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ABSTRACT

Financial Constraints and Girls' Secondary Education: Evidence from School Fee Elimination in The Gambia*

We assess the impact of large-scale fee elimination for secondary school girls in The Gambia on the quantity, composition, and achievement of students. The gradual rollout of the program across geographic regions provides identifying variation in the policy. The program increased access to secondary education substantially without harming learning outcomes. We find an increase of around 50% in the number of girls and boys taking the high school exit exam from a low baseline, as well as a 0.1 standard deviations gain in test scores in response to the program. This result is notable in a setting where expanded access could put additional strains on limited resources and the quality of schools. These findings suggest that financial constraints remain serious barriers to post-primary education and that efforts to expand access to secondary education need not come at the expense of learning in low-income countries like The Gambia.

JEL Classification: O15, I21, C93

Keywords: school fee elimination, secondary school, gender gap, Gambia

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1 Introduction

Most countries in Sub-Saharan Africa have experienced large expansions of access to primary education over the past two decades. For example, the number of primary school children has doubled between 1998 and 2009 in countries like Burkina Faso, Madagascar, Mali, and Mozambique.[1] Despite such success at the primary level, net secondary enrollment remains low in the least developed countries, at 35% for boys and 29% for girls between 2008-2011.[2] Large gender enrollment gaps in many Sub-Saharan African countries pose additional challenges for girls seeking to pursue their education beyond the primary grades. One potential explanation for the low and stagnating secondary enrollment figures is financial constraints. Relative to primary school, the overall cost of attending secondary school is much larger due to higher tuition fees, higher opportunity costs as children are older and may earn more on the labor market, and transport costs associated with fewer secondary school choices, especially in rural areas. To date, only a handful of countries in the region, such as South Africa, Ghana, and The Gambia, offer large scale tuition-free secondary education or some form of financial aid through various scholarship programs.

The Gambia has been a pioneer in promoting access to secondary education, offering fee-free public schooling for girls in grades 7-12 on a nearly national scale for more than a decade. In this paper, we evaluate this policy, known as the girls' scholarship program, on student learning. Two features of the policy make it especially suited for rigorous evaluation. First, the program was rolled out to different regions on a staggered schedule between 2001-2004. This allows us to use the regions that received the program later as a control group, exploiting variation in program receipt over time and across regions. Second, the program exclusively targeted girls, allowing us to measure differential effects between boys and girls within the same regions. To our knowledge, this is the first paper to evaluate the impact of a large-scale tuition waiver program at the secondary school level in Africa.[3]

[1]Source: EdStats, World Bank.

[2]Source: UNESCO Institute for Statistics (UIS), based on selected countries where data is available.

[3]Blimpo (2014) evaluated the effect of financial incentives on secondary school children in Benin and found

We find that the program had important effects on both access and student achievement. The policy increased the quantity of high school exit exam test takers by more than 50% over a low baseline.[4] The share of older test-takers also increased in areas that began with lower secondary enrollment, suggesting that the policy helped keep students in schools or induced some students whose studies were interrupted to return. In terms of learning outcomes, we find increases of 0.19 standard deviations for girls and 0.15 standard deviations for boys on the standardized English test score. The combined effect on both Math and English is about 0.1 standard deviations for both boys and girls in our preferred specification. Alternative specifications find robustly positive point estimates, although many of them lose statistical precision. In light of this, we conclude that the program expanded access without harming learning outcomes. This is notable in a setting where expanded access might put additional strain on limited resources as well as potentially lowering the average quality of students or schools. In recent years, the Gambian government has engaged several initiatives toward improving learning outcomes (Blimpo *et al.*, 2011; Pugatch & Schroeder, 2014a,b). The findings from this study suggest that complementary efforts to expand access to schooling, such as the girls' scholarship program, need not impede learning gains.

As mentioned previously, the study occurs against a backdrop of sustained attention among both policymakers and researchers to primary education, with relatively less emphasis on the secondary level. Expanded access to primary education resulted from concerted policies, both internationally and nationally, aimed at removing financial constraints through school fee elimination and other measures. Enrollments in primary schools have accelerated in many countries since the 1990 Jomtien conference, in which over 150 countries adopted the Education For All initiative. This commitment was renewed during the Dakar Framework for Action in 2000, where tuition elimination and the reduction of other costs were targeted. Over the past two decades, more than twenty African countries have waived tuition from

large gains on test scores. This policy, however, did not target access directly and provided no additional resources upfront.

[4]Related work by one of this study's authors also found a large enrollment effect of the policy for the relevant age group using household survey data (Gajigo, 2012).

primary education and many more have some form of targeted programs to ease access to the most disadvantaged populations. Several recent comprehensive literature reviews concluded that the great majority of interventions that reduced tuition fees and other costs increased enrollment, suggesting that financial constraints are among the most important barriers to access to primary education (Petrosino *et al.*, 2012; Krishnaratne *et al.*, 2013; Murnane & Ganimian, 2014).

These great successes on access have been achieved amid recent but growing concerns about education quality and potential degradation of learning outcomes (Pritchett, 2013). More recent research has focused on the impact of access-oriented policies not only on enrollment but also on learning outcomes. For example, Kazianga *et al.* (2013) found that a comprehensive program that included school construction and student attendance incentives increased substantially both enrollment and test scores of primary school students in Burkina Faso. A similar, but experimental study, which brought community schools to Afghan villagers found equally large effect on both enrollment and test scores (Burde & Linden, 2013). In Kenya, Lucas & Mbiti (2012a) found that elimination of primary school fees led to substantial gains on enrollments with very little negative effect on the test score of those who would have attended in the absence of the tuition waiver. These studies suggest that at least at the primary school level, the tradeoff between expanding access and learning outcomes might be less pronounced than one might think.

Given these successes in improving access and (to a lesser extent) learning in primary education, for many countries the logical next step is to improve access and outcomes in secondary education. Fewer policies and studies have focused on secondary schools, however. Early results from an ongoing study on a scholarship program in Ghana found large enrollment effects among scholarship winners relative to the control group three years after the program started (Duflo *et al.*, 2009). They concluded that financial barriers might be crucial at the secondary level as well. Outside of Africa, Muralidharan & Prakash (2013) evaluated a program that substantially reduced girls' cost of attending secondary school through provision of bicycles, increasing enrollment by 30% and cutting the gender gap by 40%. Yet major gaps in understanding remain, particularly with regard to student achievement. A review of the post-primary schooling literature by Banerjee *et al.* (2013) concluded, "Despite the overarching positive results of price-based policies in increasing school enrollment and attendance, the evidence on the effects of price reductions on student performance is less conclusive" (p. 21).

