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Estimating the impact and cost-effectiveness of expanding secondary education in Ghana

September 2016

Impact Evaluation Report 42

Education

3ie International Initiative for Impact Evaluation

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3ie accepted the final version of this report, *Estimating the impact and cost-effectiveness of expanding access to secondary education in Ghana*, as partial fulfilment of requirements under grant OW1.38 issued under Open Window 1. The content has been copy-edited and formatted for publication by 3ie. Due to unavoidable constraints at the time of publication, some figures and tables are not optimal.

Funding for this impact evaluation was provided by 3ie's donors, which include UK aid, the Bill & Melinda Gates Foundation and the Hewlett Foundation. A complete listing of all of 3ie's donors can be found on the 3ie website.

Suggested citation: Dupas, P, Duflo, E and Kremer, M, 2015, *Estimating the impact and cost-effectiveness of expanding access to secondary education in Ghana,* 3ie Impact Evaluation Report 42. New Delhi: International Initiative for Impact Evaluation (3ie).

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Estimating the impact and cost-effectiveness of expanding access to secondary education in Ghana

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Acknowledgements

Research discussed in this publication has been funded, in order of grant size, by the US National Institutes of Health, Nike Foundation, International Initiative for Impact Evaluation (3ie) through the Global Development Network, Partnership for Child Development and the International Growth Centre.

The views expressed in this article are not necessarily those of any of these donors or their members.

We are grateful to the Innovations for Poverty Action (IPA) Ghana and especially Jonathan Addie and Pace Phillips for their roles in implementing the project and collecting the data; and to Jinu Koola, Ryan Knight, Ishita Ahmed and Victor Pouliquen for outstanding research assistance.

Summary

As the world makes progress towards universal primary school enrolment, with millions of children around the world completing primary schooling and hoping to move on to secondary school, an important question is emerging for policymakers: *how quickly to expand access to secondary education?* Some have argued that secondary education is likely to have a much larger impact than primary education on long-term earnings, health, fertility, gender equality and civic and political participation. But expanding secondary education is significantly more expensive than providing free primary education.

In collaboration with the government of Ghana, we used a randomised controlled trial (RCT) to examine the medium-term effects of secondary school on a cohort of students in Ghana who earned admission into a senior secondary school but could not afford the fees. In December 2008, we identified 2,064 youths (around half of them female) who had taken the junior high school exit exam in the spring of 2007 or 2008 and gained admission into a senior high school (SHS), but had not enrolled due to financial constraints. We selected one third (682) of these students through random assignment to receive a four-year scholarship to attend SHS. This randomised scholarship assignment led to a very large gap in educational attainment: 85 per cent of scholarship winners enrolled in SHS compared to only 50 per cent of students in the comparison group. This enabled us to measure the medium-term effects of acquiring secondary education on multiple aspects of life and well-being.

We kept track of students between 2009 and 2013, conducting in-depth, face-to-face surveys with 97 per cent of them in the spring or summer of 2013 (five years after the onset of the study). This follow-up survey included questions on educational attainment and aspirations, labour market outcomes, fertility and marriage. This report presents core findings from the 2013 survey.

The scholarship programme had a large impact on educational attainment and cognitive skills, particularly among girls. The programme also had a larger impact on girls' SHS completion rates in percentage terms. Consistent with this, we found that scholarship winners were significantly more likely to be employed for a wage, running their own business or working in a family business at the five-year follow-up. In Ghana, there is a gap between completing SHS and starting tertiary training. Our five-year follow-up survey took place during this gap year, and in most cases, the students we surveyed were working while waiting to enrol in tertiary education.

Finally, the scholarship programme significantly improved reproductive health outcomes, particularly by delaying the onset of childbearing. This is consistent with earlier results from Kenya on reducing the cost of primary-level education (Duflo *et al.* 2012)

This research study is ongoing. We plan to conduct further rounds of follow-up surveys over the next 5 to 10 years to look at the scholarships' long-term effects.

Contents

List of figures and tables

Appendix figures and tables

Acronyms and abbreviations

ASU	Assessment Services Unit (Ministry of Education)
BECE	Basic Education Certification Examination
CSSPS	Computerised School Selection and Placement System
GES	Ghana Education Services
GHC	Ghana cedi
HH	household
HIV	human immunodeficiency virus
IPA	Innovations for Poverty Action
JHS	junior high school
MDE	minimum detectable effect
PISA	OECD's Programme for International Student Assessment
RCT	randomised controlled trial
sd	standard deviation
SE	standard errors
SHS	senior high school
WASSCE	West African Senior School Certificate Examination

1. Introduction

As more children fill primary schools with the hope of a future education, a pressing question confronts policymakers: *how quickly should we expand access to secondary education?* Secondary education is likely to do more than primary school to improve important outcomes such as long-term earnings and health. But in Ghana, the gross enrolment rate drops by almost 45 percentage points between junior and senior high school. This could be because secondary school is substantially more expensive.

There is little evidence to date on the returns on secondary education. Most natural experiments in the developing world have focused primarily on the effects of expanding access to primary or junior secondary education. Yet, academics and policymakers have hypothesised that secondary education is likely to have much more impact than primary education on health, sexual or reproductive behaviour, long-term earnings, gender equality and civic and political participation. Cross-sectional studies tend to find that, when measured, there is a higher correlation between earnings and an extra year of secondary education compared with an additional year at primary school.

A study in Kenya used a regression discontinuity approach to find that, compared to those who barely missed the admission cut-off, those who barely won admission to secondary school acquired more years of schooling. It also found that boys in the latter group had a higher probability of gaining formal employment later in life, while the girls were less likely to have a teenage pregnancy (Ozier 2015).

This study was designed to shed light on the issue by tracking, over a long period of time, a large cohort of adolescents randomly assigned access to secondary school. Funding permitting, we plan to track the students until 2018.

We designed the study in collaboration with Ghana Education Services (GES), the Ghana Ministry of Education. Ghana set a goal to achieve universal access to senior secondary education by 2020, and our discussions in Accra with the Director of Policy for the Ministry of Education in early 2008 showed the government's very strong interest in learning how to efficiently reach this goal. But free secondary education for everyone is costly (it is much more expensive than free primary education). Some education specialists in Ghana have suggested extending the existing scholarship programme (so far restricted to particularly impoverished areas in northern Ghana) to needy students elsewhere; others are pushing to extend vocational training.

In this context, the government of Ghana wanted rigorous information on the short-term effects of bursaries on secondary school enrolment (by gender), as well as the longer-term effects of accessing general secondary education on labour market outcomes, reproductive decisions, children's health and gender balance. These data would help it estimate the likely returns on investing in subsidies for secondary education.

The issue became particularly salient in the 2012 presidential election, when the opposition National Political Party contested on a platform that promoted universal free secondary schooling. During the debate on the feasibility of such a programme, each party presented conflicting estimates of how much it would cost to fund secondary education for a student in Ghana. There was no outside information to confirm or contradict their figures.

One of the main reasons the debate was so focused on cost is that information on the benefits of secondary education in Ghana is limited or non-existent. Although GES collects self-reported information on school characteristics and student exam performance to monitor school performance, there is no research on the returns on secondary education for the students themselves that could clarify whether the cost of implementing free secondary education would be worth the unexamined benefit.

To provide more evidence for these enduring debates, we started a randomised controlled trial (RCT) in 2008. We provided scholarships for secondary school to 682 academically qualified boys and girls, randomly selected out of 2,064 children who had gained admission to senior high school (SHS) but had difficulty funding their secondary education. We estimate the impact of the scholarships on secondary school enrolment rates and the medium-term effects on earnings, health and other life outcomes.

This report uses data we collected in August 2013 to describe the extent to which secondary school scholarships affect educational attainment. We also discuss the impact of such scholarships on key outcomes such as cognitive skills, reproductive health, fertility and labour market expectations.

2. Study context

Education in Ghana consists of six years of primary school, three years of junior high school (JHS) and three (previously four) years of SHS. Ghana adopted free primary and JHS education through a capitation system in 2005. Under this system, every public kindergarten, primary school and junior secondary school receives a yearly grant directly proportional to the number of students they have. Schools are not permitted to charge any fees to parents. Since then, Ghana has reached enrolment rates of close to 95 per cent for primary school and around 75 per cent for JHS. But enrolment rates drop to 30 per cent in senior secondary school. They are particularly low among girls, who are 20 per cent (six percentage points) less likely to reach secondary school.

SHS participation rates are low for a number of reasons:

1. It is prohibitively expensive, with average annual costs for day (non-boarding) schools at around US$150. This is a very large sum in a country where the annual per capita income was US$450 in 2005 (Ajayi 2013). For many rural families, secondary school is simply too expensive to be an option. School completion rates are lower for girls, who are more likely to drop out of primary school in times of economic stress. Girls from poor rural families typically do not attend secondary school at all.

2. While primary and junior secondary education are compulsory, senior secondary education is not.
3. Admission to SHS is not automatic, but relatively selective. It depends on a pupil's performance in the national primary school exit exam – the Basic Education Certification Examination (BECE) – taken at the end of JHS.
4. There are just over 700 SHSs in the entire country, compared to more than 9,000 JHSs. (For more information on institutional background, see Ajayi 2013.)

The school year in Ghana runs from September to July. Students who reach the end of JHS can apply to any SHS in the country. When they apply, around April of their last JHS year, they provide a ranked list of choices, including their preferred course or track – for example, general arts, science, home economics – for each secondary school of choice. GES groups the secondary schools into categories by quality – ranging from A (highest) to D (lowest) as determined by GES evaluations. Students use these categories to determine which schools to list among their choices.

Students take the BECE in April, and those with a high enough grade are allocated an SHS and track around June, using the Computerised School Selection and Placement System (CSSPS), a centralised, merit-based admission system introduced in 2005. The CSSPS is based on Gayle and Shapley's (1962) deferred-acceptance algorithm. Students then report to their allocated school for enrolment in September (Term 1), though many choose to defer until January (Term 2). Less than half of all BECE takers qualify for admission into SHS.

Using the CSSPS lists, we obtained details of all students who had gained admission into a secondary school in autumn 2008 and verified these against enrolment lists at secondary schools across Ghana, except in the north, where a government scholarship would contaminate the sample. We tracked down all the students who had gained admission but not enrolled, collecting information on background characteristics and their reasons for not enrolling. The criteria for eligibility into the study were: having a high enough BECE score to be admitted into secondary school; and having not enrolled because of financial distress. Students, headmasters and surveyors were unaware of the availability of a scholarship, so we avoided problems of self-selection into the study sample. More details on the sampling strategy are in Appendix A.

All the students in the study were enrolled under the four-year SHS system, which was replaced by a three-year system the following year. Because the scholarships we could offer were restricted to non-boarding fees, we only sampled students who had been admitted into an SHS in their local district, so they could attend as day students. Students placed in an SHS in another district are the top students who are offered a place at the (few) category A schools; they typically manage to take up these places as they can benefit from merit-based scholarships.

3. Theory of change, intervention and research hypotheses

3.1 Theory of change

Our theory of change is fairly straightforward and depicted in Figure 1. A scholarship reduces the cost of secondary education. This directly increases educational attainment by enabling students with financial constraints to access secondary education. While there may be additional barriers – such as pregnancy or household work – to educational attainment, the study's sample of youths who attain a secondary education will be representative of educational attainment under a national scholarship programme with the same additional barriers.

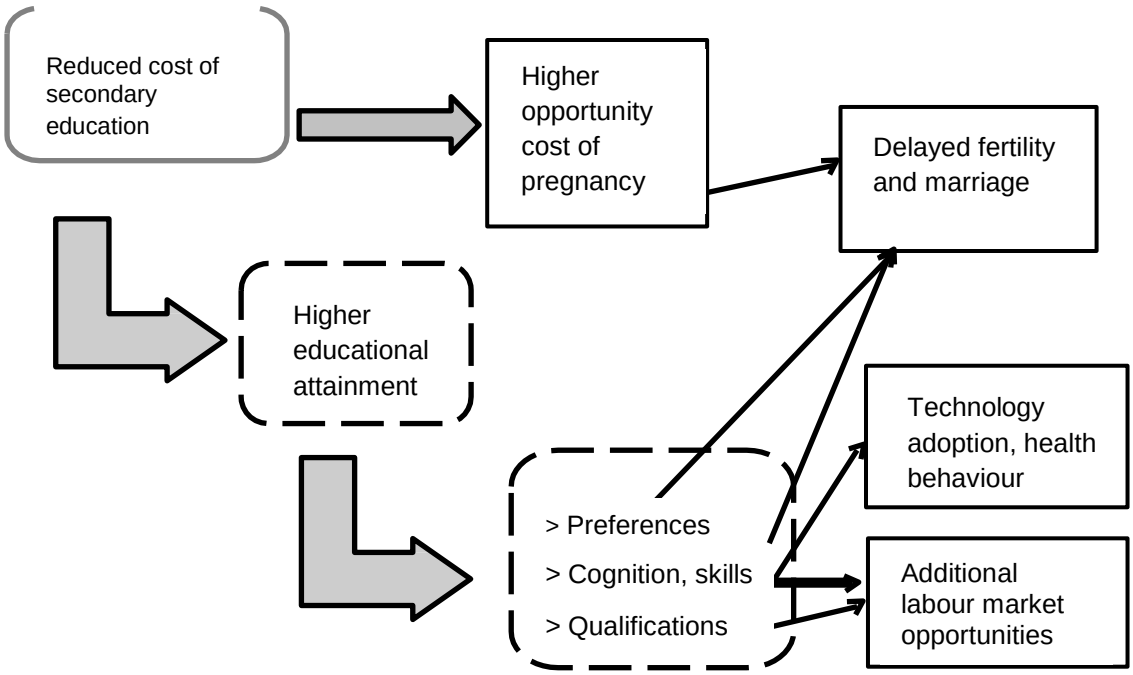
Assuming a good enough quality of teaching and school, the increase in educational attainment should lead to higher cognition and skills, changes in personal preferences – of spouse characteristics, resource allocation, reproductive behaviour, risk aversion, political and community participation – and better labour market qualifications. These, in turn, affect reproductive and other health choices, technology adoption – for example, embracing advanced farming or other productive mechanisms, or the internet – as well as labour market and marriage opportunities. The survey data have specific questions on respondent knowledge, behaviour and practices that measure each of these outcomes.

Reducing the cost of secondary education also increases the opportunity cost of pregnancy, since pregnancy can force girls to drop out of school. This would have a direct effect on fertility and marriage rates among girls who are in school.

We posit that these effects may differ by type of school, programme and gender. Indeed, the type of school or programme a student attends could affect the type of skills they acquire and therefore the returns on the labour market as well as in life choices. And because girls are less likely to enrol without a scholarship, the marginal girls affected by the scholarship may have higher returns on education.

Analysis across baseline BECE scores can also reveal whether merit affects the return on SHS education.

Figure 1: Theory of change



3.2 Intervention

The intervention was to provide scholarships for non-boarding students' full tuition and fees, paid directly to the schools and covering the entire school bill. A typical SHS bill for a day student comprises three items: government-approved fees; parent-teacher association dues; and other levies and supplies, including exam fees. The first is the same for all schools; the latter two are school-specific. The scholarship programme paid an average of Ghana Cedi (GHC) 900 (US$400) per student over four years. This is a relatively large sum: it corresponds to 150 per cent of an average farming household’s livestock holdings and more than two months’ wages for a health worker or teacher.

