan 2000-2015, the Fast Track Initiative in 2003-2004, the National Early Childhood Care and Development policy (ECCD) in 2004, the Education Sector Plan 2010-2020, the Education strategic plan 2018-2030, with the aims to expand education and reduce gender gaps in access to schooling and improving education quality (UNICEF, 2017, Ghana Ministry of Education, 2018). These initiatives include nutrition and school feeding programs, abolishing school fees, free school uniforms, free textbook programs and providing grants and cash transfers to girls and under privileged preschool aged children (Wolf et al., 2019). However, despite the government's efforts, a recent study by McCoy et al. (2016) found that around 32.6% of Ghanaian preschool-age children (3 and 4 years old) still do not meet early childhood development indicator thresholds. From this study, very little is known about the profile of these children who do not meet early childhood development, especially the existence or non-existence of a gender gap in early childhood development among the 3-4-year-old children in Ghana.

2.   Data, Child Development Measurement and Descriptive Statistics

2.1.   Data and Child Development Measurement

We use data from the 2011 round of Ghana's Multiple Indicator Cluster Survey (MICS). The MICS is a nationally representative cross-sectional household-based survey collected by the Ghana Statistical Service (GSS) with the financial and technical support of international institutions such as UNICEF, USAID, UNFPA, the Japanese Government, ICF/MACRO, the Ministry of Health/National Malaria Control Program, and the Navrongo Health Research Centre (Ghana Statistical Service, 2011).

We used the children's questionnaire to construct two early childhood development indicators. We focused on 10 items/questions, described in appendix, contained in the children's questionnaire of the MICS data to construct the MECD index (See appendix 1). This index addresses early childhood development in the domains of literacy, social, physical and learning skills. Based of the response to these ten questions, we created a dummy variable ecd_{ij} equal to one if the child i is developmentally on track with the corresponding item and 0 otherwise for each item j. We built our first early childhood development index denoted *ECDI1* as the total of items where the child is developmentally on track such as:

$$ECDI1_i = \sum_{j=1}^{10} ecd_{ij} \qquad (1)$$

Note that $sr1$ is then a count variable taking values between 0 and 10 ($sr1_i \in \{0,1,2,3,4,5,6,7,8,9,10\}$). Using a multidimensional indicator allows us to have a more complete measure of early childhood development. However, while constructing the first early childhood development $sr1$, we implicitly assume that all the items (such as reading, counting, recognizing numbers, being alone with others, the physical and health abilities…) have equal weights in a child's development.

In order to relax this assumption, we built a second early childhood development index denoted *ECDI2* using the Principal Component Analysis (PCA) method. The PCA approach is a data reduction technique that is used to extract the most relevant information from a large set of variables into a smaller set of variables called components using the following linear combination of original items:

$$ECDI2_i = \sum_{j=1}^{10} w_j sr_{ij} \qquad (2)$$

where w_j is the optimal weight of item j which is determined by the PCA method. The PCA technique constructs a new index variable as the best linear combination of the original variables so that the variance along the new variable is maximized and thus, contains the most information. The different combinations are ranked by relevance. The first principal component denoted by PC1 is the best synthetic index that combines or condenses, in a single variable the consistent information originally dispersed over the 10 items about early childhood development. We also predict the second component denoted by PC2 for robustness analysis.

3.2.1. Descriptive Statistics

The summary of descriptive statistics on male and female children characteristics are presented in Table (1). We find that, on average male and female children are respectively 3.49 years old and 3.47 years old. We find that in terms of weight children are on average 14.35 kilograms for males and 13.91 kilograms for females. The same difference appears in terms of height where male children are on average approximately 0.65 centimeters taller than female children. We also find that fathers are more involved in their male children's home education than when the child is a female. As far as mother's education is concerned, we find that almost half of mothers/caretakers have less than a primary education while around 36 % of male children and 37% of female children have a primary education.