We contribute to that literature by being the first to evaluate a large-scale tuition elimination policy for secondary education in Africa. We use administrative data on the universe of standardized test scores in The Gambia from 1998-2012; we are the first researchers to obtain and analyze this data. We also contribute to the broader literature on efforts to close the gender gap in access and learning. Several other studies have evaluated similar programs targeting girls (Kim *et al.* 1999a, Kim *et al.* 1999b, and Chaudhury & Parajuli 2010 for Pakistan; Filmer & Schady 2008 for Cambodia; Kremer *et al.* 2009 for Kenya; Baird *et al.* 2011 for Malawi; Begum *et al.* 2012 for Bangladesh; and the previously mentioned Kazianga *et al.* 2013 and Muralidharan & Prakash 2013 for Burkina Faso and India, respectively), with a consensus finding that reducing the cost of attendance leads to gains in enrollment. Of these, however, only Baird *et al.* (2011) examines learning outcomes among secondary school students as we do, using a program that is more local in scope than our setting.

In the next section, we describe the education system in The Gambia and the girls' scholarship program. Sections 3-4 present the methodology and data we use for analysis. Section 5 presents results, and Section 6 concludes.

2 Contextual Background

In the Gambian education system, the first 9 years are formally known as the Basic Cycle. This includes 6 years of primary school (grades 1-6) and 3 years of Upper Basic School (middle school, grades 7-9). High school, known locally as Senior Secondary School, consists of grades

10-12. The West African Senior School Certificate Examination (WASSCE, hereafter the Grade 12 exam), instituted in 1998, is administered at the end of grade 12, and is required for advancing to the tertiary level (i.e., university). The exam is administered by the West African Examination Council (WAEC), a regional institution that conducts examinations in the 4 former British colonies in West Africa (The Gambia, Ghana, Nigeria and Sierra Leone).[5]

WAEC generates exam questions each year in consultations with the Ministry of Education, based on existing curricula. Accordingly, the exam measures achievement in specific subjects, rather than innate ability. Students choose a minimum of 6 and a maximum of 9 subjects, but the core and mandatory subjects are Mathematics and English, which will be our focus. There is no fixed passing mark for the exam. Because the exam is based on curricula designed by the Ministry of Education, and these have not undergone any major change, the exam questions should be comparable over time.

There is a structured system in the way the exam is conducted. Each year, sealed questions are delivered at the test centers the day before the scheduled exam.[6] On the day of the exam, teachers from other schools serve as invigilators (proctors). The exams are centrally graded by WAEC. This structure is similar to the way national exams are conducted in other countries (Kremer *et al.*, 2009).

Like other African countries, The Gambia charges fees for public school attendance. The Gambia levies fees beginning in grade 7, as primary education is nominally free for public schools. Students are still responsible for purchasing textbooks, uniforms and other materials, leading students to bear costs even at the primary school level.

The scholarship program for female middle and high school students started as an initiative funded jointly by UNICEF, the World Bank, and the International Monetary Fund through the Highly Indebted Poor Countries program and the Gambian government. The

[5]Students also take an exam at the end of grade 9, also administered by WAEC, as a requirement for matriculation into high school. Because this exam was introduced in 2003, there is only one pre-treatment region-year available in the data. We therefore focus on the Grade 12 exam in this paper.

[6]Schools serve as test centers. In almost all cases, students take the exams at the school they attend.

goal of the program is to increase overall student enrollment but with a specific focus on reducing the gender gap. The program pays mandatory school fees for all girls in grades 7-12 in the regions in which it is implemented.[7] The only criteria for benefitting from the program are gender (female) and attending a public secondary school.[8]

The scholarship program began in 2001 in Regions 5 and 6 only, as these are the regions that are most rural and have the lowest enrollment.[9] The program was extended to Regions 3 and 4 in the following year. Two academic years later, the program was further scaled to include Region 2 in 2004. The scholarship program has not been extended to Region 1, which is the most urbanized region, and relatively more developed. Figure 1 provides a map of The Gambia's regions, while Figure 2 shows the rollout of the program over time.

To implement the program, a specially-designated Ministry of Education administrator handles the disbursement of funds between the program and schools. The regional offices of the Ministry verify the enrollment figures provided by individual schools before the scholarship funds are transferred. At no point do the beneficiary households handle the money, thereby removing any chance of the scholarship funds being diverted for other purposes. The average cost of the program per student was US$48, US$43, US$42 and US$43 in 2001, 2002, 2003 and 2004, respectively Gambia Ministry of Basic and Secondary Education (2004).[10] The benefit is particularly large in grades 10-12, where fees are more than 7 times those for grades 7-9 (Daly *et al.*, 2014). The program was widely publicized through local media, as well as through several workshops in various regions of the country.

This program was the only large-scale policy aimed at increasing secondary school access

[7] The major sub-national units in The Gambia are 6 regions. Region 1 includes the capital Banjul, with Regions 2-6 at increasing remove heading east along the Gambia River bisecting the country. Below these sub-national units, there are 43 districts as of 2013.

[8] For purposes of this paper, public schools refer to both government and grant-aided schools, the latter of which are publicly funded but administered privately. Both types of public schools are eligible for the scholarship program, while private schools are not.

[9] We follow the Gambian convention in referring to the 2000-2001 academic year as 2001, to 2001-2002 as 2002, and so on.

[10] The average value changed over time because of changes in the exchange rate (the average value of a US dollar per Gambian Dalasi was approximately 13, 15, 20, 27 between 2000 and 2003) and also changes in the composition of students covered (middle and high school students) over time as the program got scaled.

in the country during our sample period. Other national policies focused on primary education, and no other policy coincided with the scholarship program in geographic scope and timing. Nonetheless, a supplementary scholarship program targeting a subset of secondary schools in Region 2 was implemented during the sample period,[11] as was a program offering a salary premium to primary school teachers in all rural areas excluding Region 2 (Pugatch & Schroeder, 2014a,b). We therefore check robustness of results to the omission of Region 2 later in the paper.

3 Methodology

This paper analyzes the effect of the Gambian girls' scholarship program on student learning using administrative data on standardized test scores. The geographically staggered rollout of the program provides an opportunity to compare outcomes in regions that received the program early with those that received it late. Additionally, the targeting of the program to girls allows for comparisons between male and female students within a region after receipt of the program.

