



Regional inequalities and gender differences in academic achievement as a function of educational opportunities: Evidence from Ethiopia



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ARTICLE INFO

Keywords:

Educational opportunity
Regional inequalities
Gender
Academic achievement
Ethiopia

ABSTRACT

This study investigated regional and gender differences in academic achievement in Ethiopia, and examined whether these differences can be explained in terms of unequal educational opportunities (EO). Educational opportunity was operationalized in a broad sense based on a regional differentiation in terms of socio-economic and school environment factors. The study results are based on a multilevel analysis of the 2014 and 2015 national standardized exam for grade 12 students ($n = 194503$ and $n = 205719$). Whereas the Central (high EO) regions outperformed the other regions (Cohen's $d = 0.85$) as expected, there were some inconsistencies in the comparison between Established (mid EO) regions and Emerging (low EO) regions. Coincidentally, the two Emerging regions that were unexpectedly performing at the level of the Established regions were also the two regions in which there was no evidence for a gender gap in achievement. For other regions, including the Central regions, evidence for a gender gap sometimes as large as the regional gap was identified, with boys having on average higher scores than girls (Cohen's $d = [0.02, 0.92]$ with an average of 0.50). Plausible explanations and further policy recommendations are discussed.

1. Introduction

Recent studies by UNESCO (2015a, 2015b) indicate that sub-Saharan Africa continues to show good progress in education, yet wide disparities within each country are still holding back full achievement of the universal Education-For-All goals. In this study, we take a useful snapshot of the situation in Ethiopia to raise further awareness and set an agenda for further studies that could lead to policies and practices that can help drive improvement of educational attainment and national development in Ethiopia. The post-2015 education and development agenda stresses that the driving forces behind education and development frameworks should be 'elimination of poverty and eradication of inequalities' within and across countries, as well as providing universal and equitable access to quality education (Sayed et al., 2013).

Ethiopia has been focusing on improving students' learning outcomes and educational opportunities at all levels of the education sector (World Bank, 2005). Since the education system is seen as a means to enhance overall nation-building and achieve the national goal of eradicating poverty, it is essential that the education system actually offers equal opportunities and quality educational experiences that promote learning achievement. The Ethiopian government has expressed interest in creating better educational opportunities, with the expectation that doing so will enhance learning outcomes. In collaboration with the

World Bank, Ethiopia designed and implemented the General Education Quality Improvement Program (GEQIP). This program seeks to facilitate improvements in the quality of schooling on a national level and focus on equity and learning outcomes through investment in key inputs such as textbooks and infrastructure (MOE, 2008). This has led to an increase in the number of teachers, schools, as well as access to all levels of the education system in the country. However, many challenges still remain and substantial within-country differences and inequalities can be expected. For instance, lack of access to education and unequal educational opportunities continue to be an obstacle, especially for females and students in emerging regions in Ethiopia (e.g., regional case study, Gambella: Ketema et al., 2014; Tadesse et al., 2014).

The role of educational opportunities in regard to academic achievement has been documented in many studies (Eide and Showalter, 1998; Guiton and Oakes, 1995; Lacour and Tissington 2011; Moore et al., 2012; Rolleston et al., 2014). However, many of those earlier studies focused on Western countries and used an opportunities-to-learn curricular perspective. Yet, variation in educational opportunities and achievement is still a global concern and very limited studies have been conducted in the context of developing countries (UNESCO, 2004). Educational opportunity in this context refers to the extent to which students have equitable access to basic facilities that make up

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quality schools, and also the extent to which students encounter social and cultural barriers to proper schooling. It is a broad construct covering students' access to qualified teachers, a safe and clean school environment, textbooks and learning materials, and school-home-social conditions (Coleman 1968; Coleman et al., 1966; Stevens, 1996). Since the lack of equal educational opportunities is a major concern in developing nations, studies in such countries can provide vital contributions to the existing scientific evidence in the literature, which in turn can be used to inform local and international policies. This study explores whether inequalities in educational opportunities across different regions and groups in Ethiopia are reflected in differences in school achievement.

1.1. Structure of the Ethiopian education system

The current Ethiopian educational system was designed with the purpose of expanding the education sector, improving quality, and ensuring that educational content is harmonized with the country's development objectives. In line with the federal system, each of the regional states has their own regional educational bureaus. These Bureaus are responsible for the administration and management of general education, technical and vocational education, and teacher-training programs and institutions, while the federal Ministry of Education is responsible for higher education. The basic role of the Ministry of Education is to formulate policy and guidelines that are implemented by the different regional Bureaus or units. The general formal education structure includes pre-school education, primary and secondary education, technical-vocational education, and higher education.