4. Econometric model

4.1. Estimates Using Unweighted Index for Early childhood development

Recall that the unweighted early childhood development index denoted *sr1* is a count variable. In order to estimate gender differences in early childhood development, we use a Poisson regression which is appropriate for count data analysis. The conditional average of the Poisson model for child *i*, denotes λ_i reads as follows:

$$\lambda_i = \beta_0 + \beta_1 Gender_i + \beta_3 X_i + \epsilon_i \tag{2}$$

where *Gender$_i$* is a dummy variable and equals 1 if the child is a girl and 0 if the child is a boy. X_i is a vector of control covariates including child's age, child's gender, health indicator measured by child's weight (in kilograms) and height (in centimeters), mother's/caretaker's level of education, father's participation in child's home education, the area of residence (rural

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or urban) and the region of residence. ϵ_i is a zero-mean error term capturing the unobservable factors affecting early childhood development. The likelihood function is:

$$P(SR1 = sr1_i|Gender_i, X_i) = \frac{e^{-\lambda_i}\lambda_i^{sr1_i}}{sr1_i!} \tag{3}$$

Since the coefficients from the Poisson estimation are difficult to interpreted, we also estimate the marginal effects in order to quantify the gender gap in early childhood development.

4.2. Estimation Using Weighted Indexes for Early childhood development

Since the second measure of early childhood development is a continuous variable, we estimate the following equation:

$$sr2_i = \gamma_0 + \gamma_1 Gender_i + \gamma_3 X_i + \eta_i \tag{4}$$

Where X_i includes the same variables as in Equation (2). The parameter γ_1 captures the gender differences in terms of early childhood development after controlling for the child's characteristics. *sr2* is the weighted index of early childhood development measured by the first component pc1 estimated from the Principal Components Analysis. For sensibility analysis, we also use the second component *pc2* as a dependent variable to estimate the gender gap in early childhood development.

5. Empirical Results

5.1. Estimates Using Unweighted Indexes for Early childhood development

Table (1) reports the estimates of Equation (2). As suggested by Croft et al., (2018), our estimations are weighted and stratified by region to control for the unequal probability of households to be selected for the interview during the survey and for the regional heterogeneity in Ghana. In Model (i), we estimate the effect of gender on children's early childhood development index while controlling for children's age, weight and height. The results suggest that gender has no significant effect on early childhood development. In contrast, age and height have a positive impact on early childhood development. In Model (ii), we add mother's education as a control variable. Here, we also find that gender is not associated with a child's early childhood development. Yet, we find that a mother's education has a positive impact on children's early childhood development. In Model (iii), we control for a father's involvement in

a child's home education. Again, we find no evidence of gender differences. Results also indicate that children whose father provides home education (like reading, playing games, etc.) have higher early childhood development in contrast to children whose father does not participate in their home education at all. Finally, in Model (iv) we control for regional fixed effects. Overall, results confirm that being a female has no effect on early childhood development. Instead, the factors that affect early childhood development are a child's age, a child's height, a mother's education, a father's involvement in a child's home education and living in an urban area.

5.2. Estimates Using Weighted Indexes for Early childhood development

Table (3) reports the estimates of Equation (4) using the first component (pc1) and the second component (pc2). In Model (1), we include the same variables as Model (i). The results indicate that being a female has a positive effect on early childhood development (when we use the first component) but this effect is significant only at a threshold of 10%. This effect is not significant at a 5% threshold. Using the second component, we find no difference in early childhood development due to gender. After controlling for a mother's education in Model (2) and a father's involvement in Model (3), the results indicate that gender has no effect on early childhood development using both components while a mother's education and a father's involvement have a positive impact on children's early childhood development. Finally, after controlling for the area of residence and the region of residence, there is a small positive effect from being a female on early childhood development, but this effect is only significant at a 10% threshold. In addition, gender has no effect when we used the second component as early childhood development index.

6. Sensibility Analysis

6.1 Is there an heterogenous gender gap related to a child's area of residence

In order to test for this heterogeneity, we estimate the gender gap in early childhood development for children living in rural areas and those living in urban areas separately. The

results are presented in Table (4). We find no evidence of gender differences in both rural and urban residences when using both of our weighted and unweighted indicators of early childhood development.

6.2 Is there an heterogenous gender gap related to a child's household income

The second source of heterogeneity that we tested is a family's wealth. As in Author 1 and Author 2 (2019), we use the household wealth index to divide our sample analysis into two sub-samples: the poor and the wealthier. Subsequently, we estimated the gender gap in early childhood development for children from poor households and those from wealthier households separately. The results in Table (5) indicate that gender has no effect on children's early childhood development for both poor and rich households.

