frontiers | Frontiers in Education

TYPE Original Research
PUBLISHED 14 November 2024
DOI 10.3389/feduc.2024.1474811

OPEN ACCESS

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RECEIVED 02 August 2024
ACCEPTED 04 November 2024
PUBLISHED 14 November 2024

CITATION
Tesema MT, Blömeke S and Braeken J (2024) Mapping student enrolment and admission eligibility for higher education in Ethiopia: affirmative action as equity instrument? *Front. Educ.* 9:1474811. doi: 10.3389/feduc.2024.1474811

Mapping student enrolment and admission eligibility for higher education in Ethiopia: affirmative action as equity instrument?

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Introduction: UNICEF's Education For All steers for equal opportunities for all students and diversity in the student population. In Ethiopia, affirmative action is the policy tool addressing equity in enrolment and admission to higher education, targeting underrepresented groups such as females and students from emerging regions.

Methods: In a cross-sectional study across two-levels of education, regional differences in enrolment and admission eligibility were explored for two census student cohorts at high school (n = 858,557 and n = 785,053) and at the university preparatory program (n = 199,899 and n = 211,706). These population-level data stem from governmental registers from the mandatory national exams. Enrolment and admission eligibility statistics were computed with special attention to gender imparity. The impact of affirmative action was studied by comparison to the corresponding projected statistics computed as if affirmative action did not apply.

Results: In most regions, clearly more male than female students were enrolled across the different educational levels. Affirmative action benefitted a significant percentage of female and emerging-region students. The gender parity in eligibility rates for admission to preparatory program for most regions was restored, but not for admission to university.

Discussion: Being implemented as policy directive for nearly three decades, affirmative action at most maintained gender imparity levels in enrolment inherited from earlier educational stages but failed in redressing inequity across gender and regions. Policy implications of the results and recommendations are discussed in light of regional differences and the currently implemented type of affirmative action.

KEYWORDS

equity, enrolment, admission, Ethiopia, affirmative action

Introduction

A core policy objective of the global *Education for All* movement (UNICEF, 1990; United Nation, 2008, 2015) and the *Sustainable Development Goals* (SDG 4) (UNESCO, 2021; Sachs et al., 2024) is to promote equitable access to education and ensure diversity in student populations, aligning with national demographics (UNESCO, 2021). Higher education plays a pivotal role in social mobility, yet many underrepresented groups face systemic barriers that limit their participation. These challenges remain particularly pressing as countries strive to

improve both access and retention rates in higher education, especially for marginalized communities (Fitzgerald et al., 2023; Paivandi, 2016).

In the realm of higher education admissions, affirmative action is a key strategy to correct historical injustices and create more inclusive educational environments. Affirmative action encompasses various approaches, such as lowering entry requirements, offering remedial pre-university programs, providing financial aid, or implementing quota systems to ensure that underrepresented groups, such as ethnic minorities, women, and students from lower socio-economic backgrounds, can participate fully in higher education (Gisselquist et al., 2023; Nandi and Pathak, 2024; Teshome, 2024). The goal is not only to increase access but also to encourage these students to thrive in academic settings where they have historically been marginalized (Abrahamson et al., 2023; Nandi and Pathak, 2024; Teshome, 2024).

The implementation of affirmative action varies by country, depending on its social and historical context. For example, in the United States, affirmative action policies have primarily focused on race and ethnicity, aiming to increase the representation of African, Latin, and Native American students in universities. In India, affirmative action policies—often referred to as "reservation"—are directed toward historically oppressed castes and tribes, alongside efforts to address gender imbalances (Nandi and Pathak, 2024; Sowell, 2004). In South Africa, affirmative action has been integral to redressing the racial inequalities entrenched by apartheid, focusing particularly on Black and Colored students (Mujtaba, 2023; Teshome, 2024). In Israel, socio-economic status plays a key role, with affirmative action targeting students from lower-income families (Alon and Malamud, 2014).

Affirmative action remains controversial, generating debates about its long-term impact on educational equity. Proponents argue that it is essential for dismantling systemic barriers and fostering more diverse academic environments. Critics, however, caution that such policies can sometimes lead to reverse discrimination or unintended stigmatization of target groups (Shin, 2022). Despite these debates, the role of affirmative action continues to evolve, with many institutions and countries refining their approaches to better support diversity, inclusion, and social mobility in higher education (Crosby et al., 2003; Gururaj et al., 2021; Mujtaba, 2023; Sachs et al., 2024).

Affirmative action as equity instrument

Ensuring equal opportunities for all members of society is central to many theories of distributive justice. The principle of equal opportunity suggests that everyone should have the same chance to succeed, and that disparities in outcomes should stem from differences in effort or ability, not from systemic disadvantages (Rawls, 2001). In this meritocratic view, any bias in participation or success is seen as a reflection of unequal access to opportunities (Brighouse and Swift, 2014). Education, as a crucial societal asset, is essential in determining future societal roles, making educational inequality a persistent concern worldwide (UNESCO, 2021; OECD, 2018; United Nations, 2020). A well-educated populace is key to both democratic participation and economic prosperity (Murnane et al., 1995).

Affirmative action serves as a policy mechanism to address such educational inequalities by providing targeted support to underrepresented groups. This may include measures like reducing admission requirements, providing financial aid, or establishing quota systems to ensure access for disadvantaged groups (Gururaj et al., 2021; Nandi and Pathak, 2024; Teshome, 2024; Sowell, 2004; Anderson, 2007). However, given that resources such as educational opportunities are finite, affirmative action often involves redistributing opportunities—potentially limiting access for groups that are already overrepresented (Anderson, 2007). One common justification for this policy is to redress historical injustices, offering compensation for past discrimination (McCrudden, 2015; Sowell, 2004). Moreover, proponents argue that diversity benefits society by enriching educational experiences and broadening students' perspectives (Abrahamson et al., 2023; Mujtaba, 2023; Konan et al., 2010).

Access to higher education is shaped by years of unequal educational experiences, and theories of distributive justice diverge on how to address this. Some argue that providing basic educational adequacy may not require guaranteeing higher education opportunities (Anderson, 2007), while others argue that true equality of opportunity demands equal educational outcomes at all levels (Sachs et al., 2024; Boudon, 1974).

Despite its ethical rationale, affirmative action remains controversial. Critics argue that basing admissions on non-academic criteria undermines educational quality (Fu, 2006) and risks abuse, such as individuals falsely claiming membership in disadvantaged groups (Sowell, 2004). Others suggest that affirmative action may have unintended psychological effects on target groups, such as reinforcing stigma (Balafoutas et al., 2016; Unzueta et al., 2010).

Empirical research on the effectiveness of affirmative action is mixed. Some studies, like Sander (2004), claim that affirmative action can lead to mismatches between students and institutions, leading to poor academic performance and lower graduation rates. However, more recent studies provide a more optimistic view, suggesting that affirmative action can yield long-term social and economic benefits without compromising academic success (Alon and Malamud, 2014; Bagde et al., 2016). Furthermore, quotas may be particularly effective in contexts with high levels of segregation (Nandi and Pathak, 2024; Gaibie, 2014).

Given the inconclusive nature of much of the research, particularly in non-Western contexts, this study aims to evaluate the impact of Ethiopia's affirmative action policies on access to higher education. Ethiopia's affirmative action strategies, primarily aimed at lowering admission thresholds for regional and gender-based target groups, offer a rich case for studying how affirmative action plays out in rapidly developing societies with large educational disparities. Additionally, this study will explore how intersectionality—particularly the interplay between gender and regional disparities—shapes educational outcomes, as suggested by scholars like Unterhalter (2012) and Unterhalter et al. (2020).

The Ethiopian educational system: higher education as a lever to social mobility

Ethiopia is one of the countries with the largest population numbers on the African continent. More particularly, it is located in what is commonly known as the Horn of Africa, a region which had a history of wars and famine and a lower development index. This combination of a large evermore-growing population and difficult living conditions made it inevitably that the country witnessed large disparities between different groups of people, leading to

considerations and implementation of affirmative actions at a large scale to address, for instance, unequal participation in education.