Students who received the scholarship were responsible for their own transport, food and boarding costs, if they chose to board. School transport costs were typically limited, as the study only sampled students who were placed in an SHS in their JHS district, while a family would have to bear food costs regardless of the scholarship programme.

Students awarded a scholarship had up to Term 2 of the 2009/2010 academic year (so one year) to enrol, after which they lost their eligibility.

3.3 Research questions

This study was designed to answer the following questions:

1. Is providing scholarships enough to promote school attainment and learning?
2. Are the school system and curriculum adequate to facilitate learning for students from less privileged backgrounds?
3. Do boys and girls benefit equally from the scholarships?
4. Are there other obstacles – including teen pregnancies or other demands on girls' time (household chores) – that undermine school attainment?
5. What are the relative benefits of advanced versus basic education in a lower-middle income country context? More specifically:
    - What is the impact of secondary education on health, reproductive behaviour, long-term earnings, and gender equality?
    - Who benefits the most from subsidies for secondary school?
    - How do the benefits of expanding secondary education compare to the cost?
    - How should the government of Ghana (and policymakers elsewhere) shape their scholarship schemes and/or general secondary education policies to meet their social objectives most efficiently?

4. Programme implementation

4.1 Intervention implementation

The research team from Innovations for Poverty Action (IPA) in Ghana implemented the scholarship programme in partnership with GES and SHS staff. We awarded 682 scholarships, notifying scholarship winners by phone in January 2009 and asking them to immediately report to the SHS they had been allocated on the strength of their BECE exam result. We also informed head teachers of their SHS scholarship winners by phone and with an official letter from the director general of GES and IPA. We disbursed scholarships for the first two terms once IPA could confirm that the scholarship students had reported to their SHS.

The implementation of the scholarship programme did not differ from the planned programme. All of the secondary schools agreed to accept the scholarship students, despite them enrolling in Term 2. It is not unusual for students to enrol in Term 2: a complementary survey of 172 SHSs in our 2014–2015 sample, with funding from the International Growth Centre and J-PAL (The Abdul Latif Jameel Poverty Action Lab, MIT), found that more than 57 per cent of schools reported Term 2 as the most common term for student enrolment.

The schools regularly sent IPA the bill for their school fees. An IPA project manager received the bills from each of the schools and disbursed the payments every term. As well as paying school fees, the intervention paid the fee for the West African Senior School Certificate Examination (WASSCE), the final secondary school exam. Table 1 shows average costs of the programme per student who completed SHS.

Table 1: Average scholarship cost, by course (in GHC)

	TOTAL Mean [SD]	SCHOOL FEES Mean [SD]	EXAM FEES Mean [SD]
Average	*915.351* *[191.746]*	*825.983* *[182.552]*	*89.368* *[47.494]*
Business	884.764 [215.407]	801.224 [209.142]	83.539 [42.447]
General Arts	904.658 [185.884]	822.512 [180.382]	82.146 [38.811]
Home Economics	927.596 [176.196]	824.687 [151.716]	102.91 | [64.713]
Visual Arts	937.171 [197.221]	838.538 [189.564]	98.633 [51.523]
Agricultural Science	936.695 [194.407]	830.168 [179.389]	106.527 [45.673]
Technical Skills	964.62 [189.232]	879.67 [176.924]	84.95 [51.654]
Science	999.733 [131.637]	903.817 [147.123]	95.917 [53.785]

The average total scholarship fee per student was around Ghana Cedi (GHC) 915 (US$400). Fees vary slightly across courses, with some – such as science and technical skills – requiring more equipment throughout the year and for the final exam.

4.2 Evaluation

4.2.1 Study sample

The details of the sampling strategy are provided in Appendix A, while Table F1 (in Appendix F) presents some summary statistics on the study sample using data from baseline surveys administered to respondents and their guardians in the autumn of 2008.

Students were on average 17 years old at the onset of the study. Over 30 per cent were sexually experienced, although girls were much more likely to report this: over 45 per cent reported having had sex, compared to 18.5 per cent of boys.

Most of the guardian respondents in the sample were women. Less than 14 per cent of the guardians were married and living with their spouse. Over 40 per cent of students lived in a female-headed household. Approximately nine per cent of household heads only had primary education; about 40 per cent had been to JHS and 13 per cent had some secondary education. Less than four per cent reported having any higher education, such as university or vocational school.

At baseline, over 90 per cent of students and their guardians believed that getting some education is important: about 75 per cent of guardians said they wished for at least a university education for their children; this figure is slightly higher (78 per cent) for guardians of male respondents than for guardians of female respondents (73 per cent). Almost all of the student respondents said they believed secondary education would yield returns in the future, defined by a difference in expected income at age 25. More than 40 per cent thought these returns would be over 50 per cent; some 30 per cent thought returns would be positive, but less than 50 per cent.

4.2.2 Stratification and randomisation

We organised the sample into strata by district, SHS, JHS and student type (2008 BECE boys, 2008 BECE girls and 2007 BECE girls). Within each strata, we used a computerised lottery to randomly assign one third of the students (682) to the treatment group (a scholarship) and two thirds (1,382) to the control group (no scholarship). We informed those selected for the treatment group in mid-January 2009 that IPA would offer them a day scholarship to their allocated school starting at the beginning of the second school term. We informed head teachers of the late enrolment of SHS scholarship winners by phone and with an official letter issued by the director general of GES and IPA. IPA disbursed scholarships once they had confirmation that the scholarship students had reported to their SHS.

4.2.3 Data

We describe the data we collected in Appendix B. The main outcome data are from a follow-up face-to-face survey in summer 2013, nearly five years after the start of the project.

4.2.4 Keeping track of the study sample

The major difficulty in this project was maintaining good contact with all study participants throughout the years. We gave respondents a mobile phone at the onset of the study and attempted to reach them by phone once a year to update their contact information and current schooling status, and answer a few other follow-up questions. If we could not reach them by phone, we tried to find them in person by going to their home area. We had about a 90 per cent response rate for the phone survey, including the latest round in June 2015. We have kept in contact with another eight per cent by surveying them in their home location. So we have maintained regular contact with 98 per cent of study respondents.

We also sent study participants mobile phone credit twice a year, asking them to use SMS to update the research team on any change in their contact information. The top-ups were GHC1 from 2008 to 2013 and GHC2 from 2014 to the present. This is enough to cover sending the necessary SMS text messages. Respondents have intermittently sent SMS messages with location updates that the project manager has tracked using a Frontline SMS database. Respondents' average monthly expenditure on phone credit is GHC10–14.

These methods have allowed us to keep attrition to a minimum. As of September 2013, we had kept in contact with 97 per cent of our study sample (see Table F2 in Appendix F, Panel A). This remarkably low attrition is non-differential across treatment and control groups and is very low compared to other longitudinal studies of youths in sub-Saharan Africa.

5. Impact results

5.1 Impact of scholarships on educational attainment

Figure F1 (in Appendix F) shows the average enrolment rate by gender and treatment group for each school term in the first two years and one term after we awarded the scholarships. Among those who did not win a scholarship (the comparison group), 20 per cent enrolled in SHS in the 2008/2009 school year, rising to 38 per cent by the end of the 2010/2011 school year. This suggests that some youths need about a year to accumulate the sufficient resources to enrol. The rate was higher among boys (44 per cent) than girls (34 per cent).

Among scholarship winners (the treatment group), the enrolment rate was 75 per cent in the 2008/2009 school year, almost four times that of the comparison group. Three years later, the treatment group's enrolment rate remained twice as high as the comparison group’s, at 73 per cent overall (81 per cent among boys and 64 per cent among girls). The lower enrolment rates among girls reflects the fact that a subset of girls in our study sample had been out of school for more than a year already at the time the study started.

Distance from placement schools did not appear to be a large factor in the decision to enrol (Figure F2, Appendix F). Some students who lived far from their placement schools asked to transfer to a closer school. We accommodated these requests whenever possible.

Table F2 presents the first stage outcomes reported in the 2013 follow-up survey. Over the first five years of the study, 78 per cent of females and 92 per cent of males in the treatment group had ever enrolled in SHS. This 33 percentage point or 75 per cent increase in female enrolment and 35 percentage point (63 per cent) increase in male enrolment over the comparison group demonstrates that the scholarship considerably increased access to SHS. This seems to confirm the first step in the theory of change: reducing the cost of secondary education increases educational enrolment.

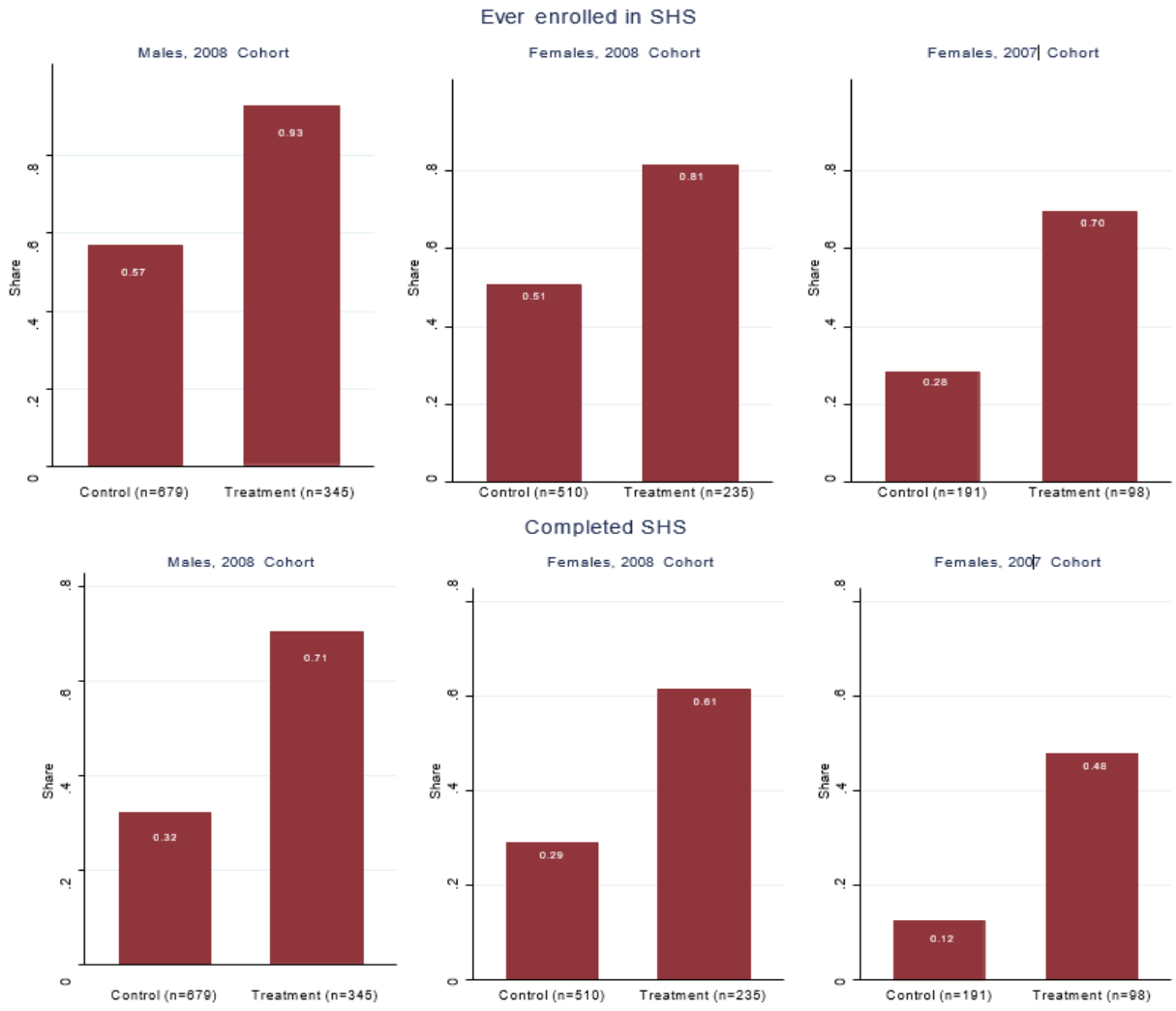
The increase in enrolment led to an increase in completion rates. While only 24 per cent of females in the control group had completed SHS at the five-year follow-up survey, 58 per cent of females in the treatment group had done so. This is more than double. Completion rates for males increased from 34 per cent in the control group to 70 per cent in the treatment group. This gap in completion rate may reduce slightly over time, since students in the control group who managed to enrol tended to do so in the following academic year, as seen in Figure F1, and will need another

year to complete SHS. So, while only four per cent of females and five per cent of males in the treatment group were still enrolled in SHS at the time of the follow-up survey, corresponding figures for the control group were 12 per cent for females and 15 per cent for males.

The bottom section of Table F1, Panel B, shows the rates of enrolment for each track or course offered. The most common track was general arts, and about 40 per cent of the impact of the scholarship on SHS enrolment was an impact on enrolment in general arts. For females, the second most common track was home economics, the gateway to nursing and teacher training colleges, and the least selective of all tracks. About 30 per cent of the increase in female enrolment was in home economics. Interestingly, for females, the scholarship programme also had a very large and statistically significant impact on enrolment in science, the most selective track that typically has very few girls. The scholarship programme increased enrolment in science from 0.1 per cent in the control group to 2.8 per cent in the treatment group. In contrast, the scholarship programme did not increase science enrolment for boys. This suggests that, in the absence of a scholarship, households manage to finance SHS education for their top performing boys, but not for their top performing girls.

Figure 2 shows the effects of the scholarship on SHS enrolment and completion vary by gender and cohort. Unsurprisingly, girls who had taken the BECE in 2007, and been out of school for at least 18 months when sampled for the study and the scholarships were announced, had the lowest rate of SHS enrolment and the lowest take-up of scholarship in the treatment group. But the gap in attainment between the treatment and control groups is highest for them: the scholarship more than quadrupled their likelihood of completing SHS.