Following the difference-in-differences strategy used to evaluate the program in Gajigo (2012), we estimate the following regression separately for boys and girls:

$$y_{isrt} = \beta D_{rt} + X_{isrt}\gamma + \delta_s + \theta_t + \epsilon_{isrt} \quad (1)$$

where y_{icrt} is the outcome (i.e., test score) of student i at school s in region r in year t; D_{rt} is a dummy for whether the scholarship program was implemented in region r at time t; X is a vector of individual characteristics, including the student's age (measured continuously, based on date of birth), age squared, and a constant; and δ and θ are school and time fixed effects, respectively. The coefficient β is the difference-in-differences estimate of the effect

[11]The Ambassador Girls Scholarship Program, led by USAID, targeted both girls and boys in selected secondary schools in Region 2. It went beyond the program studied in this paper by covering school fees, books, uniforms, and school supplies. However, its oldest recipients entered 12th grade in 2012, the last year of our data, meaning that the two scholarship programs overlap for only one region-year in our sample.

of the program because it compares changes in test performance of students in regions that received the program to changes in regions that did not. The identifying assumption is that in the absence of the program, changes in outcomes in regions that received the program early would have been the same as in regions that received the program late. We examine the validity of this assumption by testing for common pre-treatment trends across regions.

Equation (1) establishes the region as the unit of treatment and estimates the average effect of the program on male and female students separately. Because the program eliminated fees for girls only, however, we can also explore differential changes in performance between male and female students by pooling the sample and modifying the specification to:

$$y_{isrt} = \phi female_{isrt} + \beta D_{rt} + \rho D_{rt} * female_{isrt} + X_{isrt}\gamma + \delta_s + \theta_t + \epsilon_{isrt} \tag{2}$$

where $female$ is a dummy variable and all other notation is as before. In this triple-difference specification, the coefficient ρ captures any differences in program impact between male and female students.

Additionally, we can use variation in the length of program exposure among students to estimate the marginal effect of program duration on learning. For instance, students in 2004 will have had one year of program exposure if they attended school in Region 2, but 3 years of exposure in Regions 3-4 and 4 years in Regions 5-6. Within regions, students in different cohorts will also vary in their exposure. Region 6 students in 12th grade in 2001 will have one year of program exposure, while 11th graders will have two years of exposure when they take the exam the following year. Regressions that use variation in length of exposure to the program will take the form:

$$y_{isrt} = \beta yrsexposed_{rt} + X_{isrt}\gamma + \delta_s + \theta_t + \epsilon_{isrt} \tag{3}$$

where $yrsexposed$ measures the duration of a student's exposure to the scholarship program based on the date of program rollout by region combined with the test date. $yrsexposed$

ranges from zero, for students not exposed to the scholarship in their region, to 6, for students whose region received the scholarship since they attended grade 7.

In other words, we modify the main difference-in-difference specification (1) to allow the treatment effect to vary according to length of a student's exposure. Similarly, replacing the treatment indicator D with $yrsexposed$ in the triple-difference specification (2) estimates whether the effect of program exposure varies between boys and girls.

Because all students within a school may be influenced by common unobservable shocks, we cluster all standard errors by school, of which there are 32.

In all specifications, the coefficient on the treatment variable captures the reduced-form effect of the policy. *A priori*, it is not clear what sign to expect for these coefficients. Students induced to enroll by the program are likely to be less academically prepared than their peers for whom financial barriers are not a constraint. Additionally, an influx of students could strain school resources. Each of these channels would lead to a negative effect of the policy on learning. On the other hand, relaxing financial constraints among students who would have enrolled in the absence of the policy could improve learning by reducing their need to generate income or by alleviating stress. We therefore look for heterogeneity in treatment effects along these dimensions after presenting the main results.

4 Data

Outcome data are the universe of student test score records of the West African Examinations Council (WAEC). Subject-level scores are available for each student for 1998-2012, allowing for several years of pre-treatment outcomes for each region.[12] We omit Region 1 (Banjul, the capital) from all analysis because of its dissimilarity with the rest of the country. We also omit private schools because they were ineligible for the scholarship program. However, all raw test results are converted to z-scores based on the universe of results in a given year, including students from private schools and Region 1. This allows us to interpret scores

[12] We omit data from 2004 because student gender is missing for that year.

relative to the national norm. It also explains why mean z-scores tend to be negative in our estimation sample.

Although our primary interest is the population of schools and students eligible for the program, if students sort non-randomly into public and private high schools in response to the scholarship the results may be biased. In 2004, when program rollout was complete, only 2 of 43 districts had both a public and private high school (grades 10-12). By 2012, the last year for which we have data, this figure had grown to 9. We will therefore assess whether the growth in private school enrollment was related to the scholarship program.

However, all of these private schools are located in the urban districts of Region 2, near the capital, as shown in Figure A1.[13] Students in most areas are therefore constrained to attend their local public school. We later check robustness of results to various definitions of the estimation sample, such as excluding Region 2 or including private schools.

We also use data from the 1998 wave of the Integrated Household Survey (IHS) to explore heterogeneity in results by district characteristics. This survey, which is conducted by the Gambia Bureau of Statistics, is nationally representative and collects information on assets, demographic and socioeconomic information. In the 1998 survey, slightly over 1,900 households were covered including approximately 4,500 school-aged children.

The Gambia made considerable strides in reducing the gender enrollment gap since implementing the scholarship program. Figure 3 shows Ministry of Education data on enrollment in Grades 7-12, aggregated across all public schools in Regions 2-6.[14] Panels (a)-(b) rescale time so that $t = 0$ corresponds to the first year of program receipt. Panel (a) shows that female enrollment increased relative to the pre-treatment trend after introduction of the program, while male enrollment fell. Panel (b) shows the resulting increase in the female enrollment share. This is first-order evidence of the program's effect on enrollment, consistent with Gajigo (2012). Panel (c), which uses calendar time and disaggregates the data by

[13] The map shows schools in 2011, the most recent year for which location data are available. Region 1 schools are excluded from the estimation sample but shown on the map for illustration. Not all schools in the sample appear on the map due to missing location data.

[14] All data presented in this and subsequent analysis are for public schools only, unless stated otherwise.

grade, shows that the female enrollment percentage increased over time for all grades. It also shows that females comprise a lower share of enrollment as grade level increases (with only a few exceptions), meaning that females will be under-represented among test-takers relative to their enrollment shares in their corresponding schools.[15]

Test-taking patterns follow these enrollment trends. Table 1 presents summary statistics separately for boys and girls. The number of test-takers is relatively small in 1998, particularly for girls; the 210 girls taking the test that year represent only 22% of the total. By 2005, when all regions had the girls' scholarship program for at least two years, the number of students taking the exam nearly doubled and the female share rose to 35%. These upward trends continued through 2012, the last year of available data. For both boys and girls, performance improved in English over this time, but stagnated or fell in math. Overall, performance improved for both boys and girls in the sample period.

5 Results

5.1 Pre-treatment outcome trends

Before presenting estimates of the program's impact, we first check the validity of our identifying assumption of common outcome trends between regions that received the program early and those that received it late. To do so, we rescale time so that $t = 0$ corresponds to the year of treatment receipt in each region and limit the sample to pre-treatment periods only. We then regress outcomes on a time trend and its interaction with indicators for regions 5 and 6 (which received the program first, in 2001) and regions 3 and 4 (which received the program in 2002). Statistically significant coefficients on these interaction terms would indicate differential pre-treatment trends among regions, calling into question the identifying assumption of our difference-in-differences strategy.