To understand the potential impact of affirmative action in the form of lower admission thresholds for target groups, one needs to understand the crucial importance of having a proper education in Ethiopia and how admission to higher education is arranged. Primary education in Ethiopia starts typically at age 7 and consists of two cycles, grade 1 to 4 and grade 5 to 8. These two cycles are followed by two years of high school, general secondary education (grade 9 to 10), that enable students to identify areas of interest for further education, training, or work (FDRGE, 1994). After high school, the educational structure corresponds to a typical waterfall structure: Students with high grades on the standardized national exam for grade 10 would flow into the university-preparatory program, students with middle grades would go in technical and vocational training or teacher training, whereas the lower-performing students directly flow to the job market. Thus, the standardized national exam at the end of grade 10 is high stakes as it determines later education level, job opportunities, and hence socio-economic status and possibilities of the students.

Student admission and placement in Ethiopia is regulated centrally by the Ministry of Education and its support institute, the National Educational Assessment and Examination Agency (NEAEA). The admission process for higher education consists of two consecutive steps, admission to the university preparatory program and admission to the university. At each step, a standardized national exam (i.e., same exam across Ethiopia) functions as entrance test for the next level of education. Admission is based on exam threshold scores that are set centrally for each level and apply nationally to all institutions across Ethiopia. Note that in setting the thresholds the government takes into account the estimated long-term intake capacity across all institutions within the country (Mekbib, personal communication, 2016), as educational infrastructure continues to increase and develop in Ethiopia.

Admission to the preparatory program is based on the student's score on the standardized national exam in grade 10 at the end of high school and admission to the university is based on the student's score on the standardized national exam in grade 12 at the end of the preparatory program. Students eligible for further studies, those that scored above the exam threshold, indicate their preferred choice of location for further studies, and then the ministry of education places them into the different universities based on the available places across the country. Therefore, individual universities in fact do not have any control on which students get admitted to their study programs. Even when it is not their preferred first choice, students will have no doubt to start their studies at the university they are assigned due to the clear social mobility value of a higher education degree and government policy ensuring the arrangement of student housing at the universities, makes sure that there are no practical concerns.

Affirmative action in Ethiopian higher education

Similar to the situation in other developing countries (Ilie and Rose, 2016), the Ethiopian higher education system is characterized by lack of equity in enrolment which is witnessed by under-representation of certain population groups such as women, geo-politically marginalized groups, people from low socio-economic backgrounds, and people from pastoral and rural areas (MoE, 2014; Molla, 2014). In an attempt to address such equity issues, the Ethiopian government introduced different strategies such as a five-year strategic plan for universities including considerations on equal ethno-regional distribution and systematic expansion of higher education institutes, ensuring a systematic balance in the central university placement system, and encouragements for starting up institutional academic support mechanisms for students from disadvantaged and underrepresented groups (FDRE, 2009; Molla, 2018). A specific form of affirmative action is implemented with the intention to provide students from underrepresented groups (women, students with disabilities, and students from emerging and pastoral areas) with better access to higher education by *lowering the admission thresholds* for these groups (FDRGE, 1994; Molla, 2018).

Such affirmative action for women is supported by the constitution that grants women special attention. For instance, the article 35(3) of the constitution (FDRE, 1995, p. 10) states:

> "The historical legacy of inequality and discrimination suffered by women in Ethiopia taken into account, women, in order to remedy this legacy, are entitled to affirmative measures. The purpose of such measures shall be to provide special attention to women so as to enable them to compete and participate on the basis of equality with men in political, social and economic life as well as in public and private institutions".

This affirmative action is also reflected in other national education policy documents such as the Higher Education Proclamation (FDRE, 2009, Article 39.4) where it states 'there shall be special admissions procedures for disadvantaged citizens that deserve affirmative action'. Similarly the national education sector development program IV (MoE, 2014) stated its main objectives to be improving access to and success in Ethiopian higher education for the disadvantaged groups such as females, peoples from rural areas and pastoral communities, and people with special needs.

We were unable to retrieve a more precise policy formulation underlying the "lowering the admission thresholds" affirmative action and concrete criteria on when this affirmative action is considered to be successful or having reached its goal, in the publicly available government documents. Possibly due to the fact that this is hard to agree upon as it is a sensitive political issue with the involvement of regional interests and because Ethiopia is a country in development with respect to economy and educational infrastructure. The specific admission thresholds for a given year are dependent on the available places in the education system, which is continuously growing due to ongoing investments in educational infrastructure in Ethiopia. These initial specific admission thresholds suggested by the NEAE are also first put forward in the parliament for discussion and can hence be politically negotiated to some extent. What can be said, is that in practice this particular affirmative action is likely the one with the widest and most significant impact on society. With the ever-increasing number of students (i.e., up to 800,000 and growing) graduating from high school, this affirmative action of lowering the admission thresholds for further studies potentially benefits huge number of students from underrepresented groups that plan to continue their education passed regular high school in Ethiopia.

Study objective

Affirmative action policies in Ethiopia were introduced more than 25 years ago (FDRE, 1995; FDRGE, 1994) to rectify historical and cultural injustices by providing targeted support to underrepresented groups, allowing them greater access to educational and employment opportunities. These policies were initially designed as temporary measures, with the expectation that they would phase out once societal inequalities had been sufficiently addressed (Sowell, 2004).

Although there has been an increased enrolment in education and employment of different groups of society in the country, high attrition rates are reported in several universities, particularly for female students (Egne, 2014; Melese and Fenta, 2010; Semela, 2007) but also for other groups that are admitted by affirmative action (Molla and Gale, 2015). Existing research, however, has been limited to small-sample case studies of individual universities and neglected the earlier stages of education that students must navigate to access higher education. A more comprehensive evaluation of affirmative action's long-term effects on educational progress and outcomes is missing. Given the long history of affirmative action in Ethiopian education, the limited scope of studies evaluating the outcomes of the affirmative action, and its relevance to society, additional inquiries into the issue seem warranted (or even necessary).

Hence, the current study's objective is to provide further insight in what way or to which extent the affirmative action of lowering admission thresholds is succeeding/failing to address equity and maintaining student diversity in Ethiopian higher education. This cross-sectional study makes use of population-level register data from the mandatory national exams that determine students progression through the educational system from high school over the preparatory program to university (see Figure 1). The study has two core research questions:

1 *How different would student enrolment in high school and preparatory program be if the current affirmative action policy would have been absent?*
2 *How different would student admission eligibility to preparatory program and university be if the current affirmative action policy would have been absent?*

Active student enrolment is measured through participation in the mandatory national exam of the respective educational system level and admission eligibility is established based on whether the student passed the national exam of the preceding educational level. The absence of the affirmative action policy is simulated by instead of applying the differential affirmative action exam score thresholds, applying the default exam score threshold for all students and looking at the projected consequences in terms of admission eligibility for the student cohort. In exploring both research questions, we are specifically interested in how gender and regional differences might intersect when considering the projected impact of the affirmative action policy.

As pointed out above, this is one of the very few studies of the effects of affirmative action taking place in a non-Western context. Thus, our study contributes to an evaluation of the generalizability of results from Western countries to other contexts. In addition, it is one of the very few studies taking issues of intersectionality into account. Taking regional differences into account increases the transferability of our findings to other contexts given that Ethiopia is one of largest African countries and its regions cover a broad span of socio-cultural and developmental economic differences.

Method

The data in the current study stem from two cohorts of students in grade 10 at the end of high school and in grade 12 at the end of the university preparatory program, who took part in the national examinations in the years 2012 ($n_1 = 858{,}557$)/2013 ($n_2 = 785{,}053$) for grade 10 and 2014 ($n_1 = 199{,}899$)/2015 ($n_2 = 211{,}706$) for grade 12. This is official national register data made graciously available by the Ethiopian National Educational Assessment and Examination Agency (NEAEA). The national exams are an obligatory requirement for transitioning to the next stage in the national educational system and can be considered a census in the sense that they reach the complete Ethiopian student population, including the home-schooled, evening-, privately schooled, or special-needs students across all regional states in the country.