Primary education covers 8 years (ages 6 to 14) and is divided into two 4-year cycles (grades 1 through 4; and grades 5 through 8). At the end of grade 4, students take the first national examination and must achieve a score of at least 50 percent in order to continue to grade 5. At the end of grade 8, students take the national Primary School Certificate examination. The next structure is 2 years of general secondary education (grades 9–10). At the end of this general secondary education (grade 10), students take the Ethiopian General Secondary Education Certificate/10th Grade National Examination. This standardized exam is administered nationally by the Ethiopian National Assessment and Examination agency. After having successfully completed this exam, students can either follow vocational training or attend the two general upper grades (the so-called "preparatory program"). Since 2001, the

continued secondary education program consists of a 2-year period (grades 11 and 12) and is regarded as preparation for higher education. At the end of this phase, students take the Ethiopian University Entrance National Examination to obtain a university admission certificate. This entrance examination is a standardized exam administered nationally by the Ethiopian National Assessment and Examination Agency. The current study builds on national examination results of two student cohorts at the end of this preparatory program in grade 12.

Although the country has one general education policy, each regional state has a mandate to amend the components so as to fit into the local context. All regional education bureaus are expected to prepare their students for the national examination and they have the responsibility (in collaboration with the Ministry of Education) to facilitate the administration of the examinations each year. The national examinations have high stakes attached to them, and are used for selection, placement and certification.

1.2. Educational opportunity: disparities between regions

It is reasonable to assume that educational opportunity depends on the resourcefulness of a region or an institution, and that poorly resourced schools provide fewer learning opportunities to their students. In order for students to achieve better, they must have appropriate learning opportunities. Whenever different regions within a country have major economic differences, it is likely that students from economically less developed regions are more disadvantaged. Several studies across the globe have looked into differences in socioeconomic development level across regions as sources of variation in students' academic achievement (see e.g., Italy: Sibiano and Agasisti, 2013; Kenya: Amunga et al., 2010; Brazil: Ferrão, 2014; Czech Republic: Straková et al., 2006; China: Mok et al., 2009; Qian and Smyth, 2008; Nigeria: Ukiwo, 2007; Onwuameze, 2013) and the contribution of policy related practices to student learning outcomes in different regions (Belgium: Ning et al., 2016). The impact of regional inequality, social class and gender on educational outcome was significant even in a highly developed Western country as Canada (Edgerton et al., 2008).

Although Ethiopia is one of the largest sub-Saharan African countries and large within-country discrepancies can be expected, there is a lack of studies investigating the link between students' academic achievement and regional variations in educational opportunity and differences in socio-economic developments across regions in Ethiopia.

Until 1992, the country was structured according to historical



Fig. 1. Regional states of Ethiopia.

Source: United Nations Office for the Coordination of Humanitarian Affairs (OCHA).

Table 1
Overview of Regional characteristics of the preparatory school system in Ethiopia.

	Region	Population(2007)	GPI	% Private Schools	School Size	Student Teacher ratio	Textbook Student Ratio	Poverty index
Central	1 Addis Ababa	2739551	1.07	37	204	20.0	10.6	28.0
	2 Dire Dawa	341834	0.84	40	124	20.5	11.0	28.0
Established	3 Tigray	4316988	0.99	6	168	29.6	12.2	31.8
	4 Amhara	17221976	0.88	1	202	23.0	13.7	30.5
	5 Oromia	26993933	0.81	5	129	25.8	16.3	28.7
	6 SNNP	14929548	0.84	7	151	23.0	11.0	29.6
	7 Harari	183415	0.91	8	224	17.0	10.8	11.1
Emerging	8 Afar	1390273	0.70	2	99	50.8	5.1	36.1
	9 Somali	4445219	0.63	3	96	44.0	2.2	32.8
	10 BGumuz	784345	0.78	0	79	28.4	11.7	29.9
	11 Gambela	307096	0.33	0	172	30.4	3.9	32.0

Note. Source (CSA, 2007; MOE, 2013; UNDP, 2015); Preparatory school = Grade 11 and 12;

Region: names of 11 regions and educational opportunity based classification.

GPI: Gender parity index = school participation ratio of number of female students to male students.

%Private schools: percentage of private schools.

School size: average number of students per school.

Student teacher ratio: average number of students per teacher.

Textbook student ratio: average number of textbooks per student.

Poverty index: income-based poverty incidence.

geographical location into 13 provinces. The current regional structure was formulated after the current government came in to power in 1991 and it established a federal government with 11 regions (see Fig. 1). The regional division was roughly based on ethno-linguistic criteria, but in practice several distinct ethnic groups can still be residing in one region. Hence, as always there remains heterogeneity within regions with respect to ethnicity, language, geography, historical aspects, and socio-economic matters. The current Ethiopian Constitution maintains that the Regions have equal rights and powers, although they differ in size (Habib, 2011). The regional structure reflects the country's decentralized political system and the government's commitment to address regional imbalances; A regional imbalance which is most certainly there. The regional imbalance pushed the government in 2007 to establish the Emerging Regions Development Program (ERDP: estimated funding US\$13.4m, 2007) as a first step to towards poverty alleviation in four regional states: Afar, Somali, B.Gumuz, and Gambela. An overview of some regional educational and socio-economic characteristics is given in Table 1. Based on these characteristics and the regional status assigned by the government, the 11 regions were classified into 3 categories: Central, Established, and Emerging regions. Note that only the last label is an official governmental label, whereas the other two labels are a consequence of the educational and socio-economic conditions in these regions. The division can be interpreted as a means of ranking the various regions, and it is based on the extent to which students have access to proper quality education.