[15]The enrollment data do not track individual students over time, making it impossible for us to construct grade progression rates without making additional assumptions.

Table 2, column (1) shows results for the count of girls taking the exam, by school. The coefficients on the time trend-region interactions are not significant, either separately, jointly, or when comparing trends in Regions 5-6 with Regions 3-4. The analogous regression for boys in column (5) also provides no evidence of differential trends.[16] The remaining columns of the table present results for test scores at the student level, separately for English and math as well as the combined English and math score. Again, there is no evidence of differential pre-treatment trends by region.[17]

5.2 Enrollment and sorting in response to scholarship

The scholarship program could affect learning outcomes by altering the quantity of students taking exams, the composition of students, or the learning resources available to them. We examine each of these channels before presenting the main results.

In Table 3, we present estimates of the effect of the girls' scholarship program on the number of test-takers and the proportion from private schools. Here, we aggregate the data by district, as this is the relevant level for any public-private competition.[18] In column (1), the coefficient on program receipt indicates that 26.1 additional girls per district took the exam in regions that received the program early relative to those that did not, significant at 5%. In column (2) we include an interaction between program receipt and "high enrollment gap," which is an indicator for whether the school's district was below the median enrollment rate for secondary school-aged children (ages 13-18) in 1998.[19] Areas with a high enrollment gap have the highest potential influx of students from introduction of the scholarship. The coefficient on this interaction term is positive as expected, but not statistically different from

[16]Aggregating to the district level, as in Table 3, also fails to produce evidence of differential pre-treatment trends in the number of students taking the test.

[17]In the pre-treatment period there are only 11 schools, which will likely lead our school-clustered standard errors to overstate the precision of our estimates. However, this bias would lead us to over-reject the null of no differential trends, whereas we fail to reject the null in all specifications.

[18]There was only one private school-year in the pre-treatment period, making it impossible to identify the program effect separately from school dummies among the sample of private schools.

[19]The strategy resembles that of Lucas & Mbiti (2012a,b), who study the effect of free primary schooling in Kenya.

zero.

Columns (3)-(4) of Table 3 repeat the exercise with private schools' share of female test-takers in the district as the outcome. The scholarship led to a 21.1 percentage point increase in this share, significant at 10%. However, the interaction term in column (4) reverses this effect in high enrollment gap districts. In fact, these districts saw a reduction in the private school share of 8 percentage points. The results are consistent with flight to private schools due to space limitations or perceived lower quality of public schools in response to the scholarship. In high enrollment gap districts, however, students are more likely to lack the means or opportunity to exit to private schools.

Columns (5)-(8) examine the same outcomes for boys, with largely similar results. Effect sizes are large, with increases in the quantity of test-takers exceeding 50% of the mean for both girls and boys. Increases in the number of boys taking the exam are somewhat surprising, given that the program targeted girls. Yet because boys constitute the majority enrolled in the high school grades (see Figure 3), they are therefore likely to be more prevalent at the test-taking margin, making possible relatively large spillover effects from the program.[20] Columns (9)-(10) find no significant effects of the program on the proportion of test-takers who are female, though the coefficients are positive. Overall the program appears to have increased the number of students taking the exam and to have hastened the growth of private schools.

Given these increases in the number of test-takers and their shift to private schools, we are also interested in whether the characteristics of test takers changed. Table A1 compares test takers in public and private schools.[21] Compared to private school students, students in public schools earn higher scores, particularly in English (0.16 standard deviations for girls

[20]Other programs that targeted girls for reduced schooling costs have also shown increases in male enrollment (Kim *et al.*, 1999a; Begum *et al.*, 2012), which the authors explain as a spillover to male siblings. Our data do not allow us to distinguish siblings among test takers or enrolled in other grades, however.

[21]Due to the lack of pre-treatment observations for private schools (just one private school-year in the pre-treatment period), we cannot use the regression specification in (1) to compare public and private school students. Instead, Table A1 limits the sample to post-treatment observations and checks for differences in means.

and 0.22 for boys). Although we cannot determine whether these patterns reflect pre-existing differences between these students or higher quality of instruction in public schools, public school students are also younger and (for boys) less likely to be absent from the exam,[22] suggesting that weaker students sort into private schools.

Table A2 explores whether the scholarship program changed the composition of test takers within public schools. We check if test takers are older or more likely to be absent in response to the scholarship, either of which would be evidence of negative selection.[23] In columns (1) and (5), we find that students in scholarship areas are no more likely to be over 20 years old, an age threshold that roughly marks whether the student takes the exam "on time" based on typical school progression. However, columns (2) and (6) show that the program increased the prevalence of students older than 20 in high enrollment gap areas compared to low, by 4 percentage points for girls and 5 percentage points for boys. These results suggest that the scholarship retained some older students, or induced those whose studies were interrupted to return to school, in areas with lower secondary enrollment prior to the program. In column (3), we find that girls were 3 percentage points less likely to be absent from the exam due to the scholarship, though this effect is reversed in high enrollment gap districts, with the same coefficient pattern for boys. The pattern is consistent with the scholarship increasing students' perceived readiness for the exam overall, but with the marginal student in high enrollment gap areas less prepared to take the exam.[24]

Another way in which the scholarship program could change the composition of test-takers is if students migrate, or otherwise switch schools, in order to take advantage of the program. Although Gambian household surveys lack data on residential migration that

[22] Here, absence refers to students who registered for the exam but do not have a score on either the math or English subject test, both of which are required. Including enrolled students in Grade 12 who did not register for the exam could make absence rates even higher.

[23] Other than test scores, exam records report only a student's gender and date of birth, preventing us from examining other changes in student composition.

[24] The implications of these patterns of absences on estimates of test performance in response to the scholarship are ambiguous. If students are absent because they are likely to fail the exam, then lower absence rates could lead to higher average ability among remaining test takers. On the other hand, fewer absences could reflect an influx of marginal test takers who were less concerned about performance, leading to lower quality among test takers.

would allow us to test directly, we think that such a response is unlikely, because the monetary and psychic costs of migration should exceed the scholarship's value of less than US$50 annually. Switching schools without changing residence is also unlikely given the sparse geographic distribution of schools, particularly in Regions 3-6, as shown in Figure A1. If such switching occurs, it would most likely be at schools close to the border between an eligible and ineligible region. To test this possibility, we repeated the analysis of Table 3, but included an interaction effect between program receipt and whether the district was located on the border of a regional grouping with different program rollout dates (i.e., the borders between Regions 1/2, Regions 2/4, or Regions 3-4/5). If students switched schools to benefit from the program, then these border districts should see a differential change in enrollment. None of the interaction terms are significant, suggesting that such switching was not a common response (results not shown for brevity but available upon request).