Affirmative action groups

The affirmative action in Ethiopia targets female students, male students in emerging regions and pastoral areas, and students with

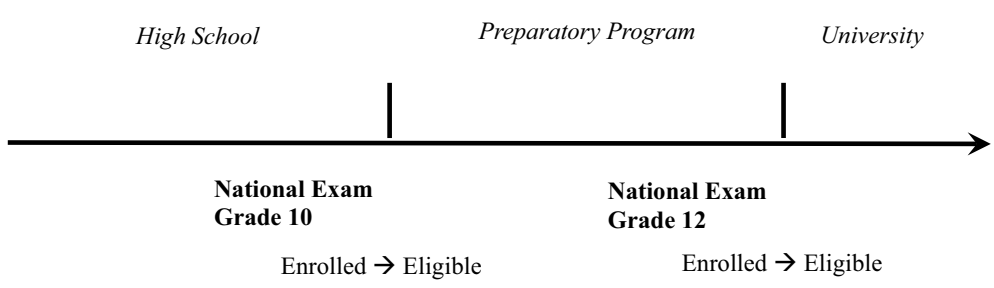

FIGURE 1
Overview of the study measures across the Ethiopian educational system. Students sitting for the exam at the end of a level are considered enrolled; students passing the admission threshold on the exam are eligible for the next higher education level. For each national exam, data of two sequential student cohorts are available.

disabilities. The disability group is relatively small and mainly consists of the 2.8% of students with severe sight problems. The students in pastoral areas outside an emerging region are a tiny group in the total student population, and insufficient information is available in our dataset to identify these students with certainty. Therefore, we considered only female students in all regions and male students of emerging regions as affirmative action target groups in our study; our analysis and results are to be interpreted with this restriction in mind.

Female students

In line with the constitutional and sector-specific policy provisions, female students are entitled to affirmative action during admission to preparatory program and university education, and this regardless of the region or area they reside in.

Emerging region students

Students residing in the so-called emerging regions - Afar, Somali, Benishangul Gumuz (abbreviated as BGumuz), and Gambela – are also entitled to affirmative action. The emerging regions are in general less well-developed socio-economically and people from those areas are considered as underrepresented in different sectors, including education.

Grade 10 national exams

Each year, in May, standardized grade 10 national examinations are administered throughout the country to students who completed high school. The median age of the participant was 18 years in the years 2012/2013. The examinations include: Mathematics, Physics, Chemistry, Biology, English, Civics and Ethical education, Geography, History, Amharic (i.e., the national language) and an exam for a regional or local language. The students should pass at least five exams to continue to the next levels of education (i.e., either preparatory program, technical and vocational education or training (TVET), or teachers' college). Going to preparatory program is very competitive since limited places are available for those who want to pursue further university education. Therefore the admission thresholds for preparatory program are higher than that of TVET and teachers college. The NEAEA is responsible to administer, assess, and award certificates with grades. Each exam is graded on a scale from 0 to 4.

Grade 10 GPA

Admission to the preparatory program depends on student's Grade Point Average (GPA), calculated as the average grade across seven subjects where mathematics and English are considered mandatory parts of the average and the five other subjects can be freely selected from all subjects the student participated in for that grade 10 national examination. Table 1 shows the GPA admission thresholds used by the NEAEA for 2012 and 2013.

TABLE 1 GPA admission thresholds on grade 10 national exam to pass to the preparatory program.

Type of students		GPA Threshold	
		2012	2013
Regular	Male	2.57	2.71
	Female	2.14	2.29
Emerging regions	Male	2.29	2.29
	Female	2.14	2.14

GPA, Grade Point Average assessed on a scale from 0 to 4.

TABLE 2 GPA admission thresholds on grade 12 national exam to pass to university.

			GPA Threshold	
Stream	Type of Students		2014	2015
Natural Science	Regular	Male	45	49
		Female	43	46
	Emerging regions	Male	44	47
		Female	43	45
Social Science	Regular	Male	41	46
		Female	40	43
	Emerging regions	Male	39	44
		Female	39	42

GPA, Grade Point Average assessed on a scale from 0 to 100.

Grade 12 national exams

Similar to the grade 10 exam, standardized grade 12 national examinations are administered, each year in May, throughout the country to students who completed the 2-year university preparatory program. The median age of the participants is 19 years. Two study streams are present, natural and social sciences. Both streams have civics, English, and a general aptitude test as common exams; the natural science stream in addition includes mathematics, physics, chemistry, and biology; the social science stream includes geography, history, economics, and its own mathematics exam. Each exam is scored on a scale of 0 to 100.

Grade 12 GPA

For each stream the total exam score across their seven subjects is used as criterion to admit students to universities. For ease of interpretation, we used student's Grade Point Average (GPA scale 0 to 100, instead of 0 to 700 for the total score). Table 2 presents the university admission thresholds used by the NEAEA for the years 2014 and 2015.

Measures

Figure 1 provides an overview of the measures used in this study, situating them along the sequence of education levels in Ethiopia. The centerpieces are the national exams at the end of each level, determining admission to the next level. Note that the data records cannot be linked across the different exams due to the lack of a unique identifier variable in the system and general data protection regulations. Thus, the measures and study design remain at the sequential cross-sectional cohort level.

Student enrolment

The availability of exam records in the dataset is used as proxy indicator of enrolment, since every student enrolled in a school is required to take the exam in order to graduate, no matter whether they want to progress to higher education or not. The exam is also high stakes for the students and their parents, as well as for the government which makes exam attendance almost guaranteed. This means that enrolment numbers for high school are based on the grade 10 exam and those for the preparatory program are based on the grade 12 exam.

Admission eligibility

Students that achieved a score above the applicable admission threshold set by the Ministry of Education are eligible for admission to the next level of education. Eligibility rates are computed, by region and gender, as the number of students that passed the admission threshold divided by the number of students sitting for the exam. Eligibility rates were also recomputed while ignoring the existing affirmative action thresholds and applying the same default threshold for all students.

Data analysis

In the statistical analyses we will focus mainly on effect sizes given the large sample sizes that we have available and that the data is fairly close to population data. Both student enrolment and admission eligibility rates will be checked for parity across gender by region. For student enrolment, the ratio of number of female students enrolled to the number of male students enrolled, is computed. For admission eligibility, the ratio of the female students' eligibility rate compared to the male students' eligibility rate (i.e., a so-called relative risk), is computed.

For inferential purposes, the study will rely on the log odds of being female compared to being male (i.e., the natural logarithm of the gender parity index) and the log odds ratio of being eligible for females compared to males (i.e., the natural logarithm of the ratio of the odds of being eligible compared to being ineligible for females and similar odds for males). The log odds takes positive/negative values when more/less female than male students are enrolled, with a zero value pointing at a balance across gender in student enrolment numbers. The log odds ratio is a dependence measure for categorical data and effect size; it takes positive/negative values when admission eligibility is related to being female/male, with a zero-value pointing at no clear relation between admission eligibility and gender. Forest plots of the 95% confidence intervals of these statistics are used as convenient graphical representations of the results. Next to these parity statistics, we will also report on how many students were able to make use of the lowered-threshold affirmative action to enter the next step of higher education.

Results

Enrolment to high school

High school enrolment numbers based on the grade 10 national exam are summarized for both student cohorts in the left side of Table 3. Figure 2 provides an overview of the parity in enrolment across gender, split up by region. The square boxes in this forest plot represent the female-to-male log odds of enrolment, with a value of 0 as represented by the grey vertical line indicating parity, that is the number of female students enrolled in that region is equal to the number of male students enrolled in that region. The confidence intervals (CI) around the squares can be used for inferential purposes. A confidence interval that fully resides at the left/right side of the grey vertical line, implies that there are significantly less/more female than male students enrolled in that region.