The *Emerging regions* (i.e., Afar, Somali, B, Gumuz, and Gambela) are considered to be economically less developed, more traditional rural areas, with high poverty levels, and frequent occurrence of drought. Girls' education is less valued and female students tend to be forced at an early age to marry and work at home. This is reflected in a low Gender Parity Index of about 0.7 (GPI: the ratio of girls to boys in school), meaning that for about every 10 boys only 7 girls enroll in school. The Gambela region has a noticeably low GPI of barely one-third. Lack of awareness about the importance of education, low level of income and household leadership burdens for students are common phenomena in these regions. The majority of the schools (more than 60%) in the region are working under poor conditions, without basic school facilities (Tadesse et al., 2014). In general, although the school sizes are smaller, the average number of students per teacher (student-teacher ratio) is higher in these regions and there is a shortage of textbooks (textbook-student ratio), implying a potentially more isolated environment and a heavier workload for teachers in the Emerging regions. These indicators are consistent with low expectations for

educational opportunities in these Emerging regions.

In contrast, *Established regions* (i.e., Tigray, Amhara, Oromia, Southern Nation Nationalities and People (SNNP), and Harari) are relatively more developed regions, consisting of both urban and rural areas, and students who live there are more advantaged, as they have access to a higher proportion of qualified teachers and better resourced schools (especially schools in urban areas). Some of these regions have improved gender parity in school participation. This puts Established regions in a better position than Emerging regions with regard to ease of providing educational opportunities for their students.

The two *Central regions* (i.e., Addis Ababa and Dire Dawa) are administered centrally by the federal government. Addis Ababa, the capital city, consists of 9 independent sub cities with an urban population. Dire Dawa is an industrial centre and home to several markets. Both Addis Ababa and Dire Dawa regions have several high quality schools (i.e., well-resourced and with well-trained, experienced teachers) and a large number of private schools as compared to the other regions. They are considered to be the most developed regions because of their capacity and resources to provide better educational opportunities in comparison to Emerging and Established regions.

Consistent with this overall picture – Emerging < Established < Central – the official poverty index report (UNDP, 2015) indicates that the poverty incidence is highest in Emerging regions and lowest in the two Central regions. There is one exception, however: the Established region Harari, which has the lowest poverty incidence of all of the regions.

1.3. Gender and educational opportunities

Gender disparity is still evident in access, enrolment and literacy figures, especially, in sub Saharan Africa, including Ethiopia. As in many other societies, women and girls constitute one of the particularly vulnerable groups in Ethiopia. It has been observed for many years that women and girls are victims of discrimination in the economic, social and political life of the community. 'Education and women' was considered as the most urgent priority in attaining the Education For All (EFA) objectives by ensuring access to and improving the quality of education for girls and women.

There are many factors that are deemed to contribute to gender inequality in education: political instability and violence, poverty and economic challenges, negative cultural values and early marriage (see e.g., Aikman and Unterhalter, 2006; Ombati and Mokua, 2012). Parents may send their daughters to school, but they still expect them to fulfil

traditional duties, such as household chores, rather than making sure they do their homework or arrive at school on time for class. The problem is even more severe in rural areas, where schools are not well equipped and/or located at large distance. Furthermore, it is very common to see primary and secondary schools without proper water supplies and separate toilets for girls and boys, and this is, in fact, one of the common reasons for girls to leave secondary school or miss classes (Hagos, 2014; Tsegaye et al., 2011).

A national survey of women between 15 and 49 years of age revealed that 75% of urban and 31% of rural women had ever been to school (Erulkar et al., 2010). Although, the education system has shown a systematic increase in enrolment at almost all levels over the past decades, there is still reason for concern, since boys still have higher enrolment ratios than girls; especially, in secondary education. The Net Enrolment Rate, a measure of students' participation at the right age, indicates that 95% of the primary school age boys (7–14) enroll in primary school whereas 90% primary school age girls participate in primary school (EFA, 2015). Dropout rate in primary education was 15.5% for females and 17.4% for males in 2011, and 19% for female students and 18.2% for male students in 2007. The National Educational Statistical Abstract indicates that for every 100 boys enrolled in secondary education, there are approximately only 77 girls (MOE, 2011).

The annual literacy statistics of 2011 indicated that for the age 15–24, 63% of males can read and write, compared to 47% of females that can read and write. For the wider age range of 15 and above, the 2012 annual literacy statistics specify that 82% of Ethiopian women aged 15 and above are illiterate (compared to 58% of men). This does indicate that there is improvement for the younger generations, but the gap is certainly not closed.

Several international agencies and collaborating partners have been supporting the initiatives to improve girls' participation in developing countries, although the information regarding the impact of such initiatives remains scarce (UNESCO, 2004; Unterhalter, 2007). In Ethiopia, for instance, United Nation Girls Education Initiative (UNGEI) have since 2005 been working in collaboration with national and regional government departments to promote girls education and accelerating the ongoing initiatives with an emphasis on marginalized areas in the country. Similarly, other national initiatives have been designed and implemented in order to improve girls' school participation and achievement. For instance, the Ethiopian government in collaboration with UNESCO had implemented a project from 2011 to 2014 to improve the learning outcome of girls in secondary schools of the B. Gumuz region (UNESCO, 2011). However, others argue that focusing on gender equality in education as a separate policy area has little impact and that women and girls benefit more from a general expansion of access to quality education (Unterhalter, 2007).