Figure 2: Impact of scholarship on SHS participation, by cohort and gender*

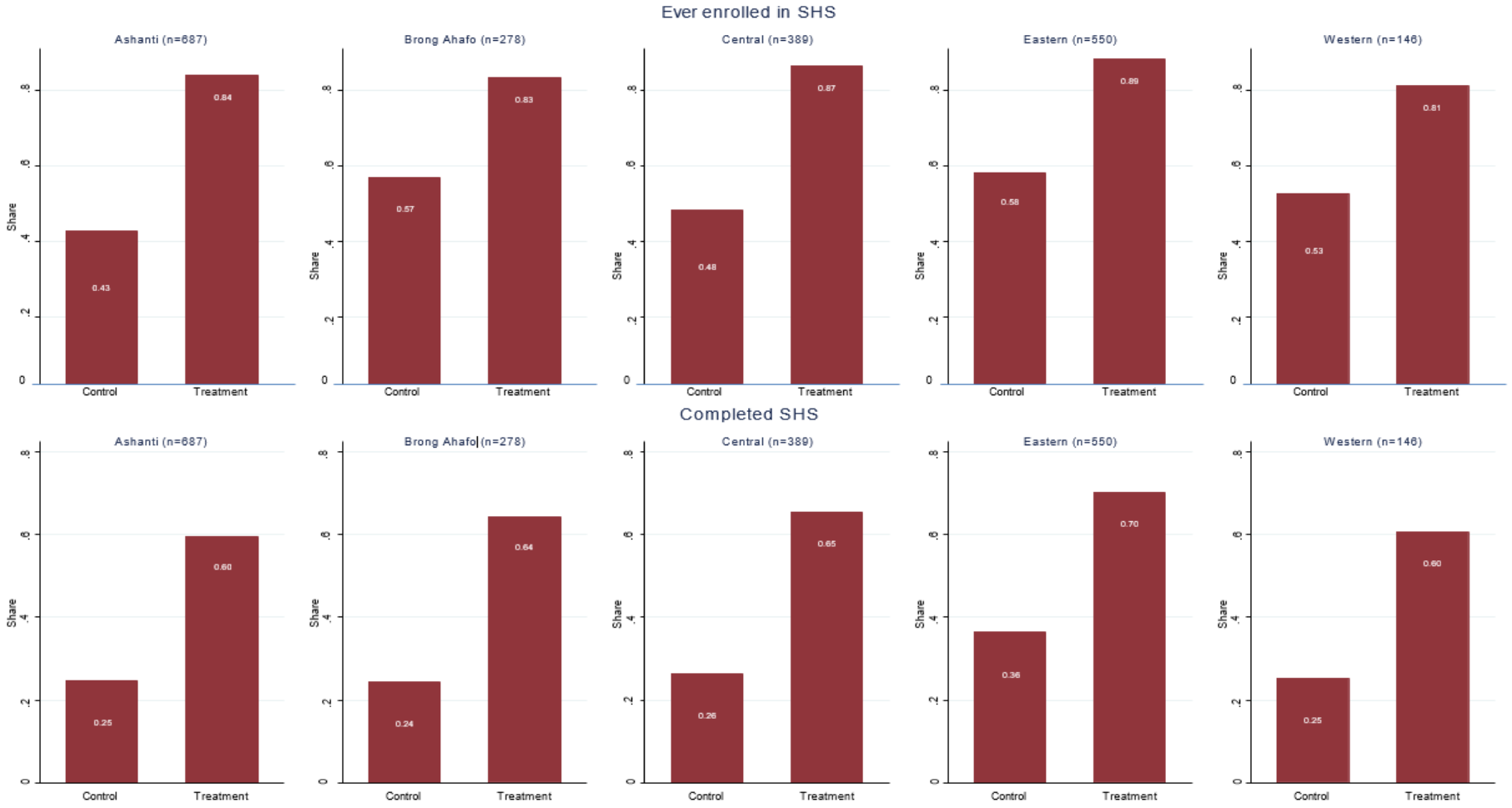


Notes: Data from in-person follow-up survey conducted in the Spring/Summer 2013, over five years after the scholarships were awarded.

** The difference between the two bars on the plot measures impact*

Figure 3 presents the results by region. With samples from five of Ghana's 10 regions, we found relatively few differences across regions in terms of enrolment rates in the control group. The treatment effect of the scholarship was also relatively homogeneous.

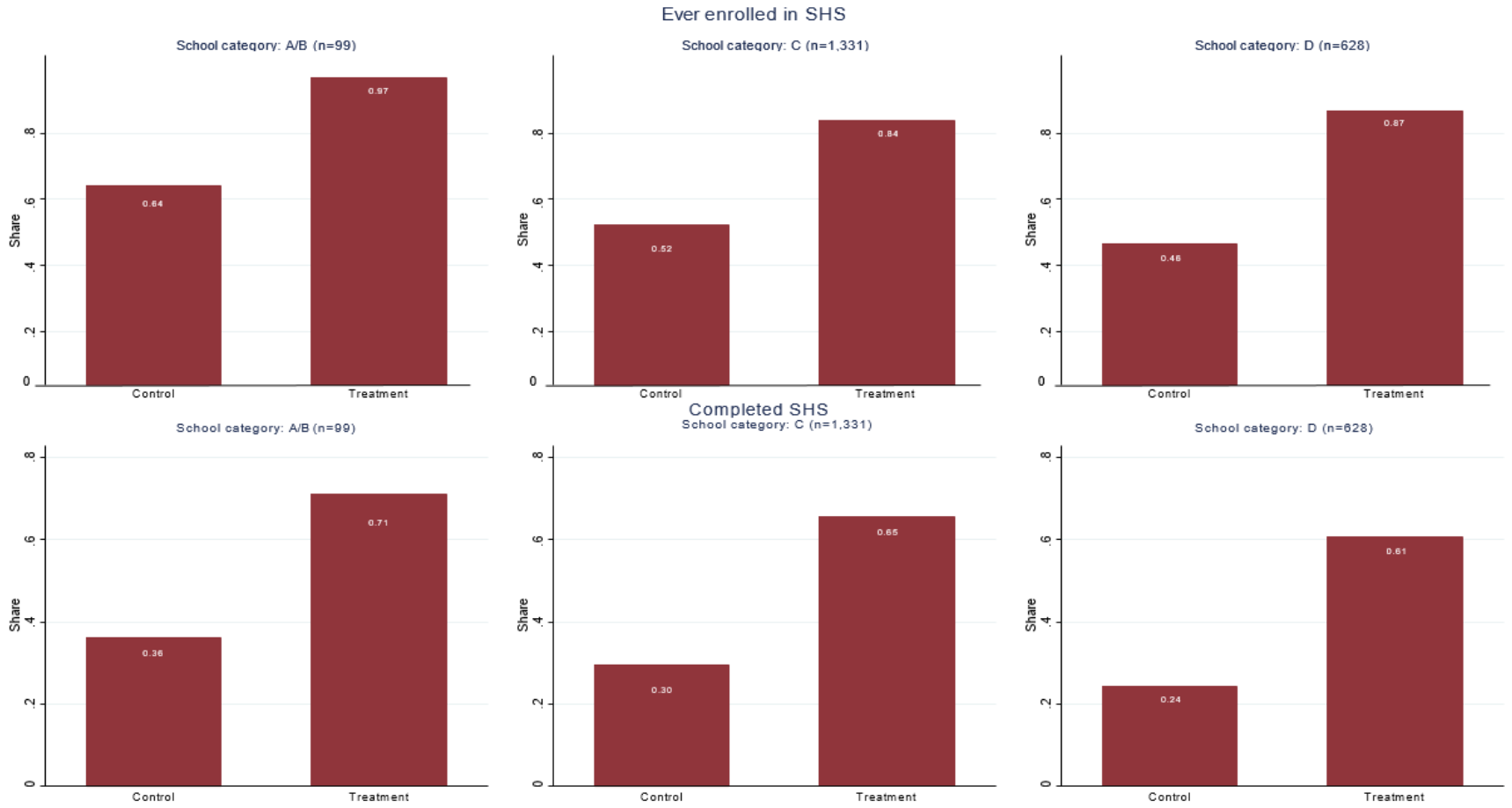
Figure 3: Impact of scholarship on SHS participation, by region*



** The difference between the two bars on the plot measures impact*

Figure 4 presents the results by school category. Somewhat surprisingly, we found no difference across school types: even students admitted into lower-ranked category D schools responded to the scholarship by enrolling en masse.

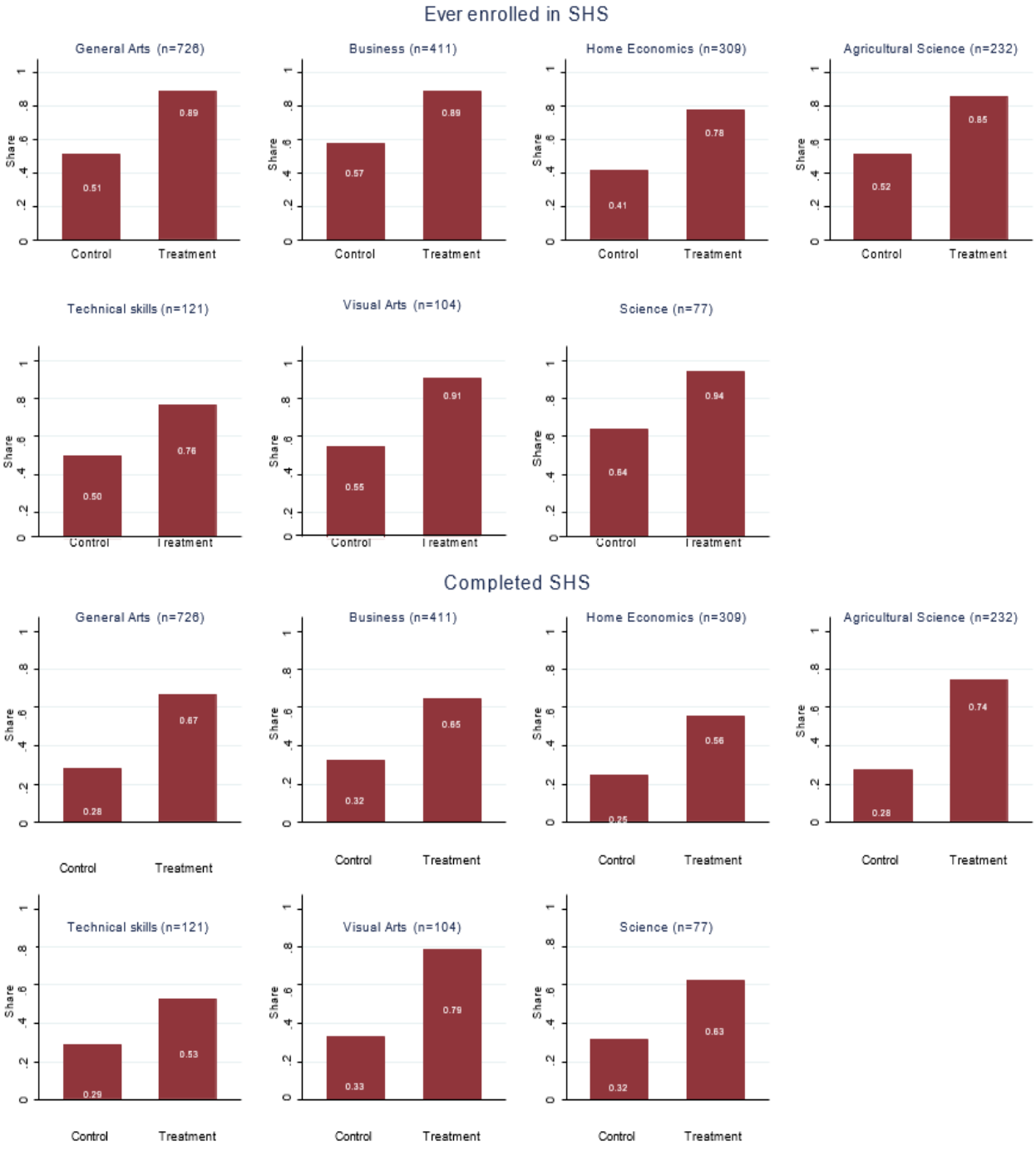
Figure 4: Impact of scholarship on SHS participation, by SHS category*



Notes: The school category is the category of the SHS in which the respondent was admitted based on his/her BECE score.
** The difference between the two bars on the plot measures impact*

Figure 5 presents the results by admission track. Again, we saw few differences: the scholarship seems to have had a very large impact across the board.

Figure 5: Impact of scholarship on SHS participation, by track*

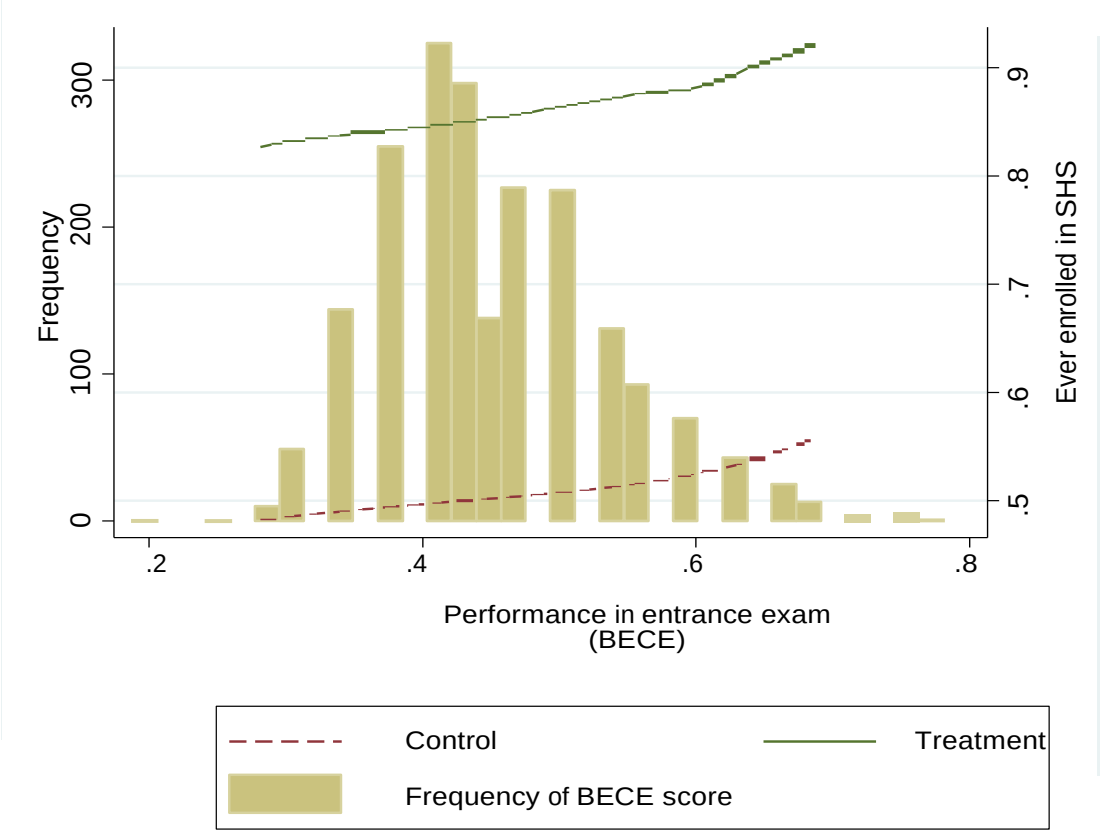


Notes: The track is the major/course in which the student was admitted. BECE cutoffs for admission vary across tracks and are most selective for Science and least selective for Home Economics (mostly female) and Technical Skills (mostly male).

** The difference between the two bars on the plot measures impact*

Finally, Figure 6 shows the impact of the scholarship on SHS enrolment rates across the distribution of baseline performance. We found that the scholarships had a very large effect across all levels of baseline performance.

Figure 6: Impact of scholarship on SHS participation, by baseline performance



Note: The figure plots a kernel-weighted local polynomial regression of SHS enrolment on the baseline score (BECE) separately for the control and treatment respondents as well as the frequency of each baseline score. The local polynomial excludes the top and bottom 0.5 per cent scores. The performance measure on the x-axis is the average BECE score across four subjects: maths, science, social sciences and English). We rescaled the BECE score to be between 0 and 1, with 1 reflecting top performance.

5.2 Impact of scholarships on cognitive skills

Table F4 presents the impact of scholarships on performance in different cognitive measures. The results in Panel A suggest that general intelligence test results were not affected by the scholarship programme (and thus by secondary schooling). This is not surprising since these are considered to be measures of IQ, which is not supposed to change with education.