Significantly less female than male students were enrolled in all regions, with the exception of Addis Ababa for the student cohort of 2012. Yet, there was a wide variation across regions in parity in enrolment of male and female students. In the emerging regions (i.e., bottom four of the list) the numbers of male students were one and a half times higher than the number of female students, where for Afar and Somali this even went up to more than double. In the more developed regions, the female-to-male odds were mostly not that strongly imbalanced, with for every 10 male students enrolled about 9 female students enrolled; the exceptions being Oromia and Southern nations nationalities and people (SNNP), where the odds went towards 10 to 7. On the positive side, there was a tendency for a slight improvement in parity from cohort 2012 (black squares) to cohort 2013 (gray squares) in Figure 2, but nothing that changed the generally imbalanced parity pattern for enrolment to high school.

Admission eligibility to the preparatory program

Admission eligibility rates for the preparatory program based on the grade 10 GPA are summarized in the right side of Table 3. The eligibility rates were generally quite low in the range of [7, 25%] reflecting the competitiveness of the preparatory program; eligibility rates increased from cohort 2012 to cohort 2013, which was especially noticeable in Harari and Afar. Yet, the lowest eligibility rates were still consistently observed for Gambela and BGumuz, two of the emerging regions. Somali, also an emerging region, stood out with eligibility rates of above 40%.

Figure 3 provides an overview of the parity across gender in admission eligibility rate, split up by region. When ignoring the lowered admission thresholds for affirmative action groups (i.e., CI's with squares in Figure 3), female students had a significantly lower eligibility rate than male students in most regions; exceptions being Addis Ababa and Afar for the 2013 cohort. There were huge differences in parity across regions. For instance in Amhara, the female students (%$F = 12$) were about half as likely than the male students (%$M = 24$) to be eligible for admission to the preparatory program, whereas in Afar and Addis Ababa eligibility rates moved more towards 1, indicating more balance. Parity numbers in eligibility rate either slightly improved or remained stable across cohorts, with the exception of BGumuz region where it dropped significantly from 0.83 in 2012 to 0.59 in 2013.

When taking into account the lowered admission thresholds due to affirmative action (i.e., CI's with circles in Figure 3), the parity pattern drastically changed. Balance was restored for most regions; the admission eligibility rate for female students was now at least as high as that for male students. The exception was Gambela, where parity only increased from 0.64 to 0.89, still significantly below 1, despite the affirmative action policy in place for students of emerging regions. In Addis Ababa, Tigray,

TABLE 3 Enrolment at high school grade 10 and eligibility rate for the preparatory program as a function of gender, region, and affirmative action (AA).

Student cohort 2012										
Region	Enrolment at grade 10				Eligibility rate for preparatory program					
					Without AA			With AA		
	N	*F*	*M*	Parity	%F	%M	Parity	%F	%M	Parity
Addis Ababa	71,102	35,941	35,161	1.02	25	29	0.84	37	29	1.26
Diredawa	6,026	2,655	3,371	0.79	10	18	0.56	20	18	1.08
Tigray	70,390	33,407	36,983	0.90	11	21	0.53	26	21	1.26
Amhara	203,069	95,638	107,431	0.89	10	24	0.42	24	24	0.96
Oromia	288,672	120,690	167,982	0.72	09	19	0.44	21	19	1.08
SNNP	177,462	70,378	107,084	0.66	08	15	0.50	19	15	1.26
Harari	2,765	1,289	1,476	0.87	14	21	0.64	24	21	1.10
Afar	5,410	1,655	3,755	0.44	15	18	0.84	37	31	1.22
Somali	13,561	3,522	10,039	0.35	40	46	0.87	58	59	0.99
BGumuz	12,059	4,890	7,169	0.68	11	13	0.83	28	23	1.23
Gambela	8,041	2,981	5,060	0.59	07	11	0.63	18	20	0.88
Student cohort 2013										
Addis Ababa	67,450	31,781	35,669	0.89	32	33	0.98	47	33	1.44
Diredawa	5,345	2,408	2,937	0.82	16	25	0.67	27	25	1.10
Tigray	71,602	35,088	36,514	0.96	17	30	0.57	34	30	1.15
Amhara	184,947	88,654	96,293	0.92	16	32	0.49	32	32	1.01
Oromia	250,332	109,640	140,692	0.78	13	25	0.53	29	25	1.14
SNNP	160,573	65,739	94,834	0.69	13	22	0.58	28	22	1.31
Harari	2,154	1,023	1,131	0.90	27	35	0.77	40	35	1.14
Afar	4,790	1,482	3,308	0.45	27	28	0.95	44	41	1.07
Somali	17,251	4,461	12,790	0.35	51	59	0.87	69	71	0.98
BGumuz	11,625	5,052	6,573	0.77	07	12	0.59	20	20	1.04
Gambela	8,984	3,472	5,512	0.63	08	12	0.64	21	23	0.89

N being total number of enrolled students in grade 10, F & M, respectively, the number of female and male students in grade 10, with parity in enrolment computed as F/M; %F and %M, respectively, the female and male eligibility rate for preparatory program, that is the percent of enrolled female students and the percent of enrolled male students in Grade 10 that are eligible to pass to the preparatory program, and parity in eligibility computed as %F/%M. With/without AA refers to which grade 10 exam thresholds were used to determine eligibility, those with or without affirmative action in place.

Oromia, and SNNP the eligibility rate for the preparatory program became even significantly higher for females than for males.

All in all, the analysis for the percentage of target groups (females students in all regions and males from emerging regions) eligible to be admitted to the preparatory program confirmed a substantial increase of the otherwise disadvantaged groups due to the affirmative action strategy. For instance, at the national level 13% of female students ($n_1 = 47{,}489$) that were eligible to join the preparatory program could be attributed to affirmative action in 2012. The percent increased to 16% ($n_2 = 54{,}881$) in 2013. These percentages vary across the regions (for cohort 2012/cohort 2013) between 10%/11 and 22%/18% with the highest percentages of students eligible due to affirmative action in the emerging regions. The overall percent of male students from emerging regions, eligible to preparatory program due to affirmative action is 11% ($n_1 = 2{,}966$, $n_2 = 3{,}097$), with the highest percent in Somali (13%) and Afar (13%) in both years. The corresponding affirmative action percentage for females in emerging regions is 17% ($n_1 = 2{,}157$) for the 2012 cohort and 15% ($n_2 = 2{,}163$) for the 2013 cohort.

Enrolment to the preparatory program

Preparatory program enrolment numbers based on the grade 12 national exam are summarized for both student cohorts (2014/2015) in the left side of Table 4. In most regions, significantly less female than male students were enrolled in grade 12 of the university preparatory program (see Figure 3). Yet in Addis Ababa the opposite was the case, significantly more female than male students were enrolled in grade 12 (i.e., parity >1.3). In contrast, in most emerging regions (i.e., bottom four of the list) the number of female students was less than half of the number of male students. Among non-emerging regions, Oromia and SNNP regions were lagging behind, with for every 10 male students, about 7 females enrolled. Hence, there was a large variation in parity across the regions, with the emerging regions on one side and Addis Ababa on the other. There was no discernible increase in enrolment across cohorts, as evidenced by the mostly overlapping confidence intervals in Figure 4.