In any case, all efforts in creating equal opportunities and equal access to quality education for both girls and boys can be expected to contribute to minimizing the gender gap in students' academic achievement. It is clear that achieving equal opportunity for both sexes requires not only equal chance of participation but also minimizing the gap in academic outcomes. Smaller scale studies on a possible gender gap in academic achievement in Ethiopia either indicate a gap in favor of male students (1st year GPA for university in the Oromia region: Tasisa and Tafesse, 2013; 1st year GPA for university in the Oromia region: Asmamaw and Getachew, 2011) or are inconclusive (Amhara regional exam for Grade 8: Eshetu, 2015a,b). Based on large-scale national data on students' academic achievement, the current study explores gender differences in academic achievement across regions that differ in socio-economic development.

1.4. Research hypotheses

The description of the Ethiopian context makes it clear that large regional differences exist, including large regional differences in

educational opportunity, which can be expected to translate into clear regional differences in educational achievement. Therefore, the following hypothesis was formulated:

H1. Regional differences in academic achievement are related to differences in educational opportunities (EO).

More specifically, we expect that (i) the Central regions – having the most EO – outperform all other regions, and that (ii) the Emerging regions – lacking EO – are underperforming compared to all other regions.

The fact that boys and girls have unequal educational opportunities implies that there are differences in access to education afforded to both sexes, as well as differences in educational achievement outcomes. Hence another hypothesis was formulated.

H2. Gender differences in academic achievement are related to regional differences in educational opportunities (EO).

This study provides a differential perspective on academic achievement in one of the largest educational systems in a developing country, and explores the theoretically expected regional differences and gender gap as a function of regional educational opportunity using Ethiopian student data on the grade 12 national standardized examination. Large quantitative studies that shed light on educational systems that are in continuous development, as is the case in Ethiopia, are currently missing in the literature.

2. Method

2.1. Sample

For this study, data for two student cohorts were graciously provided by the National Assessment and Examination Agency (NAEA) in Ethiopia. In the academic year 2014, the NAEA assessed 199899 grade 12 students from 1186 schools covering all eleven regional states throughout the country; In the academic year 2015, the NAEA assessed 211706 grade 12 students from 1371 schools covering all eleven regional states throughout the country. The increase in student and school numbers from 2014 to 2015 reflects the ongoing development and progress Ethiopia is making in terms of access to education. In both cohorts, about 3% of the students did not manage to fully complete the exam and hence, did not acquire a valid end score. This brings the effective sample size to $n = 194503$ and $n = 205719$ for the 2014 and 2015 student cohort, respectively. In both cohorts about 44% of the students were female (average age 18.7; 95% confidence interval [17,22]) and 56% male (average age 19.4; 95% confidence interval [17,24]).

2.2. Measures

2.2.1. Academic achievement

The outcome variable of this study was student academic achievement, defined as students' performance in the grade 12 national examination as measured by the average test score on the exam scaled from 0 to 100. The national examinations consist of seven subjects for each of the two different study streams: natural science (English, Math-1, Aptitude, Civics, Physics, Chemistry, and Biology) and social science (English, Math-2, Aptitude, Civics, Economics, Geography, and History). The examination provides an overall assessment of students' acquired subject matter skills, knowledge, and understanding. Each subject is covered by a standardized exam consisting of 45 to 60 multiple choice items with scores expressed on a scale from 0 to 100. Although similar in composition and number of items per subject, the 2014 exam does not contain the same items as the 2015 exam. Hence, the scores, regional differences, and gender gaps should only be compared across the two cohorts in a relative sense (i.e., comparison of exact numeric values is not warranted).

2.2.2. Educational opportunity

Because learning processes and factors related to learning are often complex, educational opportunity (EO) is a difficult construct to measure. Winfield and Woodard (1994) suggested that a minimum measure of EO should include information about the resources, school conditions, curriculum, and instruction to which students have access. We operationalized EO equally broadly in this study by relying on a classification of regions in terms of their regional educational opportunities as linked to an official governmental category system. This proxy measure for educational opportunity is mainly based on economic and school related factors and defines three ordered categories: The Central regions, the Established regions, and the Emerging regions (see also Table 1).

2.3. Statistical analysis

We used a multilevel analysis strategy (Snijders and Bosker, 2011) to properly account for the nested data structure (i.e., students within schools) when addressing the research questions. Analyses were performed in the open-source statistical software R using the package lme4 (Bates et al., 2015) for the estimation of linear mixed-effects models. The analyses were run for each of the two student cohorts separately. This provides a way to assess stability of regional differences and gender gap across the two-year period covered by the two cohorts.