7. Conclusion

We provide new evidence that there is no early gender gap in terms of early childhood development among children 3-4 years old in Ghana. We take advantage of micro-level data from the 2011 round of Ghana's Multiple Index Cluster Survey (MICS). Our strategy consists first, in building early childhood development indexes that account for children's ability to read, count, recognize numbers, interact with peers and other people, taking into consideration the child's health, physical skills as well as the child's ability to follow rules and be independent. Subsequently, we estimate the gender gap in terms of early childhood development using several specifications. Results indicate that gender has no significant impact on children's school readiness. In contrast, we find that mother's education, father's involvement in the child home education and living in urban area have a positive effect on children's school readiness. This result is consistent with Grant and Behrman (2010) and Ombati and Ombati (2012) who find that the gender gap in later education outcomes in developing countries reflect the unequal access to schooling opportunities between male and female children. This paper contains some limitations. First, the results are obtained in the context of Ghana and therefore we do not argue that these results are generalizable in other countries. Second, the questions for early childhood development are limited. A larger set of questions on early childhood development will be

needed to measure the existence of a gender gap precisely. Future research may focus on identifying the factors affecting early childhood development in Ghana.

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Appendix 1

(1) Can your child identify at least ten letters of the alphabet?

(2) Can your child read at least four simple, popular words?

(3) Does your child know his name and recognizes the symbols of all numbers from 1-10

(4) Does the child get along well with other children?

(5) Does the child usually kick, bite or hit other children or adults?

(6) Does child get easily distract?

(7) Is the child able to pick up a small object with 2 fingers?

(8) Is the child sometimes too sick to play

(9) Does the child follow simple directions?

(10) Is the child able to do something independently?

Table 1: *Descriptive statistics*

		Male					Female			
VARIABLES	N	mean	sd	min	max	N	mean	sd	min	max
Child's age	1,467	3.486	0.500	3	4	1,444	3.469	0.499	3	4
Child's weight (kilograms)	1,467	14.35	2.007	5.800	22.20	1,444	13.91	2.072	6.100	30
Child's height (centimeters)	1,464	96.62	6.481	67.50	118	1,440	95.94	6.280	70.40	119.4
Early childhood development index 1	1,467	5.211	1.560	0	10	1,444	5.181	1.612	0	10
Father involve in child's education at home	1,467	0.288	0.453	0	1	1,444	0.267	0.443	0	1
Mother's education level										
Less than primary	1,467	0.585	0.493	0	1	1,444	0.562	0.496	0	1
Primary	1,467	0.358	0.480	0	1	1,444	0.370	0.483	0	1
Secondary and more	1,467	0.0573	0.232	0	1	1,444	0.0672	0.250	0	1
Area of residence										
Rural	1,467	0.713	0.453	0	1	1,444	0.720	0.449	0	1
Urban	1,467	0.287	0.453	0	1	1,444	0.280	0.449	0	1
Region of residence										
Western	1,467	0.0545	0.227	0	1	1,444	0.0492	0.216	0	1
Central	1,467	0.132	0.338	0	1	1,444	0.132	0.339	0	1
Greater Accra	1,467	0.0552	0.228	0	1	1,444	0.0506	0.219	0	1
Volta	1,467	0.0607	0.239	0	1	1,444	0.0568	0.232	0	1
Eastern	1,467	0.0348	0.183	0	1	1,444	0.0492	0.216	0	1
Asante	1,467	0.0532	0.224	0	1	1,444	0.0609	0.239	0	1
Brong Ahafo	1,467	0.0525	0.223	0	1	1,444	0.0519	0.222	0	1
Northern	1,467	0.284	0.451	0	1	1,444	0.272	0.445	0	1
Upper-East	1,467	0.139	0.346	0	1	1,444	0.152	0.359	0	1
Upper-West	1,467	0.135	0.342	0	1	1,444	0.125	0.330	0	1

Table 2: *Estimated average partial effects on early childhood development using unweighted index*