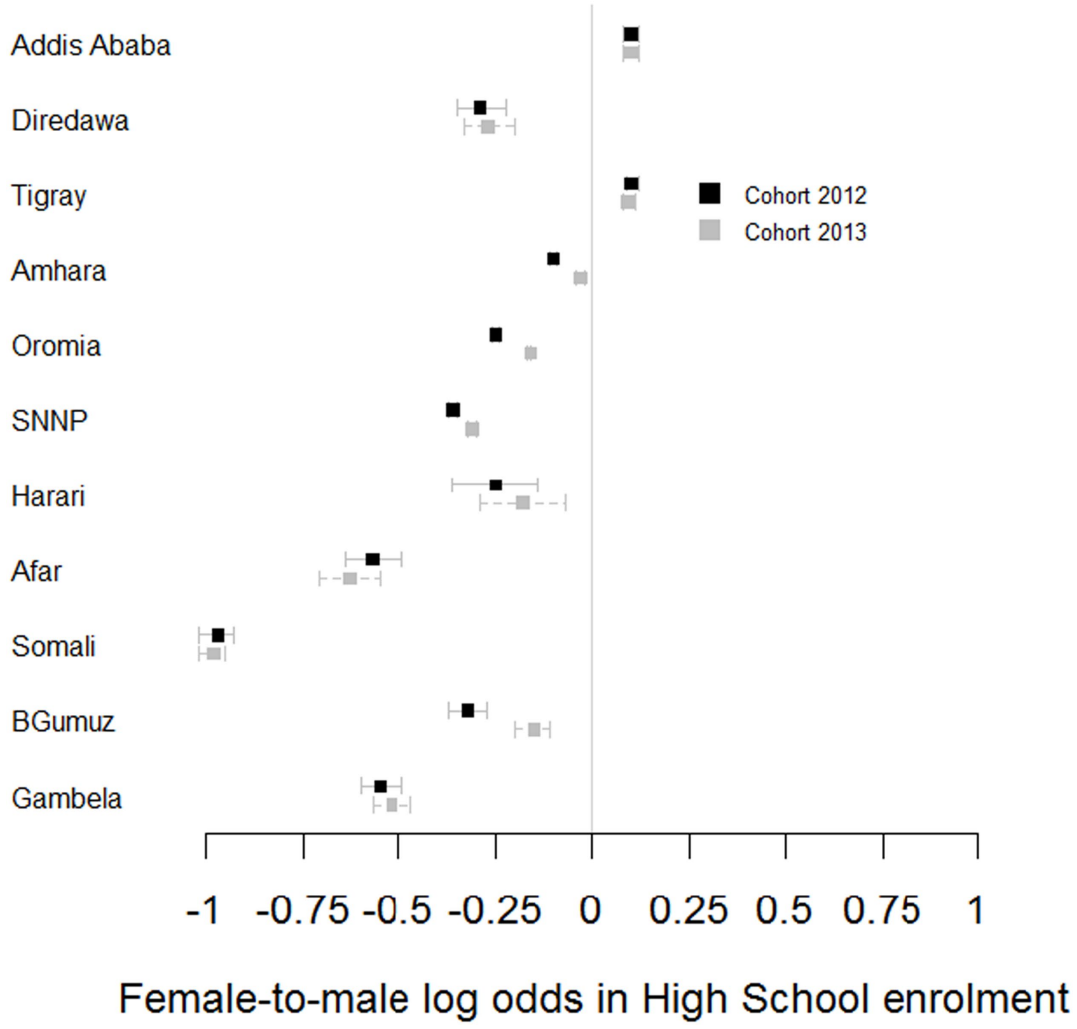

FIGURE 2
High school enrolment as a function of gender by region and cohort.

Admission eligibility to university

Admission eligibility rates for university based on the grade 12 GPA are summarized in the right side of Table 4. With a range of [13, 79%], the variation in eligibility rates was high. In general, these rates were also higher for university entry than the earlier reported eligibility rates for the preparatory program. Similar to what was found for the preparatory program, the lowest eligibility rates were observed for the emerging regions, with the exception for Somali where eligibility rates were above 50%. Consistently across the regions, eligibility rates increased from 2014 to 2015.

In Figure 5, parity between male and female students in eligibility rate is summarized by region and affirmative action. When ignoring the lowered admission thresholds for affirmative action groups (i.e., CI's with squares in Figure 5), female students had a significantly lower eligibility rate than male students in most regions; with exception of Somali where female–male eligibility rates are close to parity (i.e., CI's included grey vertical reference line of log odds ratio of 0). The lowest parity in eligibility rates across cohorts were recorded for Gambela and Amhara, regions in which the female students were about 2 times less likely to be eligible to university than male students. Although less clear than for the preparatory program (due to larger uncertainty indicated by the wider CIs), there was also an increasing trend for parity in eligibility across the cohorts (i.e., black to gray square in Figure 5).

When taking into account the lowered admission thresholds due to affirmative action (i.e., CI's with circles in Figure 5), the parity pattern slightly improved. Afar and BGumuz reached approximate parity in eligibility rate for the 2015 student cohort and in Somali, affirmative action even made the eligibility rate for female students significantly higher than that for male students. Yet, in most regions the female admission eligibility rate for university remained significantly lower than the male eligibility rate; this despite the affirmative action and including central non-emerging regions such as Addis Ababa.

For the 2014 academic year, from all female students who completed preparatory program, 7% ($n_1 = 6{,}581$) were eligible to higher education due to affirmative action. The percentage increased to 13% ($n_2 = 12{,}526$) for the 2015 academic year. At the region level, affirmative action had a differential effect on the admission eligibility. The eligibility percentages due to affirmative action varied between

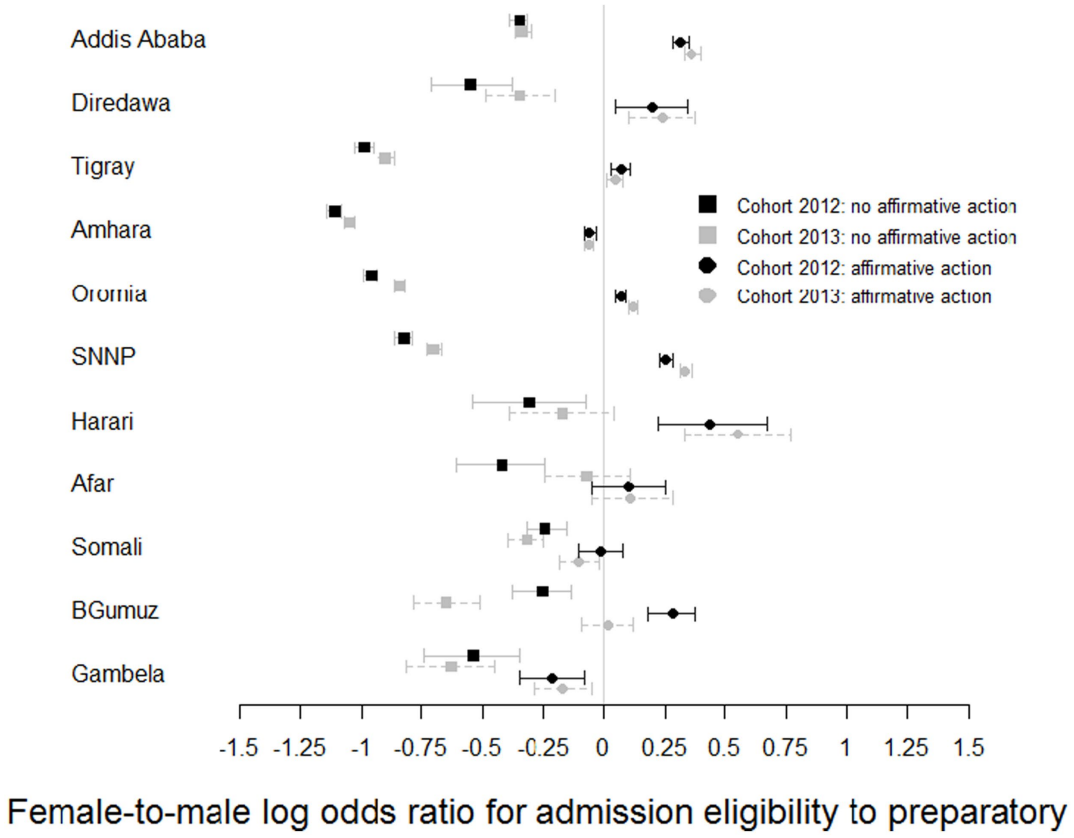

FIGURE 3
Admission eligibility to the preparatory program as a function of gender, by region and cohort, and with/without affirmative action.

6%/9 and 13%/28% (for cohort 2014/cohort 2015), with the highest percentages again for the emerging regions. The overall percent of male students, completing preparatory program in emerging regions and eligible to higher education due to affirmative action is 7% ($n_1 = 685$) and 10% ($n_2 = 1{,}269$) for the 2014 and 2015 cohort, respectively. The corresponding percentages for females in emerging regions are 9% ($n_1 = 361$) and 19% ($n_2 = 852$).