Panel B presents the results of a cognitive mathematics and reading skills test the research team integrated into the five-year follow-up survey and administered orally. Modelled on the Organisation for Economic Co-operation and Development's Programme for International Student Assessment (PISA) exam, the research team adapted it to the Ghana context with input from the Ministry of Education's

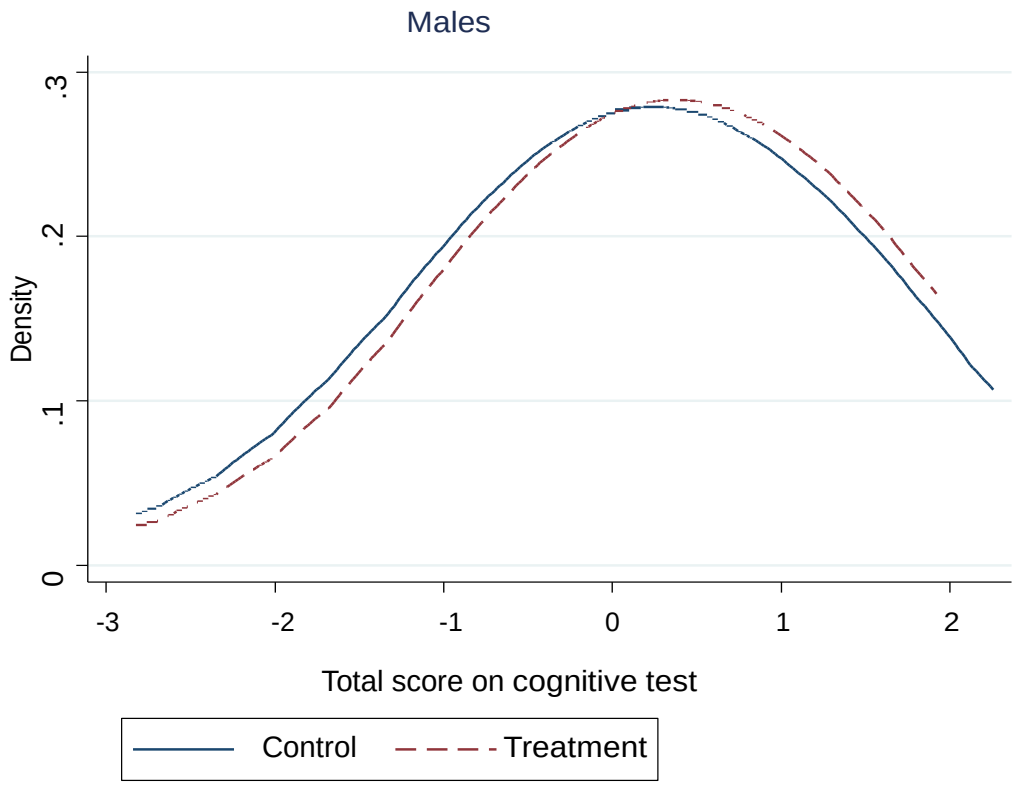
Assessment Services Unit (ASU).[1]

We found that the programme had significant impacts on cognitive skills, with scholarship recipients significantly more likely to appear as fluent readers and to better understand the content of what they read. They also performed better on maths tests. For applied maths skills, female scholarship recipients' ability to answer a more advanced profit calculation question increased by five percentage points (from a base of 10 per cent, representing a 50 per cent increase) and their ability to answer another applied maths problem on exchange rates increased by eight percentage points or 21 per cent. Both females and males were better able to interpret information relayed in a bar chart. Overall, female scholarship recipients performed 19 per cent of a standard deviation and males 13 per cent of a standard deviation higher than those in the control group.

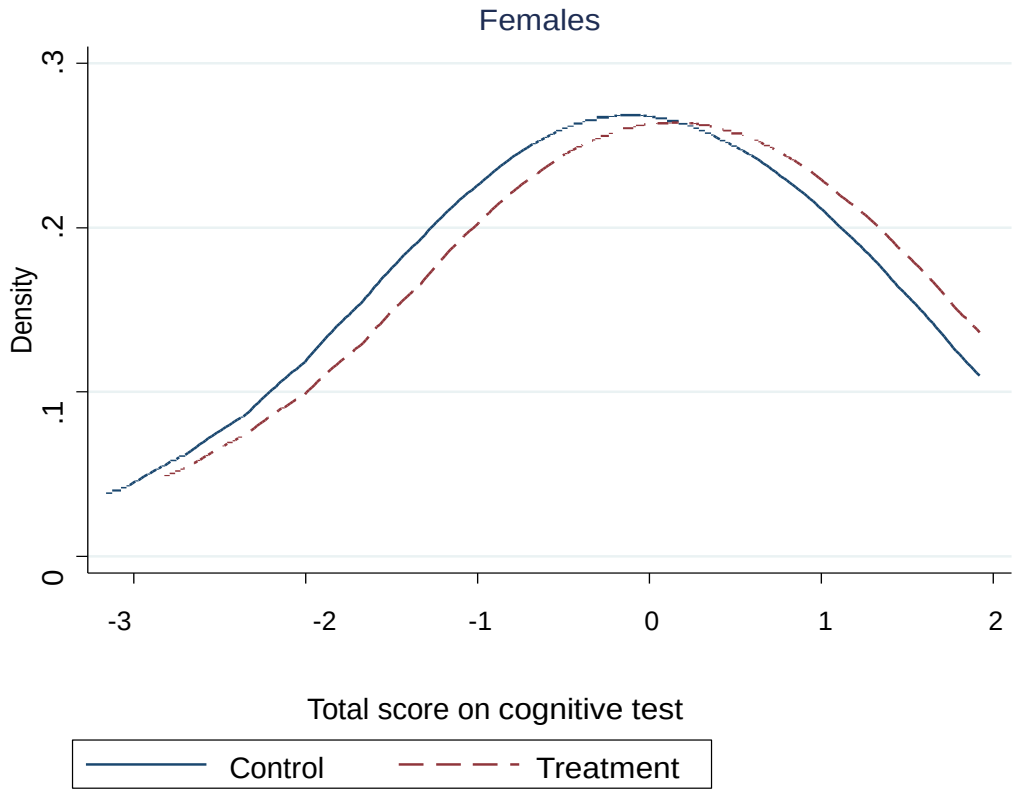
Figure 7 shows how the distribution of the cognitive score was affected by the scholarship, separately for men and women. It is very clear that the scholarship shifted the distribution of scores to the right for both genders, though the effect is more pronounced for women. For them, a formal test rejects equality of the two distributions at the one per cent significance level.

[1] The objective was to develop a standardised test, not directly linked to the school curriculum, which measures how test-takers apply their knowledge to real-life situations and their skills for participating in society. After preparing an extended concept note with examples of PISA test questions, we held a full-day seminar with two maths experts, two literacy experts and the head of ASU to develop and finalise reading and maths questions that met the objective within the Ghanaian context. After field testing the questions, we selected a final set of questions for administration.

Figure 7: Effect of scholarship on cognitive test score distribution



p-value, two-sample Kolmogorov-Smirnov test for equality = 0.257



p-value, two-sample Kolmogorov-Smirnov test for equality = 0.009

Note: Data from five-year follow-up survey. The cognitive test included 17 questions, each weighted equally, designed to gauge literacy, reading comprehension, basic and more advanced maths skills. See Table F4 for details. Total score shown was normalised to mean 0 and standard deviation 1 in the control group.

Figure 8 presents the impact of scholarship on students' cognitive skills scores, divided into four panels: by gender and cohort; by admission track; by region; and by school category.

- Panel A breaks down the treatment effect on cognitive skills by gender and cohort. We see clear differences in performance across student types in the control group: males who took the BECE in 2008 performed 0.2 standard deviation better than the average student in the control group; girls who took the BECE in 2008 performed 0.14 standard deviation worse; and girls who took the BECE in 2007 – one year before the scholarship programme started – performed at -0.27 standard deviation below the mean.

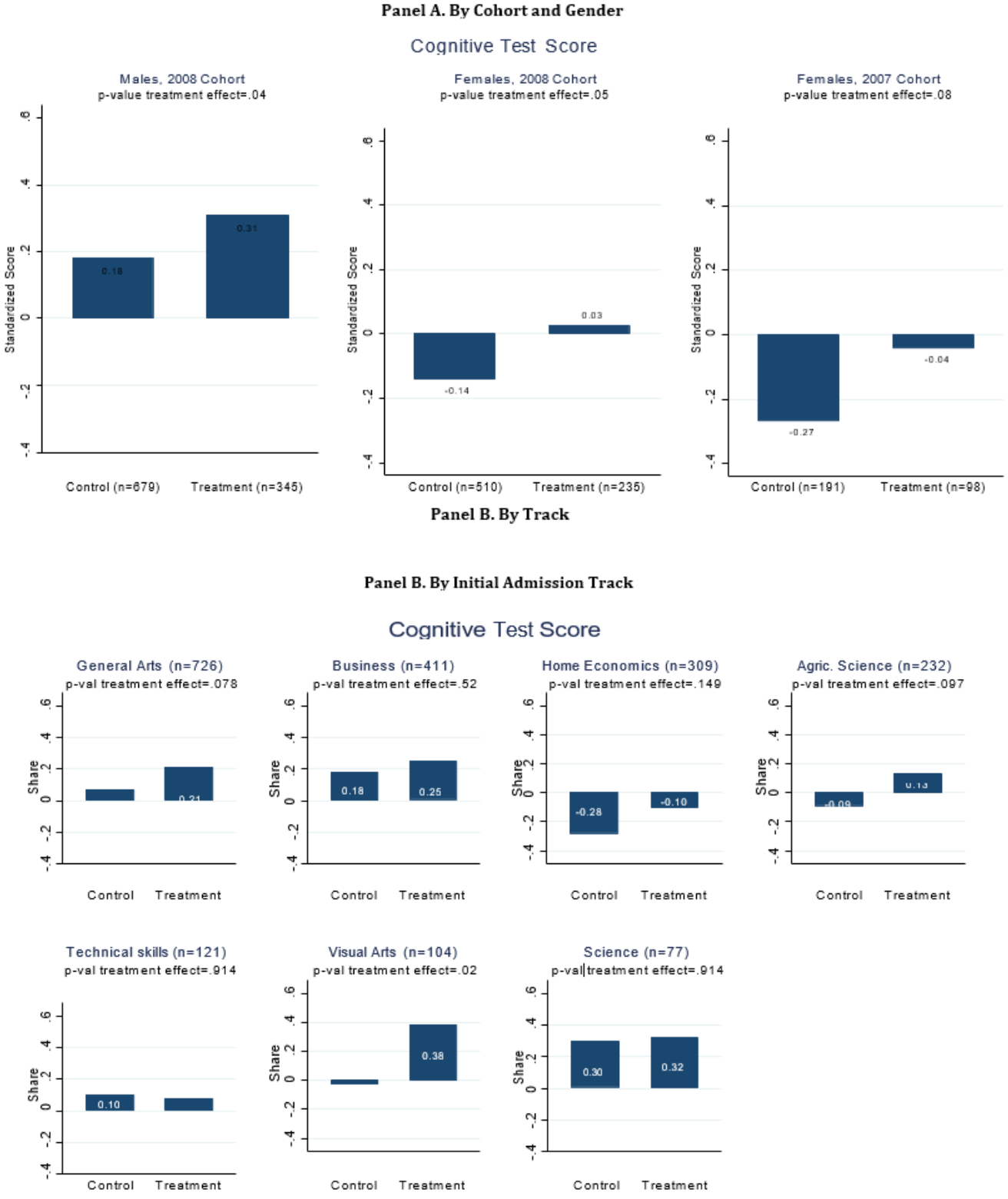
  All three student types were greatly affected by the scholarship: there are significant cognitive gains for all three types in the treatment group. They are largest among the 2007 BECE girls, who were the worst performing group. The finding that the gains are larger for females than males is both important and interesting. It is the result of two factors. First, as discussed above, the impact of the scholarship on secondary school participation was larger, in percentage terms, for girls (in particular those who had graduated from JHS a year before, in 2007). Second, because girls appear to perform worse than boys on average, there might have been more scope for improvement. Our test was tailored to capture basic skills, and it is possible that the boys in the treatment group had gains in other types of skill that our cognitive tests did not capture.

- Panel B shows considerable heterogeneity in levels of cognitive skills across admission tracks in the control group. This is consistent with our finding that the selectivity of SHS admissions varies by track. The scholarship programme led to improvements across all admission tracks, though the gains were more pronounced among those admitted in the least selective tracks. This is consistent with our findings that the 2007 BECE girls – who have the lowest performance rate in the control group – benefited the most from the scholarship.

- Panel C shows very striking differences in performance of the control group across regions. We cannot explain this yet, and we are conducting qualitative interviews to understand the source of this variation.

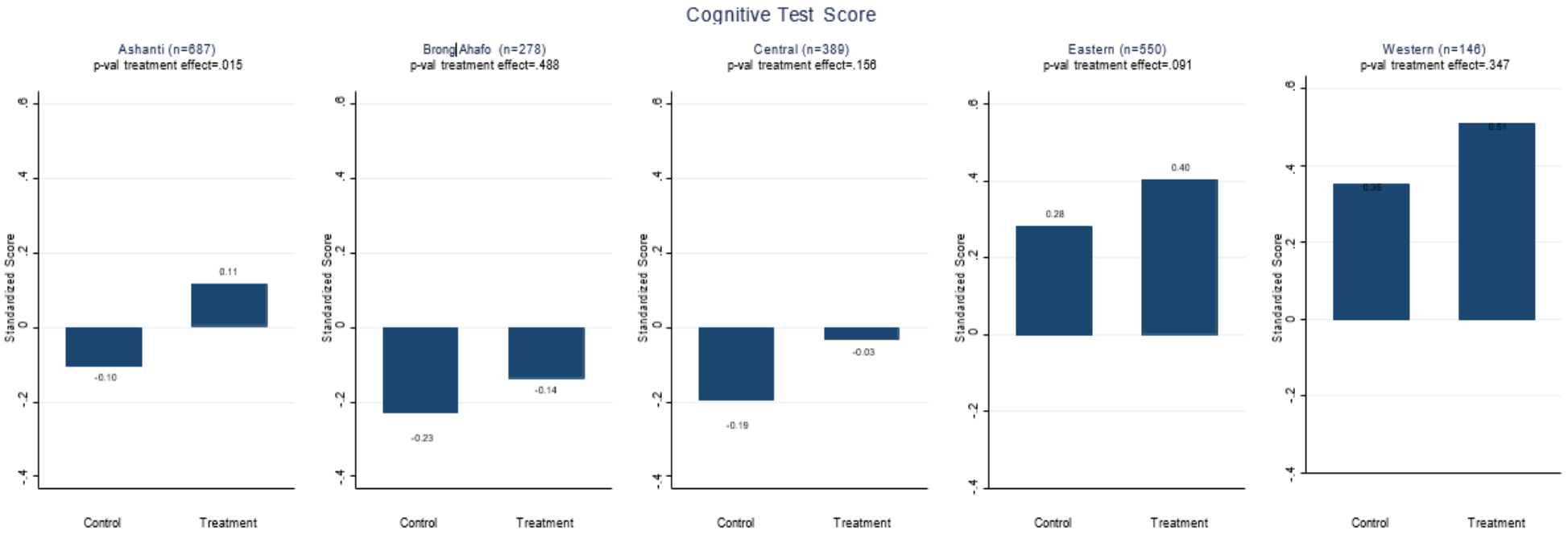
- Panel D shows the treatment effect on cognitive skills by school category. The good news here is that even category D schools generate large gains among their students.