In addition to changes in the number and composition of students, changes in enrollment can also be accompanied by changes in school quality. Table A3 explores this possibility for high schools (grades 10-12), using pupil-teacher ratio and female teacher percentage as school quality measures.[25] Increases in pupil-teacher ratio would indicate if the influx of test-takers due to the program strained teaching capacity, while changes in female teacher proportion would reveal whether the program's focus on female students also influenced the gender composition of teachers. In the first two columns, we find no evidence of significant changes in the pupil-teacher ratio in response to the scholarship program. In column (4), we find that the percentage of female teachers in high enrollment gap districts fell 6 percentage points more than in low-gap districts in response to the program, significant at 10%. This decline is notable given the male dominance in the teaching profession in The Gambia (the mean female teacher percentage in our data is 8%). These effects on student composition and school quality will be useful to bear in mind when interpreting results.

[25] Data on school quality from the Ministry of Education is limited. We had also hoped to look at whether the proportion of certified teachers changed in response to the scholarship, but data on teacher certification is recorded only for a subset of years, leaving only 5 pre-treatment observations in the school panel.

5.3 Student learning

Table 4, Panel (A) presents results from the main difference-in-difference regression (1). The program increased English scores and combined English and math scores for girls and boys. In English, the effect sizes are .19 standard deviations for girls and .15 for boys, with the estimate for boys more precise (5% versus 10%). Combined English and math scores increased by .09 standard deviations for girls and .11 for boys, with the estimates for boys again more precise.Panel (B) shows that additional years of program exposure had no significant effects on test scores for either girls or boys. The effect on boys' learning outcomes may reflect peer effects via gender composition consistent with Hoxby (2000), who found that in classrooms with more girls there are significant math test score gains for boys.[26] These results point to a modest gain on test scores. Moreover, failure to find statistically significant negative effects of the policy on learning outcomes is notable, given the student enrollment and composition effects found earlier.

Even if there were no learning effects on female students, comparing changes in their outcomes to male students could still be instructive. The triple-difference specification of regression (2) makes this comparison, with results in Table 5. Panel (A), columns (1)-(3) show no difference in program effects between female and male students in the full sample. Limiting the sample to schools in high enrollment gap districts in columns (4)-(6) reveals that girls in these districts perform .06 standard deviations better in math than boys as a result of the program, with the difference significant at 1%. No such differential effects are present in low enrollment gap districts (columns 7-9). It is not clear, however, whether the effect in high enrollment gap districts occurred because girls induced to take the test via scholarship receipt are more able than boys, or if the scholarship program re-oriented school resources and pedagogy in a way that benefitted girls more.

Table 5, Panel (B) repeats the exercise using years of program exposure as the treatment

[26] We look for evidence of this channel by interacting the treatment with the percentage of female test-takers at the school. This interaction term is positive for boys in English and combined English and math scores, though not precisely estimated. Results not shown but available upon request.

variable. For each additional year of program exposure, girls performed .006 standard deviations worse than boys in English. Although this difference is statistically significant at the 5% level, it is small, because even a girl exposed to the program from grade 7 would be expected to perform only $.006 \times 6 = .036$ standard deviations worse in English than a boy. A similar negative effect also appears for girls in high enrollment gap districts, but it is also small.

5.4 Treatment effect heterogeneity

As discussed earlier, the effect of the girls' scholarship program on student learning is theoretically ambiguous. Fee elimination could free students from the need to engage in income-generating activity or reduce stress, thereby improving performance. On the other hand, an influx of new students could lower the quality of the average student or place strain on school resources and harm the learning environment. We would expect these latter effects to be more likely in places with lower existing resources among schools or households. We explore this possibility by testing whether the program's effect differs according to pre-treatment characteristics. To some extent we have already done this through interactions or splitting the sample by district enrollment gap in Tables 3 and 5, but we expand our inquiry here.

We augment the difference-in-differences specification of equations (1) and (3) to include interactions with pre-treatment district characteristics. These characteristics, all taken from the 1998 Integrated Household Survey, are: an indicator for having a high enrollment gap, defined as being below the median enrollment rate among secondary school-aged (13-18) youth; an indicator for being at or above the median rural population percentage; and an indicator for being at or above the median level of a household asset index.[27] Table 6 shows results for combined English and math scores.[28] In columns (1) and (4), we find no

[27]The asset index is the first principal component of the following assets: bicycle, car, refrigerator, motorcycle, sewing iron, television, radio, VCR.

[28]Sample sizes drop relative to Tables 4 and 5 because not all districts are represented in the 1998 household survey. Because the survey is nationally representative, however, the dropped observations are missing at random, which will make our results less precise but still unbiased.

differences in program impact between high- and low-enrollment gap districts, regardless of whether the treatment is considered binary or continuous. In column (2), we find that girls in districts with rural population percentage at or above the pre-treatment median perform .225 standard deviations worse on math and English, or .04 standard deviations per year of program exposure, significant at 1%. Results for boys in column (5) are similar. The magnitude of the coefficients for the binary treatment in Panel (A) are large enough to make the program effect negative in the most rural districts.

In column (6), girls in districts with a household asset index at or above the median perform .027 standard deviations better with each additional year of program exposure, though the effect for boys is not statistically significant. These results present some evidence, albeit limited, that students in better-off districts gained most from the program. This result is not surprising, as those are the districts where the program may have worked more on the intensive margin rather than the extensive margin. That is, in better-off districts, students would be more likely to attend school even in the absence of the program, allowing scholarship receipt to ease finance-related stresses on academic performance. In worse-off districts, the scholarship is more likely to retain students who otherwise would have dropped out, or induce enrollment among less academically prepared students previously out of school.[29]

5.5 Robustness checks

Table A4 presents a series of robustness checks of the main results using alternative definitions of the estimation sample. Panel (A) shows combined English and math results for girls, while Panel (B) presents results for boys. In column (1), we restrict the sample to Regions 3-6, given the potentially confounding factors—including private schools and a supplementary scholarship program—in Region 2. Point estimates are larger than those in Table 4 for

[29] We also look for evidence that the effects of the policy differ by school characteristics by interacting the treatment with the percentage of test-takers who are female, the female teacher percentage, the pupil-teacher ratio, and the lagged average z-score, all measured at the school-year level. Main effects for each of these measures are also included. Of these interactions, only the female teacher percentage is precisely estimated, with a negative coefficient. Given the low proportions of female teachers and students noted earlier, this may reflect broader obstacles faced by females in Gambian secondary schools.

both girls and boys, but not statistically significant, possibly due to the smaller sample size. Column (2) pools all regions, including Region 1, which never received the program. Again, point estimates are positive but not significant.