3. Results

3.1. Descriptive statistics

In order to provide an overall picture of the nature of the outcome measure in this study and as a first descriptive step in the analysis, we set up an unconditional null model for academic achievement by allowing the average exam score to vary across schools, i.e., a so-called *random intercept model*. We report the results for the 2014 cohort and the 2015 cohort simultaneously by separating them with a “/”. The variance for the random intercept at the school level amounted to 50/62 with the residual within-school variance at the student-level being 57/58. As such, 47%/52% of the total variance in average exam score could be attributed to school-level differences and the remaining 53%/48% could be attributed to individual differences. The relatively high percentage due to school-level differences is in line with the general impression that school quality and characteristics can differ widely within Ethiopia. Fig. 2 illustrates the distribution of the best linear unbiased prediction (BLUP) for the random intercept for academic achievement at school level for the 1186/1371 schools from the 2014/2015 student cohort. The range of school-level academic achievement was wide in most regions. In Addis Ababa and Dire Dawa, for instance, 50% of the school average scores were between 40 and 60 in 2015. The null model further indicated

that the expected exam score for an average Ethiopian grade 12 student in an average school is estimated to be 43.61 (.21)/47.15 (.22) with a within-school standard deviation of 7.6/7.6.

3.2. H1: regional differences in academic achievement as a function of educational opportunity

In the next analysis step, the regional unit that a school belongs to was added to the null model as a categorical fixed-effect school-level predictor to investigate regional differences in academic achievement. Model comparison by a likelihood ratio test shows that this regional model outperforms the unconditional null model ($\chi^2(10) = 150/119, p < 0.001$), supporting the existence of regional differences in academic achievement in Ethiopia. The difference in average exam score between students of different regions can amount to over 10 points (e.g., 2015 student cohort: Addis Ababa vs B.Gumuz: $\beta = 10.47 (1.55), p < 0.001$) (see also Table 2), with the region explaining about 11%/8% of the between-school variance. The standardized regional difference effect sizes as measured by Cohen’s *d* varied from hardly different $d = 0.01$ to largely different $d = 1.51$, with an average of $d = 0.60/.50$ across all pairwise regional comparisons. This indicates that a potential clustering of regions in terms of average academic achievement might exist.

In order to test one of our core research hypotheses that regional differences in academic achievement in Ethiopia are a function of differential educational opportunities, the regional unit categorical predictor with 11 levels was substituted by a categorical EO predictor, coding for the three levels of regional educational opportunities (Central, Established, and Emerging).

As expected, the Central regions (i.e., better EO regions) largely outperformed the other two regional EO categories (Established and Emerging) by about six to seven points on average, which comes down to a Cohen’s *d* standardized difference of about 0.8 ($d = 0.92/.84, \beta = 6.94 (.89)/6.43 (.70), p < 0.001; d = 0.88/.89, \beta = 6.68 (.66)/6.78 (.90), p < 0.001$). Yet unexpectedly, the model indicated that there was no evidence for the Established regions systematically outperforming the Emerging (less EO) regions ($\beta = 0.27 (.68)/.35 (.66), p = 0.695/.589$). In fact, model comparison showed that this regional educational opportunity model was untenable as it does not perform on an equal footing with the regional model ($\chi^2(8) = 48/34, p < 0.001$). In order to be able to better interpret the model’s failure, the average predicted regional exam score under the EO model was compared to the corresponding average predicted regional exam score under the regional model (see Table 2). Although the Emerging regions (least EO) were expected to be the lowest performers in terms of academic achievement, the performance in the Somali region for 2014 and 2015, and in the Afar region for 2015 was at an equivalent level to that in Established regions. The other two Emerging regions, Gambela and B.Gumuz, did underperform ($d \approx 0.6$), as expected, compared to the

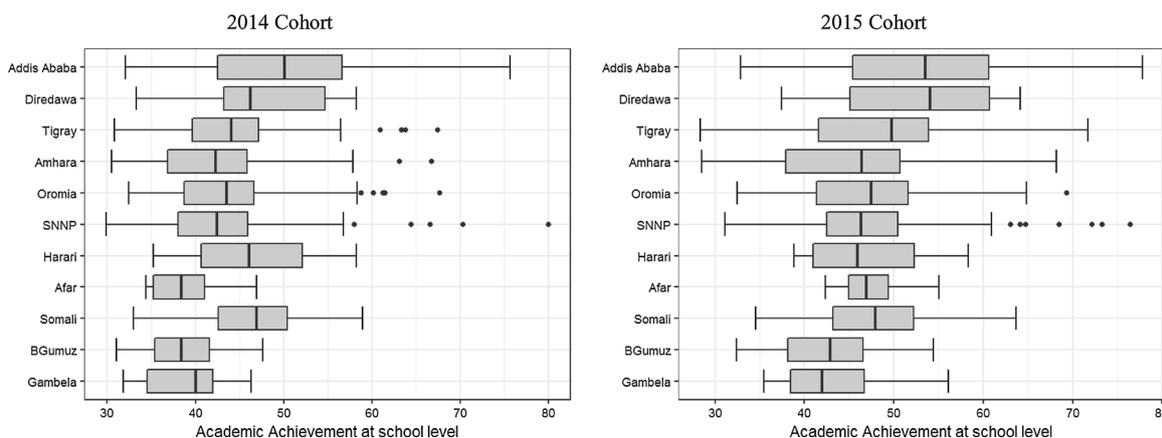


Fig. 2. The distribution of the best linear unbiased prediction (BLUP) for the random intercept for academic achievement at the school level in the 2014 and 2015 student cohort.