Figure 8: Impact of scholarship on cognitive skills test score*



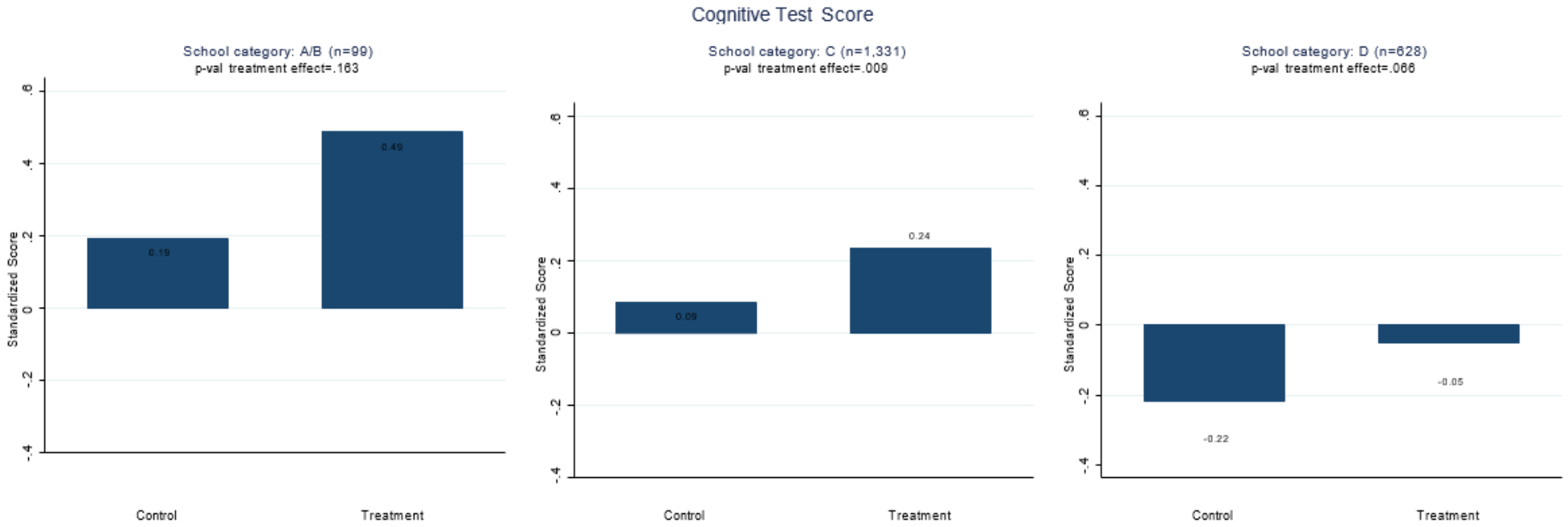
** The difference between the two bars on the plot measures impact*

Panel C. By Region



Panel D. By SHS Category

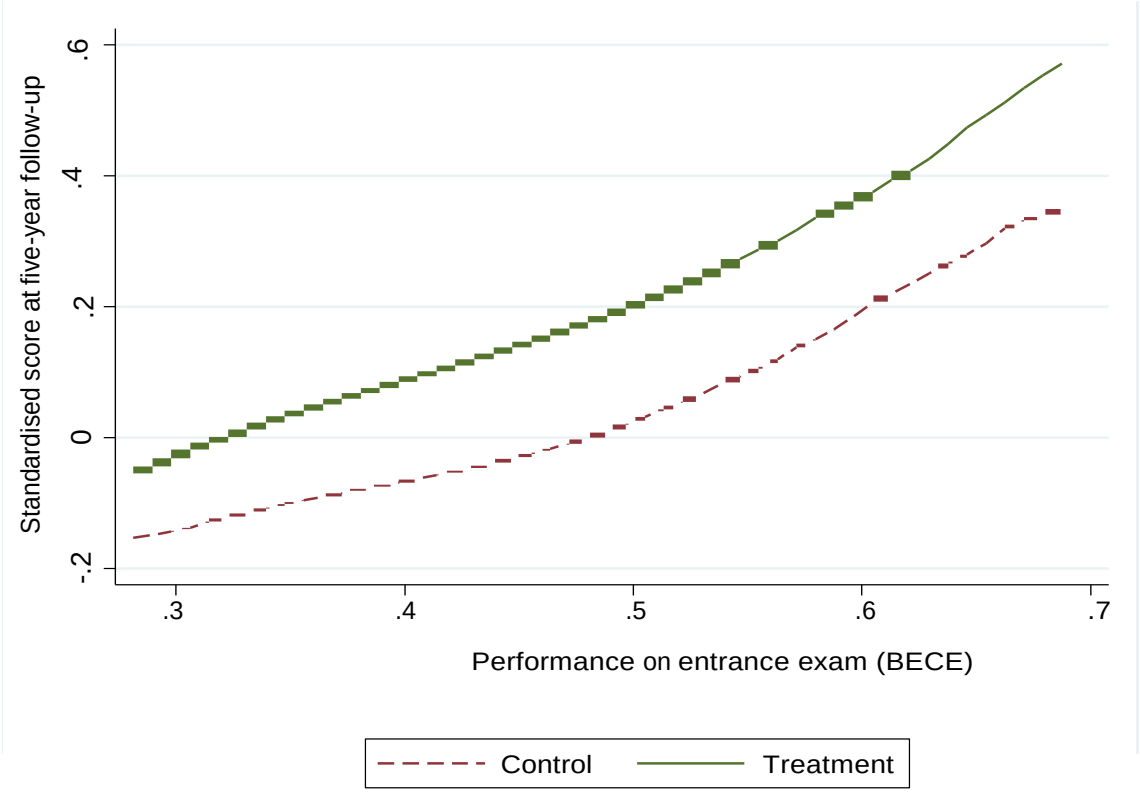
Panel D. By School Category



** The difference between the two bars on the plot measures impact*

Figure 9 shows that these positive cognitive gains are visible throughout the distribution of baseline performance. This suggests that even students who are relatively low performing when they finish JHS can benefit from a secondary school education.

Figure 9: Impact of scholarship on cognitive skills, by baseline performance



Note: The figure plots a kernel-weighted local polynomial regression of SHS enrolment on the baseline score (BECE), separately for the control and treatment respondents. The local polynomial excludes the top and bottom 0.5 per cent scores. See Figure 6 for the distribution of BECE performance.

5.3 Impact of scholarships on reproductive health and fertility

Table F5 presents the impact of the scholarship on reproductive health, sexual behaviour and fertility, showing an important decrease in risky behaviour. Male scholarship recipients are seven percentage points (10 per cent) less likely to report ever having had sex; those who were sexually active were 11 percentage points (16 per cent) more likely to report using condoms. Female scholarship recipients are as likely to be sexually active as control females, but have had significantly fewer sexual partners in their lifetime.

While self-reported sexual behaviour can be subject to reporting biases that could be amplified by the scholarship, the results on fertility and marriage outcomes would seem to confirm these reported reductions in risk taking. We found that the

occurrence of pregnancy and unwanted pregnancy was reduced by seven percentage points (15 per cent) among female scholarship recipients, and marriage rates were significantly lower among male scholarship recipients.

Overall, these results suggest that the scholarship has substantially affected reproductive health and sexual behaviour. At this time, we cannot parse out the relative importance of the potential channels (see Figure 1) through which these changes might have happened:

- the higher opportunity cost of having children
- the ability to make better choices thanks to better cognition
- the fact that education may shape or change preferences for health or decisions to have children.

We hope to separate out these channels in an academic paper, by performing further analyses of the scholarship programme's impact on preferences and technology adoption, and by testing the extent to which childbearing remains a lower hazard for scholarship winners once they have finished school.

5.4 Impact of scholarships on employment

Table F6 presents the estimates of the impact that scholarships had on respondents' current occupational status. Consistent with the educational results shown earlier (in Figure F1), those in the control group were more likely to still be enrolled in secondary school, because they started later (having had a difficult time raising funds for it). They were also more likely to be in an apprenticeship and less likely to be employed, either as a wage employee or in their own or their family's business.

Interestingly, close to a third of respondents reported doing nothing. This was because many of them were waiting for admission into tertiary education. Ghana's education system operates with a gap year between completing SHS and taking the WASSCE exam and admission into university or training college (for nurses or teachers). Table F6 shows that those in the treatment group were more likely to be planning to enrol in one of these trainings the following year (we conducted the survey between May and August 2013, after the majority of SHS students had sat the WASSCE exam in April).

But, despite their reported plans to enrol in tertiary education, preliminary analysis from a new survey wave collected in June 2015 suggests that enrolment rates were very low, at around five per cent for the control group and eight per cent for the treatment group (results not shown). While this difference is significant, the low enrolment levels overall suggest that for many respondents, the future plans they listed in the 2013 survey were wishful thinking. It is not surprising that students who could not afford SHS would have similar difficulties covering fees for tertiary education.

5.5 Impact of scholarships on expectations

Table F7 shows the impact of the scholarship on labour market and wage expectations. The treatment did not impact beliefs about the returns on education, but it did reduce the minimum wage requirements. This may be because students who are planning to enrol in a tertiary programme are willing to do any job in the meantime to earn enough to pay their fees.

Those in the treatment – especially boys – had higher expectations of how much they would earn by the age of 30. All respondents seemed to have very hopeful expectations for their own children's minimum level of education – this was particularly so for female scholarship winners' hopes for their daughters.

5.6 Impact on values, beliefs and civic engagement

Table F9 shows the impact of the scholarship on a series of indices for beliefs, values and politics, which includes increased engagement with the media, improved knowledge of national politics and higher levels of trust. But we found no impact on civic engagement – particularly in terms of voting propensity – as shown in Table F10. This could be because turnout at elections is traditionally very high, at around 80 per cent in the latest national election.

5.7 Cost-effectiveness

It is too early for us to estimate the overall cost-effectiveness of subsidising SHS education. While this is one of the aims of the study, we will not be able to do this until we have longer-term outcomes – namely labour market returns at the 10-year follow-up so we can gauge the impact of higher education on both scholarship winners' income and their tax contributions – as well as social returns, such as scholarship winners' contribution to public health and public good.

While we cannot yet quantify the main benefits, we do have detailed data on costs. We will use two sources of information on the cost of secondary schooling: administrative and survey data.

Administrative data on the direct costs of secondary education

We have administrative data on school fees and WASSCE exam fees for all the students in the study who received a scholarship (see Table 1, Section 4.1). The data corresponds to each term the students received scholarship payments, from the term they enrolled in secondary school in the 2008/2009 academic year to their last scholarship payment in the 2012/2013 academic year. We can use these data to analyse direct costs of secondary school by term and over the entire period of schooling.

Survey data on direct and indirect costs

Direct costs: In the 2013 follow-up survey, we asked all respondents who attended secondary school (regardless of whether they had received a scholarship) to report the amount they paid in school fees and WASSCE exam fees in their last term at school. We can supplement our administrative data with this information to check that the administrative data from our scholarship recipients is representative of typical school costs. These direct costs would constitute an estimate of the cost to the government under a free secondary education scheme, whereby the government would provide capitation grants to SHSs.

We also collected data on the additional costs of attending secondary school for respondents' last term in school. These included: food while in school; transport costs to and from school; rent for those not living at home; in-kind expenses; and other school fees, for example, for extra classes and supplies. Compiling these side costs with the school and exam fees will allow us to estimate the private cost of secondary school attendance, were the tuition and exam fees to be waived.

Indirect costs: The survey data also include income for all respondents since leaving JHS. We will use these data to measure the opportunity cost of secondary school by analysing the income students might forgo by attending school.

We will also be able to look at potential trade-offs within households, using data collected on sibling schooling and educational attainment. This will enable us to assess whether subsidising secondary schooling for one child crowds out educational investments for other children. For example, if a household needs to keep at least one child out of school to help with the family business or to work for money, it is possible that a scholarship for an older sibling who would otherwise have worked has negative spillovers onto the education of younger siblings. Of course, there could be a counteracting income effect and the impact on siblings' education may be positive, in which case spillovers onto siblings would enter in the benefit and not the cost part of the cost-benefit analysis. This is an empirical question we will be able to investigate as we continue with the study and collect longer-run follow-up data.

5.7.1 Partial cost-effectiveness results

We have complete data on the costs of each additional year of secondary education and of unwanted pregnancy. We can use these data to perform some cost-effectiveness analyses.

Cost per additional year of secondary education: We paid a total of GHC475,898 in scholarship funds. This represents four years' costs for the 419 students who completed SHS, and partial tuition costs for the 100 who dropped out before completing SHS. We found that the treatment group typically completed 1.3 more years of education than the control group. Since there were 682 individuals in the treatment group, we can say that the programme generated 882 additional years of schooling. Using this information, we calculated the cost of these additional years of

secondary education at GHC475,898. If we divide this by the 882 school years, we get a cost per school year of GHC539 (about US$235).

This calculation omits the costs of disbursing the scholarships. This is because the costs we incurred in the study are not a good reflection of how much it would cost a government to disburse funding at scale. We also note that our scholarship cost estimate is an upper bound since the scholarships paid to students who would have managed to enrol without one are not wasted: they are likely to generate positive spillovers onto other household members.

With so many potential impacts and ramifications, it is impossible to quantify all the benefits of these scholarships. More generally, scholarships are transfers, and as such any cost-benefit analysis should value their costs at the associated deadweight loss of taxation rather than at transfer value. We will perform this analysis in our academic paper that will come out of this study.

Cost per averted unwanted teenage pregnancy: At the request of the 3ie reviewers, we provide this cost-effectiveness calculation below. We note that this is only one of the many outcomes affected by the scholarship programme, so looking at this cost-effectiveness in isolation does not necessarily make much sense, but it is indicative. The figure we obtain is about GHC9,400 (US$2,410) per unwanted pregnancy averted. Unsurprisingly, this is considerably more than Kenya's information campaign warning young girls of the HIV risk associated with sugar daddy relationships, at US$98 per pregnancy averted (Dupas 2011). It is also about twice the estimated cost per pregnancy averted in another Kenyan initiative to integrate family planning into HIV services (Shade *et al.* 2013). It is only slightly higher than the estimated cost per unintended pregnancy averted of US family planning programmes.

Table 2: Cost-effectiveness of unwanted pregnancies averted

Cost effectiveness for Unwanted Teenage Pregnancies Averted		Note
Cost		
Cost per 4-year scholarship (GHC)	915	
Number of girls sampled for scholarship	323	
Number of girls who took up the full scholarship	186	SHS completion figure from Table 2
Number of girls who took up partial scholarship	66	We assume the scholarship costs were 50% for girls who dropped out before completion.
Total cost of scholarships for girls (GHC)	200,380	
Benefit		
Treatment effect on unwanted pregnancy averted	-0.066	(Table 6, bottom row)
Number of unwanted pregnancies averted	21	(=0.066*323)
Cost-Benefit		
Cost per unwanted pregnancy averted (GHC)	9,400	
Cost per unwanted pregnancy averted (current $US)	$ 2,410	

Note: we define teenage pregnancy as any pregnancy that occurred within 5 years of the baseline survey (2008, when the median age was 17).