Column (3) restricts the sample to Regions 2-6, but includes students in private schools. These regressions continue to define treatment at the regional level, so that female private school students in treated regions are considered program recipients even though they must pay school fees, in order to mitigate confounding variation due to non-random sorting into private schools. Point estimates decrease in magnitude compared to Table 4, consistent with the likely negative selection into private schools documented in Table A1, but remain positive.

Column (4) includes all regions and private schools, with positive but insignificant coefficients. Column (5) limits to the sample to “on-time” students (younger than 20), with estimates close to zero. This latter result is notable in showing that the positive effects of the policy found elsewhere are not driven by younger students, who are most likely to have enrolled in school regardless of the scholarship.

Overall, the positive point estimates in Table A4 are consistent with earlier findings of learning gains from the program, albeit with a loss in precision relative to our preferred specification. Failure to find any significantly negative effects of the policy for any gender or estimation sample is notable, given the potential channels through which the policy could reduce average test scores.

6 Conclusion

This paper evaluated the effect of the Gambian girls’ scholarship program on the quantity, composition, and achievement of secondary school students. Our approach relied on difference-in-differences estimation, comparing regions that received the program early to those that received it late. We demonstrated the validity of this identification strategy by verifying that outcome trends were similar across regions prior to treatment. We found that the number of students taking the high school exit exam increased due to the girls' scholarship program, consistent with the presence of financial constraints on enrollment in secondary school. These results confirm those of Gajigo (2012), who found increased enrollment among girls aged 13-18, and extend them in two important ways. First, because our results are based on the number of students sitting the Grade 12 exit exam, they demonstrate that the effects of the scholarship program persisted throughout secondary school, rather than being limited to earlier grades. Second, we find increases in test-taking for both girls and boys.

We also find changes in the composition of students in response to the scholarship. The scholarship increased the share of students in private schools, but only in districts with a low secondary enrollment gap, where students are less likely to be constrained by transport costs or lack of choice. Students were also more likely to be older than 20 and absent from the exam in response to the policy in high enrollment gap districts, consistent with negative selection. We find no changes in school resources in response to the scholarship, though data limitations prevent us from ruling out this channel entirely.

In our preferred specification, we find that test scores increased in response to the scholarship, with combined English and math scores rising by .09 standard deviations for girls and .11 standard deviations for boys. These gains were concentrated in English (.19 s.d. for girls, .15 s.d. for boys). No alternative specification yielded a negative and statistically significant effect, which is striking, given that the marginal student induced to enroll due to the scholarship program is likely to be of lower ability than average.

Analyzing the heterogeneity of these results, we find that average test scores in more rural districts decline in response to the policy, consistent with a tradeoff between access and learning. Yet such a tradeoff does not hold in other results where we would also expect to find it. For instance, we do not find reductions in average scores in districts with lower initial secondary enrollment, in which the influx of new students was greatest; nor among girls compared to boys, despite the program's targeting of girls for increased access to schooling.

Our interpretation is that any negative selection induced by fee elimination was not sufficient to reduce learning on average. In The Gambia, completing high school is rare, particularly for girls. Taking the high school exit exam is a considerable accomplishment in this context, and those who remain enrolled long enough to do so were likely among the stronger students in earlier grades. Among the set of students in all grades who benefitted from the scholarship program, those who remained in school long enough to sit the exam are more likely to be positively selected, relative to both scholarship beneficiaries and the average student.

More broadly, our results suggest that improving access to secondary education in countries where enrollment is low need not come at the expense of student learning. As developing countries increasingly turn their attention to secondary school, finding policies to promote both opportunity and achievement should sit high on the agenda.

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Tables

Table 1: Summary statistics

	1998	2005	2012
male			
test takers	749	1,161	1,404
English	-0.27	-0.20	-0.08
math	-0.06	-0.14	-0.13
combined	-0.21	-0.20	-0.12
female			
test takers	210	624	846
English	-0.52	-0.34	-0.27
math	-0.23	-0.21	-0.25
combined	-0.46	-0.32	-0.30
female proportion	0.22	0.35	0.38

Sample is public schools in Regions 2-6. Z-scores based on universe of students taking exam in that year, including private schools and Region 1.

Table 2: Pre-treatment trends

	girls				boys			
	count	English	math	combined	count	English	math	combined
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
time (years prior to treatment)	-1.3	0.02	-0.013	0.008	-4.8	-0.021	-0.007	-0.006
	(4.5)	(0.031)	(0.051)	(0.045)	(6.3)	(0.038)	(0.013)	(0.015)
time*1(region=3,4)	7.2	-0.01	0.003	0.01	14.3	0.034	0.03	0.043
	(6.7)	(0.112)	(0.060)	(0.100)	(16.6)	(0.066)	(0.038)	(0.035)
time*1(region=5,6)	4.1	0.041	-0.026	0.027	3.9	-0.067	-0.017	-0.041
	(3.1)	(0.113)	(0.070)	(0.103)	(14.5)	(0.130)	(0.081)	(0.106)
Observations	38	1,380	1,380	1,380	38	3,738	3,738	3,738
R-squared	0.67	0.3	0.33	0.4	0.6	0.27	0.3	0.37
p-value on all region-specific trends	0.43	0.87	0.88	0.96	0.70	0.73	0.37	0.48
p-value on Region 5-6 v. Region 3-4	0.58	0.62	0.62	0.86	0.57	0.47	0.43	0.47
Mean outcome	35.5	-0.28	-0.19	-0.27	93.8	-0.22	-0.09	-0.17

"Count" is number of test-takers, by school. Standard errors clustered by school. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include school and year fixed effects. Regressions for test score outcomes include age, age squared, school and year fixed effects.