VARIABLES	Model (1)		Model (2)		Model (3)		Model (4)	
	coef	dydx	coef	dydx	coef	dydx	coef	dydx
Gender(1 if female)	-0.00755	-0.0408	-0.0141	-0.0761	-0.0142	-0.0769	-0.00860	-0.0464
	(0.0185)	(0.100)	(0.0182)	(0.0983)	(0.0178)	(0.0959)	(0.0176)	(0.0950)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
child's age	0.0443**	0.239**	0.0623***	0.336***	0.0636***	0.343***	0.0695***	0.375***
	(0.0205)	(0.111)	(0.0191)	(0.103)	(0.0187)	(0.101)	(0.0188)	(0.101)
Child's weight	-0.00501	-0.0271	-0.00578	-0.0312	-0.00612	-0.0330	-0.00484	-0.0261
	(0.00647)	(0.0350)	(0.00649)	(0.0351)	(0.00648)	(0.0351)	(0.00613)	(0.0331)
Child's height	0.0116***	0.0627***	0.00909***	0.0490***	0.00873***	0.0471***	0.00792***	0.0428***
	(0.00225)	(0.0124)	(0.00216)	(0.0118)	(0.00216)	(0.0118)	(0.00216)	(0.0117)
Primary			0.0978***	0.512***	0.0963***	0.504***	0.0754***	0.397***
			(0.0159)	(0.0835)	(0.0158)	(0.0832)	(0.0184)	(0.0953)
At least econdary			0.228***	1.275***	0.225***	1.260***	0.191***	1.063***
			(0.0264)	(0.159)	(0.0274)	(0.165)	(0.0251)	(0.143)
Father involve					0.0484***	0.261***	0.0450***	0.243***
					(0.0140)	(0.0747)	(0.0147)	(0.0786)
Urban							0.0726***	0.392***
							(0.0177)	(0.0962)
Central							0.0820***	0.463***
							(0.0248)	(0.139)
Greater Accra							0.00596	0.0324
							(0.0261)	(0.142)
Volta							-0.00194	-0.0105
							(0.0262)	(0.141)
Eastern							-0.0989	-0.510
							(0.0689)	(0.340)
Asante							0.0175	0.0954
							(0.0252)	(0.137)
Brong Ahafo							-0.0488	-0.258
							(0.0299)	(0.157)
Northern							0.00850	0.0462
							(0.0229)	(0.124)
Upper-East							-0.0234	-0.125
							(0.0256)	(0.137)

	Model (1)		Model (2)		Model (3)		Model (4)	
	pc1	pc2	pc1	pc2	pc1	pc2	pc1	pc2
Upper-West							-0.0288	-0.153
							(0.0236)	(0.126)
Constant	0.478***		0.596***		0.617***		0.641***	
	(0.153)		(0.146)		(0.144)		(0.147)	
Observations	2,656	2,597	2,656	2,597	2,656	2,597	2,656	2,597
F-statistic	44.24		50.72		49.72		24.99	
Prob > F	0.0000		0.0000		0.0000		0.0000	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: *Estimated average partial effects on early childhood development using unweighted index*

	Model (1)		Model (2)		Model (3)		Model (4)	
VARIABLES	pc1	pc2	pc1	pc2	pc1	pc2	pc1	pc2
Gender (1 if female)	0.204*	0.00104	0.154	0.00655	0.153	0.00637	0.182*	0.0542
	(0.108)	(0.0757)	(0.101)	(0.0765)	(0.0978)	(0.0767)	(0.0979)	(0.0764)
Child's age	0.311**	-0.0349	0.439***	-0.0559	0.447***	-0.0545	0.489***	-0.0529
	(0.122)	(0.0769)	(0.111)	(0.0760)	(0.108)	(0.0765)	(0.107)	(0.0673)
Child's weight	0.00278	0.0416	-0.00325	0.0428	-0.00596	0.0423	-8.12e-05	0.0535**
	(0.0357)	(0.0264)	(0.0287)	(0.0277)	(0.0277)	(0.0276)	(0.0268)	(0.0254)
Child's height	0.0769***	-0.0140	0.0594***	-0.0106	0.0570***	-0.0110	0.0519***	-0.00815
	(0.0124)	(0.00875)	(0.0105)	(0.00922)	(0.0104)	(0.00923)	(0.0105)	(0.00916)
Mother's education Less than primary			0.615***	-0.235***	0.604***	-0.237***	0.533***	-0.0831
			(0.0665)	(0.0778)	(0.0639)	(0.0775)	(0.0885)	(0.0736)
At least secondary			1.704***	-0.275**	1.684***	-0.279***	1.476***	-0.0725
			(0.175)	(0.108)	(0.179)	(0.106)	(0.154)	(0.105)
Father involves					0.358***	0.0623	0.341***	0.0512
					(0.0759)	(0.0773)	(0.0766)	(0.0657)
Area of residence Urban							0.489***	-0.0890