6. Policy recommendations

Although human capital is often considered to be the primary driver of growth and development, there is very little solid evidence of the multi-faceted benefits of secondary education. The role of primary education is better studied and understood. Our ongoing study demonstrates the extent of these benefits in the relatively short term and provides information about who benefits most from attending secondary school. To our knowledge, this is the first study that rigorously estimates the returns on secondary school attendance using a randomised design. It provides critical information to the government of Ghana and policymakers elsewhere on how to shape scholarship schemes and/or general secondary education policies to meet social objectives most efficiently with limited public funds. We found that reducing the cost of SHS through scholarships has a considerable impact on attendance and completion. This suggests that financial constraints are an important barrier to education demand in rural Ghana. This is only our first follow-up, and we aim to continue measuring outcomes for our study sample for at least five years. But our findings so far suggest that secondary education has far-ranging effects on cognitive skills, employment, health and sexual behaviour. As such, countries should build a coalition to help guarantee secondary education for most children, like the current coalition on access to basic education.

We also found that scholarships have a greater impact on girls. They increased educational attainment relatively more for the girls in our sample than the boys, and correspondingly had a larger impact on girls' cognitive skills, employment and reproductive health. This suggests that it may be desirable to specifically target girls in the selection process. Knowing they are eligible for scholarships if they perform well enough to gain admission into SHS may also increase girls' incentives to study in JHS. Our data suggest that girls perform significantly worse than boys at the end of JHS; this could be because they know their parents are unlikely to invest in their secondary education.

Finally, our findings of no correlation between entrance exam test scores and returns on secondary education (at least in the medium term) suggest that bursary schemes may not need to include a merit criterion in addition to the need criterion; admission exams may need to be less selective.

Appendix A: Sample selection

The sample frame for the study was constructed as follows:

1. We included five regions in southern Ghana in the study. We excluded the three northern regions and the Volta region because the government was already running a scholarship programme there at the onset of the study.
2. We selected 54 districts across these five regions because they had a high ratio of day to boarding students (according to statistics from earlier years) and did not include the regional capital.
3. Across these 54 districts, we selected a total of 177 publicly funded SHSs that accepted day students. These SHSs represent about 60 per cent of all the SHSs in the selected districts.
4. Within each selected SHS, we considered all students who had officially been admitted into the SHS as of October 2008 for eligibility. To be considered eligible for the study, students had to have:
    - been allocated one of the 177 study SHSs by the CSSPS
    - attended a JHS in the same district as their allocated SHS (in-district students)
    - not enrolled in any SHS by October 2008 (one month after the start of the school year).

We visited senior and junior high schools and interviewed headmasters, teachers and other students in October 2008 to identify 2,246 students eligible for the study. Because fewer girls are admitted into SHS than boys every year, we had to include some girls who had graduated from JHS in July 2007 and gained admission into, but not enrolled in, an SHS.

In November and December 2009, we conducted a baseline survey with the 2,246 eligible students in their own homes. The survey instruments contained questions on all the likely channels through which education may affect fertility and child health. We used similar questionnaires in 2012 and 2015 and will do so again in 2018, with additional modules on fertility, child health and partner characteristics.

In early January 2009, we called back the entire sample to assess whether students had enrolled or intended to enrol in an SHS for the second term of the 2008/2009 school year. We then dropped 182 students who had or intended to enrol in SHS from the sample prior to randomisation. So the initial study sample was composed of 2,064 individuals (1,028 males and 1,036 females). Among the females, 746 had taken the BECE in 2008 and 290 in 2007.

At the time of the follow-up survey in 2013, we identified 14 students as deceased, so our final study sample was composed of 2,050 individuals.

Appendix B: Data

We use three main data sources: a baseline survey, a callback survey and a follow-up survey administered after five years.

Baseline survey

We conducted the baseline survey in November and December 2008, before selecting the scholarship students. The data in the baseline analysis are for the 2,064 students and their guardians who were in the final sample of the treatment and control groups.

We administered three types of questionnaires at the baseline:

- A student questionnaire, administered to the student him or herself, to collect information on occupation, political knowledge, values, beliefs and JHS final exam performance.
- A guardian questionnaire, administered to the guardian whom the student lives with, usually female. This included questions on the guardian's perceptions of education, their own literacy, their values, beliefs and quality of life.
- A household questionnaire, administered to the student's guardian. This included a baseline household roster with information on education, occupation and health as well as questions on household living conditions, assets, consumption and economic activities.

The interviewers worked in pairs, organised into 20 teams, to visit households and administer the three questionnaires. Each team had two pairs of interviewers and an editor. Among the four interviewers was a senior interviewer responsible for coordination and providing feedback to junior interviewers. The editor carried out quality control in the form of back checks. A contractor, Rising Data Solutions, double entered the survey data and the IPA data entry coordinator audited it.

While doing quality checks, editors visited all the study participants and took a digital picture of the student to facilitate future tracking. For these pictures, each student held up the seven-digit student code assigned by the research team. After the survey, each student received a mobile phone to stay in touch with IPA and facilitate future tracking.

Callback surveys

After the baseline survey and sample selection, we conducted a yearly callback survey – a short status update survey over the phone – to update contact information and ask some basic questions about respondents' schooling, occupation, marriage and pregnancy status.

The first callback survey for the whole sample was in September 2009, when we collected information for 1,686 students over three weeks. At this time, 78 per cent of the treatment group reported being enrolled in school in Term 1 of 2009, compared

to 18.7 per cent of the control group. We selected a random sample of 106 respondents for an audit survey and found a 3–5 per cent overall discrepancy rate.

During the second callback survey in March and April 2010, we reached 1,713 students and followed this up with a phone audit on 150 randomly selected respondents. We then carried out home tracking visits in May 2010 to find the 17 per cent (351) of respondents who we could not reach on the phone.

The third callback survey, from April to July 2011, involved phone interviews, school visits and home tracking visits. We collected first-hand information from 95 per cent (1,957) of respondents and third-party information for an additional four per cent, giving us a total tracking rate of 99 per cent (2,032) of respondents. An audit on 142 surveys revealed a 0.75 per cent discrepancy rate.

During our fourth callback survey, from May to July 2012, we reached 86 per cent (1,768) of respondents directly. We carried out a phone audit on nine per cent of the administered callback surveys from this round.

Follow-up survey

We conducted the first follow-up survey from April to August 2013 with 2,050 of our baseline respondents (excluding the 14 deceased students), their guardians and their households.

We spent five months developing the survey instruments, modifying the baseline survey modules and adding modules on outcomes such as schooling, occupation, cognitive skills, labour market expectations, reproductive health, fertility and partner characteristics. We prepared three questionnaires for data collection:

- A student questionnaire, administered to the student him or herself, to collect information on education and future plans, cognitive skills, economic activities, reproductive health and other modules not yet analysed.
- A guardian questionnaire, administered to the same guardian we had surveyed in 2008, to collect information on the education, health and economic activities of other members of the student's household (especially siblings), household consumption and expenditure, and quality of life. If the guardian interviewed at baseline no longer lived with the rest of the household, we administered the questionnaire to both the original guardian and the new household head. We have not yet entered these data.
- A new household questionnaire, administered to heads of students' new households where the student no longer lived with his or her baseline guardian household. It included the same topics as the guardian questionnaire. We have not yet entered these data.

We field tested all the survey modules for two months, with breaks to incorporate revisions. Our field testing sample matched the characteristics of the respondents included in our actual sample.

To organise tracking of all the students and their guardians in their home locations, we conducted a phone survey in December 2012 to confirm respondents' expected location during data collection in April 2013. Using this information, we organised survey teams based in the six regions in Ghana where the respondents were located, adding Greater Accra to our original baseline regions due to a high incidence of migration to the capital.

During data collection, each regional team had an editor to check completed questionnaires for administration errors (skip patterns, blank fields or inconsistencies). An auditor conducted a callback check survey on a random sample of 20 per cent of surveys. The IPA project assistants also conducted field visits to monitor survey administration across the different regions.

At the end of the survey administration, we reached 97 per cent of students and 90 per cent of guardians from the original baseline sample. The IPA in-house data entry team double-entered all the survey data to minimise data entry errors.

Appendix C: Power calculations

Given the level of non-compliance observed in Year 1 (15 per cent non-enrolment in the treatment group and 16 per cent enrolment in the control group), we had estimated the following power under various assumptions about attrition for the reduced form regression and for the corresponding effect of education in the instrumental variable regression (where education is instrumented with the scholarship):

At five per cent attrition: reduced form MDE = 0.11 SD, scaled MDE = 0.162 SD

At 15 per cent attrition: reduced form MDE = 0.116 SD, scaled MDE = 0.171 SD

At 25 per cent attrition: reduced form MDE = 0.124 SD, scaled MDE = 0.182 SD

For example, with 15 per cent attrition, the minimum detectable effect (MDE) size for the effect of attending secondary school on education will be 0.17 standard deviations (SD). To get a sense of what this corresponds to, Table C1 shows the values of some outcomes of interest in the baseline, as well as the standard deviation and the translation of the MDE in terms of these variables.

Table C1: Baseline means and standard deviation for some outcome of interests

	Treatment group	Control group	P-value of difference	Population std. deviation	MDE
Mental health index (from guardian questionnaire)	3.45	3.44	0.79	0.69	0.17
Monthly per capita consumption (in GHC)	40.51	39.16	0.40	33.15	8.29
Digits backward test score	4.57	4.49	0.39	1.95	0.33
Digits forward test score	8.86	8.91	0.66	2.57	0.44
Raven's test score	6.53	6.53	0.95	2.53	0.43
Patriarchy index	3.15	3.15	0.95	1.46	0.25
Age males should have first child	28.38	28.14	0.19	3.77	0.64
Age females should have first child	25.74	25.47	0.09	3.45	0.59
Desired education for a son	8.27	8.22	0.52	1.55	0.27
Desired education for a daughter	8.25	8.16	0.21	1.58	0.27
Fatalism	6.92	6.95	0.84	2.30	0.39
Beta (hyperbolic discount rate)	1.08	1.07	0.62	0.31	0.05
Delta (exponential discount rate)	0.91	0.92	0.93	0.06	0.01
Ever had sex	0.30	0.33	0.22	0.47	0.08
Used contraception at last sex	0.55	0.53	0.66	0.50	0.09
Will use contraception	0.51	0.51	0.98	0.50	0.09

Appendix D: Pre-analysis plan

We did not file a formal pre-analysis plan for this study, but prespecified our hypothesis and proposed specifications in the proposals written for donors (in particular, the proposal we submitted to the US National Institutes of Health and a CAREER proposal Pascaline Dupas submitted to the US National Science Foundation). In this section, we describe the specific hypotheses discussed in the proposal.

This study will answer the following enduring question: *what are the relative benefits of advanced (in other words, secondary) versus basic education (elementary and middle) in a low-income setting?*

More specifically, the study will answer the following questions:

1. What is the impact of secondary education on health, reproductive behaviour, long-term earnings and gender equality?
   We will use survey data on health knowledge and behaviour, labour market outcomes, and beliefs and values to measure this outcome.
2. Who benefits the most from subsidies for secondary school?
   We will disaggregate results by gender, baseline entrance exam score (to look at merit subsidies) and location.
3. How do the benefits of expanding secondary education compare to the cost?
   We use the long-term results of the study and the cost data for secondary schooling to analyse this.
4. How should the government of Ghana (and policymakers elsewhere) shape their scholarship schemes and/or general education policies to meet their social objectives most efficiently?
   We will disaggregate the long-term results to show how the scholarships affected different subgroups – for example, by gender – to determine how policymakers should target future interventions.

Our main and secondary outcomes of interest

The main outcomes of interest that we will study are:

- educational attainment (enrolment and completion)
- reproductive behaviour (age at first child, number of children)
- marriage outcomes (age at marriage, spouse's characteristics)
- health and reproductive health (hygiene and water use habits, days off work, incidence of common diseases such as diarrhoea of self and children, nutritional behaviour, age at first pregnancy, number of children, maternal and child health)
- labour market outcomes (labour market participation, career choices, earnings)
- technology adoption
- outcomes for relatives of scholarship recipients (health and welfare of parents or guardians and siblings, educational achievement of siblings).

Our secondary outcomes of interest are:

- savings and asset accumulation (including greater use of formal and informal saving mechanisms and money management)
- cognitive outcomes
- attitudes and preferences (willingness to express opinions, willingness to contribute to public good, risk aversion, fatalism, extroversion, conformism)
- non-formal sector livelihoods
- civic and political participation; beliefs, values and attitudes.

Appendix E: Study design and methods

In this appendix, we describe the prespecified empirical strategy. Given the randomised assignment of the scholarships, the analytical design and method is relatively straightforward.

1. We first run reduced-form regressions of the following type for all the outcomes of interest: our final outcome (for example, educational attainment, skills, reproductive behaviour, employment):

   $$Y=\alpha+\beta T+X'\gamma+\varepsilon$$

   where Y is an outcome of interest, T is whether the student won a scholarship, and X is a vector of baseline variables and the stratification indicators.

2. The next step will be to use the treatment variable as an instrument for whether or not the student attended secondary school:

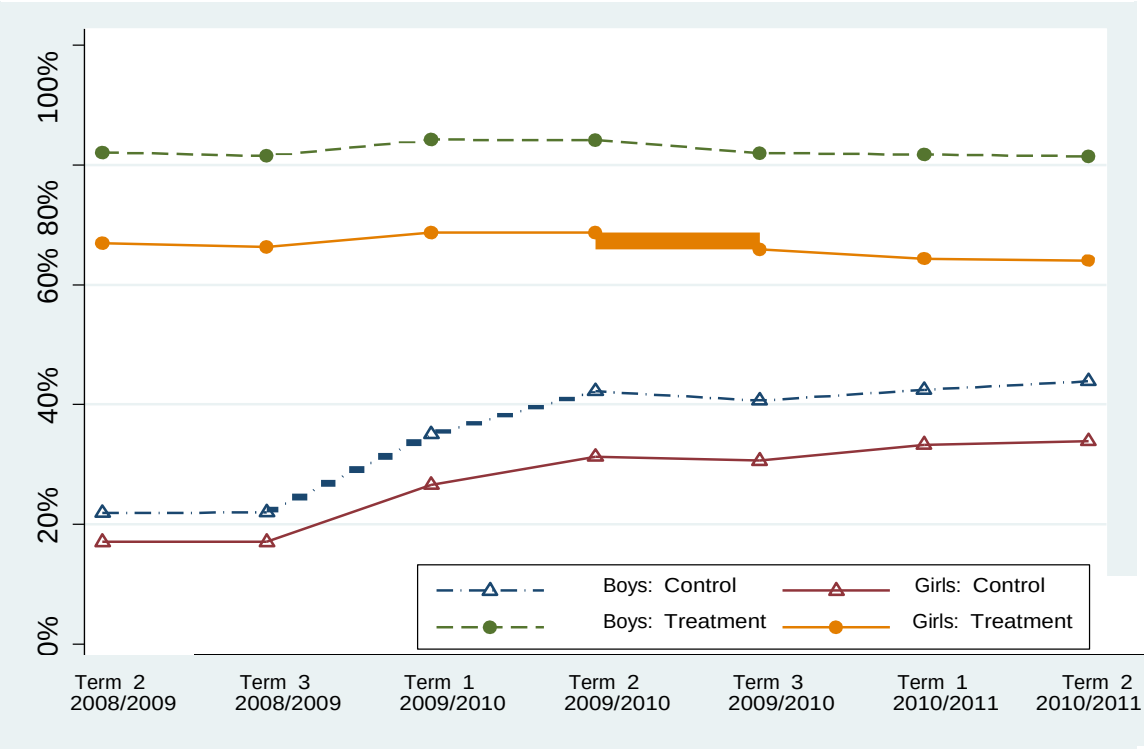
   $$Y= \alpha +\beta SHS+X'\gamma+\varepsilon$$

   where SHS (years of secondary education) is instrumented for whether the student was selected for a scholarship. The first stage (effect of treatment on attending secondary school) is very large and significant.