Table 2
Average exam score according to the Regional model compared to the average exam score according to the Educational Opportunity model for the 11 regions in Ethiopia.

Region	n	n _s	Regional Model (R)	Educational Opportunity Model (EO)	Δ(R,EO)
<i>2014 Cohort</i>					
Addis Ababa	25336	114	49.81	49.61	0.21
DireDawa	1342	10	47.24	49.61	-2.36
Tigray	15840	105	44.06	42.93	1.13
Amhara	51226	251	42.04	42.93	-0.89
Oromia	54079	377	43.33	42.93	0.40
SNNP	32324	206	42.69	42.93	-0.24
Harari	709	3	46.51	42.93	3.58
Afar	1212	11	38.89	42.66	-3.78
Somali	7799	63	46.31**	42.66	3.65
B.Gumuz	2608	31	38.40	42.66	-4.27
Gambela	2028	15	38.66	42.66	-4.01
<i>2015 Cohort</i>					
Addis Ababa	25254	127	53.02	52.97	0.06
DireDawa	1294	11	52.31	52.97	-0.65
Tigray	17651	107	48.42	46.52	1.89
Amhara	54686	278	45.02	46.52	-1.51
Oromia	53654	435	47.02	46.52	0.49
SNNP	36352	246	46.56	46.52	0.03
Harari	840	4	47.12	46.52	0.60
Afar	1541	16	47.23**	46.19	1.04
Somali	9137	99	47.76**	46.19	1.56
B.Gumuz	2464	31	42.54	46.19	-3.65
Gambela	2846	17	42.63	46.19	-3.57

Note. The regional model is the better fitting model.
n: Number of students; n_s: Number of schools; Δ(R, EO): Difference in prediction between the Regional model and the Educational Opportunity model.
** Emerging region performing at equal footing of Established regions.

Established regions (see Table 2). Hence, the Emerging regions fall into two groups: a group performing as expected, and a group performing better than expected according to EO expectations.

3.3. Gender differences in academic achievement

In order to study gender differences in academic achievement, gender was added to the null model as a categorical person-level predictor with a random slope across schools. Model comparison indicated that the gender model outperformed the null model ($\chi^2(3) = 28842/25403, p < 0.001$), with gender explaining 14%/12% of the within-school variation in academic achievement. In a typical school, a female scores about 41/44 points on average ($\beta_0 = 40.78 (0.23)/44.65 (0.23)$) while a male student scores about 4 points higher on average ($\beta_{Gender} = 4.84 (0.09)/4.29 (0.08), p < 0.001$) than a female student. This average gender gap in favor of males is highly variable across schools (Between-school variance (β_{Gender}) = 5.10/5.60), with some schools hardly showing a gender gap, whereas other schools display a gap of up to 9 points (95% CI [-0.41, 9.27]/[-0.34, 8.94]). The average score for females was more variable across schools (SD = 7.57/8.27) than for males (SD = 7.02/7.74), and higher average scores for females were related to a smaller gender gap ($r = -0.38/-0.36$) in schools.

3.4. H2: gender differences in academic achievement as a function of regional educational opportunities (EO)

In the next analysis step, the regional unit to which a school belongs was added to the gender model as a categorical fixed-effect school-level predictor, first as a main effect and then later including an interaction effect between region and gender to allow for regional differences in

gender gap in academic achievement. Model comparison indicated that the gender × region interaction model showed a better fit to the data than the (gender, region) main effects model ($\chi^2 (10) = 284/390, p < 0.001$), and the gender model ($\chi^2 (20) = 448/521, p < 0.001$). The gender × region interaction model explained 44%/48% of the total variation in exam scores compared to 34.4%/40.5% for the null model. Although the size of the gender gap in academic achievement at school level varied across regions, with an average of about 4 points in favor of male students ($\Delta = 3.99 (0.18)/3.58 (0.17), p < 0.001$), there was supporting evidence for an average gender gap in all regions and always in favor of male students (see Table 3), with the exception of the Somali region in both 2014 and 2015 ($\Delta = 0.18 (0.34)/0.77 (0.67), p = 0.604/0.254$) and the Afar region in 2015 ($\Delta = -0.02 (.30), p = 0.934$). These specific regional cases were also the two Emerging regions that surfaced in the earlier analysis as performing better than expected according to their educational opportunities classification.

4. Discussion

This study explored the theoretically expected regional differences and gender gap in academic achievement as a function of regional educational opportunity using Ethiopian student data on the grade 12 national standardized examination of 2014 and 2015.

Although the Ethiopian government has been implementing quality improvement programs – see, for instance, the General Quality Education Program (GEQIP) – to enlarge the educational opportunities across the country, our finding indicates that the average academic achievement score in the majority of regions is much lower ($d \approx -0.85$) than that in the Central regions, which also happen to be the regions providing better educational opportunities to their students.