Discussion

This study set out to map student enrolment and admission eligibility by gender and region across different educational stages in relation to the affirmative action of lowering admission thresholds for target groups in Ethiopia.

Student enrolment

Enrolment to an educational program can be considered the most rudimentary quintessential aspect to participation in education. As a country, an earlier UNESCO paper reported that, unlike primary education, Ethiopia had not documented significant progress in secondary education enrolment (Unterhalter, 2010). Based on our results, the situation improved only slowly and step-wise. While we can note an increase in enrolment of female students between 2012 and 2013 in the grade 10 high school data, there was no discernible increase in enrolment across cohorts with respect to the preparatory program. Enrolment records varied across gender and region at all levels of higher education in Ethiopia, with mostly fewer female than male students being enrolled (for a summary, see Figure 6). Similar findings are documented for other African countries (Wells, 2009; Filmer, 2005).

While the disparity in enrolment was not that pronounced in stronger socio-economical Ethiopian regions, it was especially apparent in the emerging regions with the number of female students being about half of the number of male students. The large variation in enrolment parity – consistent across the two student cohorts – might be due to unequal investments and efforts by the different regions in order to tackle enrolment imparity related to gender. Despite having a single education system and structure for all regions in Ethiopia, it is not the national but the regional education bureau which takes the lion's share to bring real change. Yet, context does matter and not all regions face the same socio-economic and cultural challenges. Therefore, the observed regional differences are also an indicator of the fact that gender equity issues intersect with socio-economic status, gender-related cultural aspects, and attitudes towards education (Unterhalter, 2012).

For instance, for Addis Ababa parity in enrolment was observed across the levels, with surprisingly even more female than male students in the preparatory program. This might be associated to the fact that the capital region is entirely urban and parents' closeness to global information and awareness about the importance of girls' education is at peak levels in contrast to

TABLE 4 Enrolment at preparatory program grade 12 and eligibility rate for the university as a function of gender, region, and affirmative action (AA).

Student cohort 2014										
Region	Enrolment at grade 12				Eligibility rate for university					
					Without AA			With AA		
	N	*F*	*M*	Parity	%F	%M	Parity	%F	%M	Parity
Addis Ababa	25,884	14,845	11,039	1.34	44	66	0.67	50	66	0.76
Diredawa	1,413	670	743	0.90	50	72	0.70	57	72	0.79
Tigray	16,136	8,432	7,704	1.09	38	67	0.56	46	67	0.69
Amhara	52,306	23,542	28,764	0.82	34	64	0.52	41	64	0.64
Oromia	56,280	22,943	33,337	0.69	42	61	0.68	50	61	0.82
SNNP	32,911	13,757	19,154	0.72	41	62	0.66	49	62	0.79
Harari	735	341	394	0.87	41	58	0.71	48	58	0.84
Afar	1,262	436	826	0.53	21	29	0.74	34	39	0.87
Somali	8,157	1934	6,223	0.31	57	56	1.03	66	62	1.06
BGumuz	2,689	1,147	1,542	0.74	20	38	0.54	29	45	0.66
Gambela	2,126	391	1735	0.23	13	32	0.41	20	39	0.55
Student cohort 2015										
Addis Ababa	25,879	14,701	11,178	1.31	41	62	0.67	51	62	0.82
Diredawa	1,367	650	717	0.91	58	79	0.73	67	79	0.84
Tigray	18,000	8,923	9,077	0.98	50	72	0.69	64	72	0.88
Amhara	56,041	25,682	30,359	0.85	35	62	0.56	48	62	0.77
Oromia	55,876	23,286	32,590	0.71	43	59	0.73	57	59	0.96
SNNP	37,104	16,070	21,034	0.76	43	60	0.72	57	60	0.96
Harari	897	400	497	0.80	40	59	0.68	52	59	0.89
Afar	1,583	516	1,067	0.48	36	43	0.84	60	55	1.09
Somali	9,499	2,361	7,138	0.33	52	51	1.01	70	61	1.14
BGumuz	2,533	1,013	1,520	0.67	25	38	0.66	46	47	0.96
Gambela	2,927	504	2,423	0.21	17	29	0.60	35	41	0.85

N being total number of students enrolled in grade 12, F and M, respectively, the number of female and male students in grade 12, with parity in enrolment computed as F/M; %F and %M, respectively, the female and male eligibility rate for university, that is the percent of enrolled female students & the percent of enrolled male students in grade 12 that are eligible to pass to university, and parity in eligibility computed as %F/%M. With/without AA refers to which grade 12 exam thresholds were used to determine eligibility, those with or without affirmative action in place.

other not predominantly urban regions. This is corroborated by the level of parity seen in Diredawa, the other predominantly urban region in Ethiopia. On the other end of the spectrum, the parity in enrolment between female and male students was severely low in more emerging regions; especially in Afar, Somali, and Gambela few female students compared to male students are attending any level of higher education. This might indicate that either the awareness about the importance of girls' education is negligible or that there are strong cultural barriers that hinder girls' attendance in high school and beyond. Yet, special support and investments in education have been targeting those emerging regions for quite a while now. Thus, this inequity in participation requires serious attention and further enquiry is necessary to dig out what actually drives those girls out to not pursue higher education, despite the long-term efforts exerted by the government and NGOs to alleviate the issue. To make better use of government funding, current strategies and initiatives that have been implemented to address girls' education need to be evaluated and checked for impact; something that is far from common practice in Ethiopia. Regional states would also need to invest even more on intervention in primary and early high school since this has an impact on later enrolment in higher education.

One potentially positive exemplary region can be Tigray, which comes close in parity in enrolment results to Addis Ababa, although not being as urbanized nor globalized as the capital region. These more positive results for parity in enrolment for higher education coincide with the enrolment parity found in primary education (i.e., grade 1–8) as documented by Unterhalter (2010), where both Addis Ababa and Tigray are at the top of the statistics concerning enrolment with even more girls in primary schools than boys. One can assume that this is an interesting finding that encourages researchers to further investigate how the Tigray region stands out from the other regions in this aspect. It might also be a fruitful avenue for further research if Ethiopia hopes to accomplish what it promised in the universal education declaration (UNESCO, 2016).

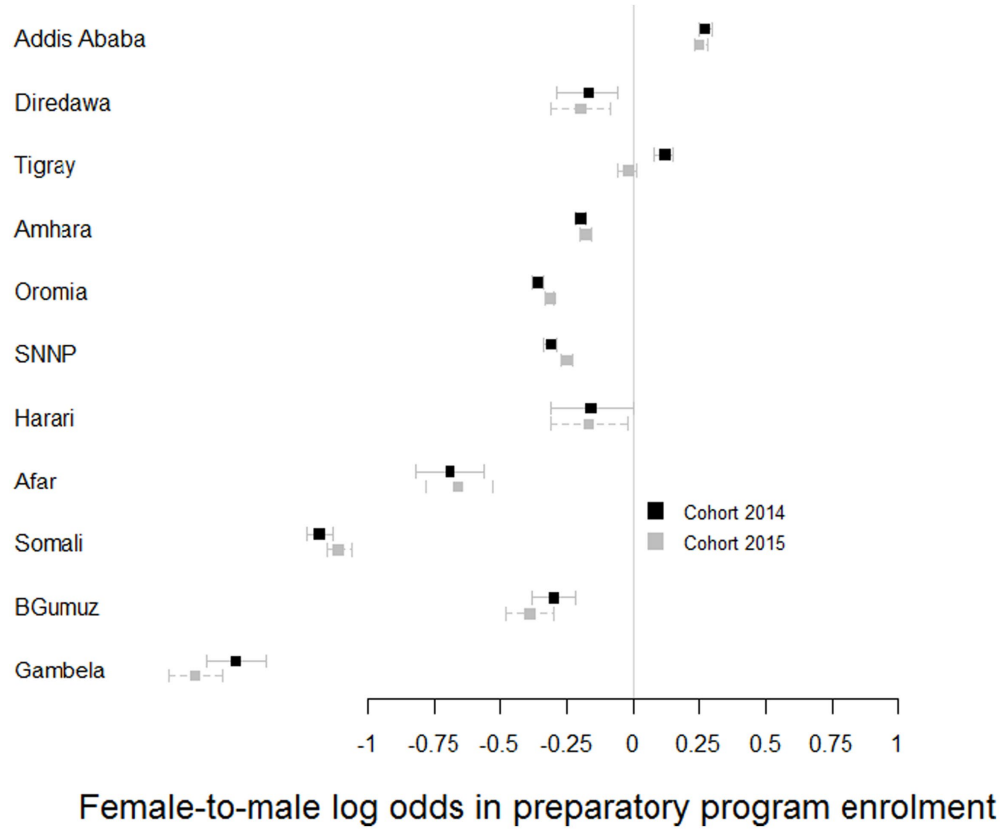

FIGURE 4
Preparatory program enrolment as a function of gender by region and cohort.