These regressions will inform us on both the final (reduced form) effect of education on early reproduction and child health, and on which intermediate outcomes are affected. Building on this, we hope to propose – and estimate (using non-experimental variation, since our experimental variation potentially affects all of the intermediate channels together) – a more structural model of reproductive choice, integrating the intermediate outcomes as pathways. This is outside the scope of this report.

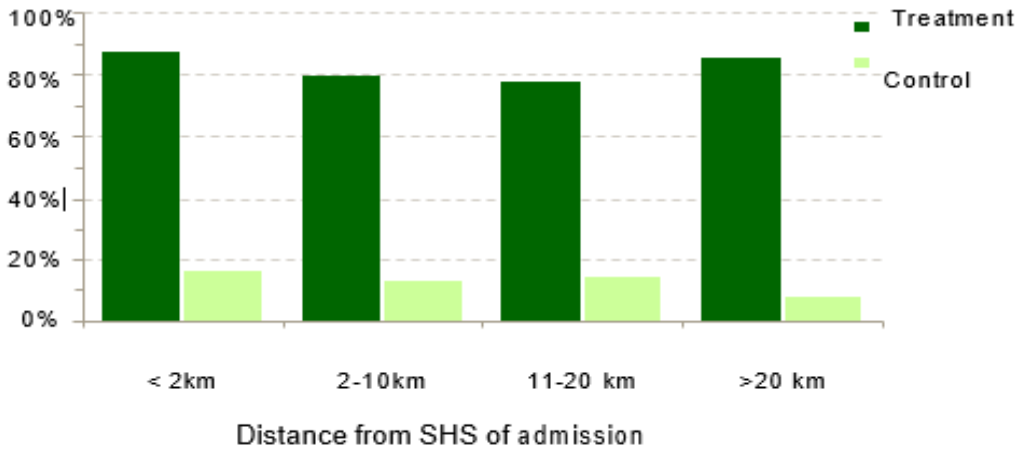
Appendix F: Figures and tables

Figure F1: Impact of scholarship on share enrolled in SHS, by school term and gender



Note: Data from phone surveys administered yearly. The scholarships were awarded at the beginning of Term 2 of the 2008/2009 academic year.

Figure F2: Impact of scholarship on share enrolled in SHS, by distance to SHS of admission



Note: The difference between the two bars on the plot measures impact

Table F1: Sample characteristics

	Female			Mal		
	Treatmen mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Survey rate	17.303	17.314	-0.011	17.386	17.41	-0.024
Age in 2008			(0.10)			(0.11)
Completed BECE in 2007	0.293	0.274	0.02 (0.03)	0	0	n/a
Distance to allocated SHS is <10 km	0.622	0.633	-0.011 (0.03)	0.626	0.626	0.00 (0.03)
Mean of BECE exam performance[a]	0.617	0.618	-0.001 (0.01)	0.633	0.629	0.004 (0.01)
BECE performance data missing	0.093	0.066	0.027 (0.02)	0.095	0.059	0.036 (0.017)**
Thinks it is very important to get an	0.903	0.907	-0.004 (0.02)	0.928	0.937	-0.01 (0.02)
Ever had sex	0.455	0.453	0.002 (0.03)	0.157	0.200 *	-0.043 (0.026)
Guardian characteristics [b]	0.893	0.898	-0.005	0.909	0.922	-0.013
Thinks it is very important for the child to get an education			(0.02)			(0.02)
Minimum desired level of education for the child is university	0.701	0.738	-0.037 (0.03)	0.765	0.795	-0.03 (0.03)
Can read a sentence in English without	0.185	0.215	-0.03 (0.03)	0.186	0.192	-0.006 (0.03)
Household (HH) characteristics						
No male HH head	0.428	0.455	-0.028 (0.03)	0.444	0.396	0.048 (0.03)
Age of HH head	51.039	51.214	-0.175 (0.92)	50.772	50.702	0.07 (0.85)
Number of HH members	5.443	5.58	-0.137 (0.15)	5.569	5.612	-0.043 (0.16)
HH head has primary education	0.033	0.047	-0.014 (0.01)	0.04	0.037	0.003 (0.01)
HH head has JHS education	0.335	0.352	-0.017 (0.03)	0.339	0.347	-0.008 (0.03)
HH head has SHS education	0.102	0.087	0.015 (0.02)	0.106	0.107	-0.001 (0.02)
HH head has vocational education	0.006	0.017	-0.011 (0.01)	0.011	0.009	0.003 (0.01)
HH head has any higher education	0.036	0.057	-0.021 (0.02)	0.043	0.041	0.002 (0.01)
Observations	333	701		345	671	

Note: Data from baseline surveys with students and their guardians.

[a] Mean BECE performance on four core subjects: maths, English, science and social studies. We rescaled the score on a 0–100% scale, with 100% being the top performance.

[b] The guardian is usually the mother or the female guardian. If neither the mother nor the female guardian was available during the baseline survey, we interviewed the father or male guardian.

Table F2: Survey rate and educational outcomes at five-year follow-up

	Female			Male		
	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Survey rate						
Surveyed in person in 2013	0.97	0.966	0.004	0.957	0.969	-0.012
			(0.012)			(0.012)
Observations	333	701		345	671	
Panel B. Educational outcomes						
Ever enrolled in SHS	0.78	0.446	0.334	0.927	0.569	0.358
			(0.032)***			(0.029)***
Completed SHS	0.576	0.244	0.332	0.706	0.323	0.383
			(0.031)***			(0.031)***
Started and stopped SHS	0.146	0.072	0.073	0.161	0.089	0.071
			(0.02)***			(0.021)***
Enrolled in SHS other than allocated SHS[a]	0.015	0.004	0.011	0.012	0.008	0.004
			(0.006)*			(0.006)
Still enrolled in SHS[b]	0.043	0.124	-0.081	0.048	0.149	-0.101
			(0.02)***			(0.021)***
Ever enrolled in SHS track…						
Agricultural science	0.068	0.012	0.056	0.094	0.055	0.039
			(0.011)***			(0.017)**
Business	0.105	0.081	0.024	0.212	0.142	0.071
			(0.019)			(0.025)***
Technical skills	0.003	0.001	0.002	0.058	0.048	0.01
			(0.003)			(0.015)
Home economics	0.186	0.08	0.106	0.015	0	0.015
			(0.021)***			(0.005)***
Visual arts	0.003	0.009	-0.006	0.109	0.043	0.066
			(0.006)			(0.017)***
Science	0.028	0.001	0.026	0.03	0.028	0.003
			(0.007)***			(0.011)
General arts	0.384	0.26	0.124	0.406	0.252	0.154
			(0.031)***			(0.031)***
Observations	323	677		330	650	

Note: Data from our 2013 in-person, follow-up survey. Panel A includes only 2,050 observations because 14 participants were reported as deceased and were therefore not sampled for the follow-up survey.
We show the mean calculation in columns 1, 2, 4, and 5: means.
Columns 3 and 6 show the coefficient estimates for the treatment assignment dummy in linear probability models excluding any controls; standard errors presented in parentheses, with ***, **, * indicating significance at 1, 5 and 10%.

[a] Students are admitted to a specific SHS and a specific track but can try to switch.

[b] Refers to students who started SHS later (primarily control students who enrolled a year later).

Table F3: SHS completion and track (if ever enrolled)

	Female			Male		
	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)
	(1)	(2)	(3)	(4)	(5)	(6)
Completed SHS	0.738	0.548	0.19	0.761	0.568	0.194
			(0.04)***			(0.036)***
Started and stopped SHS	0.187	0.163	0.024	0.173	0.157	0.016
			(0.032)			(0.029)
Enrolled in SHS other than admission SHS[a]	0.020	0.010	0.010	0.013	0.014	0.000
			(0.010)			(0.009)
Still enrolled in SHS[b]	0.056	0.279	-0.224	0.052	0.262	-0.21
			(0.031)***			(0.028)***
Enrolled in SHS track…						
Agricultural science	0.087	0.027	0.061	0.101	0.097	0.004
			(0.019)***			(0.023)
Business	0.135	0.183	(0.048)	0.229	0.249	(0.020)
			(0.031)			(0.033)
Technical skills	0.004	0.003	0.001	0.062	0.084	(0.022)
			(0.005)			(0.020)
Home economics	0.238	0.179	0.059	0.016	0	0.016
			(0.035)*			(0.007)**
Visual arts	0.004	0.020	(0.016)	0.118	0.076	0.042
			(0.01)*			(0.023)*
Science	0.036	0.003	0.032	0.033	0.049	(0.016)
			(0.011)***			(0.015)
General arts	0.492	0.585	-0.093	0.438	0.443	(0.005)
			(0.042)**			(0.038)
Enrolled in track other than admission	0.386	0.475	-0.089	0.392	0.473	-0.081
			(0.042)**			(0.038)**
Observations	252	301		306	370	

Note: See Table F2 notes.

Table F4: SHS enrolment, completion and track, by baseline performance

	In top half of performance distribution at the end of JHS						In bottom half of performance distribution at the end of JHS					
	Female			Male			Female			Male		
	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)
	(1)	(2)	(3)	(4)	(5)	(6)	(7	(8)	(9)	(10)	(11)	(12)
Surveyed in person in	0.954	0.955	-0.001	0.96	0.967	-0.006	0.983	0.974	0.009	0.952	0.971	-0.018
			(0.021)			(0.017)			(0.013)			(0.017)
Ever enrolled in SHS	0.786	0.493	0.293	0.935	0.592	0.343	0.775	0.41	0.365	0.919	0.547	0.372
			(0.048)***			(0.04)***			(0.043)***			(0.042)***
Completed SHS	0.593	0.306	0.287	0.753	0.355	0.398	0.562	0.196	0.366	0.656	0.292	0.364
			(0.048)***			(0.044)***			(0.039)***			(0.045)***
Started and stopped SHS	0.124	0.095	0.029	0.135	0.062	0.073	0.163	0.055	0.108	0.188	0.116	0.072
			(0.031)			(0.027)***			(0.025)***			(0.033)**
Enrolled in SHS other allocated SHS	0.021	0.01	0.01	0.018	0.012	0.005	0.011	0	0.011	0.006	0.003	0.003
			(0.012)			(0.011)			(0.005)**			(0.006)
Still enrolled in SHS[a]	0.048	0.082	-0.033	0.029	0.162	-0.133	0.039	0.157	-0.117	0.069	0.137	-0.068
			(0.026)			(0.03)***			(0.029)***			(0.031)**
Agricultural science	0.083	0.01	0.073	0.071	0.05	0.021	0.056	0.013	0.043	0.119	0.061	0.058
			(0.018)***			(0.022)			(0.015)***			(0.026)**
Business	0.11	0.105	0.005	0.247	0.165	0.082	0.101	0.063	0.038	0.175	0.119	0.056
			(0.031)			(0.037)**			(0.024)			(0.033)*
Technical skills	0.007	0	0.007	0.029	0.044	-0.014	0	0.003	-0.003	0.087	0.052	0.036
			(0.005)			(0.018)			(0.004)			(0.023)
Home economics	0.172	0.065	0.108	0.006	0	0.006	0.197	0.091	0.105	0.025	0	0.025
			(0.03)***			(0.004)			(0.03)***			(0.009)***
Visual arts	0.007	0.01	-0.003	0.106	0.037	0.068	0	0.008	-0.008	0.113	0.049	0.064
			(0.010)			(0.023)***			(0.007)			(0.024)***
Science	0.041	0.003	0.038	0.041	0.047	-0.006	0.017	0	0.017	0.019	0.009	0.01
			(0.013)***			(0.020)			(0.007)**			(0.011)
General arts	0.366	0.299	0.066	0.435	0.249	0.186	0.399	0.23	0.169	0.375	0.255	0.12

			(0.047)			(0.043)***			(0.04)***			(0.044)***
If ever enrolled: Enrolled in	0.360	0.497	-0.137	0.321	0.489	-0.169	0.409	0.455	-0.046	0.469	0.456	0.014
track other than admission track			0.062)**			(0.052)***			(0.058)			(0.056)

Note: See Table F2 notes[a] Refers to students who started SHS later (primarily control students who enrolled a year later)

Table F5: Impact on general intelligence and cognitive skills

	Female			Male		
	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Scores on general intelligence tests						
Memory for digit span (forward)	7.35	7.378	-0.028	7.764	7.715	0.048
	(2.587)	(2.599)	(0.175)	(2.606)	(2.515)	(0.172)
Memory for digit span (backward)	4.402	4.373	0.029	4.9	4.718	0.182
	(1.835)	(1.677)	(0.117)	(1.918)	(1.872)	(0.128)
Raven's Progressive Matrices	6.52	6.555	-0.035	7.403	7.364	0.039
	(2.512)	(2.589)	(0.173)	(2.427)	(2.572)	(0.171)
Panel B. Performance on reading and maths skills test[a]						
Reading skills						
Respondent's reaction when asked to read paragraph						
Yes, able to read	0.885	0.851	0.034	0.939	0.902	0.038
			(0.023)			(0.019)**
No, refuses to read	0	0.021	-0.021	0.012	0.014	-0.002
			(0.008)***			(0.008)
No, cannot read	0.109	0.103	0.005	0.042	0.069	-0.027
			(0.021)			(0.016)*
No, refuses (other reason)	0.006	0.022	-0.016	0.006	0.015	-0.009
			(0.009)*			(0.007)
Reading comprehension questions (all 0s if respondent did not read)						
Basic comprehension	0.717	0.686	0.032	0.83	0.771	0.06

			(0.031)			(0.027)**
Fact identification	0.748	0.718	0.03	0.815	0.763	0.052
			(0.030)			(0.028)*
Intermediate comprehension	0.14	0.117	0.023	0.115	0.139	-0.024
			(0.022)			(0.023)
Advanced comprehension	0.394	0.35	0.045	0.367	0.317	0.05
			(0.033)			(0.032)
Reading ability level (gauged by enumerator, if respondent agreed to read)						
Can read entirety with difficulty	0.381	0.431	-0.05	0.304	0.32	-0.015
			(0.036)			(0.033)
Can read well	0.432	0.352	0.08	0.521	0.462	0.059
			(0.035)**			(0.035)*
Can read very well	0.147	0.164	-0.016	0.149	0.18	-0.032
			(0.027)			(0.026)
Maths skills						
Basic computation 1	0.947	0.907	0.04	0.924	0.932	-0.008
			(0.018)**			(0.017)
Basic computation 2	0.947	0.948	-0.001	0.933	0.938	-0.005
			(0.015)			(0.016)
Basic calculator computation	0.759	0.726	0.033	0.827	0.829	-0.002
			(0.030)			(0.026)
Numeracy	0.829	0.805	0.024	0.927	0.897	0.031
			(0.026)			(0.020)
Profit calculation (easy)	0.645	0.621	0.024	0.673	0.68	-0.007
			(0.033)			(0.032)
Profit calculation (difficult)	0.153	0.106	0.047	0.176	0.195	-0.019
			(0.022)**			(0.026)
Interpreting bar chart						
Identifying mode	0.922	0.886	0.036	0.964	0.928	0.036
			(0.021)*			(0.016)**
Calculating sums (without help)	0.14	0.136	0.004	0.191	0.2	-0.009
			(0.023)			(0.027)
Calculating sums (with explanation)	0.673	0.649	0.024	0.748	0.734	0.014
			(0.035)			(0.033)

Calculating percentage	0.19	0.149	0.041	0.3	0.235	0.065
			(0.025)			(0.029)**
Applied maths skills: exchange rate calculation	0.467	0.384	0.083	0.633	0.572	
			(0.033)**			(0.033)*
Total standardised score on reading and maths skills	0.021	-0.172	0.193	0.308	0.181	
	0.126					
	(1.058)	(1.022)	(0.07)***	(0.912)	(0.944)	(0.063)**

Note: Data from 2013 follow-up survey.
See Table F2 notes.
We show the standard deviation in parentheses for non-binary variables in columns 1,2, 4 and 5.
[a]Each variable in Panel B is a dummy equal to 1 if the respondent correctly answered the question gauging the corresponding skill.