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
							(0.0745)	(0.0708)
Region of residence								
Central							0.160	-0.658***
							(0.138)	(0.107)
Greater Accra							-0.143	-0.757***
							(0.154)	(0.204)
Volta							-0.714***	-0.711***
							(0.166)	(0.183)
Eastern							-0.535*	-1.461***
							(0.297)	(0.232)
Asante							-0.208*	-0.468***
							(0.108)	(0.119)
Brong Ahafo							-0.379***	-0.407***
							(0.121)	(0.153)
Northern							-0.0168	-0.366***
							(0.107)	(0.118)
Upper-East							-0.180*	-0.295**
							(0.101)	(0.128)
Upper-West							-0.394***	-0.747***
							(0.105)	(0.129)
Constant	-8.439***	0.806	-7.583***	0.683	-7.435***	0.709	-7.120***	0.757
	(0.738)	(0.680)	(0.659)	(0.706)	(0.651)	(0.711)	(0.671)	(0.728)
Observations	2,656	2,656	2,656	2,656	2,656	2,656	2,656	2,656
R-squared	0.144	0.003	0.238	0.012	0.249	0.012	0.295	0.104

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: *Robustness check: Estimated gender gap by area of residence (rural verus urban)*

VARIABLES	Children living in rural area			Children living in urban area		
	Index1	pc1	pc2	Index1	pc1	pc2
Gender (1 if female)	-0.0163	0.120	-0.0215	0.000284	0.240	0.131
	(0.0178)	(0.0990)	(0.0787)	(0.0250)	(0.174)	(0.131)
Child's age	0.0157	0.182	-0.0526	0.123***	0.884***	-0.0521
	(0.0180)	(0.112)	(0.0966)	(0.0364)	(0.195)	(0.101)
Child's weight (kilograms)	-0.00479	-0.0364	0.0116	-0.00415	0.0462	0.0974**
	(0.00704)	(0.0314)	(0.0338)	(0.0103)	(0.0385)	(0.0391)
Child's height (centimeters)	0.0106***	0.0653***	0.0112	0.00523	0.0332*	-0.0306*
	(0.00289)	(0.0119)	(0.0100)	(0.00350)	(0.0189)	(0.0173)
Mother's education level						
Primary	0.0774***	0.504***	-0.0127	0.0605**	0.518***	-0.189
	(0.0191)	(0.0838)	(0.0955)	(0.0301)	(0.144)	(0.119)
At least secondary	0.167***	1.199***	0.218	0.193***	1.555***	-0.210*
	(0.0467)	(0.218)	(0.207)	(0.0347)	(0.162)	(0.113)
Father involve	0.0597***	0.421***	0.0823	0.0243	0.229*	0.00254
	(0.0164)	(0.0877)	(0.0870)	(0.0265)	(0.136)	(0.104)
Region of residence						
Central	0.115***	0.353***	-0.674***	0.0381	-0.115	-0.673***
	(0.0298)	(0.124)	(0.113)	(0.0459)	(0.270)	(0.178)
Greater Accra	-0.0377	-0.200	-0.754***	-0.00458	-0.293	-0.821***
	(0.0405)	(0.214)	(0.177)	(0.0406)	(0.237)	(0.249)
Volta	0.0144	-0.529***	-0.715***	-0.0274	-0.953***	-0.762**
	(0.0319)	(0.160)	(0.188)	(0.0414)	(0.260)	(0.343)
Eastern	-0.128*	-0.327	-1.570***	-0.0829	-0.894**	-1.422***
	(0.0767)	(0.247)	(0.243)	(0.0841)	(0.417)	(0.363)
Asante	0.0546	-0.0395	-0.430***	-0.0439	-0.520**	-0.585***
	(0.0333)	(0.101)	(0.140)	(0.0466)	(0.247)	(0.192)
Brong Ahafo	-0.0438	-0.338**	-0.310*	-0.0695	-0.495*	-0.605***
	(0.0394)	(0.130)	(0.165)	(0.0529)	(0.249)	(0.197)
Northern	0.0258	0.0397	-0.255**	-0.0214	-0.106	-0.549***