Admission eligibility

Scoring well on the standardized national exam is the key obstacle for access to higher education. When the affirmative admission thresholds are ignored, the admission eligibility rates are about half as high for female students than for male students in most regions. This is indicative of generally unequal access to higher education for female students in Ethiopia.

Surprisingly in Afar and Somali, two emerging regions, the parity in admission eligibility was better than in other more socio-economic developed regions. The better parity in these two emerging regions might be linked to the small number of enrolled female students in those regions and hence a selection effect. It is not unimaginable that those few enrolled female students are either from privileged backgrounds or have worked particularly hard to break all socio-cultural barriers, increasing their chances to score higher on the national examinations and be directly eligible for admission to higher education.

On a positive note, and despite the wide variation across regions, we can state that eligibility rates for the preparatory program generally slightly increased between 2012 and 2013 which might be reflecting the continuous investments, especially in the emerging regions, to improve the quality of the educational system. The only exception was the BGumuz region where the eligibility rate dropped; a case that requires more attention and further study.

Affirmative action

The comparison of the admission eligibility rates with and without affirmative action for the next level of education, showed that lowering the admission thresholds for the target groups did generally a good job at improving the balance in the admission eligibility rates for the preparatory program, such that female high school students had either an equal or slightly higher chance of being admitted than male students. Thus, affirmative action generally corrected the unequal admission eligibility rates to the preparatory program that would otherwise have been present, and in some regions the affirmative action might even be considered too strong as it overcorrected the balance in favor of females.

This is in line with other studies which indicates the importance of affirmative action in improving access to higher education for target groups in less developed countries (Vieira and Arends-Kuenning, 2019; Hill, 2017). However, these improved admission eligibility rates were unable to compensate for the largely differing baseline enrolment numbers of both genders, meaning that affirmative action at most would be able to retain a status quo. Indeed, student enrolment numbers for the preparatory program mostly showed similar patterns to those of high school. Yet, one can argue about the effectiveness of the current implementation of the affirmative action strategy as the only policy tool to promote equity in education.

In contrast to the preparatory program, the affirmative action of lowering the admission thresholds did not fully succeed in balancing

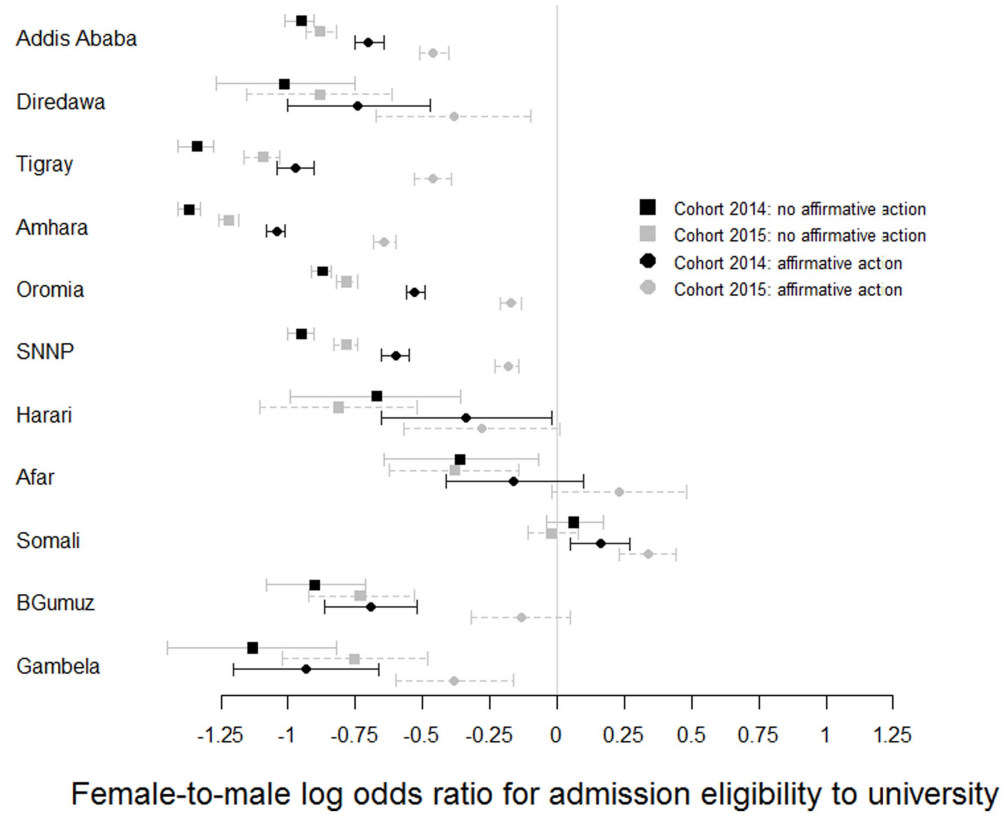

FIGURE 5
Admission eligibility to university as a function of gender, by region and cohort, and with/without affirmative action.

the university admission eligibility rates. Especially in the 2014 cohort and in the socio-economical stronger regions the eligibility rate for female students remained still noticeably lower than that for male students. This worrisome observation implies that affirmative action here will not even be able to retain the status quo in enrolment numbers and that even less females than males will be able to pursue a university degree. One can speculate that it is a side-effect of the lower-priority of more established regions in following up affirmative action students in their preparatory programs, hurting their chances for performing at a level that makes them eligible to transfer to university. Female students indeed scored on average significantly lower than male students on the grade 12 national examination as documented in Tesema and Braeken (2018). This implies that creating equity in access to the preparatory program through affirmative action does not guarantee that the extra students admitted will be able to catch up and perform up to standard to reach scores above the admission thresholds for the next level, the university. Hence, lack of follow-up support in their further education likely makes the affirmative action in terms of lowered admission thresholds not that effective.

For Addis Ababa, one can debate whether affirmative action in the form of lowering the admission threshold is really needed, as enrolment numbers across gender are quite equal and at preparatory program even largely in favor of female students. For other regions, especially for Amhara and Oromia, parity in admission eligibility heavily depended on affirmative action; here lifting affirmative action, would mean that a large proportion of girls might no longer have access to higher education. The large variation between the regions in student enrolment and admission eligibility, and in impact of affirmative action, implies that the current affirmative action in Ethiopia is not equally effective for or beneficial to every region. As a result, implementing the same affirmative measure to all female students in all regions regardless of the area, school location and facilities might not be as effective as the government might hope, in order to address access to education for those who need it.

Study limitations

Absence of policy documents

We were unable to retrieve specific policy documents covering the affirmative action and detailing the process and criteria involved in the decisions to lower admission thresholds for affirmative groups during the 25plus-years of its existence. Formal benchmarks for evaluating the success of affirmative action were therefore absent and we had to resort to a projected impact measure with respect to enrolment and admission eligibility numbers.

A thorough and comprehensive educational policy document would be needed if the implementation of affirmative action in Ethiopia is supposed to have any real effectivity in accomplishing its goals. Affirmative action remains now largely unspecified except for the documented list of differential exam score thresholds.