Table 3: Girls' scholarship program and test-takers

	girls				boys				proportion female	
	test-takers		private share		test-takers		private share			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
girls' scholarship program	26.1	24.2	0.21	0.24	42.6	38.4	0.21	0.24	0.03	0.03
	(11.1)**	(12.6)*	(0.11)*	(0.13)*	(21.9)*	(24.8)	(0.07)***	(0.09)**	(0.03)	(0.04)
program*high enrollment gap		12.1		-0.32		27.8		-0.27		0.02
		(20.0)		(0.18)*		(25.2)		(0.15)*		(0.06)
Observations	184	184	184	184	184	184	184	184	184	184
R-squared	0.6	0.6	0.84	0.85	0.67	0.68	0.85	0.86	0.64	0.64
Mean outcome	40.5	40.5	0.32	0.32	78.2	78.2	0.25	0.25	0.34	0.34

Test-takers and proportion female refer to public (scholarship-eligible) schools only. Sample is district panel, 1998-2012. All regressions include district and year fixed effects. Regressions for private share and proportion female weighted by number of test-takers. Standard errors clustered by district. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: Girls' scholarship program and test scores

	girls			boys		
	English	math	combined	English	math	combined
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: program receipt						
girls' scholarship program	0.192	-0.073	0.089	0.154	0.024	0.113
	(0.095)*	(0.053)	(0.052)*	(0.065)**	(0.093)	(0.052)**
R-squared	0.32	0.2	0.35	0.23	0.17	0.27
Panel B: years exposed to program						
years exposed to program	0.089	-0.024	0.046	0.114	0.026	0.088
	(0.054)	(0.027)	(0.040)	(0.057)*	(0.045)	(0.056)
R-squared	0.32	0.2	0.35	0.23	0.17	0.27
Observations		7,997			15,811	

Standard errors clustered by school. * significant at 10%; ** significant at 5%; *** significant at 1%. Includes age, age squared, school and year fixed effects.

Table 5: Girls' scholarship program and test scores: triple difference

	full sample			high enrollment gap			low enrollment gap		
	English	math	combined	English	math	combined	English	math	combined
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: program receipt									
girls' scholarship program	0.162	-0.002	0.104	0.005	0.078	0.028	0.205	-0.049	0.087
	(0.072)**	(0.079)	(0.038)**	(0.013)	(0.010)***	(0.011)**	(0.080)**	(0.060)	(0.032)**
program*female	-0.001	0.015	0.017	-0.012	0.058	0.032	-0.007	-0.017	-0.003
	(0.027)	(0.027)	(0.029)	(0.031)	(0.019)***	(0.021)	(0.020)	(0.023)	(0.023)
R-squared	0.25	0.17	0.29	0.13	0.05	0.12	0.32	0.22	0.36
Panel B: years exposed to program									
years exposed to program	0.111	0.01	0.078	-0.055	0.204	0.077	0.078	-0.019	0.039
	(0.055)*	(0.041)	(0.050)	(0.096)	(0.034)***	(0.055)	(0.053)	(0.044)	(0.045)
years exposed*female	-0.006	0.001	-0.002	-0.009	0.002	-0.004	-0.004	-0.003	-0.003
	(0.003)**	(0.004)	(0.003)	(0.005)*	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
R-squared	0.26	0.17	0.29	0.13	0.06	0.12	0.32	0.22	0.36
Observations		23,808			6,664			14,383	

High/low enrollment gap based on splitting sample into below/at or above median secondary-age (13-18) children enrolled in school, by district in 1998. Standard errors clustered by school. * significant at 10%; ** significant at 5%; *** significant at 1%. Includes age, age squared, school and year fixed effects.

Table 6: Treatment effect heterogeneity

	English & math combined					
	girls			boys		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: program receipt						
girls' scholarship program	0.051	0.127	-0.045	0.052	0.119	-0.014
	(0.045)	(0.034)***	(0.087)	(0.042)	(0.075)	(0.082)
program*district x	0.037	-0.225	0.130	0.046	-0.219	0.088
	(0.065)	(0.029)***	(0.084)	(0.087)	(0.095)**	(0.131)
R-squared	0.37	0.37	0.37	0.31	0.31	0.31
Panel B: years exposed to program						
years exposed to program	0.025	0.059	0.002	0.049	0.079	0.022
	(0.036)	(0.030)*	(0.029)	(0.041)	(0.039)*	(0.043)
years exposed*district x	0.004	-0.039	0.027	0.019	-0.046	0.019
	(0.007)	(0.009)***	(0.012)**	(0.011)	(0.015)***	(0.025)
R-squared	0.37	0.37	0.37	0.31	0.31	0.31
Observations	7,293	7,293	7,293	14,032	14,032	14,032
District characteristic	enrollment gap	rural	assets	enrollment gap	rural	assets

Enrollment gap = below median secondary-age (13-18) enrollment rate. Rural = at or above median rural population proportion. Assets = at or above median household assets, by first principal component. All characteristics are by district in 1998. Standard errors clustered by school. * significant at 10%; ** significant at 5%; *** significant at 1%. Includes age, age squared, school and year fixed effects.

Table A1: Public versus private school students

	Public	Private	Difference
Girls			
test takers	6,777	4,362	2,415
English	-0.26	-0.42	0.16***
math	-0.22	-0.24	0.03***
combined	-0.28	-0.39	0.11***
age	19.6	19.6	-0.1***
absent	0.02	0.02	0.00
Boys			
test takers	12,405	3,817	8,588
English	-0.14	-0.35	0.22***
math	-0.10	-0.23	0.12***
combined	-0.14	-0.34	0.2***
age	20.1	20.3	-0.2***
absent	0.03	0.04	-0.02***
female proportion	0.35	0.53	-0.18***

Test takers in post-treatment periods only. "Absent" refers to absence from English subject exam, math subject exam, or both. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A2: Girls' scholarship and composition of test takers

	girls				boys			
	age> 20		absent		age> 20		absent	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
girls' scholarship program	0.01	0.01	-0.03	-0.03	0.02	0.02	-0.02	-0.03
	(0.01)	(0.02)	(0.012)*	(0.014)**	(0.02)	(0.02)	(0.02)	(0.02)
program*high enrollment gap		0.04		0.04		0.05		0.05
		(0.014)***		(0.018)*		(0.006)***		(0.019)**
Observations	7,385	7,385	7,385	7,385	14,190	14,190	14,190	14,190
R-squared	0.64	0.64	0.08	0.08	0.67	0.67	0.06	0.06
Mean outcome	0.36	0.36	0.02	0.02	0.52	0.52	0.03	0.03

"Absent" refers to absence from English subject exam, math subject exam, or both. Regressions includes school and year fixed effects. Standard errors clustered by school. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A3: Girls' scholarship and school quality

	pupil-teacher ratio		female teacher %	
	(1)	(2)	(3)	(4)
girls' scholarship program	-33.6	-33.1	0.02	0.02
	(29.7)	(28.2)	(0.03)	(0.03)
program*high enrollment gap		-5.4		-0.06
		(21.0)		(0.03)*
Observations	254	254	254	254
R-squared	0.30	0.30	0.48	0.49
Mean outcome	37.2	37.2	0.08	0.08

Regressions include school and year fixed effects. Weighted by enrollment. Standard errors clustered by school.* significant at 10%; ** significant at 5%; *** significant at 1%. Source: School panel 1998-2012, from Education Management Information System (EMIS), maintained by the Gambian Ministry of Basic and Secondary Education.