Table F6: Reproductive health, partners and fertility

	Female			Male		
	Treatment mean (SD)	Control mean (SD)	Difference (SE)	Treatment mean (SD)	Control mean (SD)	Difference (SE)
	(1)	(2)	(3)	(4)	(5)	(6)
Reproductive health						
Ever had sex	0.861	0.845	0.016	0.618	0.686	-0.067
			(0.024)			(0.032)**
Ever had relationship with partner >20 years older	0.093	0.127	-0.034	0.036	0.032	0.004
			(0.022)			(0.012)
Ever had relationship only for gifts or money	0.313	0.284	0.029	0.103	0.111	-0.008
			(0.031)			(0.021)
Ever had sex with commercial sex worker	N/A	N/A	N/A	0.006	0.019	-0.013
						(0.008)
If ever had sex:						
Age when first had sex	18.079	18.112	-0.033	18.598	18.555	0.043
	(1.562)	(1.756)	(0.124)	(2.561)	(2.230)	(0.198)

Number of sexual partners (last six months)	0.629	0.708	-0.078	0.632	0.688	-0.055
	(0.540)	(0.506)	(0.038)**	(0.817)	(0.949)	(0.077)
Number of sexual partners (lifetime)	1.777	2.07	-0.293	2.201	2.554	-0.353
	(0.980)	(2.811)	(0.174)*	(2.397)	(2.828)	(0.228)
Contraception use (last time had sex)	0.647	0.607	0.041	0.819	0.706	0.113
			(0.036)			(0.037)***
Ever used contraception	0.781	0.764	0.017	0.853	0.789	0.064
			(0.031)			(0.033)*
Partners						
Currently living with partner (married or cohabiting)	0.115	0.139	-0.024	0.018	0.045	-0.027
			(0.023)			(0.013)**
Ever lived with partner (married or cohabiting)	0.17	0.204	-0.034	0.03	0.06	-0.03
			(0.027)			(0.015)**
Fertility						
Ever pregnant	0.384	0.455	-0.071	0.07	0.088	-0.018
			(0.033)**			(0.019)
Ever had unwanted pregnancy (full sample)	0.324	0.39	-0.066	0.061	0.076	-0.015
			(0.033)**			(0.017)

Note: Data from 2013 follow-up survey.
See Table F2 notes.
We show the standard deviation in parentheses for non-binary variables in columns 1,2, 4 and 5.

Table F7: Current activity and future plans

	Female			Male		
	Treatment	Control	Difference	Treatment	Control	Difference
	mean	mean	(SE)	mean	mean	(SE)
	(1)	(2)	(3)	(4)	(5)	(6)
Current activity or occupation						
Enrolled in formal study or training	0.074	0.144	-0.069	0.064	0.177	-0.113
			(0.022)***			(0.023)***
Apprentice	0.065	0.139	-0.074	0.052	0.109	-0.058
			(0.021)***			(0.019)***
Wage employee	0.235	0.135	0.100	0.298	0.242	0.056
			(0.025)***			(0.03)*
Day or seasonal labourer	0.012	0.024	-0.011	0.097	0.069	0.028
			(0.009)			(0.018)
Farming	0.068	0.074	-0.006	0.07	0.077	-0.007
			(0.018)			(0.018)
Working for own or family business	0.211	0.157	0.053	0.119	0.109	0.009
			(0.026)**			(0.021)
Doing nothing	0.331	0.320	0.011	0.289	0.200	0.088
			(0.032)			(0.028)***
Tertiary education and future plans						
Enrolled in tertiary institution	0.006	0.004	0.002	0.003	0.002	0.001
			(0.005)			(0.003)
Plans to continue to tertiary institution	0.622	0.361	0.261	0.712	0.496	0.216
			(0.033)***			(0.033)***
Type of tertiary institution plan to enrol in:						
Polytechnic	0.009	0.021	-0.011	0.085	0.063	0.022
			(0.009)			(0.017)
University (public)	0.062	0.055	0.007	0.188	0.181	0.007
			(0.016)			(0.026)
University (private)	0.006	0.001	0.005	0.012	0.002	0.011
			(0.004)			(0.005)**
Nurses' training	0.307	0.186	0.121	0.091	0.058	0.033

			(0.028)***			(0.017)*
Teachers' training	0.176	0.074	0.103	0.248	0.143	0.106
			(0.021)***			(0.026)***
Government job training (police, military)	0.053	0.019	0.033	0.064	0.034	0.030
			(0.011)***			(0.014)**

Note: See Table F2 notes.

Table F8: Labour market and wage expectations

	Female			Male		
	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)
	(1)	(2)	(3)	(4)	(5)	(6)
Labour supply behaviour						
Minimum daily wage required to accept full day of employment (at time of survey)	8.797 (11.498)	8.009 (9.137)	0.788 (0.676)	10.139 (11.015)	11.962 (13.832	-1.822 (0.876)**
At above minimum wage, would you accept job that…						
Requires you to move away from family?	0.854	0.854	0.001 (0.024)	0.9	0.887	0.013 (0.021)
Is labour intensive (not intellectual)?	0.563	0.556	0.007 (0.034)	0.712	0.728	-0.016 (0.030)
Likelihood (out of 10) of wage employment for average 30-year old, if:						
He or she completed JHS	4.435	4.284	0.15 (0.135)	4.301	4.465	-0.164 (0.137)
He or she completed JHS and vocational training	6.705	6.843	-0.138 (0.143)	6.827	6.826	0.001 (0.139)
He or she completed SHS	7.353	7.219	0.134 (0.130)	7.367	7.248	0.119 (0.127)
He or she went to university	8.656	8.784	-0.128 (0.117)	8.764	8.727	0.036 (0.108)
Most likely wage for average 30-year old, if:						

He or she completed JHS	10	104	-2.177	125	133	-7.921
	(75)	(87)	(5.656)	(95)	(97)	(6.489)
He or she completed JHS and vocational training	16	176	-8.761	209	218	-8.825
	(116)	(119)	(8.010)	(137)	(163)	(10.468)
He or she completed SHS	22	230	-6.271	261	276	-14.723
	(149)	(157)	(10.454)	(169)	(190)	(12.373)
He or she obtained tertiary degree	78	791	-7.121	850	865	-15.227
	(509)	(660)	(41.733)	(561)	(638)	(41.436)
Current monthly wage earnings of 30-year olds in occupation that respondent sees himself or herself doing at age 30						
Minimum wage	58	559	22.952	977	773	204.433
	(543)	(660)	(42.501)	(1827)	(789)	(84.143)**
Maximum wage	1106	993	112.774	2025	1523	501.753
	(1287)	(1013)	(75.411)	(4514)	(2321)	(219.177)**
Most likely wage	81	752	63.444	1354	1115	239.041
	(915)	(791)	(56.635)	(2503)	(1751)	(138.21)*
Expectations for own (or future) children						
Minimum level of education for daughter is tertiary	0.827	0.781	0.045	0.745	0.769	-0.023
			(0.027)*			(0.029)
Minimum level of education for son is tertiary	0.8	0.832	0.038	0.815	0.838	-0.023
			(0.025)			(0.025)
Different expectations for son and daughter	0.155	0.131	0.023	0.179	0.164	0.015
			(0.023)			(0.025)
Greater minimum education expectations for daughter	0.028	0.012	0.016	0.036	0.026	0.01
			(0.009)*			(0.011)
Greater minimum education expectations for son	0.127	0.12	0.007	0.142	0.137	0.005
			(0.022)			(0.023)

Note: Data from 2013 follow-up survey.
See Table F2 notes.
We show the standard deviation in parentheses for non-binary variables in columns 1, 2, 4 and 5.
All monetary values in cedis (GHC). Exchange rate at the time of the survey approximately US$0.5=GHC1.

Table F9: Course admitted at application

	All		Female		Male	
	Mean	*N*	Mean	*N*	Mean	*N*
	(1)	(2)	(1)	(2)	(1)	(2)
Agricultural science	0.113	2047	0.081	1032	0.145	1015
	(0.316)		(0.274)		(0.352)	
Business	0.199	2047	0.159	1032	0.239	1015
	(0.399)		(0.366)		(0.427)	
Technical skills	0.059	2047	0.013	1032	0.106	1015
	(0.236)		(0.112)		(0.309)	
Home economics	0.15	2047	0.28	1032	0.019	1015
	(0.358)		(0.449)		(0.136)	
Visual arts	0.354	2047	0.364	1032	0.344	1015
	(0.478)		(0.481)		(0.475)	
Science	0.038	2047	0.029	1032	0.046	1015
	(0.190)		(0.168)		(0.210)	
General arts	0.051	2047	0.027	1032	0.075	1015
	(0.220)		(0.163)		(0.263)	

Note: Data from baseline survey.

Table F10: Indices for beliefs, values and politics

		Female			Male			All
	Number of questions	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)	T-C Difference (SE)
		(8)	(10)	(12)	(13)	(15)	(17)	(7)
Media engagement (radio, newspaper, TV, internet)	5	-0.079	-0.154	0.075	0.213	0.161	0.052	0.068
		(0.527)	(0.473)	(0.033)**	(0.610)	(0.606)	(0.041)	(0.027)**
Political knowledge test total score (standardised)	14	-0.319	-0.381	0.062	0.495	0.397	0.098	0.092
		(0.878)	(0.873)	(0.059)	(0.906)	(0.970)	(0.064)	(0.047)*
National political knowledge standardised score	7	-0.124	-0.239	0.116	0.313	0.25	0.064	0.097
		(0.952)	(0.948)	(0.064)*	(0.951)	(0.993)	(0.066)	(0.047)**
International political knowledge standardised score	7	-0.404	-0.402	-0.003	0.52	0.419	0.102	0.063
		(0.834)	(0.839)	(0.057)	(0.900)	(0.983)	(0.065)	(0.048)
Democratic values	11	-0.034	-0.019	-0.016	0.069	0.018	0.051	0.018
		(0.363)	(0.362)	(0.024)	(0.394)	(0.393)	(0.027)*	(0.018)
Religiosity	4	-0.089	-0.07	-0.019	0	0.073	-0.073	-0.044
		(0.699)	(0.680)	(0.046)	(0.666)	(0.648)	(0.044)*	(0.032)
Women's empowerment	6	0.051	0.067	-0.016	-0.044	-0.07	0.026	0.003
		(0.464)	(0.466)	(0.031)	(0.476)	(0.452)	(0.031)	(0.022)
Trusting people of other ethnicities or religion	2	0.11	-0.049	0.159	0.052	0.051	0.001	0.081
		(0.792)	(0.865)	(0.057)***	(0.806)	(0.840)	(0.056)	(0.04)**
Trusting in general	4	0.114	-0.047	0.161	0.066	0.05	0.017	0.09
		(0.699)	(0.767)	(0.05)***	(0.743)	(0.763)	(0.051)	(0.036)**
Importance of ethnic identity	3	0.022	-0.043	0.065	0.039	0.046	-0.008	0.03
		(0.607)	(0.591)	(0.040)	(0.658)	(0.649)	(0.044)	(0.030)
Attitude towards culture	6	0.005	-0.011	0.016	0.042	0.012	0.03	0.023
		(0.374)	(0.364)	(0.025)	(0.390)	(0.395)	(0.027)	(0.018)

Note: The dependent variables are indices over groups of questions as laid out in the survey instrument. All indices are scaled so that a higher value corresponds to more modernist views. Column 2 indicates the number of questions in each index.

Table F11: Civic engagement

	Female			Male		
	Treatment mean	Control mean	Difference (SE)	Treatment mean	Control mean	Difference (SE)
	(8)	(10)	(12)	(13)	(15)	(17)
Contributed to help with any public facility or communal labour in the past year	0.46	0.434	0.026	0.541	0.535	0.006
	(0.499)	(0.496)	(0.034)	(0.499)	(0.499)	(0.034)
Number of days contributed to helping with a public facility or doing communal labour in the past year	2.15	2.039	0.111	3.149	3.042	0.106
	(4.524)	(4.585)	(0.310)	(5.999)	(5.805)	(0.401)
Registered to vote during the 2012 national elections	0.978	0.969	0.009	0.973	0.965	0.008
	(0.146)	(0.173)	(0.011)	(0.163)	(0.185)	(0.012)
Has valid voting card and shows it	0.712	0.696	0.016	0.718	0.674	0.044
	(0.453)	(0.460)	(0.031)	(0.451)	(0.469)	(0.031)
Has valid voting card but does not show it	0.266	0.27	-0.004	0.255	0.286	-0.032
	(0.443)	(0.444)	(0.030)	(0.436)	(0.452)	(0.030)
Does not have valid voting card	0.022	0.034	-0.012	0.027	0.04	-0.013
	(0.146)	(0.181)	(0.012)	(0.163)	(0.196)	(0.013)
Has valid voting card	0.978	0.966	0.012	0.973	0.96	0.013
	(0.146)	(0.181)	(0.012)	(0.163)	(0.196)	(0.013)
Voted in the last national elections	0.798	0.817	-0.019	0.824	0.858	-0.034
	(0.402)	(0.387)	(0.027)	(0.381)	(0.349)	(0.024)
Eligible to vote in the last district assembly elections	0.455	0.467	-0.012	0.452	0.463	-0.012
	(0.499)	(0.499)	(0.034)	(0.498)	(0.499)	(0.034)
*Voted in the last district assembly elections****	0.527	0.574	-0.047	0.678	0.632	0.045
	(0.501)	(0.495)	(0.049)	(0.469)	(0.483)	(0.048)

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