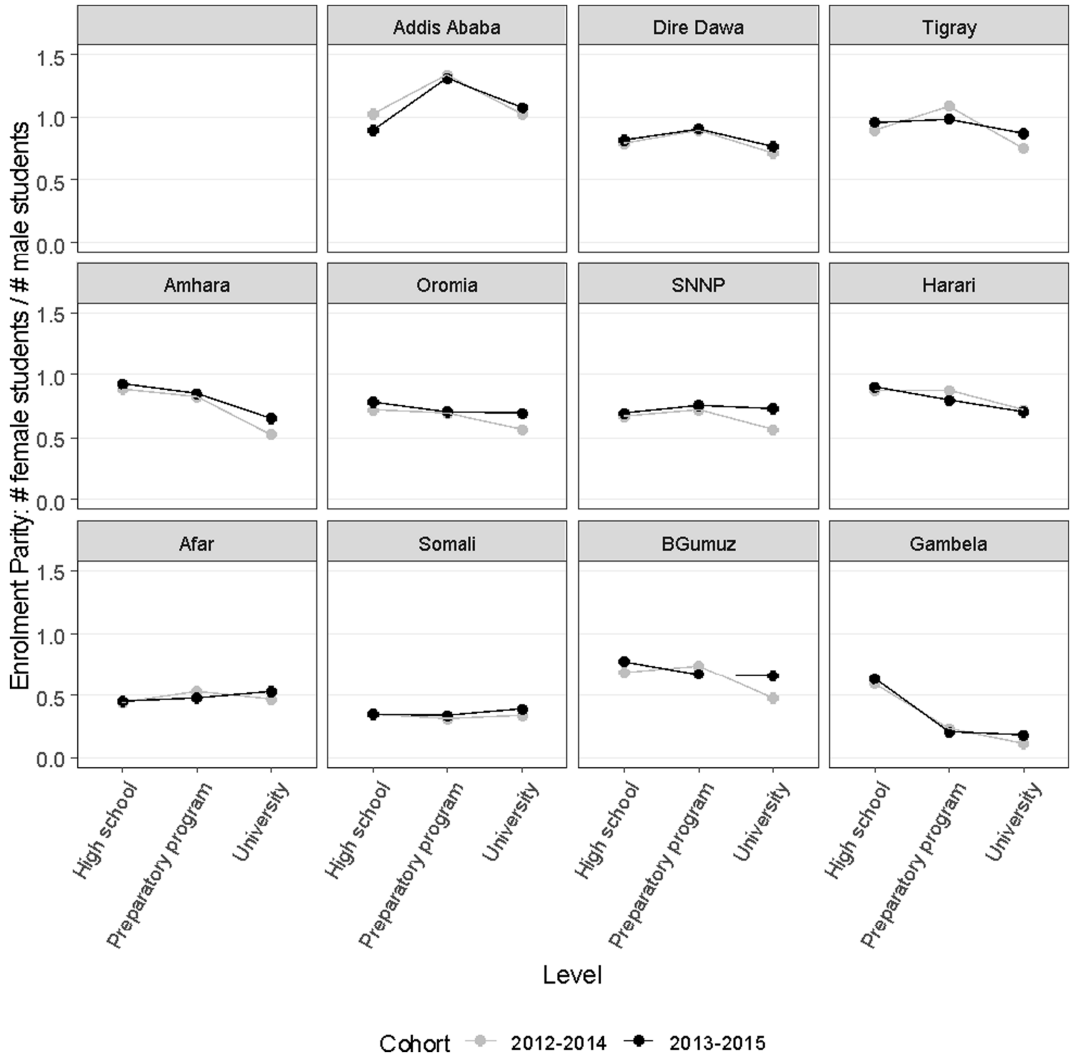

FIGURE 6
Parity across gender in student enrolment by region for different levels of higher education in Ethiopia. Parity for university is computed as the expected parity in correspondence with the expected numbers of enrolled students for university by multiplying the admission eligibility rates for university with the number of enrolled students in the preparatory program (see Table 4).

We would therefore encourage the Ethiopian government to more closely think out the country's educational policy, in the light of its particular history, including its vision on how to pursue equity and redress inequity, which strategies and mechanisms will be employed, and measurable goals to evaluate the effectiveness of their mission.

Absence of longitudinal individual student data

Students eligible through affirmative action currently do not receive any distinct status nor differential treatment, their eligibility status is merely determined based on their national exam score. Systematic ways of tracking and supporting their progress from high school to university and later in career, are also lacking. The lack of a unique identifier for every individual in the register database prevented us from following individual students through their school career as we could not link high school exams directly to preparator program exams. Hence, despite having data from sequential year cohorts, we can only make inferences at the group level and not at the individual level across the different educational system levels. To facilitate future evaluations of the educational system in Ethiopia, we would recommend expanding the national register data to allow individual tracking, but without losing sight of the necessary ethical and security concerns to safeguard the privacy of individual students.

Comprehensiveness

While this study focuses on gender and regional inequalities, we were unable to bring in additional potentially relevant socio-economical and cultural factors. The absence of these background variable in the national register data limits the comprehensiveness of the analysis. In addition to the large regional differences that can be observed, the within-region variability can still be rather large, for instance rural versus urban areas. Therefore, it is not unreasonable to recommend that the Ethiopian government would work with more

defined criteria to choose the affirmative beneficiary groups. Instead of using the current macro-level criteria in terms of any female student and/or of in specific political regions, a distinction in terms of for instance location (urban/rural) and quality of facilities could be a better option.

This study relied on two key indicators, enrolment and admission eligibility, that captured only part of students' access to and performance in the educational system. For instance, students may meet the admission eligibility criteria but fail to enroll due to financial, familial, or cultural barriers or might fail to graduate after admission. Upgrading the national register with additional metrics beyond the national exam grades would possibly allow to complete the picture provided in the current study.

These limitations highlight areas where future research could expand upon the present study. By addressing these gaps, future studies could provide a more complete picture of how affirmative action functions in the Ethiopian education system and their broader societal impacts. At the same time, despite the listed data limitations, the strengths of national register data should also not be downplayed. Where it is currently lacking in depth, it is winning in scope and representativeness; not hampered by the potential selection bias and lack of generalizability that a small, localized case study would be prone to. Thus, we call for more countries to maintain these type of register data and to also make the data available for educational researchers, nationally and globally.

Conclusion

In conclusion, the objective of *Education for All* remains unmet in Ethiopia, with ongoing disparities in access to higher education, especially for underrepresented groups. While the affirmative action policy has increased admission eligibility for these groups, they have not resolved the imbalance in enrolment. The core issue lies earlier in the educational pipeline, where significant gender disparities exist at the high school level in many regions. Without addressing these inequities at earlier stages, equal opportunities in higher education remain unattainable. This highlights the importance of considering both equality of opportunity and equality of outcomes.

Affirmative action focused solely on lowering admission thresholds does not fully address the achievement gaps between beneficiary and non-beneficiary groups. As Anderson (2007) noted, affirmative action alone is "too little, too late" in combating deep-rooted inequalities. Therefore, to foster a more equitable education system in Ethiopia that ensures both access and success for all students, we recommend an approach to affirmative action that goes beyond mere differential admission score thresholds at the later stages of the educational system. A more holistic approach is needed that acknowledges the large between- and within-regional differences and takes effect earlier on in education, reducing economic barriers through financial support (e.g., scholarships, transport, study materials) and socio-cultural barriers through community support (e.g., mentor and buddy systems). Launching such an affirmative action system would go best hand in hand with upgrading the available educational data such that students can be tracked through the educational system facilitating a more direct evaluation of the effectivity of new affirmative action measures.

Data availability statement

The data analyzed in this study is subject to the following licenses/restrictions: National government data not open to the public. Requests to access these datasets should be directed to Ethiopian National Educational Assessment and Examination Agency (NEAEA).

Ethics statement

Ethical approval was not required for the study involving humans in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and the institutional requirements.

Author contributions

MT: Data curation, Project administration, Writing – original draft, Writing – review & editing. SB: Supervision, Writing – original draft, Writing – review & editing. JB: Methodology, Supervision, Writing – original draft, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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