Table A4: Girls' scholarship and test scores: robustness

	exclude Region 2	all regions	include private schools	all regions and private schools	on-time students
	(1)	(2)	(3)	(4)	(5)
Panel A: girls					
program receipt	0.108	0.144	0.063	0.083	0.048
	(0.071)	(0.184)	(0.049)	(0.161)	(0.039)
R-squared	0.10	0.29	0.32	0.42	0.40
Observations	4,836	20,866	12,237	31,645	4,625
Panel B: boys					
program receipt	0.180	0.041	0.112	0.019	-0.007
	(0.109)	(0.149)	(0.053)**	(0.139)	(0.105)
R-squared	0.10	0.25	0.26	0.32	0.32
Observations	9,938	34,872	19,509	43,791	6,598

Columns (3) and (5) include Regions 2-6 only. "On-time" students in column (5) are under age 20. Regressions include school and year fixed effects. Standard errors clustered by school.* significant at 10%; ** significant at 5%; *** significant at 1%.

Figures

Figure 1: The Gambia and its regions

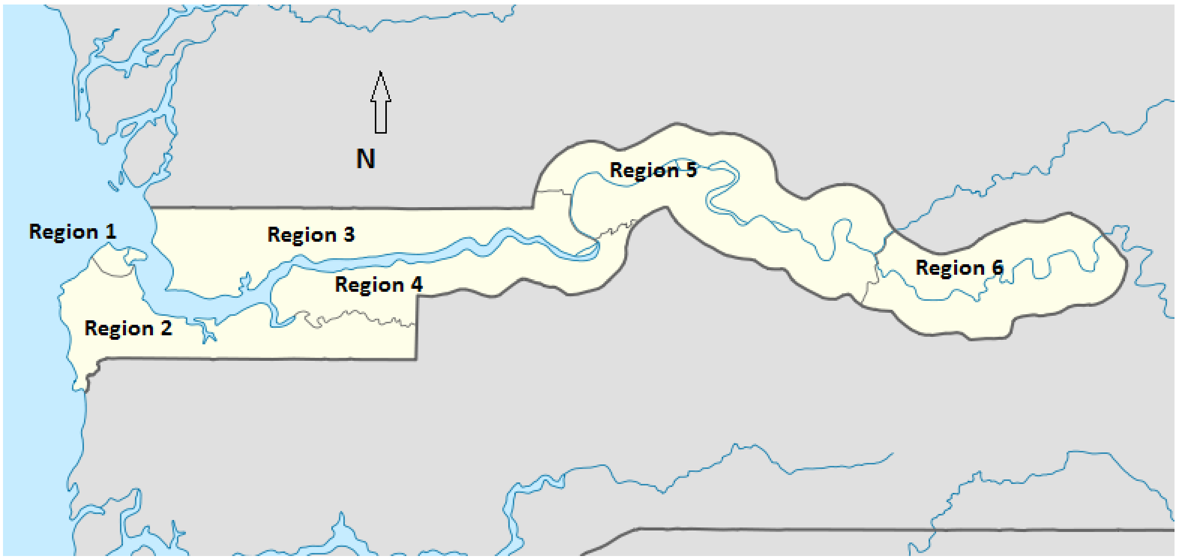
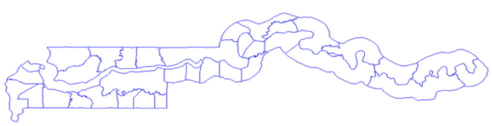
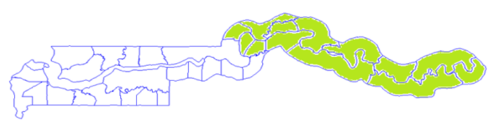


Figure 2: Girls' Scholarship Program Implementation



(a) 2000

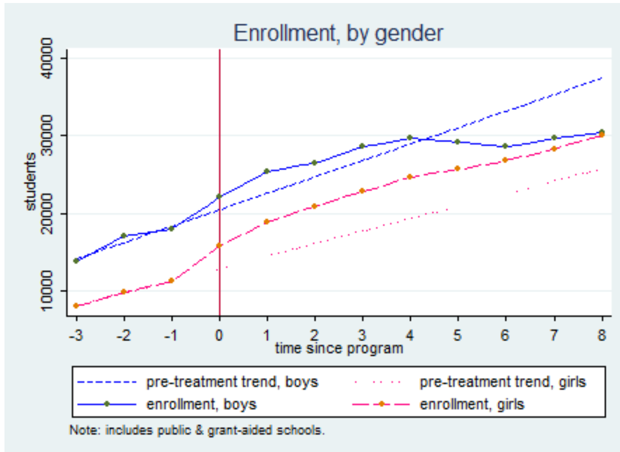


(b) 2001

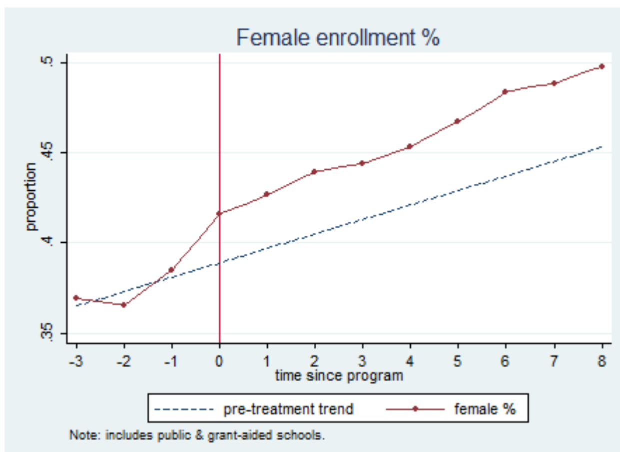
(c) 2002

(d) 2004

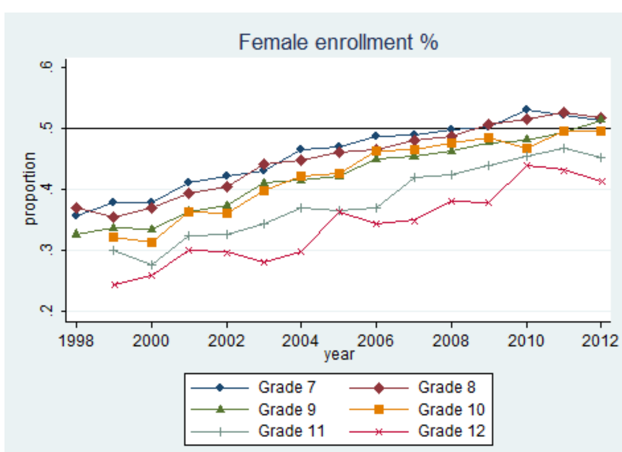
Figure 3: Enrollment, by gender



(a) Enrollment



(b) Female proportion



(c) Female proportion, by grade

Figure A1: The Gambia Middle and High Schools