This finding supports the claim that educational opportunity has an impact on students’ academic outcomes (Eide and Showalter, 1998; Ferguson et al., 2007; Lacour and Tissington 2011; Moore et al., 2012; Rolleston et al., 2014). This implies that efforts made by the government and different NGOs in order to achieve universal declarations in education (e.g., EFA goals) need to focus on minimizing differences in the provision of educational opportunity among regions. Given that the Central regions are the major economic regions, this finding could also imply that working on minimizing economic inequalities between regions might help close the gap in academic achievement. Furthermore, the Central regions having the highest proportion of private schools that might contribute to the good performance of students in those regions. Private schools are mostly better funded and as such able to provide better educational opportunities to their students. In most other regions, private schools are either hardly present or not at all. This means that there is no choice for students and no open market competition between schools, factors known to drive efforts for increasing quality of education in all schools. Therefore this finding might have an implication to question whether school privatization is creating opportunity or widening the gap between regions, given students of other regions or those from poor family have little chance to attend in those rich schools. One policy alternative could be to encourage and facilitate expansion of privatization of schools in all regions of the country. Yet, we believe that efforts to make public schools resourceful might have more impact than promoting privatization, since the proportion of public schools is high in the country. The alternative to seek affirmative policy for students of public schools would be difficult and controversial to realize, and would maintain instead of close the divide.

This result of regional differences is similar to the evidence documented in previous studies in different countries across the world on regional differences in academic achievement (see e.g., Italy: Checchi and Peragine, 2005; Sibiano and Agasisti, 2013; Kenya: Amunga et al., 2010; Brazil: bib0085Ferrão, 2014; Czech Republic: Straková et al., 2006; China: Mok et al., 2009; Qian and Smyth, 2008; Nigeria: Ukiwo, 2007; Onwuameze, 2013).

In line with our hypothesis, two Emerging regions, Gambela and

Table 3
Average exam score for male and female students, and the corresponding gender gap in exam scores for the 11 regions in Ethiopia.

Region	Male	N	Female	N	$\Delta(M,F)$	p	d	GPI
<i>2014 Cohort</i>								
Average	45.19	107497	41.20	87006	3.99	< 0.001	0.57	0.81
Addis Ababa	52.24	10761	47.93	14575	4.31	< 0.001	0.61	1.35
Dire Dawa	49.95	690	44.51	652	5.44	< 0.001	0.78	0.94
Tigray	46.59	7509	41.27	8331	5.33	< 0.001	0.76	1.11
Amhara	44.94	28009	38.52	23217	6.42	< 0.001	0.92	0.83
Oromia	45.16	31556	40.15	22523	5.02	< 0.001	0.72	0.71
SNNP	44.52	18756	39.82	13568	4.70	< 0.001	0.67	0.72
Harari	49.06	369	44.08	340	4.98	< 0.001	0.71	0.92
Afar	39.49	791	37.42	421	2.07	0.010	0.30	0.53
Somali	46.35	5916	46.18	1883	0.18	0.604	0.03	0.32
B.Gumuz	39.67	1495	36.40	1113	3.27	< 0.001	0.47	0.74
Gambela	39.12	1645	36.89	383	2.23	0.003	0.32	0.32
<i>2015 Cohort</i>								
Average	48.93	113425	45.30	92294	3.63	< 0.001	0.51	0.81
Addis Ababa	55.09	10868	51.42	14386	3.67	< 0.001	0.51	1.32
Dire Dawa	55.33	664	49.48	630	5.85	< 0.001	0.82	0.95
Tigray	50.77	8867	45.92	8784	4.86	< 0.001	0.68	0.99
Amhara	47.97	29476	41.76	25210	6.20	< 0.001	0.87	0.86
Oromia	48.74	30856	44.10	22798	4.64	< 0.001	0.65	0.74
SNNP	48.14	20533	44.30	15819	3.85	< 0.001	0.54	0.77
Harari	50.36	454	44.66	386	5.70	< 0.001	0.80	0.85
Afar	47.46	1042	46.70	499	0.76	0.263	0.11	0.48
Somali	47.77	6837	47.78	2300	-0.01	0.975	0.00	0.34
B.Gumuz	43.60	1474	40.76	990	2.84	< 0.001	0.40	0.67
Gambela	42.99	2354	41.42	492	1.57	0.017	0.22	0.21

Note. $\Delta(M,F)$: The difference in average exam score between male and female students; GPI: Gender parity index.

B.Gumuz, performed poorly. The fact that these regions are more rural and less well developed economically, compared to Central and Established regions, leads to claims that there is less access to basic school facilities and resources, which can be linked to weaker academic performance. The government and other stakeholders working in the education sector should pay attention to creating better educational opportunities for rural areas where school facilities and resources are rarely available.