	(0.0296)	(0.112)	(0.122)	(0.0420)	(0.254)	(0.186)
Upper-East	-0.0167	-0.161*	-0.177	-0.0138	-0.0497	-0.589***
	(0.0302)	(0.0914)	(0.130)	(0.0418)	(0.276)	(0.197)
Upper-West	-0.0438	-0.377***	-0.577***	0.0541	-0.202	-1.279***
	(0.0285)	(0.101)	(0.130)	(0.0609)	(0.333)	(0.254)
Constant	0.560***	-6.898***	-0.565	0.813***	-6.660***	2.369*
	(0.188)	(0.671)	(0.577)	(0.242)	(1.370)	(1.375)
Observations	1,892	1,892	1,892	764	764	764
R-squared		0.222	0.119		0.285	0.094

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: *Robustness check: Estimated gender gape by household's income (poor versus rich)*

	Children living in poor housholds			Children living in rich housholds		
VARIABLES	Index1	pc1	pc2	Index1	pc1	pc2
Gender (1 if female)	-0.0319	0.0333	0.108	-0.0227	0.214	-0.0837
	(0.0226)	(0.0875)	(0.0759)	(0.0359)	(0.239)	(0.131)
Child's age	0.0267	0.315***	0.0619	0.0995**	0.681***	-0.171
	(0.0217)	(0.113)	(0.106)	(0.0405)	(0.225)	(0.117)
Child's weight (kilograms)	-0.00962	-0.0233	0.0117	0.00226	0.0771	0.0389
	(0.00756)	(0.0312)	(0.0344)	(0.00970)	(0.0573)	(0.0499)
Child's height (centimeters)	0.00982***	0.0426***	0.0122	0.00380	0.0360	-0.0176
	(0.00281)	(0.0106)	(0.0112)	(0.00384)	(0.0252)	(0.0221)
Mother's education level						
Primary	0.0375	0.267***	0.0339	0.130***	0.757***	-0.0791
	(0.0226)	(0.0729)	(0.123)	(0.0447)	(0.260)	(0.199)
At least secondary	0.117	0.908**	0.166	0.234***	1.580***	-0.0429
	(0.0775)	(0.435)	(0.373)	(0.0457)	(0.257)	(0.191)
Father involve	0.0528**	0.287***	0.0991	0.0171	0.198	-0.0454
	(0.0225)	(0.0892)	(0.0849)	(0.0308)	(0.165)	(0.0892)
Area of residence						
Urban	0.0697**	0.591***	0.102	0.0270	0.141	-0.0463

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	(0.0300)	(0.130)	(0.128)	(0.0408)	(0.177)	(0.124)
Region of residence						
Central	0.102**	0.334*	-0.682***	0.0373	-0.249	-0.554***
	(0.0425)	(0.176)	(0.125)	(0.0334)	(0.241)	(0.183)
Greater	0.0307	-0.174	-1.153***	-0.0243	-0.365	-0.541**
	(0.0776)	(0.320)	(0.192)	(0.0339)	(0.231)	(0.237)
Volta	-0.0265	-0.732***	-0.774***	0.0523	-0.694*	-0.556
	(0.0518)	(0.150)	(0.203)	(0.0715)	(0.389)	(0.378)
Eastern	-0.135	-0.428	-1.326***	-0.104	-0.741	-1.311***
	(0.104)	(0.355)	(0.181)	(0.0627)	(0.473)	(0.374)
Asante	0.0214	-0.320	-0.787***	-0.0329	-0.420*	-0.253
	(0.0542)	(0.293)	(0.163)	(0.0426)	(0.227)	(0.173)
Brong Ahafo	-0.0707	-0.480***	-0.433**	-0.0273	-0.119	-0.702***
	(0.0440)	(0.150)	(0.180)	(0.0719)	(0.327)	(0.224)
Northern	-0.0112	-0.138	-0.325**	0.0697	0.591	-0.697***
	(0.0375)	(0.147)	(0.136)	(0.0499)	(0.363)	(0.197)
Upper-East	-0.0484	-0.256*	-0.327**	0.107***	0.836**	-0.502**
	(0.0370)	(0.134)	(0.135)	(0.0303)	(0.364)	(0.205)
Upper-West	-0.0751**	-0.461***	-0.685***	0.0720	-0.193	-1.139***
	(0.0351)	(0.147)	(0.137)	(0.0627)	(0.312)	(0.245)
Constant	0.705***	-5.186***	-1.038	0.882***	-6.927***	2.254
	(0.176)	(0.598)	(0.662)	(0.255)	(1.754)	(1.696)
Observations	1,732	1,732	1,732	498	498	498
R-squared		0.175	0.093		0.241	0.097

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1