Yet, our first hypothesis was only partially supported, as we did not find a consistent difference between Established and Emerging regions. Contrary to our expectations, not all Emerging regions performed poorly. Two of the Emerging regions, Afar and Somali, displayed unexpectedly good performance equivalent to levels expected for the Established regions. This might imply that local emphasis, operationalization, and commitment in implementing the different government-supported quality and equity enhancing programs might have made a difference. Future studies should endeavor to identify best practices and positive contextual factors in these specific regions and share these practices across other low performing regions. For instance, we noticed that in both Somali and Afar the number of schools increased with a factor 1.5 from 2014 to 2015, whereas in the other emerging regions the number of schools remained stable. Hence, investing in school facilities might be a promising candidate for policy actions to support students' education in the region. Of course, this is likely only one of many determinants underlying the current findings.

The better-than-expected performance of some Emerging regions might have implications for selection and admission to higher education. Connected to the regional label *Emerging* is an affirmative educational policy that, for students from Emerging regions, lowers the required score on the exam for admittance to university. Hence, from a policy perspective, one can wonder whether the current labelling of regions needs to be revised and affirmative policy actions reconsidered. Some caution should be expressed in interpreting the surprising findings, as there circulate many speculations on the presence of malpractices, corruption, or limited test security of the examination in some regions, which could potentially inflate exam scores. However, at this point there is no solid evidence to support such speculations. Test

security and academic dishonesty do remain an issue for high-stakes testing that requires serious attention as for instance argued by [Tadesse and Getachew \(2010\)](#) and illustrated by the 2016 incident in which stolen exam booklets lead to a complete reset of the exam across the country.

At the same time, it is worth mentioning that the Amhara region was the least performing Established region in both 2014 and 2015. This is consistent with [Ajala and Asres \(2008\)](#) who reported that this region was hindered by a lack of adequate basic educational resources and facilities for schools in this region. [Birhanu \(2017\)](#) argued that lack of adequate preparatory schools in Amhara region puts the students at disadvantage compared to students in other regions. Given that the national examination is a high-stakes exam and is used as an admission criterion for higher education, it is easy to understand the negative impact that poor exam performance will have on students in this particular region, when it comes to fairness of selection. And similarly, given that the national examination is used as a measure of effectiveness of the educational system, observing an Established region that is underperforming compared to some Emerging regions in 2015, might imply that there is a serious issue in the policy practice and the setting of the education system in that particular region.

Although efforts have been made to address gender equity and minimize obstacles that hinder girls' school participation, a significant and large gender gap in academic achievement has been found in favor of boys in almost all regions, including those regions with better educational opportunities. This finding might indicate that cultural practices still affect girls' educational opportunity, and that there is a need to create a positive atmosphere that stimulates girls' attendance at school and improves academic achievement in all regions.

However, the prospects seem hopeful. The multilevel analyses indicated that in high performing schools, the gender gap tends to be smaller. Hence, although girls face many social-cultural challenges, interventions aimed at minimizing the gender gap at school level might have significant effect on girls' school achievement. Furthermore, the only two exceptions to the large regional gender gap in achievement are in the two Emerging regions, Afar and Somali, which, as has already been observed, are performing better than expected. Although these

regions are labelled as Emerging by the government as a result of weak socio-economic development levels, it is surprising – and also promising? – to observe them performing even better than the Established regions and showing no gender gap in academic achievement. An obvious explanation in terms of a selection effect (“only the bright girls go to school”) might be less likely, as a gender gap is still apparent in the other two Emerging regions where school participations of girls is at equal levels or even lower than in Afar and Somali (see Gender Parity Index in Table 3). It should be noted that although there was no gender gap in achievement for an Emerging region as Somali, this did not mean that there was no gender inequality as there remains a huge gap in participation between male and female students in the region (GPI = 0.3).

Both the regional and gender differences have been assessed in the 2014 and 2015 cohort of students and show to be robust when the overall average exam score is replaced by an average score based solely on the common courses between the natural and social sciences streams. Together with the representativeness and size of the data sets this provides strong support for the study results. Two core limitations of this study are that a crude operationalization of educational opportunity was used and that only region level information about educational opportunity was available for the data analyses. The large between-school differences in each region stress the need for further research looking into additional more specific educational opportunity predictors at the school level. However, these data might be less easily obtainable at an equally representative and large scale. In any case, if we would like to move beyond the current exploratory mapping, further research needs to delve into more detailed and informative educational opportunity measures to better understand the potential causes behind the observed regional differences and gender gap. Although there are so many factors that influence student academic performance, this study was not able to study all the factors. Other variables beside region, educational opportunity, and gender, can also be expected to influence student academic performance.

4.1. Conclusion

In conclusion, we believe that the study’s findings contribute to clarifying to what extent educational opportunities affect academic performance of students in different regions of Ethiopia. Given the large between-school differences in all regions, school level interventions might promise to be an effective route to improve educational opportunities and learning outcomes. Furthermore, the findings might prompt educational stakeholders and government initiatives in Ethiopia to review the equality and quality improvement programs designed to address educational opportunities. The results are useful for policy makers, as they show the importance of continuing efforts to reduce regional inequalities in shaping the educational outcomes of Ethiopian students, even in the Established and Central regions of the country. We encourage further research—both small and large scale, and preferably even longitudinal if possible – on the educational systems in developing countries and the link between educational opportunities and academic achievement.

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